Diana M. Belden. Weaving a Web of Precious Materials: Hyperlinks to, from and between Some Special Collections Libraries. A Master's Paper for the M.S. in L.S degree. August, 2006. 69 pages. Advisor: Cal Lee.

This paper examines the hyperlinks to, from and between 111 special collections libraries whose parent (university) libraries belong to the Association of Research Libraries (ARL). I collected inlinks using the Alta Vista search engine, and outlinks by hand. The resulting data was examined to determine outlink targets, and to test correlations between link counts and quality rankings, geographic proximity, and collection strengths. Most outlinks from these libraries go to universities, government agencies and commercial sites, usually to institutional or divisional home pages. Top outlinkers connect users to important sites, like the Library of Congress and the National Archives and Records Administration. ARL ranking of parent library shows a slight positive correlation with number of inlinks, but does not correlate with number of outlinks. Some geographic regions interlink more than others. Finally, these libraries could be linking to each other much more based on shared collection strengths.

Headings:

College and university libraries

Library Web sites

Special collections

World Wide Web

WEAVING A WEB OF PRECIOUS MATERIALS: HYPERLINKS TO, FROM AND BETWEEN SOME SPECIAL COLLECTIONS LIBRARIES

by
Diana M. Belden

A Master's paper submitted to the faculty
of the School of Information and Library Science
of the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements
for the degree of Master of Science in
Library Science.

Chapel Hill, North Carolina

August, 2006

Approved by

_____

Professor Cal Lee

Table of Contents

1. Rationale for Study on Special Collections Hyperlinkage

Hyperlinks are the gossamer threads that make up the World Wide Web, allowing users to follow direct and formal or casual, circuitous and sometimes serendipitous paths to find further information relevant to their interests. Regular Internet users who visit an archival Web site may expect to be presented with outside links to aid in furthering their research. As Chen (1998) put it: "Users may find it very useful to have a rich collection of remote hypertext references as a gateway to a wider range of information resources on the World Wide Web". (360) Furthermore, scholarly archives users practice citation-following as a primary research method (Drabenstott 2003), and, as elucidated below, hyperlinks can be thought of as the citations of the Web, allowing these researchers to adapt a familiar practice to a new environment.

One could also conceive of hyperlinks as referrals to other sources, a practice deemed important enough by the Reference and User Services Association (RUSA) to be listed twice in their "Guidelines for Behavioral Performance of Reference and Information Service Providers". In addition, as Szary pointed out in 2001, one of the potential benefits of archival Web sites is to improve staff productivity by allowing reference archivists to focus on more complex research questions. Furthermore, Wilkinson et al. (2003) put forth that hyperlinking to outside Web sites may be more important for some institutions than others, and it seems that in the case of special collections libraries, whose collections generally cannot leave their institutions and whose study therefore usually requires travel, the more information that can be put on the

Web and thoroughly linked, the better.

For all these reasons, archival Web sites should be making full use of hyperlinks to present a pre-existing web of relevant primary source information to their patrons. This paper reports on a study of whether or not they are doing so, which should be of interest to special collections librarians, archivists, and scholars of archival studies.

2. Terminology

Below are some basic terms that will be used to describe the data in this paper.

1. An *inlink* is a hyperlink from a separate Web site to the site being described.

2. An *outlink* is a hyperlink from the site being described to another Web site.

3. A s*elflink* is a hyperlink from one area of a site or page to another area of the same site or page. I excluded selflinks from my study.

4. Two sites are *colinked* when they both hyperlink to the same third site. (1-4 from Thelwall 2006)

5. I use the term *interlink* to refer to the hyperlinks between the specific libraries in this study.

6. Visibility and luminosity are terms coined by Vreeland in 2000 to describe the impact of a Web site. *Visibility* refers to number of inlinks, or how easy it is to "see" a Web site from other parts of the Web, and *luminosity* refers to number of outlinks, or how much "light" is thrown onto other parts of the Web by the site being studied. (Wilkinson et al. 2003 present alternate terms for describing a Web site's impact, but I did not calculate the "Web Use Factor" or "Web Connectivity Factor", both of which figure in a Web site's total number of pages. These might be interesting figures to calculate in future studies of library hyperlinkage.)

3. Research Questions

Due to the dearth of previous research on this subject, my research is preliminary and exploratory. The general question I am trying to answer is this: How are special collections libraries using the Web to link to related materials? More specifically:

1. To whom are these libraries linking?

    1a) To what kinds of institutions,

    1b) To what kinds of pages, and

    1c) To what specific institutions most often?

2. Which libraries are most visible (linked to the most from outside sites)?

3. Which libraries are the most luminous (offering the most links to outside sites)?

4. Does the ARL ranking of the parent institution correlate with numbers of inlinks to or outlinks from these libraries? My hypothesis is that higher ranks will correlate with more links, in and out.

5. Which of these libraries interlink, and to what degree?

6. Does visibility or luminosity within the sample correlate with geographic proximity? I hypothesize that libraries within the same geographic region will be highly interlinked.

7. Does visibility or luminosity within the sample correlate with collection strength? I hypothesize that libraries with similar collection strengths will be highly interlinked.

4. Literature Review

4.1. Libraries/Archives and the Web

As libraries and archives have moved forward into the digital age, researchers have begun to look at the impact of the World Wide Web on traditional library and archival services. Some topics of research have included: user-centered design for library

Web sites (Payette and Reiger 1998, Davidsen and Yankee 2004); the needs of digital library users in the context of traditional archival research (Conway 1996, Craig 1998); the visual layout of archival Web sites (Duff and Stoyanova 1998); the usability of online finding aids, particularly those built using Encoded Archival Description (Roth 2001, Prom 2004); and the nature of online reference (Bao 2003, Tibbo 1995).

Furthermore, the Association of Research Libraries (ARL) recently established an "E-Metrics" project to jump-start the collection of data on the use and value of electronic resources in member libraries. (To date 47 of the 111 institutions studied for this paper are participants in the E-Metrics project.) The project tracks expenditures for and use of library Web sites, online catalogs, databases, electronic journals, e-books, other electronic reference sources, online reference transactions, and digitization activities, including the size and number of digital collections. (Association of Research Libraries, 2005)

4.2. Libraries, Archives and Hyperlinks

None of the above studies have looked specifically at the hyper-linkage from and between special collections libraries Web sites. Pamela Harpel-Burke recently published a paper looking at the home pages of medium-sized universities to see if and how they connected to their library home page and how that linkage affected different user groups, but this is not the same as tracking the outlinks from and interconnections between related library Web sites.

