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DIGITAL SCHOLARSHIP AND DIGITAL STUDIES



The State of the Discipline

Matthew Kirschenbaum and Sarah Werner

I

In dialogue with her epistolary interlocutors in *Three Guineas* (1938), Virginia Woolf sketched the current landscape for bookmaking and bookselling from the perspective of an author and small press: “Still, Madam, the private printing press is an actual fact, and not beyond the reach of a moderate income. Typewriters and duplicators are actual facts and even cheaper. By using these cheap and so far unforbidden instruments you can at once rid yourself of the pressure of boards, policies, and editors.”¹ The passage is striking, not only for the uncompromising pragmatism of “actual facts” but for how deeply it resonates with our own situation, complete with questions of access to technologies of both authorship and publication and the uncertainties of a still-shifting legal landscape. Today not only are word processors and e-books actual facts, so too are mass digitization projects and new forms of analytics ranging from so-called data mining and distant reading to visualization, geographic information systems (GIS), and advanced image processing techniques. Book history, as both a scholarly discipline and an intellectual community, now shares the world with the actual facts of these things.

Nor is this an especially new development, save perhaps for some technical particulars. Those who remember the first wave of academic enthusiasm for hypertext, cybertext, electronic textuality, and virtual-everything will also recall the unabashed enthusiasm with which glossy books with primary colored covers celebrated the coming of the empowered reader, the decentered author, non-linear narrative (seemingly paradoxically held together by “links”), and the equally paradoxical end of closure. These texts were laced with techno-neologisms or else imports from Continental theory: thus “hypertext” was deemed “writerly” after Roland Barthes, whereas the

poor, staid pages of the conventional codex were condemned to be merely readerly. Readers themselves, meanwhile, clicked through “lexias” which populated hypertexts (or hypermedia), engaging “transversal functions” to navigate the “contours” of “textons” rendered on-screen in “flickering signifiers” dubbed “scriptons.” In journalism and the popular media, meditations on the death of the book were the order of the day. The Gutenberg Galaxy was preemptively mourned by the *Gutenberg Elegies*, while *Wired Magazine* served up a monthly dose of McLuhanesque folk wisdom coupled with edgy, pixelated layouts that emblemized a new aesthetic that was equal parts MTV and William Gibson. Text was reimagined as image, whether the suddenly ubiquitous banner ads on first-generation Web sites or the Photoshopped excesses of *Wired’s* many imitators. Critics from Neil Postman to Michael Joyce reframed the age-old *paragone* between word and image as a new battle of the books: “Hurry up please, it’s time,” Joyce wrote in 1991. “We are in the late age of print; the time of the book has passed. The book is an obscure pleasure like the opera or cigarettes. The book is dead, long live the book.”²

Today, more than twenty years further on, we are perhaps in the late age of print still, even as books themselves are undeniably still being printed—indeed never more conspicuously so, as they are fabricated on the spot and “on demand” by large purpose-built machines installed in the showrooms of venerable booksellers like Politics and Prose in Washington, D.C., or the Harvard Book Store. That most modest word “text” has rather immodestly become a verb. The future of the Web turns out to be *not* immersive virtual reality—from the early Virtual Reality Modeling Language to *Second Life*, efforts to terraform the Web in three dimensions have achieved at best niche success—but rather social media. Our avatars are not the animatronic phantasmagoria projected by science fiction writers like Neal Stephenson but rather mere thumbnail images, most often “selfies” captured with ubiquitous digital camera technology; our online activities consist less of the cyberpunk exploits of Gibson, Stephenson, or Bruce Sterling than considerably more mundane interactions: the aforementioned texting, as well as “posting,” “sharing,” “liking,” and, yes, “tweeting.” Nonetheless, if the social media landscape lacks the glam escapism of techno-color science fiction, it is no less dangerous and sometimes malevolent a place, all the more so because the barriers between the “virtual” and the material are becoming ever more permeable—what Steven E. Jones, after Gibson, has compellingly framed as the “eversion” of cyberspace, its eruption into the material world.³ Whether a teen suicide as a result of cyber-bullying on Facebook or

sinister revelations about government surveillance, the Web today is considerably more perilous a place than mere LOLcats and Likes might let on.

It is also overtly textualized, governed now by what Kirschenbaum has previously termed a .txtual condition (after Jerome McGann's influential idea of the textual condition).⁴ Hypertext persists, but it has become normalized, absorbed into the most basic fabric of our daily routines, and governed neither by the readerly nor the writerly but rather by pitiless regimes of clicks, hits, eyeballs, and analytics. Innovative electronic fiction still exists, some might even say has flourished (witness Emily Short and Liza Daly's remarkable *First Draft of the Revolution* or the even more recent *Device 6*, a sophisticated piece of fiction wrapped in a series of ludic puzzles developed as an app for the iPad⁵), even if we are no longer buying the equivalent of small press titles on diskette. But the bookselling industry as a whole has been utterly transformed by the still unsettled cohabitation of print and e-books, even as massive swaths of the cultural record are digitized by Google Books, the Internet Archive, and an array of smaller initiatives. Readers will know that 2011 was the year that Amazon.com reported that e-book sales in its popular Kindle format had exceeded their sales of printed books.⁶ This, then, in broad strokes, is the media ecology in which contemporary authorship, book publishing, and reading now finds itself, a text-centric world that is categorized by new forms of short-form interaction, new economic models, new metrics of visibility and reputation, and new forms of viral dissemination, as well as a polyglot riot of devices, platforms, systems, and services, most of them held tenuously together in something known vaporously only as "the cloud."

Book history, however, must keep its feet on the ground: narratives of inevitability are as uninteresting as they are unnecessary. The "digital" pedigree that is the ostensible unifying principle for this essay therefore reflects not so much the accidents of medium—the supposed reduction of all knowledge to a lingua franca of ones and zeroes—but rather a series of material interventions in established systems of reading, writing, and publication, interventions that take shape and define themselves in relation to the affordances of other, more familiar media, the printed page not least among them. The kind of scholarship we are interested in here, whether theoretical or applied, does not posit a transcendental "digital" that somehow stands outside the historical and material legacies of other artifacts and phenomena; rather, the scholarship we favor understands the digital as a frankly messy complex of extensions and extrusions of prior media and technologies. Rather than speaking in a speculative or deterministic mode, we have

focused on the particular, grounding our review on what specific projects are now doing and what is happening in the real, decidedly non-virtual world of books today.

We have also chosen to focus our remarks on those areas where we feel we might have some authority to discern overall trends and developments, as well as where we can articulate a message we want to bring to this journal's readership. For Werner (section II), this is the relevance of digital tools and methods to diverse areas of book history and the study of books as physical objects, whether or not individual scholars may elect to identify as "digital humanists"; for Kirschenbaum (sections III and IV), it concerns the transformations underway in nearly every aspect of contemporary authorship, reading, and bookselling, and their implications for those scholars who seek to approach the study of printed books from the 1980s to the present. Both of us see the value in digital tools and in theories of the digital for complicating and reconfiguring our notions of textual "materiality" and dissemination.

Our coverage is not comprehensive, and the omission of a specific project or work should not be construed as a comment on its significance or interest; but it is not merely coincidental that in looking at these new fields, much of the scholarship we cite exists in the full range of options for scholarly publishing, from print collections to electronic editions, blog posts, and digital databases. We have made no attempt to cover technical developments in the delivery of electronic content, especially not data standards like XML or EPUB, or the particulars of device technology like electrophoretic ink or retina displays. We have largely eschewed the fascinating field of book futurism, as manifested by journalists and critics such as Tim Carmody and Matthew Battles, and organizations such as Bob Stein's Institute for the Future of the Book.⁷ Nor have we covered the public debates about the status of "reading" in contemporary society, as focalized by the media attention around the several reports on the subject from the National Endowment for the Arts.⁸ Likewise, we have given only very passing consideration to copyright, legal matters, and the court cases being waged over Google and others' mass digitization and scanning efforts.⁹ We have also made no attempt to cover the ins and outs of the debates and discussions that have accompanied the sudden and seemingly ubiquitous arrival of "digital humanities" as the term of choice for digital scholarship.¹⁰ Finally, our perspective is unavoidably parochial in that it is limited primarily to work not only in English but indeed originating in Anglophone nations. We hope whatever usefulness attends the survey that follows might help offset that last short-

coming in particular. In keeping with the style of previous “State of the Discipline” essays we have given the publication information for the many works we discuss inline in the text; these are not typically duplicated as citations in our notes. We have provided a list of resources at the end, which will be useful as a starting place for those seeking a hands-on introduction to the projects and resources we discuss.

II

There is sometimes a reluctance among book historians to see the world of digital humanities as relevant and helpful to our work. We are, after all, a group who works intensely with material texts, books in hand, seated in special collections of rare materials. Perhaps more than most other scholars, we are aware of the immediacy and circulation of texts as physical objects. Yet much of the digital work that seems to get the most attention in the press and grant world at the moment involves distant reading—using computers to analyze large corpora, looking for patterns of usage and other signals that are not readily visible through reading one book at a time. In the right hands, distant reading can reveal new insights into the development and deployment of linguistics and rhetoric and genre, the impact of cultural forces, and the patterns of literary influence. (In the wrong hands, it fails to do any of these things.) This big data trend in the humanities is not one that has spoken to book historians. It has been the tool of literary and linguistic scholars, something prized by researchers interested in text, rather than textual production.

But ignoring what digital tools can offer the study of book history cuts us off from opportunities to further develop our knowledge of how books are made and used. Not only do we need to learn what tools to take advantage of, the rest of the scholarly and public world needs our insights as part of the conversation, especially as the means by which information circulates today continues to shift in response to the technological and societal shifts around us. This approach should not be a big change for book historians. The desire to catalog and to count and to sort means that book historians have been long involved in digital humanities, whether it has been called by that name or no.

In the field of early modern English literature, this desire to collect information has produced the forerunners of many of the tools that we use today. *The Catalogue of Printed Books in the Library of the British Museum*, a

decidedly non-digital project, led to Pollard and Redgrave's *A Short-title Catalogue*, which in turn is the forerunner to the decidedly digital *English Short Title Catalogue* now hosted as an open-access resource at the British Library (we will return to the implications of this trajectory later in this section).¹¹ The ESTC is not the only catalog that book historians rely heavily on, of course, but it is a convenient stand-in for the ways in which the tools we take for granted are—whether despite or precisely *because* of their long histories—digital resources. And because they are digital resources, the information in them is available to explore and manipulate in ways that can reveal larger patterns of production and circulation. The ESTC records works printed between 1473 and 1800 in English and in the British Isles and North America; it includes information not only on author, title (typically including uniform and variant titles when pertinent), date, and imprint, but also often on format, page length, genre, subject, and current institutional holdings. With access to the full MARC data in this and similar catalogs, one has access to many of the pertinent elements of the first centuries of book printing and the ability to sort, refine, and analyze its contours.

The Atlas of Early Printing uses the data in the *Incunabula Short Title Catalogue* (another freely accessible database at the British Library with origins in print catalogs) to map out the locations of presses and their dates of operation in the incunable period. The *Atlas* also has options to indicate the locations and dates of paper mills, book fairs, universities, and conflicts, thus handily making visible the relationships between cultural and economic forces in the early days of print. (The *Atlas* also provides some background essays on early printing and books and an animated printing press, in addition to a carefully detailed explanation of where their data is from.) The *Atlas* looks at the creation of incunabula; it is also possible to use this data to look at their subsequent histories. Mitch Fraas uses the *Gesamtkatalog der Wiegendrucke* (first printed in 1925 and now available as an online database through the Staatsbibliothek zu Berlin) to look at the distribution of incunabula in institutional holdings today.¹² (The GW provides better geospatial information to work from, Fraas explains; your visualization is only as good as your data is.) While generally the map of output coincides with current holdings in Europe, there are some gaps—Fraas notes them in the Adriatic and the region south of the Baltic sea and east of Berlin—that suggests some disruption in institutional histories. The *Atlas* does not necessarily show us anything we do not already know as book historians, although it is valuable for showing us that information in a manner that makes it clearly understandable to those who are not. And while Fraas's ex-

ploration of incunabula distribution is merely the start of delving into that data, his mapping highlights how questions about institutional histories and resources are an important aspect of studying rare books today.¹³

There are numerous other mapping projects, especially for the hand-press period, including *The French Book Trade in Enlightenment Europe, 1769–1794: Mapping the Trade of the Société Typographique de Neuchâtel*, *The Atlas of the Rhode Island Book Trade in the Eighteenth Century*, and, although still in its early days, *Mapping Colonial Americas Publishing Project*. Indeed, a number of the projects highlighted at SHARP's 2013 digital showcase were mapping-related.¹⁴ Mapping, you might be thinking to yourself, is not a particularly new activity for book historians, and you would be right. We have been producing maps of the book trade for as long as we have been studying it. But that is the point: the technology and value of mapping is not foreign to book history, but of it.

Cataloging is also of book history, an information-parsing tool that we have been producing since there were first texts to be organized. With the easy manipulation that digital records allow, they can not only track texts and their locations, but help us discern other traits of production and reception. Ben Schmidt, for instance, has carefully considered whether or not we might be able to gain insight into the consumption and cultural history of genres of books by using Library of Congress classifications of books published in the mid-nineteenth century and their relative page length in order to examine whether history was read more often during revolutions.¹⁵ Schmidt has also been using LC classifications as a way of looking at the gender distribution of authors in library holdings of works published between 1800 and 1922, noting that, among other findings, the field of German history appears to be significantly more male-authored than other fields, while fiction unsurprisingly has the highest numbers of female authors.¹⁶ Meanwhile, scholars focused on the history of reading have taken advantage of database capabilities to create catalogs of readers: the *Reading Experience Database* (RED) is a multi-national collection of databases tracking evidence of reading left through a range of sources from 1450 to 1945, including marginalia, diaries, court records, and surveys. *What Middletown Read* reconfigures the detailed records of Muncie, Indiana's, public library to create a database of readers and reading materials between 1891 and 1902.

