UNBOUNDED HISTORY: TECHNOLOGY, TOOLS, SCHOLARSHIP, AND PRESERVATION IN THE DIGITAL AGE

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Computers, digital databases, and the World Wide Web and its accompanying browser technologies have become fundamental equipment for accessing and presenting information and data. The historian's craft does not seek to reproduce the past but to ask probing questions about the past and answer them in nuanced ways to provide interpretive understanding of past people, cultures, and structures. Current available digital technologies are modernizing the historian's process with innumerable ways to collect, store, manage, analyze, present, and visualize data and evidence in constructing arguments and narrative. Within the realm of digital history, scholars employ computer technology and tools as a part of their research methodology to define, query, and annotate associations in the record of the past in constructing multidimensional, or non-linear, narratives. Digital history also exists as a unique mode of presentation that can enhance possibilities for following an argument in historical communication.[1] In the increasingly digital world, the many tools available can assist historians to emerge from their research with a more thorough understanding of the past that can be presented to diverse audiences. The digital realm offers the ability to amalgamate forms for presentation, with text, images, visualizations, and audio all available in one place. Such combinations can tap into different parts of the brain's ability to associate and inquire, thereby reaching a broad audience with different learning preferences and providing perhaps more insightful historical scholarship.

[1] William G. Thomas, III, et. al. "Interchange: The Promise of Digital History," *Journal of American History* 95, no. 2 (September 2008): 453-454.

With digital tools such as databases, interactive maps, word clouds, textual analysis, and audiovisual presentations now ubiquitous, the practice of researching, teaching, and presenting the past is transforming. Dramatic technological change provides historians rapid access to remote sources, the ability to search and analyze those sources efficiently, hypertext to communicate findings, and other mechanisms to perform their craft. While many positives remain, perhaps as pertinent for the future of historical study is the skepticism surrounding the introduction of digital tools to research, as well as to maintain and preserve, the records created in the digital age so that a historical record of this time exists for posterity.

Historian and advocate for digital history, William G. Thomas, III, writes that the digital medium allows a historian "to create a thoroughly captivating, technically savvy, and wholly unexpected comparative approach … one so complex and interconnected that such a thing seemed impossible in more linear media such as film and books."[2] More so than ever, humans learn on the web or in digital environments. Surfing online, humans learn ways to piece together bits of information for themselves. As Tim Berners-Lee, creator of the World Wide Web, demonstrates, the web, through its links, makes the computer behave more like the human brain with an innate ability to connect random bits of data.[3] Through digital media, readers can literally walk through the complex and multifaceted political, social, economic, and cultural terrain of time and space, thereby making valuable connections to history.

Computers and the web have a determining impact on cultural values, social structure, research, study and learning habits. In this age of electronic media saturation, students expect multimedia integration in the classroom. Digital history resources on the

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[2] William G. Thomas, III, "Computing and the Historical Imagination," in *A Companion to Digital Humanities*, ed. Susan Schreibman, Ray Siemens, and John Unsworth (Oxford: Blackwell, 2004). Available from http://www.digitalhumanities.org/companion/ (Accessed 9 October 2008).

[3] Tim Berners-Lee, *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web by Its Inventor* (New York: HarperCollins, 1999), 1-6; 157-75; 199-209.

web open new possibilities for historians and history teachers to instruct students through non-traditional, non-linear documents and interpretations.[4] Tools, such as the *Digital History Reader* developed at Virginia Tech University, introduce students to a wide array of primary sources, historiographical trends, and historical methodologies online.[5] Harnessing technology streamlines student engagement with documentary evidence, allowing instructors to demonstrate more thoughtful and scrupulous historical analysis and interpretation in an interactive media that engages students more and fosters in them a desire to investigate historical interpretation more deeply.

Scholars and students alike now have seemingly endless and ready access to a wealth of primary sources, books, and articles related to any subject.[6] Through web-based databases and digital resource repositories such as Google Scholar, the Library of Congress, America History & Life, JSTOR, the Valley of the Shadow and other primary source repositories, historians and humanists find that they can research sources from the comfort of their home or office and share their findings quickly with colleagues and students. Such capabilities offered by digital archives and databases open fresh possibilities for connecting scholars and students to research and teaching with historical documents.[7] Prior to the advent of such digital databases and repositories, accessing historical resources required going to a physical library, locating the source, and slogging through it for even the smallest piece of information. Similarly, searching through microfilm requires significant time and patience to scroll through and find information. Digital technology cuts that process down substantially as search capabilities conveniently bring information to one's computer screen

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[4] E. Thomas Ewing and Robert P. Stephens, "The *Digital History Reader*: Teaching Resources for United States and European History," *AHA Perspectives* (May 2007). Available from http://www.historians.org/perspectives/issues/2007/0705/0705tec3.cfm (accessed 16 March 2008). See also Daniel J. Cohen, "History and the Second Decade of the Web," *Rethinking History* 8, no. 2 (2004): 293-301.

[5] Ewing and Stephens, "The *Digital History Reader*."

[6] J. Chris Arndt, Michael J. Galgano, and Raymond M. Hyser, *Doing History: Research and Writing in the Digital Age* (Boston, MA: Thomson Wadsworth, 2008), 28.