One important study of archival/special collections hyper-linkage is that of Helen Tibbo, presented in her article entitled "Primarily History: Historians and the Search for Primary Source Materials (2002). Tibbo researched a number of characteristics of

archival Web sites, including the presence or absence of hyperlinks to related sites. She states that:

> …archivists should be compiling useful links to other repositories with similar materials and to archival and historical gateways. Only about one-third of the 30 sites I visited for this study included much in the way of links to sites they felt typical users would find helpful. Since more historians visit known repository sites rather than do Web searches, these links should be a great service for them. (p. 9)

In 2004, Amanda Hill repeated this sentiment, putting forth that users of archival Web sites would benefit from more inter-institutional hyperlinkage. (p. 143).

4.3 Webometrics and "Sitation" Analysis

According to Thelwall (2006), "webometrics" is defined as "the quantitative study of Web-related phenomena," and emerged from the idea that methods originally designed for investigating the citation patterns of scientific journal articles could be applied to the Web. (Rousseau (2003) used the resulting neologism "sitation" in the title of an article for the journal Cybermetrics).

Larson (1996) was the first to argue for the application of traditional cocitation analysis techniques to the Web, stating that the "notation of citation is fundamental to both the scholarly enterprise and to hypertext networks where it provides the primary mechanism for connection and traversal of the information space." In 1997, Almind and Ingwersen argued for the viability of applying informetric methods to the World Wide Web, and gave the field the name "webometrics". According to them:

> It is obvious that informetric methods using word counts and similar techniques can be applied to the WWW. What is new is to regard the WWW as a citation network where the traditional information entities, and citations from them, are replaced by Web pages. These pages are the entities of information on the Web, with hyperlinks from them acting as citations." (p. 404)

In 1998 Chen et al took this one step further by putting forth that hyperlinks (like

bibliographic citations) “indicate the impact of a website on peer researchers and teaching staff… a department should aim to achieve a higher hypertext citation count as they would with scientific publications in traditional media.” (365) Cronin et al echoed this sentiment in 2000, putting forth that “highly linked sites are the Web’s equivalent of highly cited papers.” (2)

However, this comparison is problematic. The study of hyperlinks cannot be fully equated with the study of scholarly citations because, as Rousseau (1997) points out, Web links are more likely meant to help readers find further information, rather than to support a specific argument. Larson, Cronin and Thelwall (2001) also accede that the meanings of citations in these two contexts cannot be equated, since there is a dearth of information on the motivation behind academic hyperlinks.

4.4. Other Webometric Research into Academic Hyperlinkage

The study of hyperlinks has also been used and supported by researchers outside of the citation analysis framework. Thelwall (2001) proposes that hyperlinks can be thought of as a demonstration of trust – sites to which there are many inlinks have been recommended by others and can therefore be seen as more trustworthy. In support of this thesis, a year later Thelwall found a positive correlation between number of links to a university site and that university’s “Research Assessment Exercise” (RAE) rating, which is a measure of research productivity determined by an expert panel as part of a nation-wide government-sponsored research funding program in the United Kingdom. Thelwall’s findings were presaged by a previous study (1998) by Chen et al, who found that RAE ratings positively correlate with both number of inlinks to and number of outlinks from Scottish university computer science departments. (360)

In 2003, Wilkinson et al. concluded that academic Web links can be viewed as a type of informal scholarly communication, and research into these linkages can provide insight into "often liminal expressions of peer esteem, influence and approbation," which in turn reflect on the quality of an institution. In 2005 Thelwall went on to say:

> Inlink counts primarily indicate the productivity of the target institution, rather than the average quality or impact of the information presented. The most useful information to be gained from this relates to outliers: the identification of universities that appear to be making particularly good or poor use of the Web. (122-123)

4.5. Methods Used in Previous Webometric Research into Academic Hyperlinking

4.5.1. Basic Steps

Wilkinson et al. (2003) present a step-by-step guide for performing Web link analysis. The first step is to collect raw link data, which can be done by hand for more reliable results, though this is immensely time-consuming, or through the use of Web crawlers or commercial search engines. Second, one must choose a counting method. These authors advocate the exclusion of self-links and duplicates and a transparent explication of the level of collection. Next comes data analysis, which can make use of various statistical methods, such as the Spearman correlation, as well as network diagrams and simple bar charts or tables.

4.5.2. Level of Analysis

Aguillo (1998) puts forth the idea of a "seat," or "collection of Web pages created by a single person or organization for a specific purpose" as a unit of study for webometrics, and this is the model I had in mind when determining which pages to include as part of a special collections Web site. Thelwall (2002) later examined the definition of a Web "document," in order to find the most meaningful level of

aggregation for counting links. He provides a working definition of a Web document as "a body of work with a consistent identifiable theme produced by a single author or collaborating team. It may consist of any number of part or whole unrestricted access electronic files retrievable over the Web using a modern browser". (998) This seems to echo Aguillo's conception above. He also listed three alternative Web document heuristics: directory, domain, and entire university Web site; however the seat/document model is what I use in this study.

4.5.3 Search Engine for Gathering Inlinks

Many researchers (Larson 1996, Almind and Ingwersen 1997, Thelwall 2001, Rousseau 2003) recommend Alta Vista as a search engine to gather link data, while recognizing the limited reach and commercial secrets of search engines in general.

4.5.4. Classification of Link Types

Almind (1995) presents a method of classification for Web documents, which includes the following:

- personal home page: a home page whose main purpose is to represent an individual;
- institutional/organizational home page: a home page whose main purpose is to represent an organization;
- subject defined/ad hoc home page: a home page whose main purpose is to represent a subject;
- pointer document/index page: a Web page whose function is primarily to make a number of hyperlinks available;
- resources: Web pages which primarily make data available, for example, in the form of text sound, pictures or film. (p. 412)

I built on this list when determining my own categories.

4.5.5. Factors Affecting Hyperlinkage

As mentioned above, Chen et al. (1998) and Thelwall (2001) looked at the correlation of academic hyperlinkage and institutional quality ratings. Both Chen et al.

(1998) and Thelwall (2002) also found a possible geographic trend in university Web site interlinking, while Wilkinson et al. (2003) found that interlinking between universities in the United Kingdom is affected by geographic factors, but in the United States it appears not to be. I did not encounter any specific research into hyperlinkage between libraries with similar subject strengths, but I added this factor to my list due to my own personal curiosity, based on my work experience performing e-mail reference at a special collections library.

4.6. Some Common Difficulties in Webometric Research

As Weare and Lin (2000) point out:

> The scope of information on the Internet, its rapid rates of growth and change, and its chaotic organization obfuscate the population of messages under study and what constitutes a representative sample of those messages, thereby threatening the external validity of Web-based research. (289)

It is therefore best to gather data as quickly as possible and to note the date of each site visit. Ideally one would archive Web sites for future reference, but this requires a huge amount of storage space.