In most of these instances, what such projects are using are the metadata of books, turning their imprint and holdings information into network analysis. But what might digital tools offer scholars who are interested in textual history? Are there ways of mapping the interior of a book? Alan Galey has been experimenting with how to display textual variants and paratextual



Figure 1. Fraas's map of incunabula distribution in Europe. Screenshot by Werner.

movement across editions. As textual scholars have long noted, the instability of texts is a regular feature throughout textual transmission histories. Print editions have relied on a combination of commentary, parallel texts, and varying levels of complex notation to indicate variants. Digital editions have tended to rely on the same typographical features, albeit sometimes with hypertext functionality: one option might let you display the *Hamlet* second quarto variants only, another the folio variants. Galey's experimentation, however, plays with displaying instability itself, animating variants so that they switch back and forth without the user's input. As a method of exploring the effect of instability on textual circulation, digital tools offer options that paper does not. Animation enacts instability on the word level, but Galey has also experimented with how to visualize the instability of paratext by mapping its relative placement in and absence from textual sequencing. Tracking the levels of paratextual material in More's *Utopia*, to use his prototype example, helps us understand the nuances of its circulation and reception: the Humanist circle through which More carefully deployed his text shows up in the multiple combination of commendations published in its first four editions. (If you want to read through that paratextual material, visit *The Open Utopia*, which includes all letters found in the 1516–1518 editions, albeit not in an order that reflects any one of those printings, and which strives to provide an interface for open, social commentary on the text.)

The same mapping can be done for the levels of commentary in variorum editions, in which centuries of notes accrue in differing densities to texts. Now that increasing numbers of digital editions are being created in increasing levels of complexity—the Modern Language Association's push to release its New Variorum Shakespeare editions in XML comes to mind, as does the Folger Shakespeare Library's TEI-encoded digital texts of Shakespeare's plays—the opportunities for textual scholars to develop new tools for displaying and analyzing textual histories are rich. Galey's prototype focuses on highlighting patterns of emendations over the centuries; in response to the MLA's invitation to create projects based on its *Comedy of Errors* edition, Patrick Murray-John used their data to view the variorum commentary as a community of scholarly conversations in his *Bill-Crit-O-Matic*. The potential of electronic editions to allow social annotations not only has the possibility of expanding the knowledge pool that scholarship can draw from, it replicates the interpretive methodologies of earlier periods. *Annotated Books Online* is a digital archive of early modern annotated books that provides high-quality digital images of the books as well as tran-

scriptions and translations of their marginalia and that invites users to contribute their own transcriptions, thereby annotating the annotations. The *Implementing New Knowledge Environments* (INKE) project is, in their own words, “an interdisciplinary initiative spawned in the methodological commons of the digital humanities that seeks to understand the future of reading through reading’s past and to explore the future of the book from the perspective of its history.” One recent INKE project, the *Social Edition of the Devonshire Manuscript*, takes a sixteenth-century manuscript miscellany and turns it into a Wikibook edition, aiming to replicate in digital form the coterie circulation of early modern poems.

The circulation of texts within coteries and beyond them is another book history field that benefits from digital tools. *Infectious Texts: Viral Networks in 19th-Century Newspapers* uses algorithms to search large corpora of nineteenth-century newspapers in order to identify texts that have been reused in multiple papers. The team’s work so far has identified the most popular viral texts, suggesting that their popularity is due in part to their ability to participate in multiple contexts. More excitingly, they have used GIS software to map the print histories of these viral texts alongside transportation data, census reports, and other information in order to begin uncovering the physical and social networks that linked these viral texts. They have confirmed a correlation between the railroad and the spread of linked texts, but they have also uncovered relationships between newspapers that might not have been otherwise noticed. Their graphs revealed a close connection between the *Vermont Phoenix* (Brattleboro, Vermont) and the *Fremont Journal* (Fremont, Ohio) based on the frequency with which they reprinted texts; further investigation by the team showed that the newspapers’ editors were brothers-in-law.¹⁷ One of the participants in *Infectious Texts*, Ryan Cordell, has also produced research using similar techniques of mobilizing large-scale digitization to reveal the frameworks of social texts; looking at the early publication of Nathaniel Hawthorne’s “The Celestial Railroad,” Cordell recovered early printed witnesses of the story and paratexts that had not been part of the scholarly record.¹⁸

If the focus so far has been on ways in which digital tools are a natural home for the interests of book historians, it shifts here to argue that digital tools would benefit from the scrutiny of book historians. The *English Short Title Catalogue* (ESTC) is one example: the current version is a remarkable tool, but what do we learn from studying its history through different media incarnations? The biases embedded in the catalog’s initial creation become part of its current functionality. For instance, as Ian Gadd has been explor-

ing, the 1884 *Catalogue of Printed Books in Library of the British Museum Printed in England, Scotland, and Ireland, and of Books in English Printed Abroad to the Year 1640* used as its end-date the year 1640 because that was the terminal date used by Edward Arber in *A Transcript of the Registers of the Company of Stationers of London 1554–1640, A.D* (a date chosen not because of its significance but because after this point, in the wake of the Long Parliament, the Registers grew exponentially and working with them would have become significantly more complicated).¹⁹ That decision shaped the scope of A.W. Pollard and G.R. Redgrave's 1926 *A Short-title Catalogue of Books Printed in England, Scotland, & Ireland and of English Books Printed Abroad, 1475–1640* (STC), which catalogs extant books in major institutional holdings along the same criteria and incorporates information from Arber's *Transcript*. Works printed between 1641 and 1700 are part of a different catalog compiled in the mid-twentieth century—Donald Wing's *Short-title Catalogue of Books Printed in England, Scotland, Ireland, Wales, and British America, and of English Books Printed in Other Countries, 1641–1700* (Wing)—which, unlike the STC, does not incorporate information from the Stationers' Registers and which excludes periodicals and many ephemera. Works printed in the eighteenth century formed *The Eighteenth Century Short Title Catalogue*, which was published in the 1970s first on microfiche and later on CD-ROMs, and which was intended to be a union catalog of all known copies, again excluding periodicals and most ephemera. In the 1980s, these three catalogs were combined into the single *English Short Title Catalogue* and released first as CD-ROMs in the mid-1990s; in 2007, the ESTC was made available as an online, open-access resource hosted by the British Library.²⁰

Users of the ESTC today, therefore, are in fact consulting three separate catalogs, each following its own principles and scope.²¹ Someone who is not familiar with that history might wonder why periodicals suddenly disappeared in 1641, for instance, or why a catalog of English works includes many items printed in other languages. One small but telling detail is the way in which ETSC numbers are generated. STC and Wing numbers are ordered by author; put the numbers in order and the list of authors will also be in order. ESTC numbers, however, are determined in part by the location from which they were entered (a number starting with T was done at the British Library, for example) and are otherwise randomly generated. The earlier numbering system was shaped by the format by which users encountered the records: you needed to be able to turn through pages in a book to locate the item or the item number you were looking for. Under these

older systems, you could flip through pages to get to “Joceline, Elizabeth” to find the 1625 edition of her *A Mother’s Advice to her Unborn Child* or you could look up STC 14625 to discover what work the number corresponded to. (Wing numbers start with the first letter of the author’s last name and then proceed numerically.) But the ESTC was from its beginning conceived as a machine-readable catalog. There was no book that had to be flipped through in order to find an entry, but search fields. With locatability not being shaped by sequence but by searching, the primary purpose of ESTC numbers is durability: they provide a persistent identifier, not a key to discovery. Looking up S119882 brings you to the same Joceline edition (STC 14625), but the next edition is S124784 (STC 14625.5), followed by S1256 (STC 14625.7) and R19745 (Wing J756). S119883 leads to Nathaniel Wickins’s 1638 *Woodstreet-compters-plea, for its prisoner* (STC 25587); S119884 to Thomas Middleton’s 1609 *Sir Robert Sherley his Entertainment in Cracovia* (STC 17894). With ESTC cataloging being done in multiple locations simultaneously, random numbers make more sense than sequential ones. Both systems of citation numbers make sense according to their own needs, and if we were to look closely at the numbers without knowing their history, we might still be able to reconstruct the paths behind their creation. But without that vantage point, we miss the stories that ESTC has to tell us. A book historian’s perspective on the shaping principles and effects of this digital resource adds a much-needed lens on how its current incarnation operates.

The perspectives of book historians are also sorely needed on the large-scale digitization efforts underway at such places such as Google Books, the Internet Archive, HathiTrust, Gallica, and other institutions that are actively aiming to make print resources available as digital objects. Digitization projects are key to the history of digital humanities and to the work of book historians and textual scholars. Some of the earliest projects, like *The William Blake Archive*, which began in 1995 and continues on today, have helped us see the possibilities for online resources for bringing together disparate physical objects into a single virtual home. The *Shelley-Godwin Archive*, released in beta in November 2013, attests to the power of this kind of digital work. Combining high-resolution images of works held in multiple libraries with careful transcriptions and an interface that allows users to search and interact with the texts in a range of ways, these sites make possible a view into the production and dissemination of these important materials. More disparate digitization efforts can have the same effect. At last count, there were ten different freely accessible copies of Shakespeare’s

First Folio fully digitized by eight different institutions; although the quality of the images and the richness of the interfaces vary, it is nonetheless possible for a user to find and share variants as well as other copy-specific features.²² While it can be hard to track down digitized copies of works when they are held at different institutions, an omnibus site can also be misleading in its appearance of completeness. The newly opened *Emily Dickinson Archive* and the debate over its contents highlights some of those dangers: although the site presents itself as a source for viewing Dickinson's manuscripts, the materials online represent only a portion of the manuscripts available through its partner institutions. The controversy over how the site positions itself in relationship to already published editions of Dickinson's poems and which partner institutions have been given access to materials reflects not only the struggles for funding and publicity that all libraries face, but the long-standing battle over Dickinson's legacy and manuscripts fought first by her heirs and continued by the institutions holding the bulk of her papers.²³

Digitization has wonderful benefits for book historians: we can consult high-quality images of works from multiple locations at a single moment. But our ability to do that depends on the quality of the metadata attached to those digital objects. Finding digital copies of works can itself be a huge challenge. Anyone who has searched for something on Google Books knows how difficult it can be to know what you are looking at: multiple-volume works are recorded as separate objects without being linked together and works that exist in multiple editions (let alone multiple states) are often cataloged as different printings than what they are.²⁴ The records in HathiTrust's digital library are dramatically better (not surprising, since they are a partnership of academic and research institutions), while those in the Internet Archive are a mixed bag (depending on the quality of the information provided by the person who uploaded the item). *Eighteenth-Century Book Tracker*, run by Benjamin Pauley, strives to improve this situation by creating an index of openly accessible digital facsimiles of eighteenth-century texts linked to bibliographically reliable records. The site allows users to add texts but also provides a bookmarklet to help users navigate Google Books and Internet Archive by making it easier to identify accurate bibliographic information about the texts they hold. (Pauley is also part of the working group for ESTC 21, an effort to reimagine how the ESTC can be redesigned "as a 21st century research tool," including allowing for user input and better matching of ESTC records with digital resources.²⁵)

Of course, figuring out what you are looking at is only part of the challenge of working with digitized texts. Another is understanding the risks of

letting a copy stand in for an edition. Digitization projects often let the digitization of one book represent the entire print edition of that work. *Early English Books Online* (EEBO) claims that it “contains more than 125,000 titles” listed in STC, Wing, and the Thomason Tracts.²⁶ But what EEBO provides is access to digitized microfilms of copies of more than 125,000 titles. Especially in the hand-press period, with its proliferation of variant states, including stop-press changes and cancels, a copy is not necessarily representative of an edition. To choose but one example, the EEBO instance of the 1791 edition of the Earl of Rochester’s *Poems &c on several occasions* (R1756, to use its Wing number) is taken from the Huntington copy of the work, a copy that includes the cancellanda of leaves D3 and D7, rather than the cancels that were to replace them. (The later state of the *Poems* omits the last stanza of “Love to a Woman,” presumably out of the same prudishness about sexuality that was responsible for the cuts made throughout the collection.) There is nothing in EEBO’s record to indicate that this copy is anything other than a surrogate for the edition. But the textual history of Rochester’s poems is complicated enough without adding in confusion about states of editions.

The solution to this problem is not difficult: accurate and accessible metadata, so that we know what it is we are looking at and so that search engines can find it, would fix many of these problems. The problem of how digital objects can represent the materiality of textual objects is a more complicated one, and in many ways more interesting. At the moment, most digitizations focus on the value of the object as a text to be read. The text block is digitized, but not necessarily the endleaves or the binding (sometimes, as in *Eighteenth Century Collections Online*, even the blank pages inside the text block are omitted, presumably on a cost-saving theory that if a page does not have words on it, it surely does not have any meaning). And many images are of pages only, rather than openings, so that the text is further removed from the context and experience of reading it in a book. Digitizations of textual objects tend not to show the watermarks and chainlines of paper, the bite of type, the texture of parchment—the characteristics of an object that we observe as we handle it and that inform our knowledge of its making and its history.

Digital facsimiles appear to be flat, made up of pages without depth or relationship to other pages, part of a sequence that is made up of bits rather than bindings. But this is not because such flatness is inherent to digitization. It is because of the limited ways in which digitization has been put to work for us. We have allowed digital images of texts to be conceived

of as surrogates of those texts, rather than new objects with their own affordances. What might digitizations do other than show us pages of text? They might show us text that is not there. The work done with the *Great Parchment Book* exploits the potential of digitization to reshape the material object to our benefit. The *Great Parchment Book* is a survey compiled in 1639 of all those estates in Derry managed by the City of London through the Irish Society and the City of London livery companies. A fire in 1786 badly damaged the book, and the 165 surviving leaves remained unavailable to researchers for over 200 years. Through careful preservation, about 50% of the text was recovered, but the brittle, wrinkled parchment remained an intractable obstacle to further work. But a team at the University College London's Centre for Digital Humanities was, after detailed digital imaging, able to virtually un wrinkle the pages. About 90 percent of the text of the *Great Parchment Book* is now readable and available for examination online as images of the leaves, enhanced images, or a transcription of the text. The *Archimedes Palimpsest Project* has similarly disembodied a manuscript to make accessible text that would otherwise remain hidden, using multispectral imaging to recover two lost Archimedes treatises and other ancient texts that had been written over in the thirteenth century. The *Project* then released all of its data to the public and published the earlier state of the manuscript through Google Books, making available to read in digital form a text unreadable in its material manifestation.