[7] Daniel J. Cohen and Roy Rosenzweig, *Digital History: A Guide to Gathering, Preserving, and Presenting the Past on the Web* (Philadelphia: University of Pennsylvania Press, 2006), 1-17, 44-47.

saving valuable time and energy. Despite the seemingly endless access, students and scholars should not limit themselves to researching solely in the digital realm because only a small fraction of the historical record is available in digital form.

However, with more sources digitized and placed online, not to mention the contemporary sources created and existing only in electronic form, researchers increasingly require sophisticated digital tools to categorize and manage scholarly digital resources.[8] In his recent book, *Glut: Mastering Information through the Ages*, Alex Wright demonstrates that organizing and gathering information over the past several thousand years have been a natural part of human genetic activity. In essence, Wright posits that inherent in the biological makeup of humans is the need for information management, which governs an understanding of the world.[9] At several points, where new network technology emerged to take down an old information hierarchy, there were growing pains associated with managing and disseminating the influx of new information. For instance, the advent of the printing press created an information revolution that caused great concerns amongst many, primarily the era's ecclesiastical clergy, relating to management and dissemination of information. Religious hierarchies could no longer control their virtual monopoly on print production as secular literacy at the universities loosened the structure and created a new engagement with texts and a viable reading public.[10] Currently, the world is enduring a growing pain relating to the most recent information explosion.

Today's adjustment period to the outburst of information remains rife with debates over the future of information management and knowledge. While some believe the new global network and entire Internet movement concerning collective intelligence is a cultural meltdown, others like *Newsweek* Senior Editor Steven Levy maintain positive mind frames.

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[8] Daniel J. Cohen, "Zotero: Social and Semantic Computing for Historical Scholarship," *AHA Perspectives* (May 2007). Available from http://www.historians.org/Perspectives/issues/2007/0705/0705tec2.cfm (accessed 29 January 2008).

[9] Alex Wright, *Glut: Mastering Information through the Ages* (Washington, D.C.: Joseph Henry Press, 2007), 20-21, 155-156.

[10] Ibid., 100-109.

Levy comments "Just as the printing press was disruptive in its time, the ubiquity of the Net and the cheap tools that give voice to anyone—whether talented or not—has kicked off a period of creative ferment. The optimists among us believe that the cream will rise to the top."[11] Wright's argument suggests that humans eventually cope with new technology and information "glut" in developing logical devices towards managing information, knowledge, and understanding.[12]

In terms of the new digital network, humans are already beginning to discover ways of collecting, managing, and disseminating the influx of information with some available helpful digital tools for enhanced collective intelligence. With bookmarking tools like del.icio.us, one can gather, organize, and share information for research, teaching, and reading lists online in useful ways. Daniel Cohen at George Mason University's Center for History and New Media has created Zotero, a sophisticated tool to collect, manage, and cite web-based research. Zotero has additional capabilities for adding research notes and marginalia to one's digital research, which enables historians to use and manage information and data more efficiently.[13] While there are many information management tools currently available, including commercial reference management software like EndNote, del.icio.us and Zotero represent free, in-browser technologies that are customizable in creating tags, index terms, and, for Zotero, notes and metadata. Furthermore, digital resource management tools offer personalized tagging features for easy and more flexible categorization and referencing for digital research rather than fitting one's information into rigid, predetermined categories or folders. Bundling tags enable one to separate data, easily locate, and make connections based on related information through the visualizing related subjects. Such free categorization can help one visualize their thinking and the connections

[11] Steven Levy, "Invasion of the Web Amateurs," *Newsweek* Web Exclusive (March 26, 2007). Available from http://www.newsweek.com/id/36171 (accessed 25 September 2008).

[12] Wright, 20-21, and 40-44.

[13] For more information on Zotero see its website http://www.zotero.org/ or Cohen, "Zotero: Social and Semantic Computing for Historical Scholarship." For more information on del.icio.us, see its website at http://del.icio.us/.

amongst information, which can, not only make research more organized and efficient, but can lead to new thought about the relationships between source material.

As research progressively moves to the digital realm, use of digital tools to categorize scholarly and noteworthy resources becomes essential for useful compilation and analysis to make trails through the mass of available sources. Such tools also boast the ability for users to share information on a mass scale, which can aid in collaboration with other users and thereby generate more effective research strategies and create a greater collective intelligence. For a historian, these tools provide hope in managing the vast resources now available in both digital and analog form. As Vannevar Bush's ideas suggest in his visionary article "As We May Think," historians should seek to manage a world of infinite information, instead of encountering information overload by attempting to master everything.[14] Because academics find it trying to keep abreast of all current thought even in a restricted field, mechanical aid can assist in understanding and comprehending the summation of that knowledge. Digital tools provide an environment to compile, categorize, and analyze information while streamlining navigation, browsing, searching, and sorting, thereby assisting in the management of a world of nearly infinite information.

With digital archives and other resource repositories online providing digital sources, which certainly offer flexibility of research and exploration, employing analytical digital tools enables historians to make deeper intellectual connections from that material, thus providing new thought and insightful historiographical contributions. Digital texts allow for systematic manipulation and analysis of complex historical texts, deciphering their intricacies while preserving their complexity.[15] With a growing digital source pool, computer technology can follow and analyze the tentative connective relationships that define much of our society's workings, unveiling entirely new ways to visualize our world. Word clouds, keywords in

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[14] Vannevar Bush, "As We May Think," *Atlantic Monthly* (July 1945). Available from http://www.theatlantic.com/doc/194507/bush/4 (accessed 14 April 2008).

