THEODORE CALVIN PEASE AWARD

Providing Virtual Services to All: A Mixed-Method Analysis of the Website Accessibility of Philadelphia Area Consortium of Special Collections Libraries (PACSCL) Member Repositories

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Abstract

The impact of the Internet on archival repositories has been nothing short of revolutionary. Many repositories mount finding aids, online exhibitions, digital collections, and outreach initiatives on the Web. This study contends that we have much to learn about how well these new Web-based archival products meet the needs of users with disabilities. A literature review provides the background for the discussion, and a mixed-method study quantitatively and qualitatively examines the accessibility of a number of repository websites. The study first employed automated accessibility checkers to provide an overview of site accessibility, then used in-depth and hands-on content analysis of these sites for more detailed analysis. The author demonstrates that gauging website accessibility requires more than software-generated compliance reports. Evaluating website accessibility necessitates the same commitment to context, nuance, and user needs as does archivists' professional imperative to establish and maintain physical and intellectual control over the archival record. The study concludes by highlighting the positive influence that the field's current increased appreciation for and use of user-based studies may have on Web accessibility initiatives.

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Writing in response to the groundbreaking 1990 passage of the Americans with Disabilities Act (ADA), jurist-turned-archivist Ronald L. Girardi chided his archival colleagues for failing to discuss issues of accessibility for disabled patrons and employees. He writes, "Bluntly stated, it is difficult to find articles or essays in the archival literature that are concerned with either the disabled employee or the disabled patron. Even the most diligent researcher is not likely to find more than a handful of references to these subjects in the literature."[1] Nearly two decades later, the situation remains much the same, but with one notable new development. Given the advent and rapid rise of the World Wide Web as a communication and information delivery medium, concerns over the accessibility of archives to persons with disabilities have expanded to include virtual visitors as well.

As early as 2001, SAA president Leon J. Stout sensed that "the essence of 'archivist' is changing; both who it is and what it includes seems to be increasingly in flux."[2] Though he admits that "it's not technology alone that is responsible [for this change],"[3] he notes in his plenary remarks at the 2001 Annual Meeting of the Society that "it's primarily technology that is bringing this [paradigm shift] to the fore."[4] It is easy to find evidence of the change that technology—specifically, in this instance, Web-based archival services—has wrought. One recent survey indicates that virtual forms of interaction between patrons and repository staff (including email, website comment features, and interactive chat reference) have increased dramatically in the past decade, while traditional forms of communication, especially mail by post, have dramatically declined.[5] Similarly this same survey of 275 American and Canadian special collections libraries[6] found that only 7 percent of survey respondents provided no Web-based access to their finding aids.[7] In addition to reference services and

[1] Ronald L. Gilardi, "The Archival Setting and People with Disabilities: A Legal Analysis," *The American Archivist* 56 (Winter 1993): 706.

[2] Leon J. Stout, "SAA and the Road Ahead," *Archival Outlook* (August 2001): 3.

[3] Stout, "SAA and the Road Ahead," 27.

[4] Leon J. Stout, "Reimagining Archives: Two Tales for the Information Age," *The American Archivist* 65 (Spring/Summer 2002): 18.

[5] Jackie M. Dooley and Katherine Luce, *Taking Our Pulse: The OCLC Research Survey of Special Collections and Archives* (Dublin, Ohio: OCLC Online Computer Library Center, Inc., October 2010), 38, http://www.oclc.org/research/publications/library/2010/2010-11.pdf, accessed 1 May 2011.

[6] Libraries surveyed belong to five academic and research library organizations, including the Association of Research Libraries (ARL); the Canadian Association of Research Libraries (CARL); the Independent Research Libraries Association (IRLA); the Oberlin Group; and the RLG Partnership (U.S. and Canada). Dooley and Luce, *Taking Our Pulse*, 17.

[7] Dooley and Luce, *Taking Our Pulse*, 43.

finding aid delivery, exhibitions, digitized-collection materials, and community outreach initiatives have all moved to the virtual realm.[8]

Though it is difficult to confirm that the growth of archives' presence on the Web is solely responsible, in this same period (2000–2009), use of manuscript and archival collections increased as much as 88 percent.[9] If the Web has even partly helped to drive this increased interest in and use of archival materials, then the question arises whether these new benefits can be reaped equally by members of the abled and disabled communities. If, as archival professionals, we believe that "The global citizen should be able to access technology and participate in society on an equal basis,"[10] then we must ask whether virtual services are equally accessible to all.

This study contends that we have much to learn about the level and quality of website accessibility we provide to the users of our archives. Understanding website accessibility necessitates the same commitment to context, nuance, and user needs as does our professional imperative to establish and maintain physical and intellectual control over the archival record.[11] While members of the profession may still be "too shell-shocked by technology's impact on archives,"[12] continuing to ignore Web accessibility issues is a detriment to the profession. Indeed, turning a blind eye and allowing usability hindrances to continue unchecked will likely encourage more and more users to navigate away from the Web services provided by libraries, archives, and other cultural institutions, favoring instead those other (accessible) services provided by open-Web platforms.[13]

[8] Articles about Web-delivered archives projects are numerous. Some examples include Ian Breaden, "Sound Practices: On-line Audio Exhibits and the Cultural Heritage Archive," *The American Archivist* 69 (Spring/Summer 2006): 33–59; Morna Gerrard, "Hear Them Roar: Challenge and Collaboration in Putting the Georgia Women's Movement Oral History Project on the Web," *Archival Issues* 31, no. 1 (2007): 7–24; Trevor James Bond and Michael Walpole, "Streaming Audio with Synchronized Transcripts Utilizing SMIL," *Library Hi Tech* 24, no. 3 (2006): 452–62; Gretchen Gueguen, "Digitized Special Collections and Multiple User Groups," *Journal of Archival Organization* 8, no. 2 (2010): 96; A. Robinson and M. Terras, "Come on Let's Go: Access, Accessibility, and Digital Image Archives" (presented at the Digital Resources in the Humanities Conference, Lancaster, U.K., 2005); Stout, "Reimagining Archives"; Society of American Archivists, "I Found It in the Archives: A Year-Long Public Relations Campaign, 2010–2011" (October 2010), http://www2.archivists.org/sites/all/files/IFI_Kit_Final_10.22.10.pdf, accessed 30 April 2011.

[9] Dooley and Luce, *Taking Our Pulse*, 37.