Digitization also offers the opportunity to take objects apart so that we can study their components. The Bodleian's *Broadside Ballads Online* has not only been digitizing their large collection of sixteenth- through twentieth-century ballads, but has been experimenting with an image search tool that allows users to highlight an image—or a selection of an image—to search across the collection for other instances of its use. ImageMatch can, for example, trace the use of a woodcut image of a hat across multiple ballads; while tagging might allow one to search for “hats,” image searching allows one to look for a particular hat, even when the person depicted wearing it changes.²⁷ Rather than cutting out bits of a text, the Folger Shakespeare Library's *Impositor* strives to turn bound books back into printed sheets. Using the images and metadata produced by the Library as part of its digital image collection, Michael Poston created a tool that allows users to generate a facsimile of a printed sheet. You cannot disbind a book in order to rearrange its leaves into the format in which it would have been printed (unless the book has already been slated for conservation and the conservation team is willing to let you play with it), but digital pages can be rearranged in any order you like.

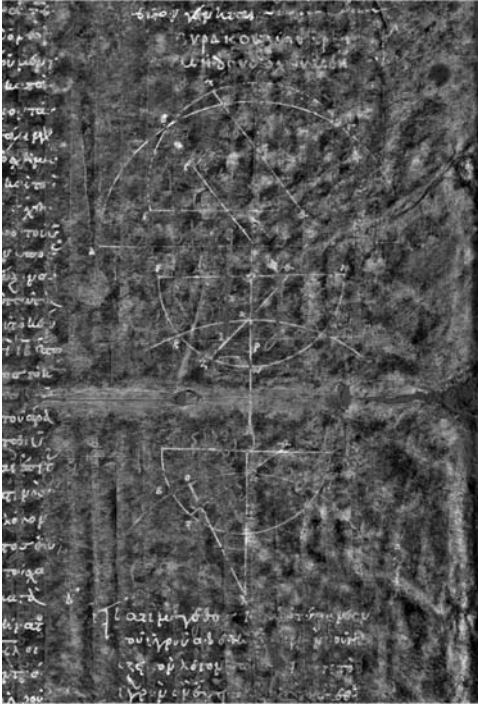


Figure 2. The first image of the recovered Archimedes Palimpsest, as seen in its Google Book incarnation. Screenshot by Werner.



Figure 3. An example of an Impositor-generated quarto imposition for *Titus Andronicus*. Screenshot by Werner.

Digital tools can help us see what is otherwise difficult to observe. Reflectance Transformation Imaging (RTI) has been used more often on archaeology and art objects than on textual objects, but it is a potentially rich tool for physical bibliography. Developed at Hewlett Packard Labs, RTI uses multiple digital photographs shot from a stationary position with varying angles of light; through an interactive RTI viewer, a user can manipulate the light source and qualities to create a detailed 3D imaging of an object's surface. With the cuneiform tablets that were used in the first exploration of the technology's potential, the relief in the RTI images revealed more clearly than photographs could the features of the tablets.²⁸ Subsequent projects have used RTI technology to explore Japanese woodblock prints, book bindings, and illuminated manuscripts.²⁹ Taking our cue from the work that Randall McLeod has done on the topographies of paper, looking at bearing type and other blind impressions, imagine what RTI could do for the study of books.³⁰

If we are going to let our imaginations run wild with what digital tools might offer the study of material books and book history, there are other suggestive paths forward. What might the distribution of dirt tell us about the usage of books? Kathryn Rudy uses densitometers to study medieval prayer books and identifies which pages were used the most often and how they were held; her research has also revealed some of the effects that cleaning treatments have had on the books' appearances today.³¹ Could smell tell us about something other than nostalgia for paper books over digital ones? Scientists have been analyzing the smell of paper and suggesting the use of odor analysis as a diagnostic tool for conservation purposes in nineteenth- and twentieth-century works, but anecdotal evidence suggests that earlier books might have different smells depending on where their paper was sized.³² Could sound help us understand books and textual scholarship? *Listen to Wikipedia* is a site that translates the edits made to Wikipedia into sound, producing the sonic equivalent of visualization that could help us grasp the nuances of variorum histories of editing.

As we hope is clear from these examples, book historians can do a lot with the digital tools that are available to us. But if we want tools that reflect the full range of work that we do as book historians, studying the social, economic, and material circulation and creation of texts, we will need to engage with the development of these resources. Even if we do not have the technical skills to create digital tools from scratch, we should understand them well enough to be able to recognize how these tools might shape our research and to participate in conversations with those who can build the tools we need.

III

Jonathan Franzen's *Freedom* was published on Tuesday, August 31, 2010. Many readers who had placed an advance order for the electronic edition of the novel woke that morning to find that the text had been wirelessly delivered to their Kindle (whether their account or an actual Kindle reader device) as they slept. *Freedom* was a widely anticipated book, even if not quite a publishing sensation on the order of, say, *Harry Potter and the Deathly Hallows* (see Ted Striphas's masterful coverage of the *Potter* franchise's marketing techniques and retail procedures).³³ It would seem uncontroversial to suggest that Franzen, National Book Award winner and Oprah enfant terrible, will be a subject of future inquiry by critics and historians of the novel and literary fiction. What will such persons wish to have available to them as prerequisites for scholarly inquiry? Merely a good, clean copy of the text? Even this might not prove completely unproblematic if one isn't careful, since the UK HarperCollins edition was subject to a recall (some 8,000 copies) when it was found to contain errors from an uncorrected proof of the text published by mistake.³⁴ But of course many will want much more than just a clean reading text. Depending on one's interests, we might well want as many editions and printings and translations as we can lay our hands on, including an exemplar of the corrupt UK release (Amazon lists no fewer than 45 formats and editions).

The Kindle release is just one of these, yet it presents a reader with a number of unique features. One can access the Popular Highlights function to see passages that other readers have singled out as significant. For example, we can know that 1,180 other readers have taken note of the fact that "She knew that you could love somebody more than anything and still not love the person all that much, if you were busy with other things."³⁵ The Amazon Kindle edition also includes "extras" like a plot summary, lists of characters and important places in the book, memorable quotes, errata, and recommendations for other books a reader might like if they like this one (this content is all drawn from something called "Shelfari," an "editable book encyclopedia"). The plot synopsis includes an option to toggle spoilers on and off. Clearly a future student of Franzen's *Freedom* would have some cause to wish to access this electronic incarnation along with a printed text, even if we assume the textual content, what McGann once termed the linguistic codes, to be the same.

But of course, there's more. In Amazon's online listing for the book, we find, as of this writing, 1,197 customer reviews, many of them in turn rated

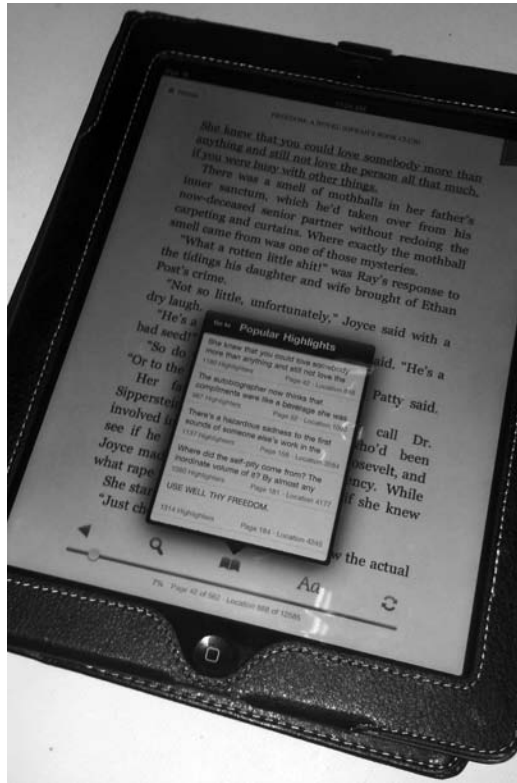


Figure 4. Page from Franzen’s *Freedom* as displayed in Kindle for iPad version 2.7 on an iPad 4 running IOS 6.1.3 in a leather carrying sleeve. The “Popular Highlights” tab is open, with a passage selected by some 1180 other readers marked with underlining at the top of the screen. Font has been enlarged to suit the owner’s preferences. Photo by Kirschenbaum.

and commented by other members of the Amazon community. We can see that the book’s current Sales Rank, again as of this writing, 13,945, though it was in Amazon’s Top 10 at the time of its publication. We can purchase the audio book, read by one David LeDoux; there is an exclusive fourteen-minute interview with Franzen for the Amazon Omnivoracious podcast; there is a discussion forum, with active threads. We can “look inside the book,” and, more intriguingly, perform, within the limits of fair use on copyrighted material, keyword searches to call up specific passages. And then there are the other obligatory ports of call. Franzen’s official page at his publisher, Farrar, Straus and Giroux; the Oprah Book Club site, a universe all its own with spiraling nebulae of supplemental material and vast

galaxies of discussion forums; dozens and dozens of videos on YouTube, capturing Franzen at readings, in interviews, even on the street. Unlike, say, Margaret Atwood or Alice Walker or William Gibson, Franzen himself, a strident social media refusenik, does not blog or tweet, though there have been several Franzen fakes on Twitter. Pirated copies of *Freedom*, meanwhile, were reported on the usual torrent sites no later than September 3. And all of this thus far relates only to the book's publication and reception. We have not yet said anything about the novel's composition, its editing, or production. Franzen himself, according to *Time* magazine, writes with a "heavy, obsolete Dell laptop from which he has scoured any trace of hearts and solitaire, down to the level of the operating system."³⁶ Where are the digital manuscripts? Will Franzen allow them to be accessioned by whatever institution eventually acquires his literary papers? Will the documents contain track changes and other algorithmically encoded versions and variants? What would forensic computing tell us about the expurgated fragments of files on the original hard disk? And what of the digital prepress materials at Farrar, Straus and Giroux? Franzen's email correspondence with agents, editors, publicists, and friends, and confidantes?

What does it mean, then, to study histories of authorship, publishing, and reading right now? What will future scholars have to account for as *different* with respect to today's books, even a mainstream piece of literary fiction, when it is released into the kind of networked media environment that characterizes our most mundane daily interactions, whether paying a bill or checking the forecast? What are the material realities of book-writing, bookmaking, and bookselling in the present moment? That is the question to which we turn in this latter part of our State of the Field essay. For in 2014, book history shades ineluctably into media history. Some might see a hopeless schism, or better, a punctuation mark for book studies, the point at which the book as physical object is subsumed by a much vaster media spectrum where it is at best a derivative object in a system of digitized production and vertically integrated transmedia content. Yet over the last ten years or so there has been a marked "material turn" in digital studies that, we will insist, more or less aligns with the material turn that brought about the study of books as historically situated and socially manufactured artifacts. A variety of scholars, theorists, and media arts practitioners now recognize that computers—by which we mean not only the tangible hardware, but also software and even the very algorithmic processes of computation—are material phenomena. How we move from the seemingly counterintuitive assertion that code, bits, symbolic logic, and signal processing are in fact

“material” has been the decisive maneuver in digital studies, largely defining the state of the field as it is conducted today. There is thus a marked contrast between current scholarship in digital studies and the early enthusiasms we limned at the beginning of this essay. Moreover, given the media ecology surveyed in our brief discussion of *Freedom*, the convergence between the materially-minded pursuits of book history and the agendas of contemporary digital studies opens the way for sophisticated studies of contemporary reading, writing, and publishing that are grounded in the individual circumstances of authoring technologies like word processing and beyond, as well as the bookseller’s marketplace, networks for electronic dissemination, and readerly histories that spill across the whole of the Web 2.0 landscape.

The materialist turn in digital studies is not a unified or prescribed movement, and practically speaking it has coalesced through several different sub-fields that we will survey below. There are, however, some broadly shared assumptions: the materialist turn assumes that computers and computational processes are material in nature, and thus subject to documentary and historical forms of understanding; it is technically rigorous and acknowledges the material particulars of media and computation as worthy of critical investigation; it understands the particular constraints of software, code, and platform as generative for studying the processes and products of digital culture; it cultivates and actively seeks to refine an archival record for digital culture; and it understands the activity of archiving itself in new and capacious ways, that include such techniques as crowd-sourcing, hacktivism, restoration and retro-computing, and citizen archivists. Of course none of the above are concerns or ideas that have manifested exclusively in just the last ten years, and certainly not only in the primarily Anglo-American contexts we will look at below. Harold Innis, whose key books on the materialities of communication have been overshadowed by Toronto colleague Marshall McLuhan’s fame and following, laid the groundwork for such an agenda in the years immediately following the Second World War (see especially *Empire and Communications* [1950] and *The Bias of Communication* [1951]). In Germany, meanwhile, Friedrich Kittler rejected the overtures of post-structuralism in favor of the dubious allure of a soldering iron and machine code, fabricating a techno-hardcore media historiography that displaced human agency from the central circuits of the culture machine, paving the way for the media archaeology movement that we will discuss in some detail. Kittler, of course, is routinely taken to task for playing fast and loose with his historical accuracies, but his impact is undeniable; as Geoffrey Winthrop-Young writes in his book-length intro-

duction to Kittler's legacy, "The battle cry 'media determine our situation' is reduced to the tacit agreement that scholars should pay some attention to media formats after having paid none at all for decades."³⁷ Kittler is also surely the most brutally minimalistic of all the techno-materialist thinkers, arguing that in the end "there is no software" because all digital phenomena "come down to absolutely local string manipulations and that is, I am afraid, to signifiers of voltage differences."³⁸ (The canonical introduction to Kittler remains his *Gramophone, Film, Typewriter*, especially the opening chapter wherein he presents the thesis about the nineteenth century's liberation of media from the symbolic constrictions of exclusively alphabetic forms, but the essays collected in *Literature, Media, Information Systems* are likewise very approachable [those in *Optical Media* somewhat less so]; both are recommended before attempting the Gesamtkunstwerk, *Discourse Networks 1800/1900*.) Finally, Nancy Ann Roth's recent translations of the Czech Vilém Flusser's work for the University of Minnesota Press (*Into the Universe of Technical Images* and *Does Writing Have a Future?* [originally published in German in 1985 and 1987, respectively]) have helped restore to our attention a theorist who, as the late Mark Poster puts it in his introduction to both volumes, "stands out, with only a handful of others, as one who presciently and insightfully deciphered the codes of materiality disseminated under the apparatus of media" (xi). Innis, Kittler, and Flusser have each produced work that is broadly relevant to students of all media forms, wherein the inscription and transmission of the written word and specifically the materialities of print and literature are channeled through a wider media spectrum. Together with figures such as Benjamin and McLuhan, they offer a foundation for an approach to book history in the current threshold moment of the digital, even as more recent thinkers have challenged, revised, and extended their positions. To these we now turn.