[15] Perry Willett, "Electronic Texts: Audiences and Purposes," in *A Companion to Digital Humanities*. Available from http://www.digitalhumanities.org/companion/ (accessed 8 September 2008).

context, geospatial reconstruction, and other computer-based methods of visualizing language and movement through time and space highlight relevant correlations in the historical record that might otherwise be invisible.[16] Digital tools, employed as part of one's research strategy, allow scholars to approach material with new questions, thereby allowing them to investigate and present historical events, patterns, and trends in more nuanced ways. Historians can create more distinctive, layered, and coherent forms of narrative, analysis, and interpretation that adequately exploit the possibilities offered by technological developments. New research methodologies emerge in part because of the vast size of the source pool, which requires technological assistance to see through the mass and make interpretations on the interrelationships amongst the evidence.[17] It is not simply collecting diverse materials on a subject, but making sense of that collected evidence and weaving it together to construct an understandable story.

Digital history opens new realms for historical analysis. Some of the already developed and available tools include textual analysis for analyzing the connective relationships within language, Geographic Information Systems (GIS) for spatial comparisons over time and place, and MIT's Simile project, which among others helps one create interactive time-based maps, timelines, and citation data exhibits.[18] Historians using textual analysis, for instance, can decipher language and communication visually and analyze

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[16] John Burrows, "Textual Analysis," in *A Companion to Digital Humanities*, ed. Susan Schrelbman, Ray Siemens, and John Unsworth (Oxford: Blackwell, 2004). Available from http://www.digitalhumanities.org/companion/view?docId=blackwell/9781405103213/9781405103213.xml&chunk.id=ss1-4-4&toc.depth=1&toc.id=ss1-4-4&brand=default (accessed 29 December 2008.) Word clouds provide a visual depiction of the frequency of words in a document's content. Shown by a variation in font size or color depending on their frequency, the word clouds identify the most crucial words used in a document. Another impressive feature in textual analysis rests in being able to view particular words in context. Emphasizing words in their immediate context allows one to visualize that word's usage in several instances within a document.

[17] Willett, "Electronic Texts: Audiences and Purposes."

[18] For more on text analysis see John Burrows, "Textual Analysis." See also Brian L. Pytlik Zillig, "TokenX: a text visualization, analysis, and play tool" available from http://libxml1a.unl.edu/cocoon/tokenx/index.html?file=../xml/base.xml (Accessed 28 December 2008). For more on MIT's Simile see http://simile.mit.edu/.

the connections within language and across media over time.[19] Word usage and meanings change, using textual analysis tools one can ask why particular words appear at certain times and places in a corpus of texts and examine the meaning, context, and relationship to other words in making or enhancing a historical argument. The visual elements created by text analysis trace the interconnections of all the different textual threads by comparing texts and displaying the relationships among discourse, rhetoric, and ideas. The visual representations can help scholars demonstrate the connections and their analysis to colleagues and students as another non-linear mode of scholarly communication and teaching.

Textual analysis tools further help historians analyze the contingent connective threads in historical texts by manipulating and analyzing all words on an equal footing, even the common words that many researchers continually disregard. As John Burrows states, "the real value of studying the common words rests on the fact that they constitute the underlying fabric of a text, a barely visible web that gives shape to whatever is being said."[20] Therefore, historians will find inherent value in many different sorts of literary inquiry, helping to resolve debates, to carry arguments forward, and to open entirely new questions based on word usage, changes in meaning, and context. Similarly, using spatial reconstruction tools one can observe movement and the relationship to events and patterns in time and space with results that can open new understandings of great complexity.[21] Essentially, digital tools can highlight aspects in the historical record that may not be visible without them, allowing scholars to adopt new research strategies and make more nuanced arguments.

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[19] The *New York Times* recently developed an example of illustrating language change over time through their word cloud visualization of presidential inaugural addresses from 1789 to present. Available from http://nytimes.com/interactive/2009/01/17/washington/20090117_ADDRESSES.html (accessed 1 February 2009).

[20] Burrows, "Textual Analysis."

[21] Robert M. Schwartz, "New Tools for Clio: GIS, Railways, and Change over Time and Space in France and Great Britain, 1840-1914," *Digital History* (February 2007). Available at http://digitalhistory.unl.edu/essays/schwartzessay.php (accessed 1 March 2009).

Using digital tools and digital research techniques compels historians to think in terms of layered analyses and, as William Turkel suggests, simultaneity, or telling the story of many things happening in different places at the same time.[22] Digital history as a methodology can illuminate relationships, multiple layers, and simultaneous patterns emerging, to help historians visualize correlations and make new intellectual connections concerning their topic or era. Digital history changes historical methodological conceptions and the ways historians collect, store, and present history online, which promises to lead historians to conduct research and present history in slightly different ways in the future. The fundamental elements of research, analysis, and interpretation relating to the historian's craft will remain constant in principle, but digital technology changes how one might approach these elements.

Computers serve many purposes, but one of importance to historians is that they are an excellent tool for visualization. Historian and educator David J. Staley writes that visual secondary sources, of which the creation and presentation of digital history projects apply, are a unique way to inquire into, interpret the past, and see different patterns not conceivable in the written word.[23] Visual secondary sources, like written ones, are an abstraction and arrangement of primary sources formed into a narrative. The big difference is that visual secondary sources are typically associative, allowing historians to see patterns in the visual evidence and make contrasts and comparisons. The visual elements seem particularly suited to the movement of discourse and ideas as well as spatial thinking. The associations and relationships created by visual evidence can tap into parts of the brain that written words cannot, thereby creating a new level of engagement and education to the scholar.[24] Visual

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[22] William Turkel, interview by *Digital History*, digital video recording, April 24, 2008. Available from http://digitalhistory.unl.edu/interviews.html#turkel (accessed 24 September 2008).