[10] Catherine Easton, "The Web Content Accessibility Guidelines 2.0: An Analysis of Industry Self-regulation," *International Journal of Law and Information Technology* 19 (January 2011): 74.

[11] This explanation of the role of the archivist is largely paraphrased from the Society of American Archivists, "So You Want to Be an Archivist: An Overview of the Archival Profession," 10 July 2010, http://www2.archivists.org/profession, accessed 1 May 2011.

[12] Stout, "Reimagining Archives," 10.

[13] This trend of users turning away from library-based services to other open-Web solutions is discussed at length in the LIS literature. See, for example, Paiki Muswazi, "Usability of University Library Home Pages in Southern Africa: A Case Study," *Information Development* 25 (1 February 2009): 56, 59.

Central to this argument is that Web accessibility concerns all archival repositories and not only those large repositories with the staff, time, knowledge, and experience to address accessibility issues. Rather, a repository's level of Web accessibility should not depend on its in-house resources. If a Web presence is deemed to be worth developing, then the same care and attention should be paid to its accessibility as is paid to its visual appeal, content (spelling, grammar, and punctuation), and accuracy.

This study examines the Web accessibility of repositories belonging to the Philadelphia Area Consortium of Special Collections Libraries (PACSCL). PACSCL includes thirty-three member institutions and is useful for this study as it encompasses a broad range of archives and special collections types and sizes. These repositories range from a regional branch of the National Archives,[14] to public, public-private, and private university repositories large and small,[15] to topically centered repositories,[16] to various religious institutions, private collections, and/or historical societies.[17] The collections held by PACSCL's member repositories comprise "more than 4,000,000 rare books, 260,000 linear feet of manuscripts and archival materials, and 9,000,000 photographs, maps, architectural drawings, and works of art on paper [including] rich collections of materials on national, regional, and local history; the natural and social sciences; world history, literature, and religion; art and architecture; and business and industry."[18]

Literature Review

A review of the literature on archival website accessibility is an exercise in finding meaning in omission. While no fully formed and nuanced resources yet exist within the archival literature, relevant writings from other fields and writings on closely related topics from the archival literature can be combined in meaningful ways to introduce the issues critical to understanding archival website accessibility. An analysis of extant archival and nonarchival literature

[14] The National Archives, Mid-Atlantic Region is located in center-city Philadelphia.

[15] For example, the University of Pennsylvania, Villanova University, Drexel University, the University of Delaware, Bryn Mawr College, Franklin and Marshall College, and Swarthmore College.

[16] Including, among others, the Hagley Museum and Library; Winterthur Museum, Garden, and Library; the Delaware Art Museum; the Chemical Heritage Foundation; and the Abraham Lincoln Foundation of the Union League of Philadelphia.

[17] Such as the Lutheran Theological Seminary at Philadelphia, the Historical Society of Pennsylvania, the Chester County Historical Society, and the German Society of Pennsylvania, among others. For a complete listing of the thirty-three PACSCL member libraries, see Philadelphia Area Consortium of Special Collections Libraries, "Member Profiles" (2011), http://www.pacscl.org/libraries, accessed 1 May 2011.

[18] Philadelphia Area Consortium of Special Collections Libraries, "About PACSCL" (2011), http://www.pacscl.org/about, accessed 1 May 2011.

demonstrates the intersection between accessibility and broader trends and developments within the archival profession.

Much can be learned from the writings of professionals in affiliated fields. Scholars in the disciplines of information science and technology and computer science have paved the way for discussions of website accessibility guidelines. Their efforts have been instrumental in crafting these guidelines, and these scholars have also been on the forefront of writing about the history and development of these guidelines. Articles about both the original 1999 release of the Web Content Accessibility Guidelines (WCAG) and the 2008 WCAG 2.0 update provide researchers from a variety of fields with valuable background information on the historical development, rationales, and ongoing changes to and critiques of this preeminent standard.[19]

In tracing the most important differences between the WCAG 2.0 and the earlier WCAG 1.0 standard, Ribera et al.'s "Web Content Accessibility Guidelines 2.0: A Further Step Towards Accessible Digital Information"[20] is particularly helpful. The authors demonstrate that, although the WCAG merely lists recommendations drafted and maintained by the Web Accessibility Initiative (WAI) Working Group of the World Wide Web Consortium (W3C) since 1998, the guidelines have developed force beyond recommendations. Indeed, many nations, including the United States,[21] have granted the WCAG *de facto* and even *de jure* legal standing by incorporating them into national legislation.

Though the article is purposely broad in coverage—its three case studies assess the accessibility of a variety of different types of sites including those used for social networking (Facebook), entertainment (YouTube), and e-commerce (eBay)—the authors do discuss the relevance of website accessibility regulations to "information centres." They define "information centres" as government-sponsored and administered "public, university and school libraries, administrative archives, documentation centres of government departments, etc."[22]

[19] See, in particular, Alison Adam and David Kreps, "Disability and Discourses of Web Accessibility," *Information, Communication and Society* 12 (October 2009): 1041–58; Alison Benjamin, "Making Conformance Work: Constructing Accessibility Standards Compliance" (master's thesis, University of Toronto, 2010); University of Toronto Research Repository, "T-Space," https://tspace.library.utoronto.ca/handle/1807/25429, accessed 9 April 2011; Easton, "The Web Content Accessibility Guidelines 2.0."; S. Leuthold, "Beyond Web Content Accessibility Guidelines: Design of Enhanced Text User Interfaces for Blind Internet Users," *International Journal of Human Computer Studies* 66, no. 4 (2008): 257–70; Jacob E. McCarthy and Sarah J. Swierenga, "What We Know about Dyslexia and Web Accessibility: A Research Review," *Universal Access in the Information Society* 9 (June 2010): 147–52; Christopher Power and Helen Petrie, "Accessibility in Nonprofessional Web Authoring Tools: A Missed Web 2.0 Opportunity?," in *Proceedings of the 2007 International Cross-Disciplinary Conference on Web Accessibility (W4A) 2007, Banff, Canada, May 07–08, 2007* (New York: ACM Press, 2007); Mireia Ribera et al., "Web Content Accessibility Guidelines 2.0: A Further Step Towards Accessible Digital Information," *Program: Electronic Library and Information Systems* 43, no. 4 (2009): 392–406.

[20] Ribera et al., "Web Content Accessibility Guidelines 2.0."