Almind & Ingwersen (1997) also note that another limitation of webometric research is the limited scope of search engines and Web crawlers, and the lack of standardized page/site structure with which these technologies can work. Human researchers can gather links with more reliability but at a far slower pace. Additional researchers (Cronin et al 2000, Chu 2002 and Thelwall 2006) also acknowledge the shortcomings of search engines.

Furthermore, Thelwall (2006) warns that large amounts of data are required for reliable studies and warns that interpretations are likely to be complex and thus difficult

to categorize. This obstacle is demonstrated by the lack of inter-researcher agreement on link classification encountered by Wilkinson et al. (2002).

5. Methods

5.1. Population

The population I chose to study includes the 111 special collections libraries at predominantly English-speaking universities belonging to the Association of Research Libraries (ARL), whose Web site is located at http://www.arl.org/. The ARL is a nonprofit organization of research libraries in the US and Canada who share a similar commitment to academic research. As these libraries are committed to research, it is feasible to think they would be invested in helping researchers find further related materials; as they belong to the same association, it seems reasonable to expect they would link to each other. Also helpful is that this number comprised a reasonable study size and that the ARL conducts annual statistical research on its member institutions (parent libraries) – ranking data for special collections libraries proved elusive.

5.2. Searching for Inlinks

To gather inlinks to these special collections sites, I used the Alta Vista search engine, located at http://www.altavista.com. As stated in the preceding literature review, this search engine is recommended by many webometric researchers. Alta Vista was started in 1995 by research scientists in Palo Alto. (Alta Vista 2006) According to Searchenginewatch.com, Alta Vista is now a part of Yahoo and uses the same search engine, which is one of their top two (after Google). Yahoo's Web index is noted for filtering out large amounts of spam-related results, captures the full text of Web pages up to 500k (compared to Google's maximum of 101k), and seems to get more results,

according to Chris Sherman, Search Engine Watch's Executive Editor (Search Engine Watch 2004).

I entered searches for inlinks as "link:address AND NOT `url:address`" in order to avoid counting self-links. Only the total number of in-links was gathered, and some may have been duplicates. Gathering in-links via this method was certainly simplistic and did not capture links to special collections online exhibits under different URLs or links containing aliases, but can still provide a preliminary idea of the "visibility" of each site in the linking landscape.

5.3. Searching for Outlinks

Gathering out-links was a more complicated process. Though I tried the specialized SocSciBot software offered by webometrics researchers at http://socscibot.wlv.ac.uk/, the software was only able to gather links beginning with a given Uniform Resource Locator (URL). This is problematic because sometimes different sections of a special collections library or online exhibits from the library are held under a different URL. For example, the home page of the University of Alberta's special collections library is located at http://www.library.ualberta.ca/specialcollections/. However, their exhibit for the Alberta Folklore and Local History Collection, which is listed on the library's home page as part of its Canadiana collection, is located at http://folklore.library.ualberta.ca.(The exhibit page also states that this collection is housed in the special collections library). Furthermore, when I conducted spot checks of sample sites I discovered that the software was not gathering all the external links on any given site, even limited to the programmed URL. Also, the software crashed my computer repeatedly. Therefore, I ended up gathering all outlinks by hand.

I visited every site within the course of one day each, to avoid the potential complications of site redesigns or updates. Every site was visited during the course of the spring semester or early summer of 2006. (See **Appendix A** for a list of the dates links were gathered for each library.) I found the homepage for each special collections Web site via the "Repositories of Primary Sources" site hosted by the University of Idaho (http://www.uidaho.edu/special-collections/Other.Repositories.html), which is maintained by Terry Abraham, Professor Emeritus at the University of Idaho library, former head of their special collections and archives department, and an active and well-published member of professional archival organizations. Abraham's vita can be found at http://www.uidaho.edu/special-collections/vita.ta.html, and guidelines for inclusion on the site can be found at http://www.uidaho.edu/special-collections/criteria.html.

I included in the links-gathering process any pages having a direct inlink from the special collections home page and specifically pertaining to special collections material. In practice, this meant that at least one of two criteria was met: either the linked-to page resided at the same base URL address as the special collections home page, and/or it was described, either on the linking page or the linked-to page, as pertaining to or containing solely special collections materials. I also included any pages containing direct in-links from these secondary pages (and so forth), as long as they met either one of the preceding conditions. I did not include general library directions or tutorials, or any library-wide electronic/digitized collections *not specific to special collections*.

For example, the page located at http://www.lib.ua.edu/libraries/hoole/visitinghoole.htm is specific for visitors to the University of Alabama's special collections library, so the external links for visitor's

information located at the bottom of that page would be included in the links-gathering process. However, the page located at http://www.lib.ua.edu/policies/ encompasses general library policies, so none of the links on that page would be checked as part of the process. For another example, the page located at http://www.lib.ua.edu/libraries/hoole/happenings/exhibitionshoole.htm# is specific to exhibitions of materials from the University of Alabama's special collections library and would be included in the links-gathering process. However, the page located at http://www.lib.ua.edu/dpac/ is inclusive to the digital exhibits of the entire university library, and would therefore not be included.

In addition, for each special collections site that linked directly to special collections finding aids, I checked at least three of the finding aids to see if hyperlinks were included. In no case did a finding aid contain hyperlinks to external sources.

5.4. Compiling the Data

I briefly visited each link to determine if it was broken or required a password. I also marked links leading to software support pages or tourist information pages as non-scholarly. The links from each site were entered into a plain text file, marked B for broken, P for password-protected and N for non-scholarly. I then imported the plain text files into a Microsoft Excel spreadsheet, as shown in **Figure 1** below.

Figure 1. Example of raw link data in Excel spreadsheet.

BERKELEY	hcom.monterey.edu/oralhistory/index.html	B
BERKELEY	http://academics.utep.edu/Default.aspx?alias=academics.utep.edu/oralhistory	
BERKELEY	http://aidshistory.nih.gov/	
BERKELEY	http://app.harpweek.com/	P
BERKELEY	http://aquila.papy.uni-heidelberg.de/Kat.html	

I collected a total of 7306 links. Duplicate links (*from* the same site *to* the same exact page) were deleted, and the remaining links (6738) put into an adjoining workbook, along with their markings of B/P/N. I then truncated these links (as shown in **Figure 2** below, featuring the first five links in the non-duplicate table) and put the results into an additional adjoining workbook, which was then edited for duplicates as well, leaving 6141 truncated links. I utilized the non-duplicate links and truncated links for different levels of analysis, as described below.

Figure 2. Example results of link truncation.