[23] David J. Staley, *Computers, Visualization, and History: How New Technology will Transform our Understanding of the Past* (London: M.E. Sharpe, 2002), 64-85.

[24] Ibid., 64-85.

structures are as useful as verbal structures in organizing thoughts about the past and communicating these ideas as a part of historical inquiry.

While there are inherent limitations in all media, the digital realm offers an excellent space to combine them in an act of joining, linking, and juxtaposing sources to analyze, interpret, and discern patterns in the past. Digitally based research and presentation take advantage of the mass, multiplicity, speed, and precision offered by computers.[25] Placing specialized source material, tools, and expertise together in an electronic environment aids in the process of intellectual work and the production of new knowledge.[26] By immersion in the digital realm, historians can deal more effectively with multiple sequences, voices, and outcomes to spread contextual wisdom concerning the interrelatedness of experience.[27] Historians can arrange ideas and analysis in an unconstrained way to share and aggregate previously hidden data. By stockpiling that mass of information in a multimedia venue, readers can visualize interrelationships within information and explore primary source material that comprises the evidence for an argument in a meaningful way. Historians can do more, reach more people, store more data, get more primary sources into the classroom, and provide more perspectives in a digital environment, which could have large ramifications on the epistemology and pedagogy of the historical field.[28]

Digital historical scholarship also provides greater transparency in terms of method and source interpretation. The reader no longer has to take the author at their word; through digital historical capabilities, they can access the evidence immediately and inspect it for themselves. At length, historians have attempted to convey complexity through words, footnotes, and appendices in print form. Most historians will concur that print form does

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[25] Edward L. Ayers, "The Pasts and Futures of Digital History," Virginia Center for Digital Research (1999). Available from http://www.vcdh.virginia.edu/PastsFutures.html (Accessed 3 March 2008).

[26] Carole L. Palmer, "Thematic Research Collections," in *A Companion to Digital Humanities* ed. Susan Schreibman, Ray Siemens, and John Unsworth (Oxford: Blackwell, 2004), 348-365.

[27] Daniel J. Cohen and Roy Rosenzweig, *Digital History: A Guide to Gathering, Preserving, and Presenting the Past on the Web* (Philadelphia: University of Pennsylvania Press, 2006), 7. See also Ayers, "The Pasts and Futures of Digital History."

[28] Cohen and Rosenzweig, *Digital History*, 7.

not embrace a fraction of the past's complexity.[29] Weaving together text, visualizations, and source, digital history embodies historical complexity on screen and provides a mode to unlock the store of information and human knowledge hidden in archives and books and combine them onto one widely used medium. The "Differences Slavery Made: A Close Analysis of Two American Communities," a digital article of Edward Ayers and William G. Thomas, III unveils this unique form of professional digital scholarship, where primary sources, analysis, and interactive maps intertwine to create a new layer of historical complexity not reproducible on paper.[30]

Ayers and Thomas's "The Differences Slavery Made" was an early experiment with the digital form of scholarly communication and production. From the authors accounts it is clear that the point of their effort was to fuse content and form in the digital environment. This article provides an excellent example of digital potential by using hypertext as well as comparative spatial analysis and spatial presentation to examine the interrelationships between historical evidence and interpretation. The comparative aspect allows readers to investigate the agriculture, demography, transportation, class relations, religion, and political activism comparing the Northern and Southern states and placing them in a regional perspective. The format advantageously used GIS and Extensible Markup Language (XML) to connect the significant amount of evidence to their deep, thorough analysis. If, as was earlier suggested, digital history is employing technology and tools as a part of one's research methodologies and constructing a multidimensional, or non-linear, narrative, then "The Differences Slavery Made" certainly meets this definition in every way. In their introduction, the authors assert, "Nothing that came into either close contact or proximity to slavery was

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[29] Ayers, "The Pasts and Futures of Digital History."

[30] William G. Thomas, III and Edward L. Ayers, "The Differences Slavery Made: A Close Analysis of Two American Communities," available from http://www.vcdh.virginia.edu/AHR/ (accessed 14 March 2008). The evidentiary base for this digital article comes primarily from the "Valley of the Shadow Project." The Valley Project is a digital archive of primary sources documenting the lives of people in Augusta County, Virginia and Franklin County, Pennsylvania during the United States Civil War era. For more information, see http://valley.vcdh.virginia.edu/usingvalley/valleyguide.html.

constant, nothing linear, nothing singular, nothing transparent."[31] When thinking about this as a whole, the article certainly suggests that, the digital medium is best suited to depicting the role of slavery and the differences it made because it can take advantage of that non-linearity. It seems then, that in producing a deep and multi-sequential argument and narrative, the authors have captured the essence of digital history.