[21] WCAG 2.0 forms the basis of Section 508 of the United States Rehabilitation Act.

[22] Ribera et al., "Web Content Accessibility Guidelines 2.0," 403.

Noting that cultural heritage institutions often provide resources that originate from third-party commercial vendors (e.g., electronic journals), the authors recommend that information centers concentrate on effecting change in the accessibility of such products by acting consortially. Such a recommendation is certain to have merit in the archival world. In a similar vein, the authors' discussion of preserving the semantic structure of content for users with disabilities in an online environment,[23] the importance of retaining digital originals of currently accessibility-deficient file formats (in the hopes that accessibility will be improved in the future),[24] and the accessibility challenges presented by the increased usage of Content Management Systems[25] are all familiar to a modern-day archival community that is grappling with how to meaningfully contextualize content (particularly finding aids) in an online environment, deal with digital preservation concerns, and provide robust and nuanced online resources with limited staff expertise, time, and funding.

In addition to these discussions of accessibility guidelines (most notably WCAG 2.0), information professionals have also paved the way for numerous fields' understandings of usability, user studies, and system analysis. Alison Benjamin examines how individuals on the frontlines of Web development and design have done more than just "implement" accessibility guidelines, by actively shaping "how people experience the Web and invest accessibility with meaning."[26] Similarly, studies such as Ribera et al.'s review of WCAG 2.0 endeavors to champion usability studies and user-centered design over "quick fixes" such as automated accessibility compliance checkers and ambiguous standards that allow designers to "comply" without actually following the spirit of such guidelines.[27]

In a similar vein, our colleagues in library science have laid the groundwork for future accessibility studies centered specifically on archival issues. Offerings such as Ravonne A. Green and Julia Huprich's survey of website compliance and accessibility course offerings at the nation's top schools of library and information science,[28] Linda Baldwin Alexander's checklist of ADA resources for librarians,[29] Michael Providenti and Robert Zai's review of the legal requirements and enforcement mechanisms to which academic libraries

[23] Ribera et al., "Web Content Accessibility Guidelines 2.0," 396.

[24] Ribera et al., "Web Content Accessibility Guidelines 2.0," 403–4.

[25] Ribera et al., "Web Content Accessibility Guidelines 2.0," 405.

[26] Benjamin, "Making Conformance Work," 3.

[27] Ribera et al., "Web Content Accessibility Guidelines 2.0," 405.

[28] Ravonne A. Green and Julia Huprich, "Web Accessibility and Accessibility Instruction," *Journal of Access Services* 6 (January 2009): 116–36.

[29] Linda Baldwin Alexander, "ADA Resources for the Library and Information Professions," *Journal of Education for Library and Information Science* 46 (Summer 2005): 248–57.

are subject,[30] and Paiki Muswazi's and Mohammad Hassanzadeh and Fatemeh Navidi's case studies of the accessibility of southern African university library[31] and Iranian ministerial[32] websites respectively, provide a road map for future archival research into Web accessibility.

Though Alexander's study focuses almost entirely on physical accessibility issues for library patrons, rather than on Web-based ones, her discussion raises an important concept that has helped to inform the analysis offered in this study. Alexander frequently refers to the expense of and concomitant need for expert assistance in planning for the physical accommodations required of libraries by the ADA. Though Web accessibility guidelines are not yet legally mandated to the degree that physical accommodations are, Alexander's analysis raises questions about the expenses (both monetary and intangible) associated with providing accessible websites for archival users. If the expense of making physical changes to the built environment of libraries and archives has already been justified by the increase in open and equitable access provided to users, why can this same logic not be used to argue more vigorously for improved access for virtual users as well? Indeed, unlike many physical changes made in response to ADA legislation, many of the changes that are likely to occur on institutional websites as a result of accessibility audits will likely improve the usability of such sites for both users with disabilities and members of the abled public. Put simply, improved virtual resources will benefit all users. Additionally, the desire to accommodate disabled virtual visitors may be just the impetus needed to get more cultural heritage institutions to take their Web presences more seriously. This could result in the creation of new funding lines for website consultants or full-time Web design staff.

Finally, just as works from the professional library literature can be used as valuable introductory primers on Web accessibility by archival practitioners, so too can works from the fields of education, communication, and the humanities. Given these fields' shared focus on the "human element"—including, but not limited to, human cognition, learning behaviors, and linguistics—works

[30] Michael Providenti and Robert Zai III, "Web Accessibility at Academic Libraries: Standards, Legislation, and Enforcement," *Library Hi Tech* 25, no. 4 (2007): 494–508.

[31] Muswazi, "Usability of University Library Home Pages in Southern Africa."

[32] Mohammad Hassanzadeh and Fatemeh Navidi, "Website Accessibility Evaluation Methods in Action: A Comparative Approach for Ministerial Websites in Iran," *The Electronic Library* 28, no. 6 (2010): 789–803.

originating from each field can speak with currency and accuracy as to the human agent/user in human-computer interactions.[33]

A particularly strong example is Peter Fairweather and Shari Trewin's recent "Cognitive Impairments and Web 2.0."[34] Although Fairweather and Trewin focus on cognitive impairments (and not the physical impairments under consideration in this paper), their understanding of the changes to human-computer interaction patterns that have been brought about by the adoption of Web 2.0 technologies is one that can easily be appropriated for use by archivists. The authors question whether Web 2.0 technologies provide equal opportunity for users with different abilities, and, after examining a variety of different cognitive impairments (including, among others, autism/Asperger's, dyslexia, and attention deficit disorders), they find that newer Web 2.0–inspired human-computer interaction patterns have been "potent forces narrowing access to computers"[35] for such users.