School	Link	Truncated link
ALABAMA	http://academicinfo.net/africanamlibrary.html	http://academicinfo.net/
ALABAMA	http://alpha.furman.edu/~benson/docs/	http://alpha.furman.edu/
ALABAMA	http://andromeda.rutgers.edu/~jlynch/Lit/medieval.html	http://andromeda.rutgers.edu/
ALABAMA	http://docsouth.unc.edu/	http://docsouth.unc.edu/
ALABAMA	http://englishhistory.net/tudor.html	http://englishhistory.net/

From the spreadsheet of non-duplicate links, I found totals for outlinks, broken links, password-protected links, non-scholarly links, and "qualified" (working, freely accessible and scholarly) links. These totals were added to a new Excel spreadsheet, along with the number of inlinks per library, with each library also coded for ARL ranking, a score that takes into account volumes held, volumes added (gross), current serials, total expenditures and total professional plus support staff. (See **Appendix B**, summary spreadsheet.) Correlations between ARL rank and numbers of inlinks and outlinks were determined using the SAS statistical package.

5.5. Looking More Closely at a Random Selection

Also from the non-duplicate list, I chose a selection of 364 non-broken links using a random number generator from http://www.random.org/. I visited every link from this sample and took notes on the organization hosting the page and the type of page linked to. Once all links were visited, I placed each organization into one of 20 broad categories. While not all of these categories are mutually exclusive, I assigned each organization to the category that I determined to be the best fit.

ORGANIZATION TYPES

1. University. The parent organization hosting the page is a university, be it an Association of Research Libraries member, non-ARL member (inside the United States), or foreign university (outside the United States). An example is the home page for a historical football exhibit hosted by Washington State University: http://www.bowlgame.wsu.edu/history/bowlgame-1.html.

2. Government. The parent organization was governmental, whether local, state, federal or foreign. For example, the home page for Fiji's Ministry of Information and Communications: http://www.fiji.gov.fj/publish/m_info_media.shtml.

3. Commercial. The parent organization exists to make monetary gain. For example, the home page of a hotel: http://www.admiralinn.com/.

4. Professional organization. The parent organization is for the benefit of the members of a profession, usually requiring membership dues. For example, the home page of the "Archivist's Toolkit" from the Archives Association of British Columbia: http://aabc.bc.ca/aabc/toolkit.html.

5. Personal or volunteer-run. The site is not run by a university, government agency or

corporation, but by one single person or small group of people who do so on an unpaid basis. For example, the homepage of "Mountain Men and the Fur Trade," located at http://www.xmission.com/~drudy/amm.html and run by an "association of individuals dedicated to the preservation of the traditions and ways of our nation's greatest, most daring explorers and pioneers."

6. News/magazine. The parent organization is a news network, newspaper or magazine, whether or not it has a print outlet. For example, an archived article from CNN: http://archives.cnn.com/2000/US/05/04/kent.state.revisit/.

7. Museum/gallery/zoo. I lumped these organizations together as they fall under the more general label of "cultural institution." An example of this type is the home page of the National Communications Museum: http://www.nationalcommunicationsmuseum.org/.

8. Advocacy. The parent organization is usually a non-profit company, but the hallmark of an "advocacy" group is that they are advocating for a cause, for example the Farm Animal Reform Movement's call for the ethical treatment of farm animals: http://www.farmusa.org/.

9. Historical society/preservation group. I grouped these two types of groups together, since both are concerned with studying and preserving history. An example is the Historic Landmarks Foundation of Indiana: http://www.historiclandmarks.org.

10. Independent (non-university, non-government) research agency. For example, the Canadian Music Centre, http://www.musiccentre.ca/.

11. Non-university library. (Mainly public libraries, one foreign.) An example is the Birmingham, Alabama Public Library at http://www.bham.lib.al.us/.

12. Cultural/community group. The site is mainly concerned with promoting awareness of a certain culture or community. For example, the Chilean Cultural Heritage Site located at http://www.nuestro.cl/eng/default.htm.

13. Educational organization. The parent group is not university-run or company-owned, but is more formally structured than the personal/volunteer-run type above, and exists to educate the public. For example, Humanities and Social Sciences Online's web page about labor history: http://www.h-net.org/~labor/.

14. Political group. The site exists to educate about or promote a political party, such as the Green Party (http://www.gp.org/) or Republican National Committee (http://www.rnc.org/).

15. Scholarly network. The parent group exists to aid researchers in finding or sharing information in a specific academic discipline. For example, the Association for Social Anthropology in Oceania: http://www.asao.org/.

16. Search engine. Familiar examples will include Google (http://www.google.com/) and Yahoo (http://maps.yahoo.com/).

17. Religious group. The parent organization exists to educate about or promote a particular religion. For example, the Mormon Research Ministry, located at http://www.mrm.org.

18. Regional organization. The site exists to provide information about or promote a specific region. For example, the CNMI Guide, "your guide to Saipan, Tinian and Rota" (in the Northern Mariana Islands), located at http://www.cnmi-guide.com/.

19. A partnership of any of the above. For example, a state government/university partnership runs the Georgia Encyclopedia, found at

http://www.georgiaencyclopedia.org.

20. Unknown, for the two opaque foreign language sites located at http://byzantinorossica.org.ru/dmitrievskii.html and http://www.etk-muenchen.de/literatur/exil/index.html.

I divided page types into the following twelve categories, based on but also expanding upon Almind's 1995 list:

PAGE TYPES

1. Organization home page. For example, the home page for an entire university (http://www.umich.edu/) or library (http://www.loc.gov/index.html).

2. Sub-division home page. The organization represented is part of a parent organization; for example, the University of Michigan's University Archives program (http://www.umich.edu/%7Ebhl/bhl/uarphome/uarpprog.htm) or the Library of Congress' American Memory Project (http://memory.loc.gov/ammem/index.html). When I experienced doubt as to whether to classify a page as belonging to an organization or sub-division, I looked at the URL to determine if the page was part of a subset of a larger institution's site.

3. Subject-specific page. The page contains information about a particular subject, such as the Tasmanian Parks and Wildlife Service's page about the Southern Brown Bandicoot, located at http://www.parks.tas.gov.au/wildlife/mammals/bband.html, or Wikipedia's page about the Dada art movement, at http://en.wikipedia.org/wiki/Dada.

4. Place page. A page describing a particular geographic place, such as a National Park (http://www.nps.gov/fomo/).

5. Pointer page. The main purpose of this kind of page is to point the user to resources

on other parts of the web. The resources may focus on one particular subject, but information on that subject is not the primary focus of the page. Examples include links pages such as Conservation Online's links to disaster recovery resources at http://palimpsest.stanford.edu/bytopic/disasters/, as well as subject indexes and directories.

6. Collection home page. The homepage of a specific library collection, such as the University of British Columbia's Sheet Music collection (http://www.library.ubc.ca/music/bcmusic/default.htm) or SUNY-Albany's German and Jewish Intellectual Émigré collection (http://library.albany.edu/speccoll/emigre.htm). These pages describe the collection and may provide access to finding aids or news releases, but do not showcase an effort to digitize the source materials.