The digital realm thus provides new avenues for enhanced dialogue and interactivity amongst professional historians and readers, opening professional history to a broader, more diverse audience previously restrained in the confines of print publications. As the web flourishes and expands, people often turn first to the web for information.[32] Great potential exists for utilizing history within a digital environment to advance and free historical erudition from the bounds of written texts and make it more accessible to broader audiences. The public historical sphere encourages access not simply to existing historical resources, but also to the new modes of thinking and understanding for a diverse audience. Through more engaging and interactive digital historical scholarship, historians have the potential to broaden public access. Although historians once enjoyed a broad audience, Edward Ayers notes that most of the academy's best work now seems disconnected from the desires of the general reading public.[33] Digital history and technological tools can facilitate a re-connection with the public, further indicating the high importance for historians to be at the front of the digital conversation.

The world today, as Jeff Gomez points out in his book *Print is Dead: Books in our Digital Age*, is connected in unbelievable ways. Hundreds of millions of people electronically

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[31] Thomas and Ayers, "The Differences Slavery Made." See http://www2.vcdh.virginia.edu/xslt/servlet/XSLTServlet?xml=/xml_docs/ahr/article.xml&xsl=/xml_docs/ahr/article.xsl&section=text&area=intro&piece=presentation&list=&item=.

[32] The Pew Internet & American Life Project reports that by 2008 approximately 90 percent of Americans between ages 12 and 25, and more than 80 percent of Americans under the age of 50 are online. The project also demonstrates that 40 million Americans use the Internet as their primary source of information. See http://www.pewinternet.org/default.aspx and for more specifics see http://www.pewinternet.org/Reports/2009/Generations-Online-in-2009/Generational-Differences-in-Online-Activities/2-Internet-use-and-email.aspx?r=1 (accessed 27 February 2009).

[33] Ayers, "The Pasts and Futures of Digital History."

linked share thoughts, ideas, information, and just about everything else digitally.[34] Many, perhaps most, people read their news, get their information, communicate, share, take notes, and listen to music in digital environments.[35] With more engagement and interaction with reading in a digital form, it becomes necessary to reconsider the book and its paramount place in historical scholarship. As the nature of reading changes from the linear task of turning pages in books to the circular mode of browsing through interlinked digital literature, the form or forum for producing and distributing words and literary content must also change so that people will read and share new historical discoveries, understanding, and knowledge. Historians research and write to have their work read and discussed, not just amongst their colleagues, but for the interested public as well. The digital realm can reach far beyond that interested public who might pass over a book in a bookstore, if a bookstore will carry a nuanced historical monograph in the first place.

When considering that libraries worldwide only purchase between 200 and 400 copies of a book, it seems clear that access to and reading of that historical research and writing is inhibited.[36] Logically then, in print form, historical work is not read widely. With more people reading electronically, fewer field-specific works of print scholarship make it to publication because publishers have little financial incentive for such studies. Relating this dilemma to the historical profession, historian Patrick Manning has noted that the current key to promotion and tenure is research defined as the publication of a field-specific monograph.[37] With the prospect of less history PhD's earning employment and tenure because of the limitations in publishing, it seems that the digital environment offers stimulating possibilities for presenting research and for informing broader audiences.

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[34] Jeff Gomez, *Print is Dead: Books in Our Digital Age* (London: Macmillan, 2008), 3-4.

[35] Ibid., 53-55; "Newspaper website readership up 31%," *Reuters*, 4 October 2006.

[36] Robert Darnton, "The New Age of the Book," *The New York Review of Books* 46.5 (March 18, 1999). Available from http://www.nybooks.com/articles/546 (accessed 12 December 2008).

[37] Patrick Manning, "Gutenberg-e: Electronic Entry to the Historical Professoriate," *The American Historical Review* 109.5 (December 2004): 1505-1526.

Nevertheless, skepticism remains within the historical profession regarding digital scholarship. The historical profession has yet to generate professional and peer review standards for digital scholarship.[38] Historians Daniel Cohen and Roy Rosenzweig indicate, "When you move your history online, you are entering a less structured and controlled environment than the history monograph, the scholarly journal, the history museum, or the history classroom."[39] Further, historian Carl Smith asserts, as do many other digital history advocates, that "the only way to see to it that there is serious history on the Web is to put it there ourselves."[40] Those in favor of web-based history advise colleagues to take control and utilize new digital media tools, to have an active hand in creating and maintaining digital history. Historians receive much less encouragement, however, from the historical profession at large because digital history as serious scholarship remains unconsidered for promotion and tenure purposes.

Edward Ayers recommends that historians take on more digital projects and establish peer-review standards to ensure that the profession at large takes seriously this new form of scholarly communication. According to Ayers, "until we build scholarship that can hold its own with the best work done on paper, tenure and promotion will not follow…Young scholars who dream of new kinds of scholarship can read the situation: Steer clear of the major technological change of our time. Play it safe. Stick to paper."[41] The ubiquity of computers and the displayed power and potential of the Web for historical scholarship

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[38] Digital scholarship here refers to born-digital forms of scholarship that employ digital tools as part of their research methodology and presentation rather than digitized versions of journals online. For examples of digital scholarship see William G. Thomas, III and Edward L. Ayers, "The Differences Slavery Made: A Close Analysis of Two American Communities," available from http://www.vcdh.virginia.edu/AHR/; Crandall Shifflett, "Virtual Jamestown," available from http://www.virtualjamestown.org/page2.html; Andrew Torget, "Texas Slavery Project," available from http://www.texasslaveryproject.org/; or Douglas Seefeldt, "Envisaging the West: Thomas Jefferson and the Roots of Lewis and Clark," available from http://jeffersonswest.unl.edu.