Fairweather and Trewin encourage Web accessibility advocates to ask difficult questions about the relationship between technological advancements and the new user behaviors these advancements *can* (but certainly do not always) support. Such reasoning adds greater support to the idea that true "accessibility" cannot be determined via the use of automated site checkers. A full and complete understanding of accessibility necessitates an examination of both the documentable actions and amorphous *behaviors* that users exhibit when interacting with Web objects. Furthermore, it is not always possible for the creators of new Web-based technologies to predict the impact that their creations will have on human-computer interaction patterns, since an immediate use for new technological capabilities is not always evident to technology pioneers.[36] The big picture theoretical approach to analyzing the relationship between

[33] See, for example, the following articles from the fields of communication, English, and education: Adam and Kreps, "Disability and Discourses of Web Accessibility"; Christian Bühler and Björn Fisseler, "Accessible E-Learning and Educational Technology—Extending Learning Opportunities for People with Disabilities," in *Proceedings of the International Conference of Interactive Computer Aided Learning ICL2007: EPortofolio and Quality in e-Learning* (presented at the ICL2007, Villach, Austria, 2007); Elizabeth Ellcessor, "Bridging Disability Divides," *Information, Communication and Society* 13 (1 April 2010): 289–308; Peter Fairweather and Shari Trewin, "Cognitive Impairments and Web 2.0," *Universal Access in the Information Society* 9 (September 2009): 137–46; McCarthy and Swierenga, "What We Know about Dyslexia and Web Accessibility"; Clay Spinuzzi, "Accessibility Scans and Institutional Activity: An Activity Theory Analysis," *College English* 70 (1 November 2007): 189–201.

[34] Fairweather and Trewin, "Cognitive Impairments and Web 2.0."

[35] Fairweather and Trewin, "Cognitive Impairments and Web 2.0," 138.

[36] This insight is developed in the authors' discussion of the 1999 development of the XMLHttpRequest object. This technological advance provides the foundation for dynamic asynchronous delivery of Web information. Though in existence in its modern form since 1999, the authors argue that this new technology did not find a place in the modern Web designer's lexicon until it was appropriated by Google in its Maps API to enable dynamic, real-time user interaction with maps (dragging, zooming, etc.) in 2005. Fairweather and Trewin ultimately conclude that this type of dynamic interaction with visual cues is detrimental to users with many types of cognitive and physical disabilities. For more on this discussion, see Fairweather and Trewin, "Cognitive Impairments and Web 2.0," 138–39.

technology, user behavior, and accessibility demonstrated by Fairweather and Trewin is invaluable to a nuanced understanding of accessibility issues.

Though coverage of Web accessibility in archival literature has been found to be lacking, discussions of ways to accommodate physically and mentally disabled employees and patrons within the physical repository itself are more common. In his 1993 literature review and legal analysis, Ronald L. Gilardi finds discussion of access accommodations for disabled archival users as early as Lance Fischer's 1979 *The American Archivist* article "The Deaf and Archival Research: Some Problems and Solutions."[37] Written in direct response to the then recently enacted Americans with Disabilities Act (ADA), Gilardi's focus on physical access to archival repositories is understandable; however, even as recently as Frank H. Serene's 2008 NARA-sponsored publication, "Making Archives Accessible for People with Disabilities," questions of accessibility in the archival literature are almost always restricted to discussions of physical accommodation.[38] Similarly, almost all of the advice offered in the best practice documents, promotional literature, and preliminary survey findings compiled by SAA's Joint Archives Management/Records Management Roundtables Working Group on Accessibility in Archives and Records Management in 2008 and 2009 is geared toward physical access.[39] Ultimately, while considerations of Web accessibility for people with disabilities are often missing from the archival literature, discussions of usability studies, user-centered design, and archival metrics tools used in gathering this type of user-based evaluation data have become relatively commonplace on the pages of archival publications.[40] One can only hope that this increased focus on providing users with the robust,

[37] Gilardi, "The Archival Setting and People with Disabilities," 706.

[38] Frank H. Serene, "Making Archives Accessible for People with Disabilities" (National Archives and Records Administration, 2008), http://www.archives.gov/publications/misc/making-archives-accessible.pdf, accessed 9 April 2011.

[39] Michelle Ganz, "Survey Conducted on 'Accessibility in Archives'," *Archival Outlook* (December 2008): 8, 24; Joint Archives Management/Records Management Roundtables Working Group on Accessibility in Archives and Records Management, "Best Practices for Working with Archives Researchers with Physical Disabilities" (Society of American Archivists, 9 August 2010), http://www2.archivists.org/standards/best-practices-for-working-with-archives-researchers-with-physical-disabilities, accessed 22 December 2011; Joint Archives Management/Records Management Roundtables Working Group on Accessibility in Archives and Records Management, "Best Practices for Working with Archives Employees with Physical Disabilities" (Society of American Archivists, 9 August 2010), http://www2.archivists.org/sites/all/files/BestPract-Disabilities_Employees_0.pdf, accessed 9 April 2011.

[40] Works of this type are too numerous to note exhaustively here. Nevertheless, a handful of studies consulted during the course of this study illustrate this type of archival writing, including Wendy Duff et al., "The Development, Testing, and Evaluation of the Archival Metrics Toolkits," *The American Archivist* 73 (Fall/Winter 2010): 569–99; Gerrard, "Hear Them Roar"; Gueguen, "Digitized Special Collections and Multiple User Groups"; Cory Nimer and J. Gordon Daines, "What Do You Mean It Doesn't Make Sense? Redesigning Finding Aids from the User's Perspective," *Journal of Archival Organization* 6, no. 4 (2008): 216; Susan Tucker, "Doors Opening Wider: Library and Archival Services to Family History," *Archivaria* 62 (2006): 127–58.

intuitive, and multifeatured Web applications that they desire will, in time, lead to increased focus within the profession on issues of accessibility.

Finally, having examined multiple literatures for insight into questions of Web accessibility to disabled users, a number of important intersections between Web usability/accessibility and broader archival topics emerge. These intersections provide fertile ground for comparisons between the two fields of study and help to shed light on the centrality of Web accessibility issues to some of the most hotly contested topics in the archival profession today. For example, questions over how to convey the appropriate level of contextual meaning and semantic structure to online displays of formerly paper-based archival finding aids take on added meaning when it is realized that, as Ribera et al. explain, "*Success Criterion 1.3.1* [of WCAG 2.0] stresses the importance of the 'semantic structure of content' (through headers, lists, etc.) in order to help users of screen readers and devices with small screens to understand the structure of the Web page and to locate the content that interests them more easily."[41] Similarly, the archival practitioner aware of the complex tabular EAD container list display solutions employed by many of today's archival repositories (owing largely to widespread adoption and adaptation of Michael J. Fox's *EAD Cookbook* stylesheets for <dsc> level data) will be disheartened to read that, "As tables increase in complexity (especially if there are nested columns or rows), it becomes increasingly challenging for non-visual users to understand their position within the structure of the table."[42]

Additional intersections between accessibility and archival topics are seen in the archival profession's increasing adoption of Web 2.0 at the same time as many Web accessibility experts have begun questioning the accessibility of these technologies to users with physical and cognitive disabilities. For example, while the use of Web 2.0 and Content Management System (CMS) solutions (e.g., blogging software, Omeka, etc.) facilitate easier creation of archival websites, many of these products have yet to implement accessibility recommendations.[43] On the opposite side of the spectrum, archival use of Web 2.0 technologies (particularly social networking sites like Facebook and Twitter) may also serve to unwittingly promote technology that, at present, is less accessible to disabled users than more traditional Web platforms.[44]

[41] Ribera et al., "Web Content Accessibility Guidelines 2.0," 396.