Over a decade old, the *New Media Reader* edited by Noah Wardrip-Fruin and Nick Montfort and released in 2003 by the MIT Press is an appropriate milestone to demarcate the onset of what we have characterized as the material turn in digital studies. The *NMR* was very much intended as an intervention when published, bringing together artists, humanists, and technologists from the second half of the twentieth century, pointedly *ending* with Tim Berners-Lee's 1994 paper about the World Wide Web. The "new media" between its covers (and on the accompanying CD) thus arrived already overtly historicized, the very heft of the hardbound volume a reminder of the fact that conversations about computers, writing, art, and interactive design had been underway for decades prior to the advent of to-

day's desktop browser. The historical documents range from Turing, Bush, Licklider, and Weiner to Burroughs, Roy Ascott, Brenda Laurel, and Lynn Hershman; of particular interest to students of book history will be pieces such as Ted Nelson's "Proposal for a Universal Electronic Publishing System and Archive" (from 1981's *Literary Machines*) and Robert Coover's much-cited 1992 "End of Books" *New York Times Book Review* essay, as well as a compendium of Oulipo writings including a complete do-it-yourself cut-up implementation of Raymond Queneau's *Cent mille milliards de poemes*. The volume deploys a deliberate contrapuntal strategy, juxtaposing, say, Bush's Memex with Borges's "Garden of Forking Paths." While a useful compendium for researchers and a compelling choice for classroom instruction, the *NMR* also helped inaugurate a new historically-aware phase of digital studies, one in which the presentism that afflicted so much of the field in its earlier incarnations—or else the crude historicism whose fulcrum was *ceci tuera cela*—is filled in by documentation of the decades of dense aesthetic and scientific conversation on the very borders of the screens, pages, windows, and frames that limn the contours of our contemporary media landscape.

Two other figures whose careers have been heavily identified with aspects of book history and textual scholarship deserve particular mention at this point. Johanna Drucker, whose pathbreaking scholarship on the radical typographic experiments of the modernist avant garde will be known to many readers here, as will her steady output of artist's books, began speaking and writing overtly about digital media in the 1990s. Many of her early statements about digital media, are collected in *Figuring the Word: Essays on Books, Writing, and Visual Poetics*, a 1998 Granary Press volume; her formal identification with "digital humanities" as it manifests today can be seen in *Digital Humanities* (MIT, 2012), co-authored with Anne Burdick, Peter Lunenfeld, Todd Presner, and Jeffrey Schnapp. Her University of Virginia colleague Jerome McGann, meanwhile, had been integrating ideas from early hypertext theory into his thinking and writing about critical textual editing since the 1980s; by the 1990s, the Rossetti Archive project was well underway, and it furnished a continual source for theoretical reflection and provocation. These essays of McGann's are collected in 2004's *Radiant Textuality: Literature After the World Wide Web* (Palgrave), while his more recent thought on matters digital can be found in *A New Republic of Letters* (Harvard, 2014). What Drucker and McGann each offered in their own way were models of figures whose deep engagements in the materialities of books and printed matter served to shape and refine their thinking about

electronic textual forms, rather than positioning them in reductive opposition as was the case for such bibliophiles as Sven Birkerts. Both of them introduced perspectives from the material study of textuality to audiences otherwise engaged with electronic technologies, who then found occasion to bring such perspectives to bear on digital objects and artifacts.

One such point of influence was N. Katherine Hayles. Though Hayles's intellectual trajectory was already well established, marked out by her training and scholarship in the history of science, her short 2002 *Writing Machines* from MIT Press (which featured a collaboration with graphic designer Anne Burdick) carried concepts from textual materiality directly to readings of works that included both threshold codex productions like Mark Danielewski's *House of Leaves*, as well as Talan Memmott's online hypertext *Lexia to Perplexia*. Here Hayles introduces the term "media-specific analysis," and enjoins her readers to no longer "treat text on the screen as if it were print read in a vertical position. Electronic text has its own specificities, and a deep understanding of them would bring into view by contrast the specificities of print, which could again be seen for what it was, a medium, and not a transparent interface."³⁹ Similarly, Matthew Kirschenbaum's 2008 *Mechanisms: New Media and the Forensic Imagination* (MIT Press) explicitly brings together perspectives from textual scholarship and book history, as well as the technical field of computer forensics. This approach produces new readings of landmark digital work such as William Gibson's "Agrippa" and Michael Joyce's *Afternoon*, and demonstrates the extent to which computer forensics—which locates, recovers, and authenticates digital evidence to a degree admissible in legal settings—offers the specific methodological bridge between new forms of electronic writing and the traditional concerns of bibliographers and textual scholars. Arguing that the previous generation of writing about electronic textuality had been governed by a "medial ideology" in which tropes such as light, lightning, speed, and ephemerality predominated, Kirschenbaum insisted instead on the forensically replete realities of inscription for devices such as hard drives to argue that a "computer," like a "book," is in fact an individuated artifact, always subject to deep historical forms of understanding.

What has become one of the most important routes to such understandings emerged almost in passing, as a throwaway, in the course of an enormously influential book in its own right, Lev Manovich's *The Language of New Media* (MIT Press, 2001). Manovich's work here is justly celebrated as perhaps the most comprehensive formal framework of digital media and objects to date; it has been influential for its linkages between digital media

and cinema, as well as a provocative (if much contested) “opposition” between database and narrative as cultural organizing principles. But early in the pages of the book Manovich presents us with a vignette. He is seeking to distance himself from what he perceives as the vulgar futurism, as well as the lack of interest in the messy details of actual software and computer programs, of previous academic commentators on the digital technologies emerging all around us. At stake are not just better theories, but also the actual history of digital culture and its myriad non-virtual realities. “Where,” he asks, “were the theoreticians at the moment when the icons and the buttons of multimedia interfaces were like wet paint on a just-completed painting, before they became universal conventions and thus slipped into invisibility?” He then poses the question even more insistently, evoking the hypothetical but eminently plausible “historical moment” when

a young 20-something programmer at Netscape took the chewing gum out of his mouth, sipped warm Coke out of the can—he was at a computer for 16 hours straight, trying to meet a marketing deadline—and, finally satisfied with its small file size, saved a short animation of stars moving across the night sky? This animation was to appear in the upper right corner of Netscape Navigator, thus becoming the most widely seen moving image sequence ever until the next release of the software.⁴⁰

This is an enormously captivating and compelling gesture, dramatizing as it does the distance from the so-called “theoreticians” of first-generation digital studies to the specific, localized, embodied, and ineluctably materialist concerns Manovich wishes to foreground. He called the research agenda he was then proposing “software studies,” and although its uptake was not immediate, software studies has now emerged as a recognized sub-field of digital studies, complete with a dedicated book series from the MIT Press. The affinities with book history should at this point require no great elaboration on our part: Manovich, and those who followed him in to software studies are interested in specific software packages, their conceptualization, design, engineering, implementation, and their use and circulation within particular communities. Matthew Fuller, editor of *Software Studies: A Lexicon* (MIT Press, 2008) puts it this way in his introduction: “While applied computer science and related disciplines . . . have now accreted half a century of work on this domain, software is often a blind spot in the wider, broadly cultural theorization and study of computational and networked digital media Software is seen as a tool, something you do something with. It is neutral,

grey, or optimistically blue.”⁴¹ (Fuller’s important early work, meanwhile, is collected in *Beyond the Blip: Essays on the Culture of Software* [Autonomedia, 2003].) Software studies thus emerges as a framework for historicizing software and dislodging it from the purely instrumental sphere. One could imagine useful convergences of software studies and book history around applications such as WordStar or Microsoft Word, or Aldus PageMaker, to name just some of the most obvious.

Yet software is not always an intuitive artifact, which surely helps account for the kind of blind spots Fuller notes. Is software the user interface that most of us see and experience, or is it the lines of source code? Is it the application or the complete operating environment? What about documentation, packaging, and other kinds of ancillary material? Closely related to the ambitions of software studies then is the practical challenge of software preservation—how will researchers actually access historically important software packages in decades to come? How is the history of software being preserved? Some software history is contained in the corporate archives of entities like Microsoft and Adobe, and researchers will need to become proactive about seeking access to these typically cloistered settings. But much is also now available on the open Web, for example the efforts of the Internet Archive, whose recently launched Historical Software Collection offers users the ability to interact with emulations of key software programs natively in their browser; likewise, large amounts of documentation are readily available through grassroots computer history efforts such as BitSavers.⁴² Finally, oral history interviews with living key technological innovators can be extremely valuable, as Belinda Barnet demonstrates in her *Memory Machines: The Evolution of Hypertext* (Anthem, 2013). Though she does not use the term, Barnet’s software studies approach makes her work very different from first generation treatments of hypertext theory. Manovich’s most recent book, *Software Takes Command* (Bloomsbury Academic, 2013), takes as its centerpiece an extended history and “reading” of Adobe After Effects, the industry standard for creating moving image animations.

Critical code studies is a related movement which focuses not so much on software as an application or artifact but on the literal code of the application itself. If software studies is akin to the study of paper or bindings or typography, critical code studies asks us to reckon with the underlying *processes* of computation, much as we would seek to understand the interaction between, say, collation and imposition in the hand-press period. While often regarded as the sole province of programmers and other specialists,

the reality is that all “computer code” as we typically know it is really only ever *human* readable; it only becomes legible (which is to say actionable, or operationalized) by the machine once it has undergone a process known as compiling, which takes so-called “high-level” languages like Java or BASIC or FORTRAN and converts them to the binary ones and zeroes that furnish a computer’s operating instructions. Critical code studies thus foregrounds software and computer programs as semantically replete fields of interpretation, written by and for human beings (nor is this strictly a humanistic conceit: Donald Knuth, perhaps the most famous living computer scientist, espouses the same principles through what he terms literate programming).⁴³ Critical code scholars are given to close readings of individual lines of computer code, looking for the expressive dimension of such elements as the names given to variables or the choice of conditional structures used to govern the actions of the program; however they also locate agency at the level of the *process* the code enacts, the specific computational behaviors set in motion by the source code. Noah Wardrip-Fruin, in his book *Expressive Processing: Digital Fictions, Computer Games, and Software Studies* (MIT Press, 2009) writes eloquently of a code literacy as not only a scholarly virtue but a civic necessity, from the algorithmically ranked results of “everyday Google searches to the high stakes of Diebold voting machines”;⁴⁴ the book itself offers close, “procedural” readings of the semantics and structure of individual software programs, including the *Tale-Spin* story generator, *SimCity*, and *Eliza*. In yet another example, Dennis Jerz recovered the original FORTRAN source code for the foundational interactive story-game ADVENTURE, and offers a detailed “reading” of its particulars and their implications for our understanding of the composition of the game in a model of both critical code and software studies.⁴⁵ But perhaps the most extreme, and tantalizing, example of the potential of the critical code approach is a book cryptically entitled *IO PRINT CHR\$(205.5+RND(1)); : GOTO IO* (MIT Press 2013).⁴⁶ The book, which was jointly authored by a collective of some dozen members, takes that single eponymous line of source code for the Commodore 64 (which drew a randomly determined maze pattern on the screen) as the basis for an exploration of 1980s home computer culture that ranges from discussions of the labyrinth as a cultural form to the nature of computational randomness to the means of dissemination for early computer programs, which often included (for example) print magazines, from which a reader would transcribe and retype them into his or her own system. *IO PRINT* thus uses a line of code as the proverbial grain of sand (silicon) within which to see a world; it is a remark-

able example of the cultural richness and repleteness of a supposedly purely operational expression.

Closely aligned with both software studies and critical code studies (involving many of the same individual scholars) is the “platform studies” movement, which is most heavily associated with Nick Montfort and Ian Bogost, who edit another MIT Press book series devoted to the topic and published its inaugural volume, *Racing the Beam: The Atari Video Computer System* (2009). Textbooks and tutorials often explain the fundamentals of modern computing to newcomers by employing the metaphor (and visual imagery) of stacks and towers, working from hardware and machine code up through levels of abstraction including assembly code, high-level program languages, and finally end-user applications and what we see on the screen. Much of the scholarship comprising the material turn in digital studies has tended to hew, sometimes quite explicitly, to this same model (which, it is worth noting, is itself a historical construct, an artifact of the Von Neumann architecture for computer systems). “Platform,” Montfort and Bogost tell us, “is the abstraction level beneath code, a level which has not yet been systematically studied. If code studies are new media’s analogue to software engineering and computer programming, platform studies are the humanistic parallel of computing systems and computer architecture, connecting the fundamentals of new media work to the cultures in which they were produced and the cultures in which coding, forms, interfaces, and eventual use are layered upon them.”⁴⁷ The title of their Atari 2600 book, *Racing the Beam*, in fact refers to the beam of the cathode ray gun that would “paint” the game’s graphics on a television display in a continuously scanning horizontal pattern that programmers of the system’s cartridges not only had to compensate for but sometimes took advantage of to overcome the inherent limitations in memory and processing power also characteristic of the system. This close dialectic between the technical particulars of the platform, sometimes articulated at very high levels of detail, and their implications for the kind of creative and imaginative work performed on those systems is characteristic of platform studies, which has also seen books covering the Nintendo Wii (*Codename Revolution*, by Steven E. Jones and George K. Thiruvathukal [2012]) and the Commodore Amiga (*The Future Was Here*, by Jimmy Maher [2012]). Though “platform” is perhaps most conveniently associated with physical computing hardware (as the preceding examples suggest), Montfort and Bogost are quick to point out that platforms can be virtualized as well: for example, a forthcoming book in the series addresses the Web’s once ubiquitous Flash technology as a “platform.” Here too then

we can see the explicit parallels to book history: what would it mean to think of the Kindle as a platform, for example, to critically examine the constraints and affordances of the device (both its physical incarnation as well as its architecture and protocols)? Platform studies, like the history of the book, is characterized by close, some might even say obsessive or unseemly, attention to detail out of the fundamental conviction that such material particulars are ineluctably part of the history of communicative objects, artifacts, and our human interactions with them.