[39] Cohen and Rosenzweig, *Digital History*, 9.

[40] Carl Smith, "Can You Do Serious History on the Web?" *AHA Perspectives* 36.2 (1998): 5-8.

[41] Edward L. Ayers, "Doing Scholarship on the Web: Ten Years of Triumphs – and a Disappointment," *Journal of Scholarly Publishing* (April 2004): 143-147.

suggests that this should not be the message sent, particularly to new historians. The ancient discipline of history has begun to metamorphose, so too must its presentation.

Historian and Sociologist Orville Vernon Burton suggests that history "is badly in need of models beyond the monograph … and where scholarship itself is in need of new genres and new strategies for reaching new audiences."[42] Digital history represents this new genre. Yet in challenging and re-creating the historical discipline, historians as a community must come to understand digital complexity and discuss it openly in order to assess its enduring value. Vernon Burton noted further, "Historians will not develop digital history technological skills because there is not a field of digital history to make those skills worthwhile."[43] Historians around the world are creating incredible digital work, so it remains debatable whether the field of digital history will expand due to the technological skills hurdle. Nevertheless, Burton and others encourage active input and involvement of professional historians at every digital level, so that the digital tools in particular that are developed are applicable to the historian's craft. The historian must drive the developing of tools and techniques if they are going to add new dimensions to the historical discussion and if digital history is to become a respected field and methodology to the profession at large. However, to involve historians in digital tool and research technique development necessitates a reward structure for digital work by providing tenure and promotion for digital work, a problem that, currently, continues to suppress the many potentials of digital history.

A need has arisen for peer-review standards, for digital editing, for digital work to count towards tenure and promotion, for new approaches to writing, and for new methodologies that accompany historical digital scholarship. Robert Darnton, in his article "The New Age of the Book," states, "Scholars should set standards. They should maintain quality control in the academic world, and they can do so by attacking the crisis I have described at two points: the point where beginners turn dissertations into books and the

[42] Orville Vernon Burton, "American Digital History," *Social Science Computer Review* 23, no. 1 (2005): 206-220.
[43] Ibid., 220.

point where veterans experiment with new kinds of scholarship."[44] In other words, the historical profession must come to an agreement on accepting digital scholarship for the academy in the same definition as the published monograph currently. It is important to begin thinking about how technology can serve the interests of history and create new, deeper historical interpretation.

What does all this suggest about history in the digital age? It seems to suggest that older hierarchies wedded to the print world are meeting an emergent and increasingly digital network. Alex Wright asserts that hierarchies and networks do not necessarily have to stand in opposition; rather "they may not only coexist, but ultimately prove consilient."[45] Such a statement seems salient for history and the historical profession. Currently, an established hierarchy exists for history: Research, print publication, and reward. The networked digital medium threatens this existing hierarchy, just as the printing press once threatened ecclesiastical control. Perhaps digital will triumph over print, but more likely, in the near future the two mediums will coexist and unify for history and invite people the world over to engage with and form a collective intelligence concerning history. In 1945, Vannevar Bush noted that the historical profession would consist of trailblazers, "those who find delight in the task of establishing useful trails through the enormous mass of the common record."[46] In the digital world, the historian can help ease the information growing pain, moving from the hive mind towards collective understanding and knowledge by providing associative trails through today's enormous mass of information.

Research, teaching, and scholarly analysis are not the only aspects in flux for historians in the digital age; preserving the cache of digital information currently created represents perhaps the most challenging aspect of the digital age. As custodians of memory, archivists, librarians, and other heritage preservationists face the multi-faceted and daunting

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[44] Darnton, "The New Age of the Book."

[45] Wright, *Glut: Mastering Information Through the Ages*, 235.

[46] Bush, "As We May Think," *Atlantic Monthly* (July 1945).

task of determining how to preserve the surge of electronically generated information for posterity. Whereas parchments, paper documents, and engravings can remain readable for an extended period and have a recognized degradation pattern, computer produced electronic records disappear as quickly as created. Contemporary digital records can fail completely with just a single damaged bit, becoming unreadable.[47] Research in digital records reveals an uncertain future. What will historians of the future study and use as an evidentiary base concerning the late 1900s and early 2000s? Without a historical record for this era, how will historians implement the digital tools to form their interpretation and analysis?

The extraordinary facility to organize, save, and circulate information is more easily lost because digital storage methods, while vastly more capacious than the paper they are rapidly replacing, have proved fallible.[48] Commentator Brad Reagan posits, "digital information is so simple to create and store, we naturally think it will be easily and accurately preserved for the future. Nothing could be further from the truth. In fact, our digital information — everything from photos of loved ones to diagrams of Navy ships — is at risk of degrading, becoming unreadable or disappearing altogether."[49] Lost digital information limits the amount of information available for contemporary and future public use that may create a glaring gap in the historical record.[50]

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[47] Roy Rosenzweig, "Scarcity or Abundance? Preserving the Past in a Digital Era," *American Historical Review* 108.3 (June 2003): 735-762. Also available from http://chnm.gmu.edu/resources/essays/d/6#ref11 (accessed 3 March 2008).

[48] Charles Piller, "Off the Record: How digital data make archiving a nightmare," *The Sacramento Bee*, September 24, 2006, D1-D2.