[42] Terrill Thompson, "Guidelines for Making Web Content Accessible to All Users," *EDUCAUSE Quarterly* 32, no. 1 (2009): sec. "Data Tables."

[43] Power and Petrie, "Accessibility in Nonprofessional Web Authoring Tools: A Missed Web 2.0 Opportunity?"

[44] Fairweather and Trewin, "Cognitive Impairments and Web 2.0"; Ribera et al., "Web Content Accessibility Guidelines 2.0"; Thompson, "Guidelines for Making Web Content Accessible to All Users."

Ultimately, archival websites are an extension of the practitioner's professional imperative to facilitate outreach and, "to promote open and equitable access to their services and the records in their care without discrimination or preferential treatment, and in accordance with legal requirements, cultural sensitivities, and institutional policies."[45] Though Web accessibility concerns might, to some, seem overwhelming and less worthy of practitioner time than reducing backlogs, increasing collections, and other forms of community outreach, by improving the functionality of our virtual services to users with disabilities, we will ultimately create new satisfied constituents for our repositories' services.

Methodology

To gain greater knowledge of the current state of archival repository website accessibility to users with disabilities, I designed a mixed-method research study. Both generations of WCAG guidelines have been criticized by industry insiders and onlookers alike for failing to consider the intricacies involved in assessing the accessibility of a website. As a result, a research design that only employed commercially available accessibility checking software in a large-scale quantitative study would likely neglect much of this nuance and user focus. At the same time, quantitative studies are invaluable in analyzing greater numbers of entities in a highly controlled manner. By incorporating both an initial quantitative study, and a more detailed qualitative website content analysis, this paper strives to get at the heart of what it truly means for an archival website to be accessible.

For the quantitative stage of this study, specific PACSCL member institutions were selected for analysis by means of simple random sampling. Five numbers between 1 and 33 were selected by using a copy of the RAND Corporation's A Million Random Digits random number table.[46] When a number over 33 was selected, the next number under 33 in the randomly selected column was used instead. The five numbers that were identified via this sampling method were then compared to the numbered list of PACSCL institutions included in the PACSCL brochure, "Gateway to Philadelphia-area Research Collections from PACSCL—the Philadelphia Area Consortium of Special Collections

[45] Society of American Archivists, "Code of Ethics for Archivists," *SAA: Council Handbook (App. K-A Code of Ethics with Commentary)*, 5 February 2005, sec. "Article VI. Access," http://www.archivists.org/governance/handbook/app_ethics.asp, accessed 10 April 2011.

[46] The table used is reproduced in Lynn Silipigni Connaway and Ronald R. Powell, *Basic Research Methods for Librarians*, 5th ed. (Santa Barbara, Calif.: Libraries Unlimited, 2010), 122.

Libraries."[47] Ultimately, the home pages[48] of five institutions—the National Archives, Mid-Atlantic Region; the Athenæum of Philadelphia; the Free Library of Philadelphia's Rare Book Department;[49] the University of Delaware Library Special Collections; and Bryn Mawr College Special Collections—were tested using the Firefox add-on Total Validator.[50] One of many validators recommended on the W3C's WCAG 2.0 website,[51] Total Validator was selected because of its ease of use and reliance on the newer WCAG 2.0 guidelines.[52] Finally, another Firefox add-on, WCAG Contrast Checker,[53] was used to gather supplemental data regarding sites' conformance to Level AA[54] color contrast/luminosity standards (a check that is not run by the Total Validator). Luminosity standards are discussed in Guidelines 1.4.3. and 1.4.6. of WCAG 2.0, with Guideline 1.4.3. stipulating that "The visual presentation of text and images of text [should have] a contrast ratio of at least 4.5:1."[55]

[47] Philadelphia Area Consortium of Special Collections Libraries, "Gateway to Philadelphia-Area Research Collections from PACSCL—the Philadelphia Area Consortium of Special Collections Libraries" (2011), http://www.pacscl.org/files/brochure.pdf, accessed 1 May 2011.

[48] Due to the size constraints placed on this current study, only the home pages have been examined. Nevertheless, this project would be greatly enhanced by expanding this examination to include many of the different (likely more content-rich) pages frequently found on archival websites, including finding aids, online exhibition pages, databases and search tools, and digital collection pages. Given the greater complexity of these types of pages, even more accessibility challenges are likely to be encountered.

[49] This title is somewhat of a misnomer since the department includes manuscript and archival collections with many finding aids available from the library's central OPAC or via the PACSCL Hidden Collections Finding Aids Database. For more information, see Free Library of Philadelphia, "Rare Books FAQs," (2011), http://libwww.freelibrary.org/faq/faqsubcat.cfm?FAQCategory=60, accessed 2 May 2011.

[50] This study used Total Validator version 6.11.0 running in Firefox 4.0.1 on a Mac OS 10.6.7 system. In addition to checking pages against the WCAG 2.0 guidelines, this utility also checks (X)HTML validity and Section 508 compliance, looks for broken links, and spell checks page content. For more information, see the Total Validator home page at Total Validator, "Home" (2011), http://www.totalvalidator.com/, accessed 1 May 2011.

[51] World Wide Web Consortium Web Accessibility Initiative, "Complete List of Web Accessibility Evaluation Tools" (17 March 2006), http://www.w3.org/WAI/ER/tools/complete.html, accessed 1 May 2011.

[52] Despite receiving W3C recommendation in 2008, many free browser-based accessibility checkers still do not run sites against WCAG 2.0, but use the older WCAG 1.0 release instead.

[53] Version 1.1.02 was used for this study running on the same hardware and software specifications outlined in note 50 above. For further information about this utility, see Mozilla Firefox Add-ons, "WCAG Contrast Checker" (18 August 2009), https://addons.mozilla.org/en-us/firefox/addon/wcag-contrast-checker/, accessed 1 May 2011.