The distinctions between software studies, critical code studies, and platforms studies can sometimes be opaque intellectual terrain for the uninitiated, not only because of the technical connotations of such terms but also because the boundaries between them—in terms of people, publishers, and intellectual approach—can seem rather permeable. Indeed, the *10 PRINT* volume discussed above in relation to critical code studies was published as part of the MIT Press's Software Studies series. Other works have also blended the three approaches to create generative readings of electronic media. Terry Harpold's *Ex-Foliations: Reading Machines and the Upgrade Path* (University of Minnesota Press, 2009) is meticulous in its documentation of specific platforms and software versions for the creative electronic literature it takes as the focus of its discussion, including (again) Joyce's *Afternoon*. Likewise, Christopher Funkhouser's *Prehistoric Digital Poetry: An Archeology of Forms, 1959–1995* (University of Alabama Press, 2007) is a deeply researched volume based on the archival recovery of primary source documentation for the period under discussion, in this regard treating “digital poetry” no differently from other literary phenomena where such explicit period demarcation is commonplace. And Steven E. Jones's *The Meaning of Video Games: Gaming and Textual Strategies* (Routledge, 2008) applies a textual and software studies approach to the study of computer games as material artifacts. Perhaps the single most illustrative and effective example of the relevance of all three approaches to book history comes in the form of Alan Galey's 2012 *Book History* essay “The Enkindling Reciter: E-books in the Bibliographical Imagination.” This essay, which won the 2012 Fredson Bowers Prize, is a tour de force in its demonstration of the both the new materialist sensibility and new bibliographic—and forensic—techniques in the investigation and evaluation of digital book objects. Readers will recall that we have already encountered Galey's innovative interface designs in the *Visualizing Variation* project; here he solves an actual bibliographical problem (several, in fact) in the electronic presentation of the text of Johanna Skibsrud's *The Sentimentalist*, winner of the 2010 Canadian Scotiabank Giller

Prize. Since readers of the present essay will have ample access to Galey's text we will not rehearse its particulars in detail, but instead remind our readers of Galey's closing contentions around "stripping the veils of code," offered in conscious revision not only of Bowers but also Kirschenbaum's earlier work on digital forensics:

One of the consequences that the bibliographical study of e-books forces upon us is the need to rethink traditional bibliography's basis in empiricism. To reverse the terms of the errant William James epigraph, the different forms of e-books may have no rocky bottom, no absolute Real that serves to anchor the evidence of our senses. The reason is simple: e-books, like all digital texts, require us to interpret phenomena not directly observable by the senses. We must rely on layers upon layers of digital tools and interfaces, as we have seen in the examples above. A purely empirical and forensic perspective assumes that objects speak for themselves, and yield up their evidence to the observation of human senses and the inquiry of human reason. My purpose in drawing attention to the role of the enkindling reciter is to emphasize that digital objects do not speak for themselves; someone always speaks for them.⁸

Ultimately software studies, critical code studies, and platform studies are each varyingly inflected methodologies for cultivating both the critical sensibility and the technical acumen necessary to swim deep into the cultural reservoirs of contemporary digital production, if not quite touch that final rocky bottom. We would advise our readers to attend to the commonalities between them rather than succumbing to the parsing of their differences.

There is one other articulated movement with direct bearing on the material turn, developing not primarily in North American but rather Anglo-European settings. Media archaeology is a term which originates in cinema studies with the work of C.W. Ceram, but which has more recently expanded to offer coverage to the full spectrum of media phenomena, including, of course, the products and productions of the digital age. Kittler, discussed earlier, is often regarded as a prototypical media archaeologist for his assignment of radical agency to non-human actors and technologies, though he himself would have disavowed the label. Media archaeology's most influential figures have nonetheless tended to emerge from the Continental intellectual scene, though the movement's most prominent English-language organizer and advocate, Jussi Parikka, is a Finn working in the British university system. Parikka's *What is Media Archaeology?* (Polity, 2012) and a collection co-edited with Erkki Huhtamo, *Media Archaeology: Approaches*,

Applications, and Implications (California, 2011), will be the best starting points for most of our readers. In North America, meanwhile, media archaeology has been increasingly absorbed into the academic conversation around digital technologies, with ground already been prepared by the thinkers and trends discussed above. As Parikka himself acknowledges, there is a general compatibility between the methods and concerns of software studies, critical code studies, platform studies, and computer forensics, and media archaeology.

Broadly speaking then, media archaeology is characterized by an intense fixation on the technological operations of media. Its historiography generally hews to Foucauldian genealogies of “disruption” and discontinuity. Siegfried Zelinski’s *Deep Time of the Media: Toward an Arcaheology of Hearing and Seeing by Technical Means* (MIT Press, 2006) and the work collected in his series of edited *Variantology* volumes (Verlag der Buchhandlung Walther König, 2005–), as well as Erkki Huhtamo’s *Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles* (MIT Press, 2013) are representative in this regard. Though invested in the recovery of neglected, forgotten, crashed, erased, and overwritten media devices in order to question and reframe established narratives of media history, media archaeology is also, in the eyes of at least some practitioners, about a radical revisionary historiographical practice in which machines assume primacy of agency in the recording and narration of cultural events. Wolfgang Ernst, who uses the term “archaeography” to describe this process, by which the “archive” writes itself through varied modes of technical inscription—many of them forms of signal processing occurring at sub-semantic levels—is the key figure here: his writings are collected in English in *Digital Memory and the Archive*, edited by Parikka (Minnesota, 2013). There is a practical component as well, in that hardware conservation and preservation are important facets of media archaeology, the skills and expertise necessary to restore vintage computers and other technologies to working condition. (Ernst maintains such a facility, the “Media Archaeology Fundus”; Lori Emerson’s work with her Media Archaeology Lab at the University of Colorado Boulder, which maintains dozens of vintage computers in working order, is likewise exemplary here.⁴⁹) Finally, as the title of Ernst’s collection above suggests, “the archive” has emerged as a site of intense interest for media archaeological investigation, not only for the practicalities in preserving access to its technological apparatus but also because the very conceptualization and theorization of archives has direct implications for our articulation of media history. Wendy Hui Kyong

Chun thus lays great stress on the technological as well as the bio-informatic origins of archive and memory in her *Programmed Visions: Software and Memory* (MIT, 2011), a work that has been generally embraced by media archaeological writing.

For book history, media archaeology offers a framework for media investigation which tends to have an even longer historical reach than the primarily North American movements described above; media archaeological investigations routinely extend back into the nineteenth century and beyond, grounding themselves in “prehistoric” (recall Funkhouser) manifestations of cinema and the moving image, photography, and recorded sound. There is also a conspicuous strain of media archaeology that takes as its primary locus documents, records, and writing technologies such as the typewriter and telegraph, as well as “soft” technologies such as shorthand. Lisa Gitelman’s work is exemplary and indispensable here, and though she has never overtly declared herself a “media archaeologist” she has both influenced and been influenced by the movement. Her *Scripts, Grooves, and Writing Machines* (Stanford, 1999) offers a more historically attentive narrative of nineteenth century inscriptive economies than Kittler, and an essay collection co-edited with Geoffrey B. Pingree, *New Media 1740–1915* (MIT, 2004), consolidates and amplifies the import of this period as a long antecedent to the media landscape of today. More recently, her *Always Already New: Media, History, and the Data of Culture* (MIT, 2006) offered perhaps the first serious attempt to genuinely historicize the Web, including explicit attention to the twin concepts of records and documents in electronic (and aural) culture; her newest monograph, *Paper Knowledge: Toward a Media History of Documents* (Duke, 2014), supplies readings of documentary technologies from nineteenth-century job printing to the ubiquitous PDF format of our own time. A scholar such as Gitelman thus foregrounds the linear conceptual path from book history to media history and back again, with the additional virtue of a long historical perspective that understands the screens and devices of the present as descendants of earlier technological dispensations. Much the same could be said of Darren Wershler and *The Iron Whim: A Fragmented History of Typewriting* (Cornell, 2005), which offers archaeologies of book-writing and media alike. Similarly, Ben Kafka, in *The Demon of Writing: Powers and Failures of Paperwork* (MIT, 2012) explores paper as a medium, even as he develops a media archaeological account of bureaucracy and office work. Cornelia Vismann, in *Files: Law and Media Technology* (Stanford, 2008; translated by Geoffrey Winthrop-Young, also Kittler’s chief translator and explicator) brings similar attention

and stress to the construct of the “file” in legalistic and documentary contexts. Jean-Francois Blanchette’s *Burdens of Proof: Crpytographic Culture and Evidence Law in the Age of Electronic Documents* (MIT, 2012) draws together (again) legal discourse with forensic technologies and a consideration of the longstanding problems of diplomatics, namely document authentication and documentary authority, in relation to the particular problematics of born-digital documents. Lori Emerson’s forthcoming *Reading/Writing/Interfaces* (Minnesota, 2014) employs media archaeological precepts to consider the physical substrates of experimental poetry and poetics, with authors ranging from Dickinson to contemporary Canadian writers such as Steve McCaffery and bpNichol. Finally, Jonathan Sterne’s *MP3: The Meaning of a Format* (Duke, 2012), might appear at best oblique to the interests of book history—that is until one remembers to consider the place of digital audio books amongst today’s reading public.

IV

Media archaeology, together with software studies, critical code studies, and platform studies, gives us a route into the vexed, recursive layers of today’s textual landscape that is broadly compatible with the sensibilities and intellectual agendas of today’s scholarship in book history. More than that, however, all of these movements or trends offer the opportunity to reconsider the book as the locus of critical attention. Books, after all, have always been a narrow and particular subset of humankind’s *written* endeavors and activities. What *is* the nature of the relationship between books and documents, or books and records, or books and paper or other forms of media and material supports? Such questions, we maintain, are not mere theoretical prompts, but essential prerequisites for responsible scholarship of books as they are written and read today; for despite some important contributions, book history by itself does not yet have a critical mass of scholarship with which to answer that challenge. Works such as Jason Epstein’s *Book Business: Publishing Past, Present and Future* (Norton, 2002) are invaluable as memoirs but they lack the necessary critical and theoretical framework for working through questions such as we have raised. David M. Levy’s *Scrolling Forward: Making Sense of Documents in the Digital Age* (Arcade, 2001, now sadly out of print) offered a starting place for a materialist reconsideration of the status of texts as embodied documents amid the shifting landscape of digitization. Bonnie Mak’s concise *How the Page Mat-*

ters (Toronto, 2011) historicizes the seemingly homogenous “page” as both a conceptual and a material unit in manuscript, print, and digital culture through a case study of what Randall McLeod might have called the “transformations” of one particular text. Andrew Piper’s *Book Was There: Reading in Electronic Times* (Chicago, 2012) is a focused, sometimes personal attempt to historicize today’s questions about the significance of reading (specifically) books, informed but not burdened by Piper’s training in critical theory; it is usefully considered with both Jeff Gomez’s *Print is Dead: Books in Our Digital Age* (Palgrave, 2007) and Alan Jacobs’s *The Pleasures of Reading in an Age of Distraction* (Oxford, 2011). The best critical overview of book publishing in the present moment is undoubtedly John B. Thompson’s *Merchants of Culture: The Publishing Business in the 21st Century* (Plume, 2012). Of equal relevance is Ted Striphas’s aforementioned *The Late Age of Print: Everyday Book Culture from Consumerism to Control* (Columbia, 2009) which grounds its analysis not in futurisms but rather in research and critical analysis of the status of the book in the present, from big-box bookselling and electronic distribution systems to reading clubs, and the (yes) the Harry Potter phenomenon, among other topics; Striphas, whose intellectual pedigree is more cultural studies and materialist Marxism than the digital studies authors we have been discussing, nevertheless offers an example of a project that understands that the distinction between book history and media history is now literally and purely and finally only academic. The recent collection *Comparative Textual Media: Transforming the Humanities in the Postprint Era*, edited by N. Katherine Hayles and Jessica Pressman (Minnesota, 2013) as well as the new *Cambridge Companion to Textual Scholarship*, edited by Neil Fraistat and Julia Flanders (Cambridge, 2013), likewise eschew unproductive distinctions between these fields.

Let us now offer some additional examples to demonstrate the potential for scholarly inquiry bridging the various approaches to media history and theory we have been surveying, and the history of the book, broadly conceived. We can begin with the fact that computer history has spawned any number of compelling book objects that ought to be of interest to book history. There are surely projects for those who wish to explore the publication histories of newsletters and ’zines like that of the Homebrew Computing Club (whose archives are at Stanford), or *Mondo 2000*; similarly, landmark publications such as Ted Nelson’s *Computer Lib/Dream Machines* and the *Whole Earth Catalog* are fascinating book objects, filled with complex assemblages of visual and verbal material. The massive popular interest in personal computing and video games that had taken hold by the early 1980s



Figure 5. A selection of 1980s trade books written as guides to home computers and video games, whose diverse and notable authors include Martin Amis, Michael Crichton, Newt Gingrich, Frank Herbert, Hugh Kenner, and Jerry Pournelle; also a 1984 pop-up book entitled *Inside the Personal Computer*. Photo by Kirschenbaum.

(in 1982, *Time* magazine anointed the computer its “machine” of the year) spawned hundreds of mass-market trade publications, including introductions, tutorials, how-tos, and guidebooks (see Fig. 5). Computer magazines such as *BYTE* and *PC Magazine* and *Macworld* also offer key documentation from this period. In short, the reality is that much significant computer history has been written and rendered in print; this is a vast and largely unexplored space.