7. Exhibit home page. The home page of an online exhibit, for example the University of Virginia's exhibit of American Civil War materials at http://etext.virginia.edu/civilwar/._An exhibit home page differs from a collection home page in that at least some materials from the collection have been made available online.

8. Informational page. This type of page provides administrative information, such as a description of the parent organization hosting the web site (Archives USA's "About Us" page, for example: http://archives.chadwyck.com/infopage/ausa_abt.htm), or tourist information, such as hotel locations (http://www.functionjunction.ca/restaurants2.htm).

9. News page. A news article or news release, such as this page announcing the winner of a professional archivist award: http://southwestarchivists.org/HTML/ACADSA.htm

10. Research tool. These pages do not provide specific subject information, nor do they point the user to any one external source, but they can help the user shape their search

strategy. Examples include research guides, catalogs, search systems, subject thesauri, dictionaries, bibliographies, and help pages.

11. Technical. Descriptions of software or downloads needed to view web pages, such as Adobe's Reader program (http://www.adobe.com/products/acrobat/readstep2.html).

12. Unknown (due to language barrier).

Figure 3 shows a selection from the spreadsheet of 364 randomly selected links, coded for types of organization and page.

Figure 3. Screenshot from Excel spreadsheet of random sample of 364 links coded for organizational and page types.

Link Address	Notes	Type of Organization	Org. Code	Type of Page	Page Code
http://www.academybh.o	Academy of Bosnia and	educational	1	home page	A
http://cfwe.org/default.as	Colorado Foundation for '	educational	1	home page	A
http://www.h-net.org/~lab	subject page on the hist	educational	1	subject page	B
http://www.spartacus.scl	"The Vietnam War" - pec	educational	1	subject page	B
http://www.academicinfo	Academic Info - U.S. His	educational	1	subject-specific	D

5.6. Finding Colinks and Interlinks

Using the spreadsheet for all truncated links, I sorted by link address and created a new spreadsheet containing each URL and the ARL special collections libraries that link to them. In this way, I was able to determine the outside sites linked to by more than one of the institutions being studied. These URLS were then sorted by number of institutions linking to them, and a chart of top outlinked URLs is included in the Results section.

Also from the truncated list, interlinks between ARL institutions were found by searching for their base URLs. This list was further broken down by interlinks that connect to ARL libraries, and ARL special collections libraries specifically.

5.7. Determining Regional and Subject Groups

In order to compare regional interlinkage, I used the regions assigned by the ARL

itself – a map is included in the Results section. According to the ARL (http://www.arl.org/stats/arlstat/ddoc.html), these are the same regions used by the U.S. Census Bureau, which, according to the Bureau (http://www.census.gov/geo/www/GARM/Ch6GARM.pdf), should be "roughly similar in terms of historical development, population characteristics, economy, and the like." (p.1)

In order to investigate subject strength interlinkage, I found test groups for three subject strengths via the University of Idaho's Repositories of Primary Sources "Additional Lists" page. For African-American studies, I utilized a list from the University of Delaware libraries, given at http://www2.lib.udel.edu/subj/blks/internet/afamarc.htm. For labor history, I used a list supplied by Wayne State University's Walter P. Reuther library, found at http://www.reuther.wayne.edu/Links/archivelinks.html. For women's studies, I found a list provided by the University of Texas-San Antonio library, at http://www.lib.utsa/Archives/WomenGender/links.html. I found subject strengths for two additional collecting areas via professional organizations; The Oral History Association at http://www.dickinson.edu/organizations/oha/org_cc.html and the Advanced Papyrological Information System at http://www.columbia.edu/dlc/apis.

A list of the ARL libraries included in each of the groups above was compiled (and checked, through a visit to each site) for each subject and the institutions included were coded and sorted for matches. For libraries that showed a subject match, the link was briefly checked to determine if the content of the link matched the subject. A spreadsheet with all of this data is included as **Appendix C**.

5.8. Social Network Analysis

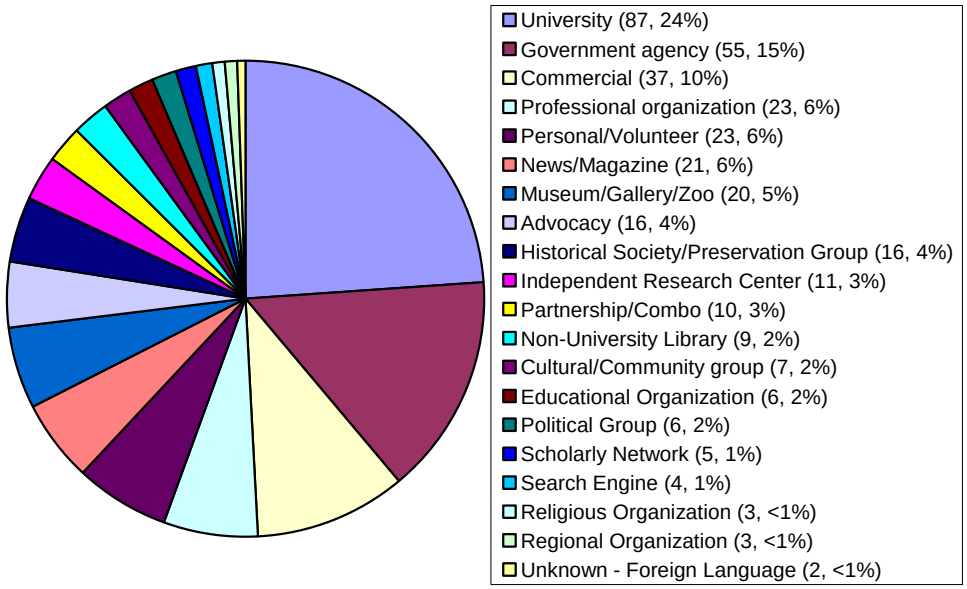
Once the hyperlinks for each level of analysis were amassed, they were transposed into symmetrical spreadsheets for use with the Ucinet6/NetDraw software (http://www.analytictech.com/ucinet/ucinet.htm), in order to create the social network diagrams included in the Results section.

6. Findings

6.1. Types of Institutions Linked To

Of the 364 links randomly selected for further investigation and categorization, almost half belonged to the top three categories of universities (87), government agencies (55), and commercial sites (37). A pie chart showing the breakdown of all categories is included in Figure 4.