[54] Three different levels of conformance are defined in WCAG 2.0, ranging from Level A (the lowest) to Level AAA (the highest). This tiered system addresses the different accessibility needs of numerous groups in a variety of settings. Level AA conformance was tested in this study as the suitable middle ground for the diverse audiences attracted to archival websites. For more information, see World Wide Web Consortium, "Web Content Accessibility Guidelines (WCAG) 2.0," Introduction (11 December 2008), http://www.w3.org/TR/WCAG20/, accessed 1 May 2011.

[55] World Wide Web Consortium, "Web Content Accessibility Guidelines (WCAG) 2.0," sec. 1.4.3.

After running these five PACSCL member sites against the Total Validator and WCAG Contrast Checker, the total number of errors per WCAG Guideline number for each site was recorded in an Excel spreadsheet. To control for the varying length and complexity of repository home pages, the total number of lines of code for each site was also determined and entered into the spreadsheet. Finally, the total number of errors (from both checkers) was divided by the number of code lines to provide a normalized ratio for ease of comparison. The results of this exercise are discussed in greater detail in the Findings section below.

Having used an automated method for compliance checking—the method so often used in archival and related literature alike—a qualitative, human eye was then brought to bear on these findings. The results from stage one of this study suggested the "most" accessible site to be the Athenaeum of Philadelphia (with approximately 0.01 errors per line of code) and the "least" accessible the home page of the Special Collections Department at Bryn Mawr College (about 0.19 errors per line). As a result, I selected these two sites for further qualitative analysis. These findings are also discussed in greater detail below.

Findings and Discussion

As discussed above, ratio scores were developed for each of the five institutions under study. The full findings are listed in Appendix 1, with the summary scores for each home page as follows: Athenaeum of Philadelphia, 0.01; University of Delaware Special Collections, 0.04; National Archives Mid-Atlantic Region, 0.06; Free Library of Philadelphia, 0.07;[56] and Bryn Mawr College Special Collections, 0.19. This makes the average error ratio for the five sites combined 0.074.

For purposes of comparison outside of the archives field, five additional sites were selected and analyzed using the same method. These supplemental sites were selected by choosing the top five sites from Google's February 2011 list of the thousand most-visited sites on the Web.[57] A complete list of findings appears in Appendix 2, but the error ratio for each of these sites is as follows: Wikipedia, 0.005; YouTube, 0.03; Yahoo!, 0.05; Live.com, 0.05; and Facebook, 0.24. The average ratio for these five nonarchival websites is 0.075. Overall,

[56] The Rare Books Department of the Free Library of Philadelphia does not have a department home page. Therefore, I examined the home page for the Central Library (the branch where the department is located). This is the home page provided for the repository on all PACSCL-related documents and serves as the primary Web portal for this repository. See Free Library of Philadelphia, "Central Library" (2011), http://libwww.freelibrary.org/branches/branch.cfm?loc=CEN, accessed 1 May 2011.

[57] Double-Click Ad Planner by Google, "The 1,000 Most-Visited Sites on the Web" (February 2011), http://www.google.com/adplanner/static/top1000/, accessed 1 May 2011.

these findings suggest that the accessibility of the home pages of PACSCL member libraries (0.074) is nearly equivalent to that of the most-visited sites on the Web (0.075). On the surface, this is encouraging, especially considering the great disparity in the resources available to the largely ad-supported, commercial sites in the "top 5" and PACSCL member sites.[58]

As is often the case, however, these numbers are deceptive and require further examination. Facebook.com earned the worst rating of all the sites (archives and other) examined, but in real terms, the home page only had 13 total errors. However, these few errors appear on a site that has just 55 total lines of code, leading to a much higher ratio score. The "least accessible" archives site—that of Bryn Mawr College Special Collections—included 50 compliance errors over the course of 258 lines of code. All but 2 of these errors were directly related to the site's poor color contrast ratio. This color scheme appears to be institutionally mandated (nearly all Bryn Mawr College sites follow the same look and feel), so laying blame at the feet of archives staff is difficult.

These comparisons demonstrate that checking for accessibility is not as simple as running one's site against an automated checker. Though resources used to guide the *creation* of accessible websites such as the Web Accessibility Initiative's (WAI) "Quick Tips to Make Accessible Websites,"[59] and, for that matter, WCAG 2.0 itself, are valuable, there are no "quick and dirty" methods for meaningfully measuring the accessibility of existing websites. This study therefore turns to a qualitative website analysis to address some of the elements lacking when Web accessibility is boiled down to a list of machine-generated numbers.

Returning to an examination of PACSCL websites, those sites receiving the highest and lowest marks during the quantitative portion of this study were the home pages of the Athenaeum of Philadelphia and Bryn Mawr College Special Collections.[60] Founded in 1814, the Athenaeum is "a member supported, not-for-profit, special collections library"[61] whose collections include "[a] 100,000-volume research library; [an] architectural archive consisting of more than 180,000 drawings, 300,000 photographs, and 1,000,000 manuscript items representing the work of more than 2,000 American architects

[58] For example, it has been widely reported that 2010's most-visited website, Facebook.com, earned about $1.86 billion in advertising revenue alone during the 2010 calendar year. See Leslie Horn, "How Facebook Earned $1.86 Billion Ad Revenue in 2010," *PC Magazine*, 18 January 2011.

[59] For a library-centric discussion of this publication, see Cheryl Riley, "The Electronic Resources (ER) Librarian and Patrons with Disabilities," *Collection Management* 32 (21 February 2008): 83–98.

[60] Screen shots of these sites as they appeared at the time of this writing are included in Appendix 3.

[61] The Athenaeum of Philadelphia, "Home" (2011), http://www.philaathenaeum.org/index.html, accessed 2 May 2011.

and firms; and [a] fine and decorative arts collection."[62] Similarly, Bryn Mawr College Special Collections "manages extensive collections of art, artifacts, rare books, manuscripts, and photographs, as well as the historical records of the College."[63] In addition to providing general information on visiting[64] and conducting research at these repositories, both websites provide links to online exhibitions; act as gateways to existing library catalogs and/or collection databases; advise virtual visitors about available fellowships, prizes, and awards; and contain news items related to the work and collections of each repository. Bryn Mawr's home page also notes the existence of a number of digital collections.