Book history has the potential to bring much-needed nuance to tired, reductive binaries around the *paragone* between print and the digital. Abigail J. Sellen and Richard H. R. Harper have argued compellingly that far from eliminating it, digital technologies (such as word processing and the laser printer) greatly exacerbated the consumption of paper in office settings.⁵⁰ It is tempting to explore similar dynamics in other milieu: for example, the avant garde literary arts journal *Between C&D*, a “little magazine” which began publication in New York’s East Village in 1983 and was printed and distributed on fanfold paper from a dot matrix printer and came packaged

in a ziplock bag. (Authors included Kathy Acker, Dennis Cooper, Gary Indiana, Patrick McGrath, and Lynne Tillman.) As editors Joel Rose and Catherine Texier recall: “The combination of our high-tech look—the computer printout, the fanfold, the dot-matrix print type—in conjunction with handmade art by East Village (or Downtown) artists on the front and back covers, and the ziplock plastic bag binding, along with, needless to say, the featured ‘new writing’ immediately attracted both readers and writers, from New York City and elsewhere.”⁵¹ Such episodes dovetail, at least anecdotally, with the kinds of arguments scholars such as Harold Love and Peter Stallybrass have long made about the persistence of scribal and manuscript writing into cultures of printing, whereby the cross-transfer between two active media spheres (in this case print and the digital) results in the proliferation, rather than the diminishment, of prior forms of media and inscription.⁵²

One notable exemplar from this period is Robert Pinsky, Steve Hales, and William Mataga’s *Mindwheel*, published by Synapse/Brøderbund in 1982. *Mindwheel* is a self-described “Electronic Novel.” While our readers will know who Pinsky is of course, it is unlikely they will recognize either of the other names. That is because they are computer programmers who share the authorship credits with Pinsky. *Mindwheel* is in fact a hybrid book/digital artifact. It consists of a ninety-page clothbound volume (packaged in a paper slipcase) containing prose materials (credited separately to one Richard Sanford), artwork, verse, photos, and faux-interviews, journals entries, and other documentary materials; also included is a sleeve containing a 5.25- or 3.5-inch computer disk, available for Macintosh, the Apple II, and the PC. One engaged *Mindwheel* by beginning with the thirty or so pages of Sanford’s prose in the printed volume, at which point the transition to the interactive content was effected by way of a dream sequence; practically speaking, the reader would set the book aside, boot the disk, and find him- or herself in a “text adventure” style environment where they would read prose descriptions of their current situation and type their intended actions, to be interpreted by the program’s parser which would advance the action of the story accordingly. This in itself was no great novelty at the time, and in fact text adventures constituted an important segment of the computing gaming market for home computers (Infocom set the standard with dozens of such titles). What set *Mindwheel* apart, however, was both the dual book/disk combination (though it should be noted the packaging of Infocom games routinely included printed paraphernalia such as maps, letters, and photos), and the engagement of Pinsky as a “significant” literary



Figure 6. *Mindwheel*, by Pinsky, et al. Slipcover, book, and 3.5-inch diskette. Note label on slipcover specifying it as the Macintosh version and the two “Programmers” who are given billing alongside of the “Author.” Pinsky was responsible for the electronic content, but the text in the printed volume was by Sanford. Photo by Kirschenbaum.

talent. (In a feature which conspicuously leverages the material affordances of print versus disk media as an anti-piracy safeguard, the participant in the interactive portion of the text must enter a “password” which is discovered by referencing a particular page in the accompanying volume.) Clearly the conceit of an “electronic novel” as a combined print and interactive experience was envisioned as a paradigm for future publishing—the phrase was apparently even trademarked. Alas, it was not to be: Synapse went under shortly thereafter. Pinsky himself today still seems to recall his contributions to the project fondly, and talks freely about it in interviews.

We rehearse this history not only because of *Mindwheel*'s import in its own right, though it does bear genuine significance both for the involvement of a future Poet Laureate of the United States and as an early exemplar of a hybrid publishing model which would be often repeated in the avant garde world,⁵³ as well as in the commercial market, where for a time CD-ROMs (far more durable than diskettes) were routinely bundled with all manner of

trade books and textbooks. As these examples show, digital media cohabit with the codex, not only just in close physical proximity—between the same covers—but occupying conceptually coterminous textual and narrative space. But *Mindwheel* also raises the vital question of preservation, and how one accesses it today as a significant historical artifact. One option, of course, is to seek out an original copy on the secondhand market, and at least as of this writing they are not especially difficult to find or priced prohibitively; yet it would still be impractical to assign the book to a class full of students, and even having an original diskette in hand raises the question of how it can be accessed on a modern computer, which lacks the disk drives to say nothing of the appropriate operating systems. An alternative presents itself in the form of the Web’s so-called “abandonware” hubs, where software of uncertain copyright status (presumed “abandoned” by the original rights holders) may be downloaded under conditions of questionable legality and experienced by way of an emulator, a piece of software whose function is to replicate the graphics and behaviors, using the original programmed logic, of some long-vanished platform; PDFs of the original printed volume, meanwhile, are also in circulation, and their copyright status is equally dubious. Both abandonware repositories and emulators are situated within what is at best a grey area where, as Galey has also noted in the context of his work on e-books, copyrights and Digital Rights Management technologies can render seemingly innocuous scholarly activities illicit uncertain under the letter of the law. *Mindwheel* thus dramatizes the complexities of doing book history on this comparatively recent material, as well as the importance of scholars acquainting themselves with the various issues and trade-offs inherent in various forms of digital preservation. Such knowledge is no different in principle from what we expect of those who would navigate a reading room for access to special collections materials because they understand that a facsimile is not an adequate substitute for the experience of the original volume.

Books themselves can also be used as a kind of emulator, to capture and document the experience of the digital, a trend we see in mainstream publishing in a novel like Jennifer Grose’s *Sad Desk Salad* (2012), which embeds the ubiquitous chat balloons, message icons, and avatars of social media into its prose pages. But the most interesting such work typically takes the form of artist’s books or novelty projects. The most literal example may be Richard Moore’s *Paper Pong* (2008), which allows you to actually “play” the classic video game using a system of directed page references similar to the old-style Choose Your Own Adventure™ books. The difference is that

instead of a picaresque adventure plot, one makes their decision about what to do next (which way to move the paddle) based on a visual depiction of the current state of the game, which is rendered in a full page layout. Silvio Lorusso and Sebastien Schmieg's *56 Broken Kindle Screens* (2012) presents the reader with exactly that, uncaptioned black and white photo-reproductions of the eponymous cracked and shattered devices. While clearly intended as a statement on the materiality of the digital and its counterintuitive persistence in the form of print, the book also serves to document the surprising variety and aesthetic allure of these unfortunate accidents. More extreme in this regard is Martin Howse's *Diff in June* (2013), a 1600-page tome, like *56 Broken Kindle Screens* available as either a PDF or a print-on-demand publication from Lulu.com. The project is described as follows: "Using a small custom script, for the entire month of June 2011 Martin Howse registered each chunk of data which had changed within the file system from the previous day's image. Excluding binary data, one day's sedimentation has been published in this book, a novel of data archaeology in progress tracking the overt and the covert, merging the legal and illegal, personal and administrative, source code and frozen systematics."⁵⁴ The experience of encountering *Diff in June* as a printed volume is to be confronted with a dense slab of text whose closest cousin may be a telephone book for a large-sized metropolitan area. The pages are the data dump, most of it simply opaque and even the infrequent pockets of legibility resisting any simple semantic engagement since they are messages intended for the operating system of the computer rather than the attention of a reader. *Diff in June* reminds us that the vast majority of writing that takes place now occurs without human agency or intervention: it is machines writing to machines, as Félix Guattari once said, a fact which makes this volume a primary media archaeological artifact after the likes of Kittler and Ernst. Yet this book, like Moore's, and Lorusso and Schmieg's, also speaks to some more mundane but no less consequential facts about book publishing today: practically speaking, *Diff in June* could not exist without either electronic distribution or the print-on-demand services harnessed by a company such as Lulu. Similarly, Moore's *Paper Pong* is also available as a PDF, under a Creative Commons license, which grants its reader the ability to "share" and "remix" the work as long as Moore is credited and there is no commercial profit from the activity; *56 Broken Kindle Screens*, meanwhile, is not available electronically, but this book too could not exist without digital media, not only in the obvious sense of its subject matter but also because the images it collects were themselves harvested from the Web, from Flickr and other photo-sharing services. All of these works thus demonstrate the book's surprising capaciousness as a

platform for documenting the minute particulars of the digital world and its devices, even as new digital publishing practices and economies of circulation are reconfiguring the status and consumption of books themselves.

With the exception of boutique letterpress editions and the like, all books today, as Kirschenbaum has previously argued,⁵⁵ are “born digital” in the sense that at some point in their composition, editing, layout, and printing they become (re)configured as data objects in software packages such as Word and Quark. The history here is very rich and very much in the process of active exploration, but we can cover it only in passing. Computer typesetting began in the mid-1970s, with pioneers like Roderick Chisolm at Brown University and Douglass Hofstadter, who has attested that *Gödel, Escher, Bach* (1979) could not have been completed without the assistance of an early Stanford program called TV-Edit. Bessinger and Smith’s *Beowulf Concordance* (1969) was even earlier, and is a landmark of both “humanities computing” and digital presswork. Starting in 1977 meanwhile, Stanford computer scientist Donald Knuth took nearly a decade away from his writing of what are still the definitive textbooks on *The Art of Computer Programming* to develop TeX, a computer typesetting language that enabled him to lay out the mathematical equations and other specialized elements of the books to his satisfaction, something his commercial publishers were not then capable of doing; the story is told in his *Digital Typography* (CLSI, 1999). Small presses were also often innovators, as John Maxwell’s ongoing work on Coach House Press will demonstrate when published; document markup technologies, including the Web’s ubiquitous XML, owe substantial debts to innovations by Stan Bevington and others associated with Coach House. Kirschenbaum, meanwhile, has documented what is likely the first book written with a word processor, Len Deighton’s *Bomber* (1970), as part of his ongoing research on the literary history of word processing.⁵⁶ John Updike summed up much the state of things at a 1988 conference at MIT: “And in regards to the iron curtain that exists between the humanities and the sciences, the computer is a skillful double-agent: the production and analysis of texts has been greatly facilitated by the word processor; for instance, programs for the making of indices and concordances have taken much of the laboriousness out of those necessary scholarly tasks. In my own professional field, not only does word processing make the production of perfectly typed texts almost too easy, but computer-setting has lightened the finicky labor of proofs.”⁵⁷

But while computers have had an obvious impact on the circumstances of authorship and the industry of publishing, they are also responsible for key aspects of what we might think of as a widespread renaissance in the

appreciation of the book as material object. Steven E. Jones, in his aforementioned *The Emergence of the Digital Humanities* (Routledge, 2013) narrates the way in which such an extraordinary and intricate book object as Jonathan Safran Foer's *Tree of Codes* in fact owes its existence to computer-mediated design and production. Describing a video released by the publisher, Jones notes: "At about one minute in, we see the large computer screen of the designer at work, and then what looks like a laser cutter producing the dies."⁸ *Tree of Codes*, therefore, turns out to be a book which, despite its flagrant *bookishness*, could not have been created—or certainly could not have been practically fabricated as a trade multiple—without the employment of sophisticated digital technologies. Any scholar attentive to the actual facts of book history must regard such a work not as a protest against digitization but as material evidence of the interplay between analog and digital forms. One could multiply examples here with other recent books with conspicuous design dimensions whose production was abetted by desktop publishing and layout tools: Mark Danielewski's novels come immediately to mind, including his first, *House of Leaves* (2000), which circulated as a PDF samizdat before being picked up by Pantheon (legend has Danielewski flying to New York to lay out the book himself in QuarkX-Press in his publisher's offices). Likewise, the 2013 collaboration between J.J. Abrams and Doug Dorst, *S*, is a faux-library volume dating from the 1940s which comes complete with a slip case and interior pages stuffed full of postcards, scrap paper, ephemera like a coffee shop napkin, and marginal annotations. The design firm who did the work, Melcher Media, is based in New York City's West Village and recently hosted a "Future of StoryTelling Summit." *S* is thus not a nostalgic offering; it is a proleptic one. Perhaps the most extreme example we can consider is the remarkable and aptly titled *Between Page and Screen* (2012), which is a collaboration between writer Amaranth Borsuk and programmer Brad Bouse; originally produced in a limited letterpress edition, the book is now available from Siglio Press. To read it, one opens the pages of the volume, which turn out to contain not text but rather large, geometric black and white glyphs loosely resembling the more familiar QR codes. By itself, then, the book is essentially meaningless; but when one accesses the accompanying Web site they are directed to activate their computer's camera and hold the book's pages up to the lens: software on the Web site interprets the glyphs as captured by the camera, and the result is an "augmented reality" text that appears to literally float above the pages of the book when rendered by the computer's display of the camera's image—the effect never fails to be breathtaking, and the project,



Figure 7. Borsuk and Bouse's *Between Page and Screen*. Here what one is looking at is a reproduction of a screenshot taken of the feed from her computer's digital camera, which has captured an image of Borsuk facing the screen with the book open to one of its glyphs, thus generating the legible text which the software superimposes on the display of the camera image. Screenshot by Borsuk and Bouse, used by permission.

though it wears its prejudices on its sleeve, nonetheless serves as perhaps the definitive statement on the jointly enabling potential of computers and codex.

Some readers may object that these are specialized texts, projects which sought out their opportunities to make a statement on the "the future of the book." The reality, however, is that in today's bookselling economy digital media are often integral to the publishing phenomenon. Books are thus not only "born digital" in the sense that their composition and layout involves digital tools and technologies, but often their viability as marketable book projects is itself a direct outgrowth of a digital pedigree. One could argue, for example, that the massive online fan culture devoted to the *Harry Potter* books is indispensable to that franchise's success. "Harry Potter," after all, is not just a series of novels; it is a *platform* from which fans engage in their own creative acts, whether via official extensions of the franchise or

through fan fiction, with online sites hosting literally hundreds of thousands of creations set in the Potter universe. A less prominent example is the experience of Hugh Howey, author of the science fiction novel *Wool*, which began in 2011 with a short story released through Amazon's Kindle Direct Publishing. The story's reputation spread through online word-of-mouth, and Howey was prompted to write additional installments, eventually packaging them as a novel-length offering; after intense interest from conventional publishers, he sold one-time rights for an edition of 500,000 copies to Simon and Schuster, but retains online distribution rights himself and has also negotiated foreign publishing rights and a film deal with 20th Century Fox. Customers who buy a copy of the Simon and Schuster edition, whether from a brick and mortar bookseller or an online e-tailer, will therefore hold in their hands a book whose existence as a printed object is a derivative outgrowth of the success of its digital forerunner. (In an "advice to writers" essay on his personal Web site, Howey encourages aspiring authors to leverage social media and to think of themselves as a "start-up" enterprise.⁵⁹) Jennifer Egan, meanwhile, well established as one of the more significant voices in contemporary American fiction, has experimented with Twitter as a storytelling platform. In May, 2012 she began tweeting (yes, in 140-character installments) her short story "Black Box" from the *New Yorker's* account. The serial tweets were broadcast nightly over the course of ten days, with the *New Yorker's* followers replying and retweeting all the while. The complete piece was then published in the June 4, 2012 print edition of the *New Yorker*. What becomes especially interesting, however, is Egan's disclosure in an interview that the story was initially drafted longhand in a Japanese notebook whose pages were ruled with rectangular boxes that could accommodate prose statements roughly the length of a tweet.⁶⁰ The particular features of this notebook, then, were a material constraint for the project as much as Twitter. "Black Box" therefore is an artifact of multi-faceted interchange, a generative friction, between print and digital writing platforms. (On Amazon, meanwhile, there is a German Kindle edition of the work available, a fact which serves to demonstrate that digital forms are no more self-identical than printed exemplars.) A "book history" project engaging the work of contemporary fiction writers such as J.K. Rowling, Hugh Howey, or Jennifer Egan will *of necessity* also be a software studies, platform studies, and media archaeology project.