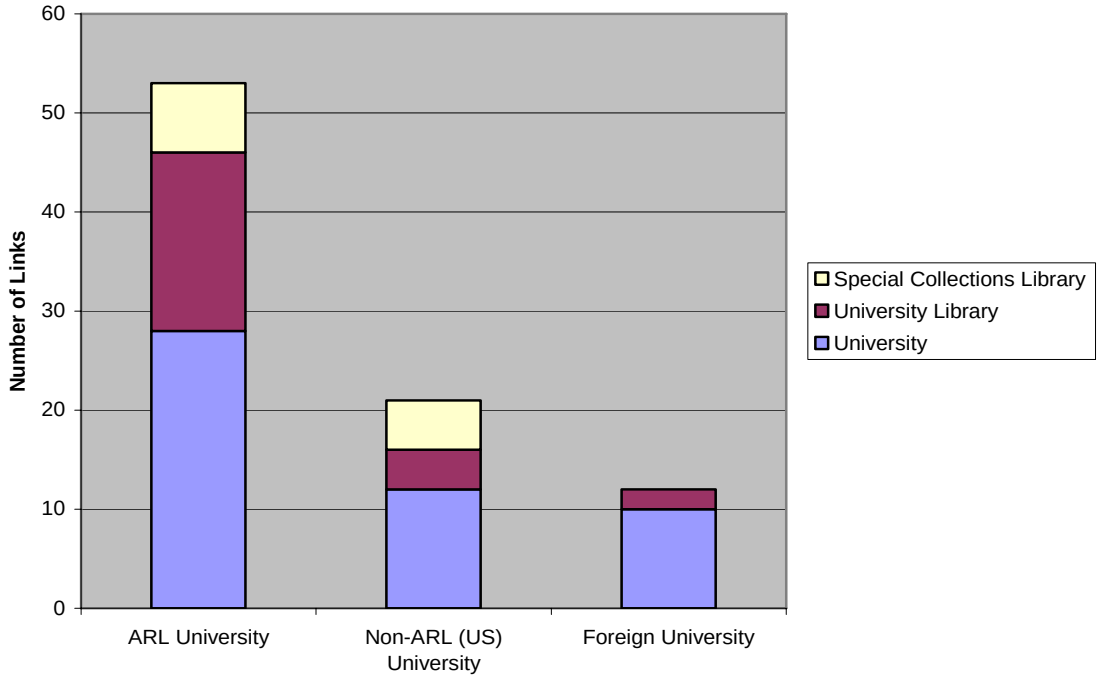
Figure 4. Kinds of institutions linked to from ARL university special collections libraries, from random sample of 364 links.



Figures 5, 6 and 7, below, further break down the university, government and commercial links. Of the 87 links to other universities, most (53) were to another ARL

university, though not necessarily to the university library (18), much less to the university's special collections library (7). As I will point out again later in the paper, the number of interlinks between the libraries in this study population is strikingly low. However, a more in-depth exploration of the context and motivation behind the hyperlinkages between special collections libraries would need to be undertaken in order to investigate why this is the case.

Figure 5. Breakdown of university links.



Most government links were to the United States Federal government, with 10 out of 24 going to libraries or archives, closely followed by US state government agencies, with 7 out of 17 going to libraries or archives.

The commercial links can be broken down mainly by media outlets, software companies, travel sites, and research tools (the two remaining "other" sites were for pet information and event-hosting.) The media outlets included music labels, publishers,

booksellers, broadcasters, and television and movie producers. It is interesting to note the multimedia nature of these links; the libraries are connecting their users to other kinds of sources in addition to the traditional books. The links to software companies are most often for program downloads in order to better view the more technologically advanced library web sites, though sometimes the libraries will simply reference the technologies they used in creating online exhibits. The number of links to travel-related sites (airlines, hotels, travel agencies, tourist information) is a nod to the extensive travel often required to visit these repositories and view their collections in person.

Figure 6. Breakdown of government links.

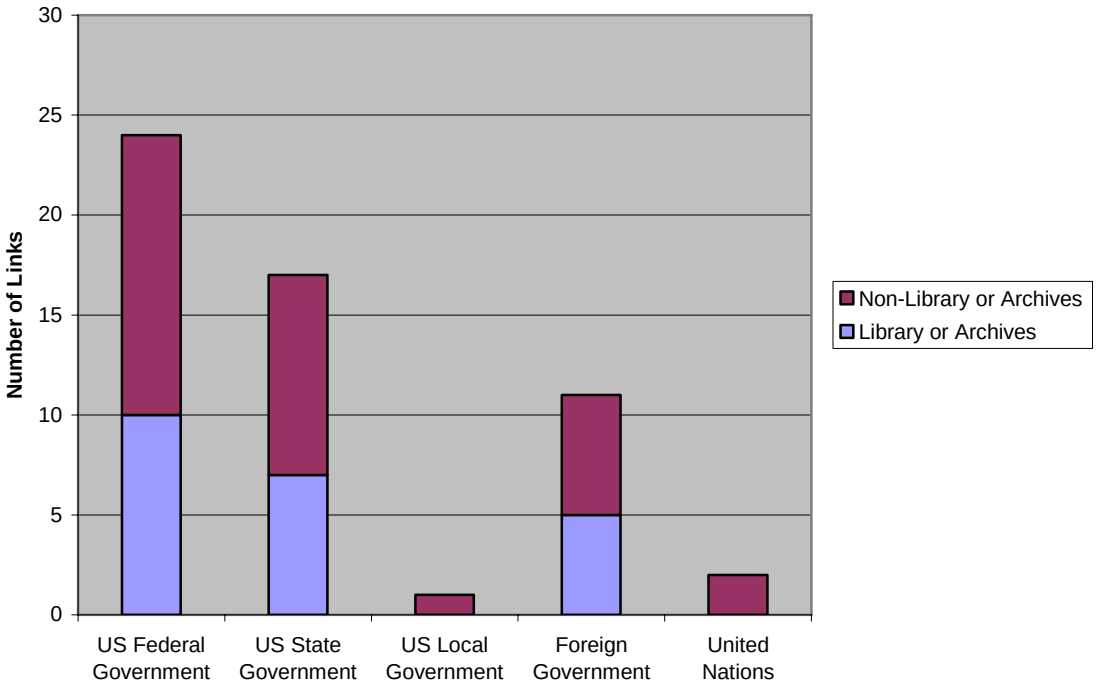
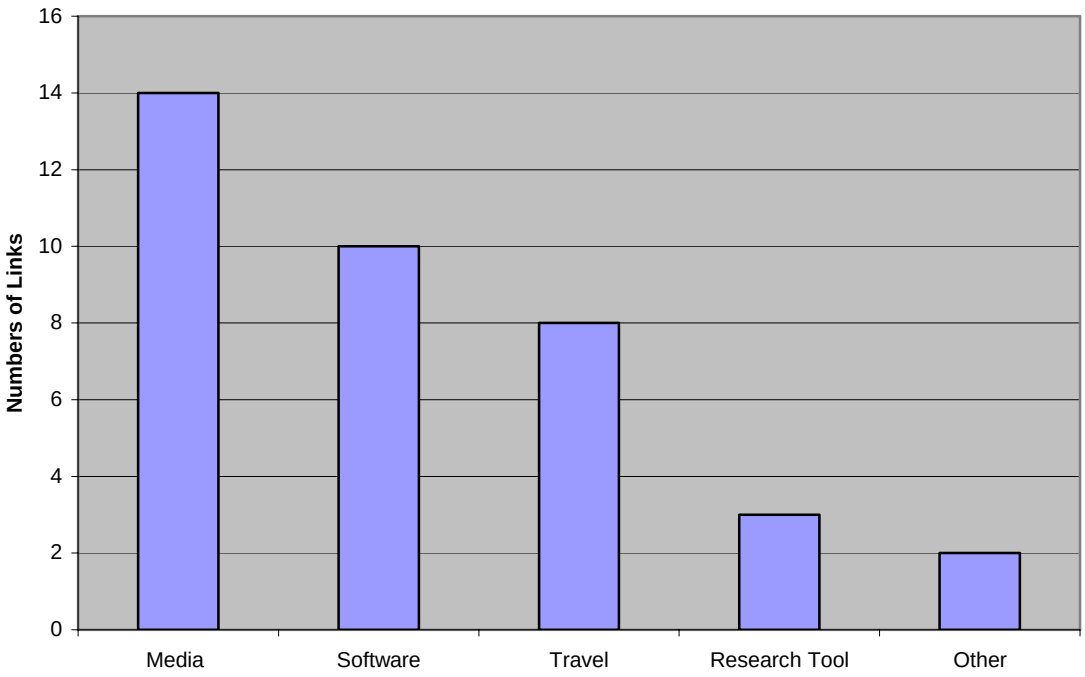