[49] Brad Reagan, "The Digital Ice Age: The documents of our time are being recorded as bits and bytes with no guarantee of future readability. As technologies change, we may find our files frozen in forgotten formats. Will an entire era of human history be lost?" *Popular Mechanics*, December 2006, 1. Available from http://www.popularmechanics.com/technology/industry/4201645.html?page=1 (accessed 3 March 2007).

[50] Bruce W. Dearstyne, *The Archival Enterprise: Modern Archival Principles, Practices, and Management Techniques* (Chicago: American Library Association, 1993), 40-42 and Gregory S. Hunter, *Developing and Maintaining Practical Archives* (New York: Neal-Schuman Publishers, Inc., 1997), 92.

A fundamental shift in the nature of records requires reassessment of not only, preservation methods, but also how future researchers might use them.[51] Local, state, and federal governments generate complex and voluminous digital information every day. In 2000, the United States National Archives and Records Administration identified more than 4,500 different digital data file types used by the federal government.[52] Today, more than ever, government documentation originates and spends most of its life cycle in electronic form, typically appearing only on a government Web site and never in print.[53] The state of California, for instance, no longer publishes many of its government documents and reports, including the Roster of Public Officials or the certified lists of candidates for elections, making them available exclusively in digital form.[54]

Personal records, such as letters and diaries, and other non-governmental records remain crucial sources of historical data. Since the advent of e-mail and social networking in a digital environment, people communicate less via pen and paper and more via computer blogs, e-mails, or instant messages. Recently, e-mail preservation has received significant press relating to White House correspondence. Despite recovery efforts, an entire week's worth of vital e-mail from Vice President Dick Cheney's office went missing. A 2005 government analysis estimated that more than 1,000 days of White House e-mail were missing from January 2003 to August 2005.[55] Without those e-mails and other digitally created memoranda, current justice officials cannot adequately complete a probe into the

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[51] Richard Pearce-Moses, "A Bridge to the Future: Committing Intentional Acts of Memory," (paper presented at the annual meeting for the Society of Southwestern Archivists, Baton Rouge, Louisiana, 27 May 2005), 1. Available from http://www.lib.az.us.diggout/presentations/Bridge.pdf. (accessed 25 September 2006).

[52] For further information, see the Electronic Records Archives at the National Archives and Records Administration website. Available from http://www.archives.gov/era/about/documentation.html (accessed 21 February 2007).

[53] John Hill, "Digital age perplexing for state archivists: With no uniform process to keep records, officials say much is being lost," *The Sacramento Bee*, 14 December 2005, A3-A4.

[54] Information furnished by the State of California, Office of the Secretary of State. See http://www.sos.ca.gov/executive/ca_roster/ for more information (accessed July 21, 2007).

[55] "Cheney's subpoenaed e-mails missing: Vice President's e-mail lost for key week in CIA leak probe," Associated Press updated 11:34 a.m. Wednesday 27 February 2008. Available from http://www.msnbc.msn.com/id/23367672 (accessed 27 February 2008).

White House's handling of information. Moreover, future researchers will not be able to ascertain much about the White House's day-to-day activities. Although most government agencies started using e-mail and word processing in the mid-1980s, the National Archives still does not require digital records retained in that form and governmental employees profess confusion over whether they should preserve electronic files.[56] Revolutionizing archival work, the proliferating digital information and electronic records pose a tremendous problem for history's future.

Non-government individuals pose an even greater problem in maintaining their personal correspondence for posterity. Even if a person conscientiously saved all of their e-mail or electronic personal papers to a disc, the archives that receives that disc years later probably will not have the technical capabilities to read or access the saved information. The unwarranted assumption that archives can appraise and accession records many years after their creation will not work in the digital era because of digital information's inherent fragility.[57] In a recent newspaper article, archivist Paul Eisloeffel notes, "There's going to be a 'dark age' for historians from about 1980 on."[58] Moreover, Minnesota State CIO Peter Quinn states, "this is a significant issue that goes well beyond governments ...If the general populace thought their kids or grandkids couldn't get at a historical document – like you can walk into a state archive or state library today – I think they'd be pretty incensed."[59] Government, academic, and historical archives face a significant challenge in preserving these electronic records due to their diverse nature and the large volumes of electronic

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[56] Jeffrey Benner, "Is U.S. History Becoming History?" *Wired News*, 9 April 2001. Available from http://www.wired.com/politics/law/news/2001/04/42725 (accessed 29 March 2008).

[57] *SRA International, Report on Current Recordkeeping Practices within the Federal Government* (Arlington, Va., 2001). Available from http://www.archives.gov/records-mgmt/faqs/pdf/report-on-recordkeeping-practices.pdf (accessed 28 March 2008). This report responded to an earlier report relating to electronic records preservation practices and changing technology: U.S. Government Accounting Office, National Archives: Preserving Electronic Records in an Era of Rapidly Changing Technology (Washington, D.C., 1999).

[58] Bob Reeves, "Will Current history be lost in cyberspace?" *Lincoln Journal Star* Sunday 13 January 2008.

[58] Reagan, "The Digital Ice Age," 1.

[59] Shane Peterson, "Formatting for the Future," *Government Technology*, 31 July 2006, 8. Available from http://www.govtech.net/magazine/story.print.php?id=100356 (accessed 14 August 2006).

records already in existence, complicated by the lack of appropriate tools and experience in electronic records management.