No account of the interplay between digital and traditional forms of authorship, reading, and the book market would be complete without the *bête noire* of contemporary publishing. We refer, of course, to *Fifty Shades of*

Grey (2012), whose author, E.L. James, famously displaced J. K. Rowling as the best-selling author of all time on Amazon.com UK. Besides its sensational sales records (for which e-books bear a disproportionate responsibility⁶¹), the novel is best-known for its supposedly daring content, which has sparked the predictable controversies and debates in the predictable venues. But its e-book sales are not incidental in this regard, since as many observers have pointed out e-books offer the opportunity for private reading in public spaces: in a crowded train car, no one around you can tell if you're reading E.L. James or Henry James. (Every book has the same non-judgmental cover.) *Fifty Shades of Grey* (hereafter *FSOG*) has an additional significance in the terms of our discussion, however. Its trajectory to print *or* screen makes those of Franzen, Pinsky, Egan, Danielewski, Howey, and others we have discussed appear straightforward. The story involves not just the usual binaries between print and the digital, but also relationships between fans and producers, between traditional publishing and viral content online, and between multiple layers of socially sanctioned forms of authorship. It is also a cautionary tale about the conduct of literary history in the present moment and the stakes for the future, since whatever one's view of the novel's content it is undeniably groundbreaking and historic as an illustration of just how complex the contemporary book's media environment has become.

FSOG has its origins as an instance of so-called "fan fiction," briefly mentioned above in relation to the Harry Potter series. Fan fiction, as the name implies, involves original storytelling (emphasizing prose, but also illustrations and other media) undertaken by the devotees of popular film, TV, and book franchises; its quality varies widely from the sophomoric to the sophisticated, but with leading fan authors garnering formidable followings of their own on the sites and portals where their work is disseminated and discussed. Various franchises take different views of fan fiction, some (including Rowling) accepting it, while others actively seek to discourage the phenomenon. E.L. James began writing fan fiction set in the *Twilight* vampire universe under the penname "Snowqueens Icedragon" in 2010. Her work was sexually explicit, something different fan sites and communities have varying degrees of tolerance for; James opted to remove her work from the FanFiction.net hub where it was being distributed and to instead serve it from her own personal Web site, *FiftyShades.com*.⁶² By this time she had already garnered a substantial readership, hundreds of thousands of readers by some reasonable estimates.⁶³ Crucially, at this point James also began rewriting the text, which had originally been published under the title *Master of the Universe*; all vestiges of the *Twilight* universe were expunged. She

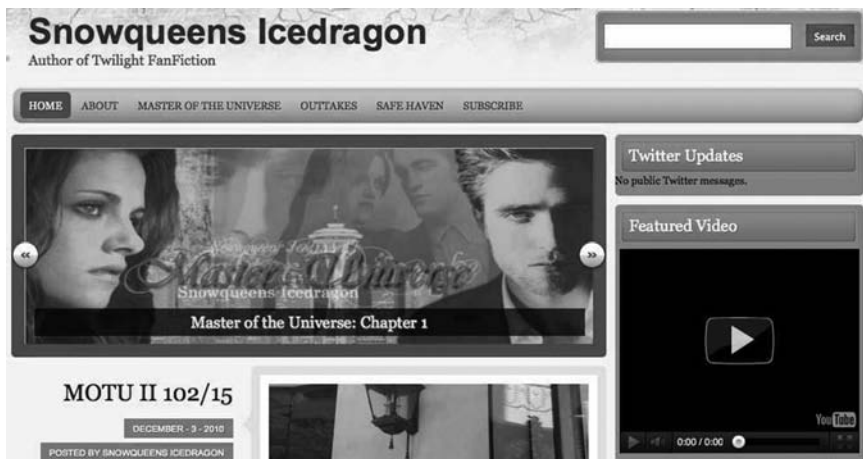


Figure 8. E. L. James’s *Master of the Universe* as it was presented on her FiftyShades.com site in December, 2010 under her original penname “Snowqueens Icedragon.” Screenshot from GalleyCat.com.

then brought the revised story to The Writers’ Coffeehouse, an Australian-based print-on-demand company. It was published there as *Fifty Shades of Grey* in May 2011; a year later James sold the rights to Random House’s Vintage Books, the move which yielded its now meteoric sales figures. Thus a book which began as the derivative work of another fiction franchise now commands even larger assets. (As of this writing a *FSoG* movie is on the way, with its own attendant controversies).

Today, of course, *FSoG* is no longer available from The Writers’ Coffee House; James’s original FiftyShades.com is a standard author’s platform, with no trace of *Master of the Universe*; and her profile has been scrubbed from FanFiction.net. No doubt whatever unease a successful writer (or a protective publisher) may feel upon encountering reminders of a work’s inauspicious origins is greatly exacerbated in this instance by its relationship to the *Twilight* universe. A scholar of the future, then, whether interested in so-called “Mommy porn” or the fan fiction phenomenon or James’s career will have a difficult if not impossible time amassing the primary source materials required to do his or her work. Likely they will have to rely on a network of individuals who may, improbably, still have a copy of the original files sequestered on some piece of now obsolescent media (PDFs of the original *Master of the Universe* remain in circulation, though they are wholly dissociated from the *FSoG* brand); they may have some luck with content crawlers like the Internet Archive (though its archived crawls of

FiftyShades.com have now been removed); or else they will have to rely on a smattering of screenshots and third-person accounts. One could argue that this is no different from the kind of sleuthing and serendipity good research has always required; but we believe the combination of technologies, distribution networks, and the legalities of blockbuster properties spanning multiple media platforms renders the situation qualitatively different. We have suggested that the various approaches we have surveyed from digital studies and media theory can serve to offer some traction on these questions, and this is true. But more fundamental issues remain, chief among them that the scholarly and archival apparatus for contemporary book studies is quite simply unequipped to accommodate the particulars of today's book publishing landscape, necessitating as it would the use of technologies such as Web crawlers, torrent sites, screen scrapers, social media feeds, and sometimes even trafficking in illicit file trading.

V

If book history is the study of how platforms shape and deliver texts, then today's platforms of pixels and plastic are as much a part of those studies as paper and papyrus. How many of us encounter the objects of our study unmediated through subsequent technologies? Even in special collections, what we find is presented to us through the thresholds of catalogs, phase boxes, and call slips. We all experience this, even if we do not always theorize it. But what might we learn if we do think about the entrance of old media into the platforms of new media? Whitney Trettien's exploration of print-on-demand copies of *Areopagitica* suggests that such debased "zombified" books can teach us more about how texts are circulated today than most deliberately translated or hybrid works can. *English Reprints Jhon Milton Areopagitica*, as one of these POD books is titled, is a mish-mash of bad metadata and worse Optical Character Recognition, but its "remediated, *dis*mediated strangeness brings the increasingly normalized processes of digital archiving into sharp relief." Through her engagement with the long history and digital and physical presences of these works, Trettien shows how "these moments of engaging with the *printed* materiality of *digital* texts point to the multiform ways digitization is altering the weight of history." And through her clever coding, Trettien's online *Digital Humanities Quarterly* essay performs the deformation it discusses, disrupting the normal mediation of code we have come to expect.⁶⁴

Meanwhile, works such as the story of @MayorEmanuel reveal all the messy interplay between text and real life that exclusively fictional stories like Jennifer Egan's do not capture. A parody twitter account that emerged during Rahm Emanuel's campaign to be elected the mayor of Chicago in the 2010-2011 winter, @MayorEmanuel appeared at first to be a one-note joke. (Rahm Emanuel swears. He swears a lot.) But over the course of the campaign, the account began to introduce recurring characters, to respond to events happening in the real campaign, and to weave together a fictional narrative that played out in real time. @MayorEmanuel's conclusion came the day after the Emanuel's election and, uncannily, played off a hailstorm happening in Chicago. After the account's creator was revealed to be the founder of the music 'zine *Punk Planet* and journalism professor Dan Sinkler, the @MayorEmanuel story was retold in articles and released as a book.⁶⁵ But what the book fails to capture is what made the story so exciting: it was a narrative that coincided with real life. The tweets played out over five months, and the story it told happened over the same five months; when the Bears lost, @MayorEmanuel mourned; when @MayorEmanuel was stuck in the sewer pipes for seven hours, the tweets played out over seven hours. The details of @MayorEmanuel's campaign were interspersed in followers' feeds with the details of their other friends' feeds, with no visible demarcation between fact and fiction. The platform on which the text of @MayorEmanuel was created and through which it was delivered made possible not only the mechanisms of its reception but the shape and meaning of its story. If that's not "book" history—think of the analysis of Christian adoption of the codex as the form through which to receive the Bible—then what is?

So what can we say about today's objects of tomorrow's book history? Books themselves are transmedia properties, franchises spanning multiple formats, media channels, and distribution networks. Today's texts are also, inevitably, hybrid artifacts, migrating back and forth between digital and analog states. Importantly, the print does not always precede the digital; in fact the norm may be the other way around. Moreover, the digital is no longer exclusively a presentist form, if it ever was: the digital itself is now historical. A work such as *Mindwheel* is now more than thirty years old. Like textual scholarship, then, the book history of tomorrow will consist in the application of techniques from fields like digital forensics, as archivists and other experts work to stabilize, authenticate, and index the born-digital materials that now function, indisputably, as primary records in and of themselves. But scholars will also need to understand something about network effects, the massive assemblages of data that will be susceptible to analysis

through text mining and visualization rather than traditional close reading. There can be no other way to evaluate the thousands of user reviews on a site like Amazon, for example, other than in aggregate, as streams which we will sift for patterns and anomalies.⁶⁶ Nor will the material circumstances of the digital be homogenous: they will encompass an array of different platforms, systems, formats, and standards, some of which will interoperate and some of which will not, but all of which a future scholar will have to contend with in the same way as the complex imbrications of printings and editions (all of which will also still obtain). Finally, our scholarship will have to confront the reality that its largest challenges may not be technological but legalistic. Intellectual property, digital rights management, terms of service, end-user license agreements will govern access at least as much or more than media obsolescence, bit rot, or curatorial neglect. Legalities, material hybridity, network effects—contemporary book studies shares many features in common with its predecessors, but we ignore the marked material differences at the peril of our scholarly legacy.

List of Digital Resources

- Annotated Books Online (Utrecht University): <http://www.annotatedbooksonline.com/>
 The Archimedes Palimpsest (Walters Art Museum): <http://archimedespalimpsest.org/>
 The Atlas of Early Printing (University of Iowa Library): <http://atlas.lib.uiowa.edu/>
 The Atlas of the Rhode Island Book Trade in the Eighteenth Century (Rhode Island Historical Society): <http://www.rihs.org/atlas/index.php>
 Bill-Crit-O-Matic (Patrick Murray-John): <http://billcritomatic.org/>
 Bodleian Ballads Online (Bodleian Library): <http://ballads.bodleian.ox.ac.uk/>; to search using ImageMatch <http://zeus.robots.ox.ac.uk/ballads/pageo>
 The Dickinson Electronic Archives (Dickinson Editing Collective): <http://www.emilydickinson.org/>
 Early English Books Online: <http://eebo.chadwyck.com/home> [subscription only]
 Eighteenth-Century Book Tracker (Benjamin Pauley): <http://www.easternct.edu/~pauleyb/cr8booktracker/>
 Eighteenth Century Collections Online: <http://gdc.gale.com/products/eighteenth-century-collections-online/> [subscription only]
 Emily Dickinson Archive (Harvard University): <http://www.edickinson.org/>
 English Short Title Catalogue: <http://estc.bl.uk/>
 Folger Digital Texts (Folger Shakespeare Library): <http://www.folgerdigitaltexts.org/>
 The French Book Trade in Enlightenment Europe (University of Western Sydney): <http://fbtee.uws.edu.au/main/>
 Gallica (Bibliothèque nationale de France): <http://gallica.bnf.fr/>
 Gesamtkatalog der Wiegendrucke Database (Staatsbibliothek zu Berlin): <http://www.gesamtkatalogderwiegendrucke.de/>
 Google Books: <http://books.google.com/books>
 The Great Parchment Book (London Metropolitan Archives): <http://www.greatparchment-book.org/>

HathiTrust Digital Library: <http://www.hathitrust.org/>
 Implementing New Knowledge Environments (University of Victoria): <http://inke.ca/>
 Impositor (Folger Shakespeare Library): <http://titania.folger.edu/impositor/>
 Incunabula Short Title Catalogue (British Library): <http://www.bl.uk/catalogues/istc/>
 Internet Archive: <https://archive.org/>
 Listen to Wikipedia (Stephen LaPorte and Mahmoud Hashemi): <http://listen.hatnote.com/>
 Mapping Colonial Americas Publishing Project (Brown University): <http://www.stg.brown.edu/projects/mapping-genres/index.html>
 The Open Utopia (Stephen Duncombe): <http://theopenutopia.org/>
 Reading Experience Database (Open University): <http://www.open.ac.uk/Arts/reading/>
 The Shakespeare Quartos Archive (Bodleian Library, Folger Shakespeare Library, and MITH, University of Maryland): <http://www.quartos.org/>
 The Shelley-Godwin Archive (New York Public Library and MITH, University of Maryland): <http://shelleygodwinarchive.org/>
 A Social Edition of the Devonshire Manuscript (INKE): http://en.wikibooks.org/wiki/The_Devonshire_Manuscript
 Visualizing Variation (Alan Galey): <http://individual.utoronto.ca/alangaley/visualizingvariation/>
 What Middletown Read (Ball State University): <http://www.bsu.edu/libraries/wmr/>
 The William Blake Archive (IATH, University of Virginia and Carolina Digital Library and Archives): <http://www.blakearchive.org/blake/>

Notes

1. Virginia Woolf, *Three Guineas* (New York: Harcourt, 2006), 116.
2. Michael Joyce, "Notes Toward an Unwritten Non-Linear Electronic Text, 'The Ends of Print Culture' (A Work in Progress)," *Postmodern Culture* 2.1 (September 1991): <http://pmc.iath.virginia.edu/text-only/issue.991/joyce.991>.
3. See Steven E. Jones, *The Emergence of the Digital Humanities* (New York and London: Routledge, 2013).
4. Kirschenbaum, "The .txtual Condition: Digital Humanities, Born-Digital Archives, and the Future Literary," *Digital Humanities Quarterly* 7.1 (2013): <http://www.digitalhumanities.org/dhq/vol/7/1/000151/000151.html>. See also McGann's *The Textual Condition* (Princeton: Princeton University Press, 1991).
5. Released in 2012, *First Draft of the Revolution* is available at <http://lizadaly.com/first-draft/>. The work is subtitled "an interactive epistolary story." For *Device 6*, see <http://simogo.com/games/device6/>.
6. As was widely reported in the press; for example: <http://techcrunch.com/2011/05/19/that-was-fast-amazons-kindle-ebook-sales-surpass-print-it-only-took-four-years/>
7. See <http://www.futureofthebook.org/> for Bob Stein (of Voyager publishing fame) and his colleague's ongoing work and thought in this field. The 2013 Frankfurt Book Fair featured a "Sprint Beyond the Book" organized by the Arizona State University's Center for Science and the Imagination, and sponsored by Intel; over the course of 72 hours a group of writers collectively authored an online "book" exploring the titular theme: <http://www.sprintbeyondthebook.com/>.
8. See *Reading at Risk* (2004) and *To Read or Not to Read: A Question of National Consequence* (2007), available at <http://arts.gov/publications/reading-risk-survey-literary-reading-america-0> and <http://arts.gov/publications/read-or-not-read-question-national-consequence-0> respectively. Each generated considerable media coverage, debate, and attempts at rebuttal.