Figure 7. Breakdown of commercial links.



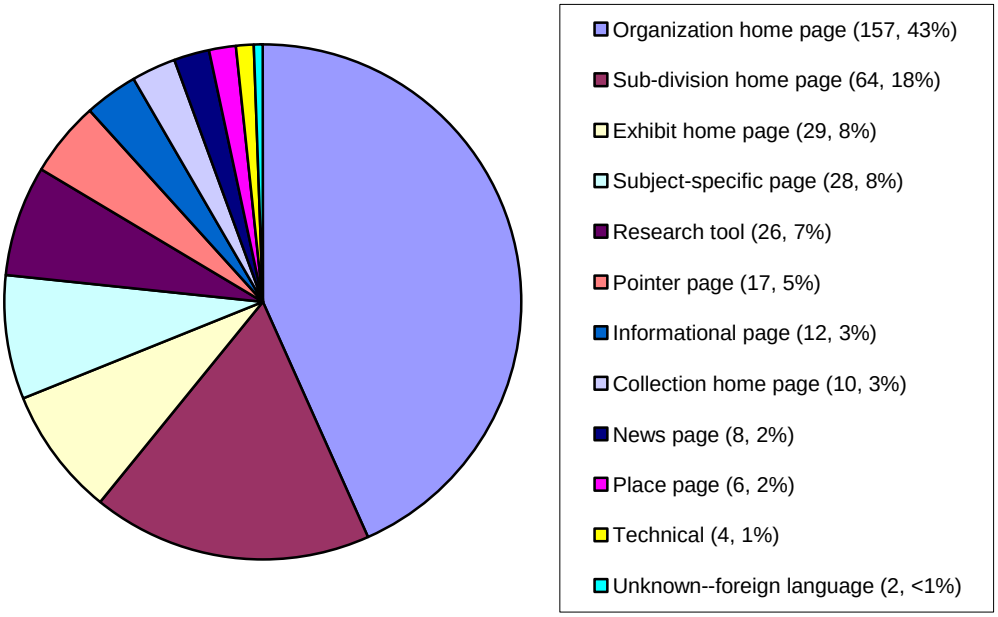
6.2. Types of Pages Linked To

Of the 364 randomly selected hyperlinks, the types of pages linked to were also coded for analysis. The results are represented in the pie chart in Figure 8, below. The largest group (157) was organizational home pages, with 64 more as home pages of organizational divisions. Exhibit home pages, subject pages, and research tools had 29, 28 and 26 each, followed by pointer pages, informational pages, collection home pages, news pages, place pages, technical pages and two pages marked as "unknown," as they were composed in a foreign language.

I find it interesting that so many of the sampled links lead to organization or sub-division home pages (together making up 61% of the sampled links), meaning that these libraries are pointing users to other sites they might want to explore more often than referring them to pages with specific subject information or research tools. Perhaps this

is a sign that the libraries expect their users to possess enough ability and comfort in online searching to utilize other web sites accordingly. Whether or not that is the case, in addition to general user preference regarding the type of pages linked to, might be interesting areas for future research.

Figure 8. Kinds of pages linked to from sample of 364 links.



6.3. Sites most often linked to

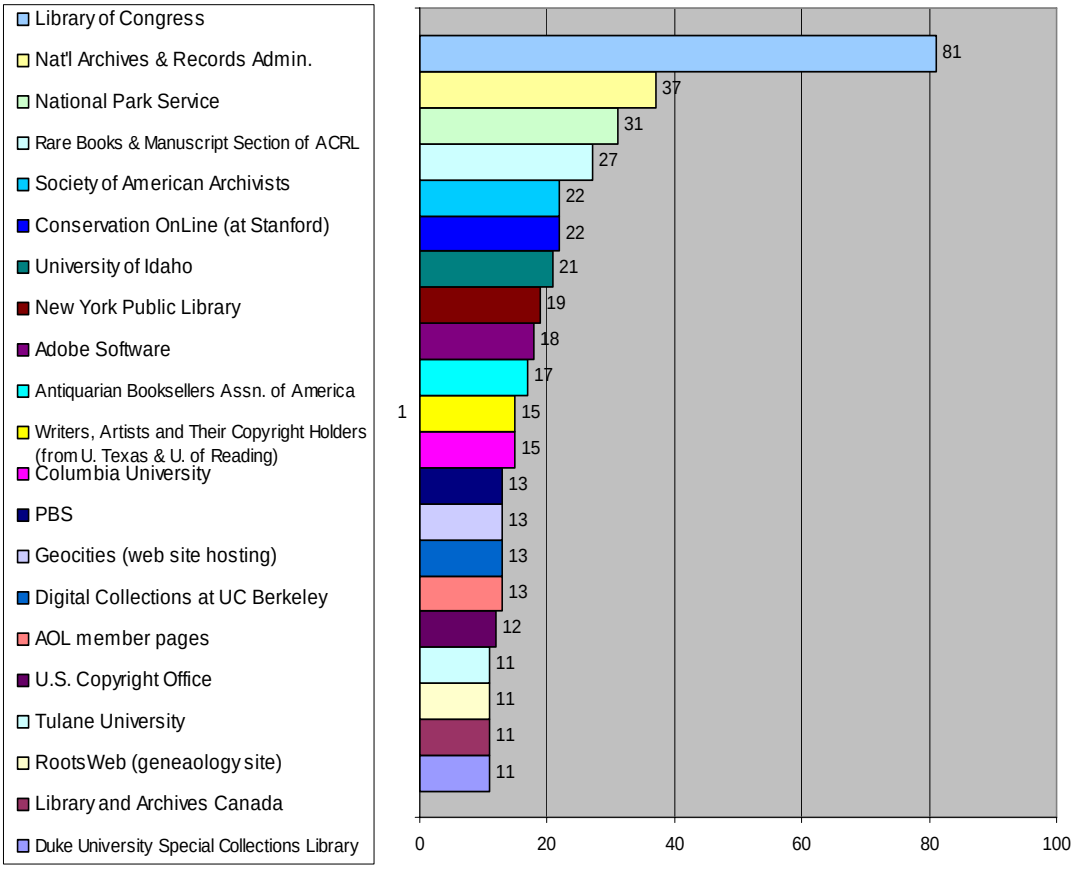
From the list of 6141 truncated, non-duplicate links (only one link allowed from one institution to another), the ten sites receiving the most links from multiple libraries were the Library of Congress (81), National Archives and Records Administration (37), National Park Service (31), Rare Books and Manuscripts Section of the ACRL (27), the Society of American Archivists (22), Conservation OnLine (hosted by Stanford University) (22), the University of Idaho (21), the New York Public Library (19), Adobe Software (18), and the Antiquarian Booksellers Association of America (17).