The rising problems of electronic records preservation threaten the maintenance of the historical record, a threat that if left unanswered, will have a detrimental impact on future scholarship, teaching, learning, and memory. Preserving digital information remains essential to the maintenance and the public's accessibility to history, historical documents, and societal operations. The threat of lost or corrupted data due to increased reliance on digital media to store documents, video, photographs, and other electronic information faces virtually everyone in today's technological culture.[60] Losing contemporary digital information and government created electronic records will have a prodigious impact on history and availability of historical information to the public now and for posterity creating a gap in historical memory.

Efforts made to save contemporary digital information have been slow to catch up to the information explosion. Government entities, such as the Washington State Digital Archives and the Electronic Records Archives at the National Archives and Records Administration, University-based initiatives, such as LOCKSS, and others, such as Portico, are making great strides toward meeting the digital preservation need by preserving and providing access to government records and scholarly literature published in electronic form.[61] The Internet Archive, a private, non-profit organization that began archiving the web in 1996, also endeavors to preserve born-digital sources.[62] The Internet Archive, however, seeks to preserve web-based content. It has become the Web's largest database and library, offering free, unfettered public access to the digital collection through the "Wayback Machine." According to Roy Rosenzweig, by February 2002, "the Internet

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[60] Reagan, "The Digital Ice Age," 1.

[61] To learn more about these various entities and their efforts see Washington State Digital Archives at http://www.digitalarchives.wa.gov/; Electronic Records Archives at http://www.archives.gov/era/; LOCKSS at http://www.lockss.org/lockss/Home; and Portico at http://www.portico.org/about/.

[62] The Internet Archive's purpose is to expand universal human knowledge and to offer permanent access to historical collections in digital format. See more at http://www.archive.org/index.php.

Archive had gathered a monumental collection of more than 100 terabytes of web data—about 10 billion web pages or five times all the books in the Library of Congress—and was gobbling up 12 terabytes more each month."[63] The Internet Archive, however, remains far from the complete solution to the problem of digital preservation primarily because it does not deal with the born-digital records that vex the National Archives and other repositories. While it may save websites, it does not archive much formally published literature, including e-books and journals, gated from public view.[64] Furthermore, the Internet Archive cannot preserve hyper-textually linked web pages. As Rosenzweig notes, "to save a single page in its full complexity could ultimately require you to preserve the entire web, because virtually every web page is linked to every other. Therefore, anyone who searches the Internet Archive regularly encounters such messages as 'Not in Archive' and 'File Location Error.'"[65] However, with the combination of digital preservation efforts by government agencies, universities, and other entities, eventually one will find a plethora of digital resource repositories at which to research, and, hopefully, a concrete and thorough historical record of the digital age.

The historical professional landscape is changing. More than a century ago, former American Historical Association president Justin Winsor, pled with the profession to convince Congress to preserve and provide access to existing historical manuscripts for the study of history. That need has risen again. Historians in the digital age need to call again for preservation and access to existing and newly created records to allow historians to engage broadly with the promises and potential pitfalls of the digital age.[66] Historians may think that the culture of abundance created by ready access to online resources will continue

[63] Rosenzweig, "Scarcity or Abundance?" 735-762.

[64] Ibid., 735-762.

[65] Ibid., 735-762.

[66] Justin Winsor, "Manuscript Sources of American History: The Conspicuous Collections Extant," Papers of the American Historical Association 3, no. 1 (1888): 9–27. Available from http://www.historians.org/info/AHA_History/jwinsor.htm (accessed 30 March 2008).

and if preservation in the digital age occurs, the astonishingly rapid accumulation of digital data should cause one to consider that future historians may face information overload.[67] With preservation uncertain, however, future historians may face a paradigm shift from ready access and information overload to a historical dark age with little to no evidentiary base.

Historians should consider taking a more proactive approach to changes in the increasingly digital world. The digital world keeps changing; one either keeps up or is left behind. Most of the world's expertise, historical and in other fields, still resides in books, but as the World Wide Web becomes the preferred venue for obtaining information, it is the experts who need to drive the digital production of scholarship. As digital history progresses in its new scholarship stage, only professional historians can decide whether professional history will participate in the immersive, interactive, and intoxicating possibilities available. Already coming to fruition, the inevitability of digital history encourages historians to get involved and embrace the changes to create new modes of historical thought and interpretation while preventing information loss for the future. Otherwise, future generations may not understand completely the complexities and intricacies of understanding the past. They will not be attentive to the historical processes that underlay their world and they will not be able to analyze and interpret human interactions and events. Rather, they will see history, even more so than now, as chronology and tidbits of information contained in print relics.

Digital historical scholarship incorporates digital tools to inform research strategies and communicate findings, thereby establishing a unique electronic form that will reach wider audiences, provide new historical interpretations, and new ways of reading history for generation download, generation upload, and subsequent generations of digital natives. Interactive and engaging, digital history can provide something to a reader exceptional from

[67] Rosenzweig, "Scarcity or Abundance?" 735-762.

print publication: new ways to visualize and literally explore history. Digital tools, can among others, allow historians to include interactive maps, textual analysis with visual word clouds, timelines, animation, and hyperlinks that will hold a reader's attention and truly connect them with history. Digital history advances the historical pursuit of understanding the past in a technologically changing realm and has the ability to speak to a new generation of readers. While print is not dead and may never completely die, the way people read is changing and is increasingly electronic and if historians want people to continue understanding history, as well as to read and discuss their scholarship, it seems pertinent to move scholarship into the digital realm and to do so quickly.