Examining the Athenaeum's highly ranked home page reveals a number of concerns. The site fared exceptionally well in the quantitative portion of this study with only two Level A compliance errors. Both errors result from nonconformance with WCAG Guideline 1.1.1. "Non-text Content," which stipulates that "All non-text content that is presented to the user [must have] a text alternative that serves the equivalent purpose."[65] The first of these violations stems from the site creator's failure to include an alternative text element for a Flash-based slideshow announcing repository events, exhibitions, and programs, while the second results from failure to provide link text for the "Pay Dues or Make Donation" graphical link at the bottom right corner of the home page. Though few in number, these violations are problematic in terms of sheer scale. Most troubling is that the slideshow for which no alternative text is provided comprises over 90% of the viewable area of the home page when viewed on a standard resolution (1280x800) display. While this situation generates just one error, this lone error may likely render the great majority of this page inaccessible to individuals using screen readers and other assistive technologies.

On the opposite side of this spectrum, Bryn Mawr Special Collections' home page received the highest ratio score in part one of this study, suggesting that this site should be the poorest of the five examined in terms of accessibility. As has already been noted, however, 48 of this site's 50 noncompliances stem from the insufficient color contrast employed in the site's design—a design used throughout the college's website. The two remaining errors uncovered via stage 1's automated site check include one violation of the above-referenced nontext content guideline (Guideline 1.1.1.), as well one failure to conform with Guideline 1.3.1., "Info and Relationships," which recommends that

[62] Philadelphia Area Consortium of Special Collections Libraries, "Athenaeum of Philadelphia Member Profile" (2011), http://www.pacscl.org/node/85, accessed 2 May 2011.

[63] Bryn Mawr College, "Special Collections" (2011), http://www.brynmawr.edu/library/speccoll/, accessed 2 May 2011.

[64] Interestingly, the Athenaeum provides a page outlining the physical accommodations available on-site for visitors with disabilities. See the Athenaeum of Philadelphia, "Accessibility" (2011), http://www.philaathenaeum.org/access.html, accessed 2 May 2011.

[65] World Wide Web Consortium, "Web Content Accessibility Guidelines (WCAG) 2.0," sec. 1.1.

"Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in text."[66] Rather than failing to provide alternative image text as was the case with the Athenaeum's alternative text violation, however, Bryn Mawr's site earns the same number of violations for including an alternative text attribute for an image that appears on the page's "Special Collections in the News" inset that is too long. Similarly, the site's other conformance error stems from improperly nesting an H4 (heading) tag beneath an H2 tag (skipping the H3 level altogether). While in a strict sense this code violates WCAG Level A guidelines for programmatically conveying semantic structure in a nonvisual manner that can be interpreted by users of screen readers and other assistive technologies, this violation reminds observers that not all Level A violations are necessarily equal.

Returning to the color contrast errors found in the Bryn Mawr example, the discovery that the site's color palate was almost certainly mandated by the institution at large encourages greater discussion of who are and, perhaps, who should be the decision makers for archival repository websites. Such questions are certainly not new to those following the archival literature. Indeed, one of the many questions asked in the 2010 OCLC Research report *Taking Our Pulse: The OCLC Research Survey of Special Collections and Archives* was "Who should be responsible for institutional websites that have almost completely replaced countless physical brochures, newsletters, and other publications, but which, in physical form, were the responsibility of the university archives?"[67]

In theory, ceding control of these valuable outreach tools to Web design professionals—though tough to swallow—*should* improve accessibility guidelines compliance. However, as this Bryn Mawr case study illustrates, theories do not always inform reality. While it is unclear whether the Bryn Mawr site was outsourced to professionals or built in-house by staff, it nevertheless is clear that some element of high-level institutional oversight was employed to standardize the college's Web presence. Unfortunately, in this instance, standardization did not increase accessibility. Furthermore, given the rapid pace of technological development and the concomitant slow maturation process of guidelines and standards such as WCAG, such guidelines may never "cut it" for either amateur or professional Web designers. Finally, as documented in numerous studies,[68] nonprofessional Web authoring tools, Content Management Systems, and user-friendly Web 2.0 solutions, rarely prove to be magic bullets in terms of Web accessibility.

[66] World Wide Web Consortium, "Web Content Accessibility Guidelines (WCAG) 2.0," sec. 1.3.

[67] Dooley and Luce, *Taking Our Pulse*, 62.

[68] See, for example, Power and Petrie, "Accessibility in Nonprofessional Web Authoring Tools: A Missed Web 2.0 Opportunity?"; Brian Kelly, "Accessibility 2.0: Next Steps for Web Accessibility," *Journal of Access Services* 6 (1 January 2009): 265–94; and Fairweather and Trewin, "Cognitive Impairments and Web 2.0."

Conclusion

So, if it is nearly impossible to assess meaningfully site accessibility after the fact in an automated and labor-saving manner; if Web design professionals and amateur-friendly Web authoring tools do not guarantee improved site accessibility; and if the demand for Web-based delivery of archival resources continues to rise as staffing, budgets, and institutional support remain stagnant or even shrink, what is the accessibility-minded archival practitioner supposed to do? As with the many other difficult decisions that practicing archivists must make in collection development, privacy-related accessibility, processing priorities, and institutional politics, the first step is realizing that battles must be chosen wisely and sleep should not be lost over things that cannot be changed. Next, before succumbing to defeatism, however, accessibility-aware archivists should focus on ensuring that projects still in development benefit from the latest advancements in accessibility guidelines *and* usability testing. Finally, they should work on securing greater institutional buy-in for the goal of maximizing Web accessibility.[69]

Luckily, support for user-based studies is quite possibly at an all-time high within the profession. Duff et al.'s latest update on the Andrew W. Mellon–supported Archival Metrics Project shines an important light on the issue of user-based evaluations.[70] Indeed, institutional Web presence is addressed as one of this project's three primary types of user-repository interaction, with the authors writing, "We identified 3 primary types of interactions: 1) those with the archives staff; 2) those with the physical repository; and 3) those with the access tools of the archives or special collections (e.g., a website or the online finding aids)."[71] Other studies, such as those addressing issues of online finding aid delivery and EAD;[72] digital collections and online exhibition projects;[73] and

[69] This approach is largely the focus of Kelly et al., "Accessibility 2.0: Next Steps for Web Accessibility."

[70] Duff et al., "The Development, Testing, and Evaluation of the Archival Metrics Toolkits."