9. See last year's State of the Discipline report on the subject: Meredith L. McGill, "Copyright and Intellectual Property: The State of the Discipline," *Book History* 16, no. 1 (2013): 387–427.

10. Those readers wishing for an introduction to digital humanities will be well served by the following collections, all of which exist in print and in freely available online editions: Matthew K. Gold's edited collection *Debates in the Digital Humanities* [Minnesota, 2012; <http://dhdebates.gc.cuny.edu/>]; Blackwell's *Companion to Digital Humanities*, edited by Susan Schreibman, Ray Siemons, and John Unsworth [2004; new edition pending; <http://www.digitalhumanities.org/companion/>]; and Blackwell's *Companion to Digital Literary Studies*, edited by Ray Siemons and Susan Schreibman [2008; <http://www.digitalhumanities.org/companion-DLS/>].

11. British Museum, *Catalogue of Books in the Library of the British Museum Printed in England, Scotland, and Ireland, and of Books in English Printed Abroad, to the Year 1640*, ed. George Bullen (London: By order of the Trustees, 1884); Alfred W. Pollard and G. R. Redgrave, *A Short-title Catalogue of Books Printed in England, Scotland, & Ireland and of English Books Printed Abroad, 1475–1640* (London: Bibliographical Society, 1926). The URL for the *English Short-title Catalogue*, along with all other online resources discussed here, are provided in the projects cited list at the end of this essay.

12. Mitch Fraas, "Mapping Books: Mapping Pre-1500 Printed Books Today," *Mapping Books*, July 29, 2013, <http://mappingbooks.blogspot.com/2013/07/mapping-pre-1500-printed-books-today.html>.

13. See also Fraas's exploration of the dispersal of medieval British libraries: Mitch Fraas, "Mapping Books: The Dispersal of the Medieval Libraries of Great Britain," *Mapping Books*, November 12, 2013, <http://mappingbooks.blogspot.com/2013/11/the-dispersal-of-medieval-libraries-of.html>.

14. For a list of these projects, see Eleanor Shevlin, "SHARP 2013 Digital Projects and Tools Showcase," *Early Modern Online Bibliography*, accessed October 31, 2013, <http://earlymodernonlinebib.wordpress.com/2013/07/29/sharp-2013-digital-projects-and-tools-showcase/>.

15. Ben Schmidt, "Sapping Attention: Do Revolutionaries Really Read History?" *Sapping Attention*, July 11, 2012, <http://sappingattention.blogspot.com/2012/07/do-revolutionaries-really-read-history.html>; Ben Schmidt, "Sapping Attention: Making and Publishing History in the Civil War," *Sapping Attention*, July 12, 2012, <http://sappingattention.blogspot.com/2012/07/making-and-publishing-history-in-civil.html>.

16. Ben Schmidt, "Sapping Attention: Women in the Libraries," *Sapping Attention*, May 8, 2012, <http://sappingattention.blogspot.com/2012/05/women-in-libraries.html>.

17. David A. Smith, Ryan Cordell, and Elizabeth Maddock Dillon, "Infectious Texts: Modeling Text Reuse in Nineteenth-Century Newspapers," *Proceedings of the Workshop on Big Humanities*, accessed November 11, 2013, <http://www.viraltexts.org/infect-bighum-2013.pdf>.

18. Ryan Cordell, "'Taken Possession of': The Reprinting and Reauthorship of Hawthorne's 'Celestial Railroad' in the Antebellum Religious Press," *Digital Humanities Quarterly* 7, no. 1 (2013), <http://www.digitalhumanities.org/dhq/vol/7/1/000144/000144.html>.

19. Gadd points to Arber's *A Transcript of the Registers of the Company of Stationers of London, 1544–1640 A.D.* (London, 1875–1894), volume V, p. xxi, and volume I, p. xvii, for support of these points.

20. British Museum, *Catalogue of Books in the Library of the British Museum Printed in England, Scotland, and Ireland, and of Books in English Printed Abroad, to the Year 1640*; Pollard and Redgrave, *A Short-title Catalogue of Books Printed in England, Scotland, & Ireland and of English Books Printed Abroad, 1475–1640*; Donald Goddard Wing, *Short-title Catalogue of Books Printed in England, Scotland, Ireland, Wales, and British America, and of*

English Books Printed in Other Countries, 1641–1700 (New York: Index Society, 1945); ESTC (Project) and British Library, *Eighteenth Century Short Title Catalogue (ESTC)* (London: British Library, 1981); “English Short Title Catalogue,” accessed October 31, 2013, <http://estc.bl.uk/>. For a helpful overview of this history of the ESTC, see Ian Gadd, “The Use and Misuse of *Early English Books Online*,” *Literature Compass* 6, no. 3 (May 2009): 680–92, doi:10.1111/j.1741-4113.2009.00632.x.

21. For a description of what is included in the ESTC and what bibliographic standards are used, see Adrian Edwards, “English Short Title Catalogue—Content,” accessed November 5, 2013, <http://www.bl.uk/reshelp/findhelprestype/catblhold/estccontent/estccontent.html>.

22. For an overview of the different copies available as online facsimiles and for an assessment of the various interfaces, see Sarah Werner, “First Folios Online,” *The Collation*, April 22, 2013, <http://collation.folger.edu/2013/04/first-folios-online/>; Sarah Werner, “What Do We Want from Online Facsimiles of Shakespeare?” *Wynken de Worde*, May 4, 2013, <http://sarah-werner.net/blog/index.php/2013/05/what-do-we-want-from-online-facsimiles-of-shakespeare/>.

23. Liz Bury’s article in *The Guardian* provides an overview of the conflict and reflects the way in which the story appeals to the media today: Liz Bury, “Emily Dickinson Legacy Fuels War of the Archives,” *The Guardian*, October 25, 2013, <http://www.theguardian.com/books/2013/oct/25/emily-dickinson-legacy-archives-online>.

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26. “About EEBO,” accessed November 11, 2013, <http://eebo.chadwyck.com/marketing/about.htm>.

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29. “Cultural Heritage Imaging | More RTI Examples,” accessed November 17, 2013, http://culturalheritageimaging.org/Technologies/RTI/more_rti_examples.html; “RICH (Illuminare) | Portable Light Dome,” *Portable Light Dome*, accessed November 17, 2013, <http://portablelightdome.wordpress.com/category/rich-illuminare/>; “Cultural Heritage Imaging | Reflectance Transformation Imaging (RTI),” accessed November 17, 2013, <http://culturalheritageimaging.org/Technologies/RTI/>.

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31. Kathryn Rudy, “Dirty Books: Quantifying Patterns of Use in Medieval Manuscripts Using a Densitometer,” *Journal of Historians of Netherlandish Art* 2, no. 1–2 (June 2010), doi:10.5092/jhna.2010.2.1.1.

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33. Striphos, *The Late Age of Print: Everyday Book Culture from Consumerism to Control* (New York: Columbia University Press, 2009).

34. See <http://www.theguardian.com/books/2010/oct/01/jonathan-franzen-freedom-uk-recall>.
35. Indeed, ever more information about individual user's reading habits is being collected by these devices, on the one hand raising obvious questions about privacy and personal data security, but also creating truly unprecedented opportunities for the study of public reading habits at scale. See, for example, David Streitfeld's story on the phenomenon in the December 24, 2013 *New York Times*: http://mobile.nytimes.com/2013/12/25/technology/as-new-services-track-habits-the-e-books-are-reading-you.html?hp=&_r=0.
36. See Lev Grossman's "Jonathan Franzen: Great American Novelist," April 10, 2010: <http://content.time.com/time/magazine/article/0,9171,2010185,00.html>.
37. In Winthrop-Young, *Kittler and the Media* (Cambridge: Polity, 2011), 145–46.
38. "There is No Software" has been reprinted many times; here the source is the electronic copy available from the CTheory site: <http://www.ctheory.net/articles.aspx?id=74>.
39. N. Katherine Hayles, *Writing Machines* (Cambridge: MIT Press, 2002), 3.
40. Lev Manovich, *The Language of New Media* (Cambridge: MIT Press, 2001), 7.
41. Matthew Fuller, *Software Studies: A Lexicon* (Cambridge: MIT Press, 2008), 3.
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43. See Knuth, *Literate Programming* (Stanford, California: Center for the Study of Language and Information, 1992).
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48. Alan Galey, "The Enkindling Reciter: E-books in the Bibliographical Imagination," *Book History* 15 (2012): 210–47, at 247, doi:10.1353/bh.2012.0008.
49. The MAL has a Web presence here: <http://loriemerson.net/media-archaeology-lab/>. "The MAL is a place for cross-disciplinary experimental research and teaching using obsolete tools, hardware, software and platforms, from the past."
50. See *The Myth of the Paperless Office* (MIT Press, 2002).
51. From their introduction to the collection *Between C&D: New Writing from the Lower East Side Fiction Magazine* (Penguin, 1988), ix.
52. See Love, *Scribal Publication in Seventeenth-Century England* (Oxford, 1993), and Stallybrass, "Printing and the Manuscript Revolution," in ed. Barbie Zelizer, *Explorations in Communication and History* (Abingdon, UK, and New York: Routledge, 2008), 111–18, and "Little Jobs': Broadsides and the Printing Revolution," in *Agent of Change: Print Culture Studies after Elizabeth L. Eisenstein*, ed. Sabrina Alcorn Baron, Eric N. Lindquist, and Eleanor F. Shevlin (Amherst, MA: University of Massachusetts Press, 2007), 315–41.
53. Paul Zelvansky's artist's book *The Case for the Burial of Ancestors* (1984), John Mc-Daid's HyperCard fiction *Uncle Buddy's Phantom Funhouse* (1992), William Gibson, Dennis Ashbaugh, and Kevin Begos, Jr.'s *Agrippa: A Book of the Dead* (1992) and Ian Bogost's *A Slow Year* (2012) are all subsequent exemplars. Of these, *Agrippa* has the most notoriety. See the *Agrippa Files* Web site for complete documentation: <http://agrippa.english.ucsb.edu/>.
54. See <http://linkedititions.tumblr.com/howse>.

55. See Kirschenbaum, "The .txtual Condition."
56. See "The Book-Writing Machine," *Slate* (March 1, 2013): http://www.slate.com/articles/arts/books/2013/03/len_deighton_s_bomber_the_first_book_ever_written_on_a_word_processor.html.
57. In "Where Money and Energy Gather: A Writer's View of a Computer Laboratory," *Research Directions in Computer Science: An MIT Perspective*, eds. Albert R. Meyer, et al. (Cambridge: MIT Press, 1991): n.p.
58. Jones, *The Emergence of the Digital Humanities*, 156.
59. See <http://www.hughhowey.com/my-advice-to-aspiring-authors/>.
60. See <http://www.newyorker.com/online/blogs/books/2012/05/coming-soon-jennifer-egan-black-box.html>.
61. One source cites 50% ebook sales against the usual 20%: <http://www.theguardian.com/media/2013/mar/26/fifty-shades-random-house-record-profit>.
62. See http://www.mediabistro.com/galleycat/fifty-shades-of-grey-wayback-machine_b49124 for screenshots of the original FiftyShades site.
63. See <http://fiftyshadesofpopculturetheory.blogspot.com/2012/03/full-exchange-with-jason-boog-for.html> for the reasoning behind this figure.
64. Whitney Anne Trettien, "A Deep History of Electronic Textuality: The Case of *English Reprints Jhon Milton Areopagitica*," *Digital Humanities Quarterly* 7, no. 1 (2013), <http://www.digitalhumanities.org/dhq/vol/7/1/000150/000150.html>.
65. The revelation of the account's author came from Alexis Madrigal in the essay that best captures the nature of the narrative: "Revealing the Man Behind @MayorEmanuel," *The Atlantic*, February 28, 2011, <http://www.theatlantic.com/technology/archive/2011/02/revealing-the-man-behind-mayoremanuel/71802/>. The full series of tweets was later published in book form, along with Sinkers' narratives about writing it: Dan Sinker, *The F***ing Epic Twitter Quest of @Mayor Emanuel* (Scribner, 2011).
66. Ed Finn has done some excellent preliminary investigation of "distant reading" the kind of user data housed on Amazon and GoodReads for contemporary fiction; see his "Revenge of the Nerd: Junot Díaz and the Networks of American Literary Imagination" in *Digital Humanities Quarterly* 7, no. 1 (2013), <http://www.digitalhumanities.org/dhq/vol/7/1/000148/000148.html>.