[71] Duff et al., "The Development, Testing, and Evaluation of the Archival Metrics Toolkits," 578.

[72] For some examples, see Nimer and Daines, "What Do You Mean It Doesn't Make Sense?"; Burt Altman and John Nemmers, "The Usability of On-line Archival Resources: The Polaris Project Finding Aid," *The American Archivist* 64 (Spring/Summer 2001): 121–31; Ruth C. Carter and Thomas J. Frusciano, "Online Finding Aids and Users of Archives: Continuing the Dialog," *Journal of Archival Organization* 2, no. 3 (2004): 1–5; Joyce Celeste Chapman, "Observing Users: An Empirical Analysis of User Interaction with Online Finding Aids," *Journal of Archival Organization* 8, no. 1 (2010): 4–30; Lisa R. Coats, "Users of EAD Finding Aids: Who Are They and Are They Satisfied?," *Journal of Archival Organization* 2, no. 3 (2004): 25; Duff et al., "Archivists' Views of User-based Evaluation: Benefits, Barriers, and Requirements," *The American Archivist* 71 (Spring/Summer 2008): 144–66; Jihyun Kim, "EAD Encoding and Display: A Content Analysis," *Journal of Archival Organization* 2, no. 3 (2004): 41; Christopher Prom, "User Interactions with Electronic Finding Aids in a Controlled Setting," *The American Archivist* 67 (Fall/Winter 2004): 234–68; Elizabeth Yakel and Deborah Torres, "AI: Archival Intelligence and User Expertise," *The American Archivist* 66 (Spring/Summer 2003): 51–78.

[73] See, for example, Bond and Walpole, "Streaming Audio with Synchronized Transcripts Utilizing SMIL"; Breaden, "Sound Practices"; Gerrard, "Hear Them Roar"; Gueguen, "Digitized Special Collections and Multiple User Groups"; and Deborah Kaplan, "Choosing a Digital Asset Management System That's Right for You," *Journal of Archival Organization* 7, no. 1 (2009): 33.

archival reference and outreach, have all championed the dual causes of user-focused evaluation and usability testing.

Ultimately, as Ribera et al. contend, "Owing to their definition and form, the WCAG can only be a starting point on the path towards accessibility, and unfortunately even this starting point often seems too far away."[74] Though daunting, this statement is not yet cause for despair. As the authors continue, "Real accessibility can only be achieved through the observation of users and a thorough knowledge of their needs."[75] Fortunately, the field is already witnessing a shift to this type of user-focused and evidence-based research and practice. By continuing to strive for improved virtual access to information about our repositories and the resources that they hold through whatever means available—automated checkers; user studies; responsible Web design; interdepartmental, interprofession, and interinstitutional cooperation; and so on—future generations of abled and disabled patrons will reap countless benefits.

[74] Ribera et al., "Web Content Accessibility Guidelines 2.0: A Further Step Towards Accessible Digital Information," 405.

[75] Ribera et al., "Web Content Accessibility Guidelines 2.0: A Further Step Towards Accessible Digital Information," 405.

Appendix 1. Stage One Quantitative Data for Archives Websites (Compliance Errors per Code Line)

	National Archives, Mid-Atlantic Region	Athenaeum of Philadelphia	Free Library of Philadelphia Rare Books Department	University of Delaware Library Special Collections	Bryn Mawr College Library Special Collections
Principle 1: Perceivable - Information and user interface components must be presentable to users in ways they can perceive.					
Guideline 1.1 Text Alternatives	5	2	5	4	1
Guideline 1.2 Time-based Media					
Guideline 1.3 Adaptable	2		9	5	1
Guideline 1.4 Distinguishable					
Principle 2: Operable - User interface components and navigation must be operable.					
Guideline 2.1 Keyboard Accessible					
Guideline 2.2 Enough Time					
Guideline 2.3 Seizures					
Guideline 2.4 Navigable	13		2	2	
Principle 3: Understandable - Information and the operation of user interface must be understandable.					
Guideline 3.1 Readable					
Guideline 3.2 Predictable					
Guideline 3.3 Input Assistance					
Principle 4: Robust - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.					
Guideline 4.1 Compatible			20		
Total WCAG Errors	**20**	**2**	**16**	**11**	**2**
Luminosity					
Level AA Compliance (Guidelines 1.4.3)	14		17	8	48
Total WCAG and Luminosity Errors	**34**	**2**	**33**	**19**	**50**
Additional Data Points					
Total Lines of Code	568	167	450	446	258
Errors per Line of Code (%)	**0.06**	**0.01**	**0.07**	**0.04**	**0.19**

Appendix 2. Stage One Quantitative Data for Other Websites (Compliance Errors per Code Line)

	Facebook	YouTube	Yahoo!	Live	Wikipedia
Principle 1: Perceivable - Information and user interface components must be presentable to users in ways they can perceive.					
Guideline 1.1 Text Alternatives	2	5	5		
Guideline 1.2 Time-based Media					
Guideline 1.3 Adaptable	1	12	2		3
Guideline 1.4 Distinguishable		2			
Principle 2: Operable - User interface components and navigation must be operable.					
Guideline 2.1 Keyboard Accessible					
Guideline 2.2 Enough Time					
Guideline 2.3 Seizures					
Guideline 2.4 Navigable		4	26		
Principle 3: Understandable - Information and the operation of user interface must be understandable.					
Guideline 3.1 Readable					
Guideline 3.2 Predictable		3			
Guideline 3.3 Input Assistance					
Principle 4: Robust - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.					
Guideline 4.1 Compatible		2			
Total WCAG Errors	**3**	**26**	**33**	**0**	**3**
Luminosity					
Level AA Compliance (Guidelines 1.4.3)	10	1	17	1	
Total WCAG and Luminosity Errors	**13**	**27**	**50**	**1**	**3**
Additional Data Points					
Total Lines of Code	55	944	1002	22	630
Errors per Line of Code (%)	**0.24**	**0.03**	**0.05**	**0.05**	**0.005**

Appendix 3. Screen Captures of Archives Home Pages

Home page of the "most accessible" repository website, the Athenaeum of Philadelphia. See http://www.philaathenaeum.org, accessed 2 May 2011.

Home page of the "least accessible" repository website, Bryn Mawr College Special Collections. See http://www.brynmawr.edu/library/speccoll/, accessed 2 May 2011.