Figure 9, below, lays out the top 21 outlinked sites from these special collections

libraries.

The Library of Congress is the clear outlier here, most likely due to its extensive collection of online exhibits from libraries around the country. If a library were to link to only one outside site for additional primary source material, the Library of Congress would be a good choice. In addition, many institutions likely point to their own exhibits that are hosted by the Library of Congress web site.

Figure 9. Institutions most often linked to (from truncated, non-duplicate list).



The National Archives and Records Administration is the primary source for information on U.S. government archives, so it is not surprising to see the NARA web site coming in second. I did find it surprising to see the National Park Service come in at number three. However, in the course of my links-gathering I found that many of these

libraries have collections pertaining to their geographic region, and thus refer to other sources for specific place information.

Sites like the Rare Books and Manuscripts Section of the Association of College and Research Libraries, the Society of American Archivists, and Conservation Online serve to give users further information on the types of materials typically housed in these libraries and the concerns surrounding their storage and use.

The University of Idaho hosts a well-known index called the "Repository of Primary Sources," (which I utilized in my research for this paper), which users can use to find other libraries with materials relevant to their interests, so it is both unsurprising and encouraging to see it among the top scorers here. The inclusion of other universities such as Columbia, Berkeley, Tulane and Duke in the top 21 likely signals a recognition of the high quality of their online collections.

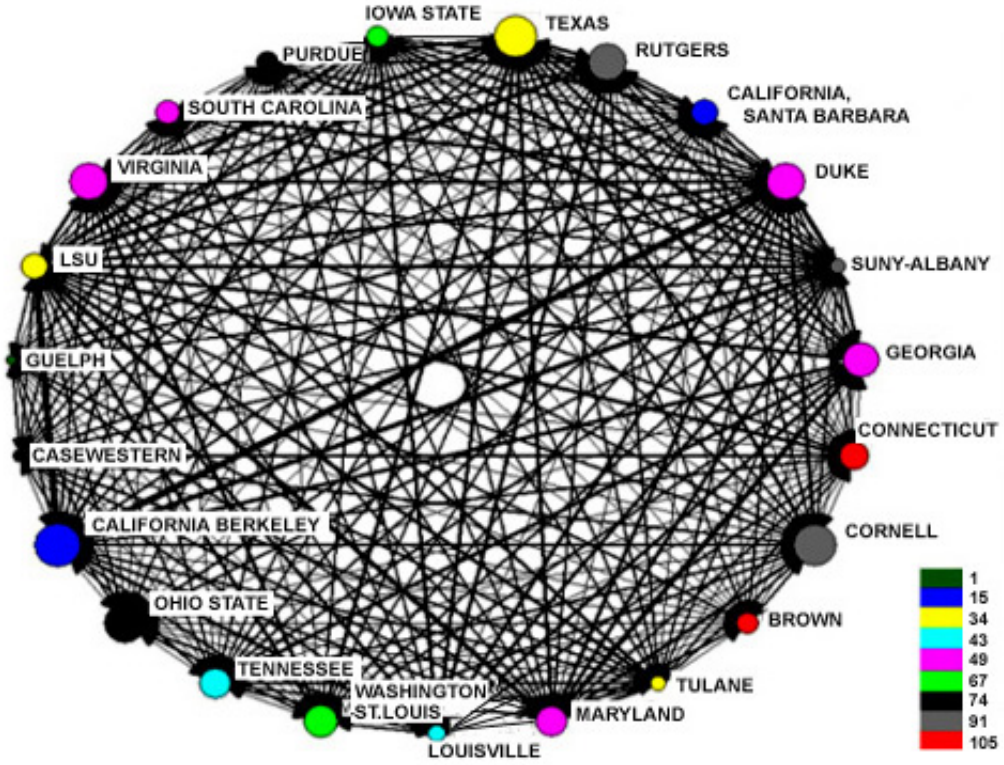
Adobe seems to be the software brand of choice for creating/viewing the more technologically advanced library web sites. The library community's concern for copyright compliance is shown by the inclusion of the University of Texas's copyright database along with the United States Copyright Office. Finally, the number of Geocities and AOL member pages shows the respect paid to pages created by individuals and volunteer groups which, despite their lack of university or government affiliation, can still be helpful with academic research.

6.4 Colinks

As so much has been written on the relationship between academic hyperlinkage and citations between scholarly journal articles, I thought it would be interesting to look at the colinkages among these special collections libraries. Figure 10, below, shows the

top 23 outlinking libraries, coded by color for region and size for rank (larger size for higher rank). Connecting lines are shown when both libraries link to the same institution, and the lines become thicker the more outlinks the libraries have in common. It is interesting first to see that Region 27 (defined later in the paper) is the only region not represented, and that many different sizes and therefore ranking levels are included in the list of top outlinkers. Also, this diagram is dense with co-linkage relationships, which would seem to show that the top outlinking libraries are all linking to a lot of the same sites (see chart above).

Figure 10. Social network diagram showing colinking relationships between the top 23 outlinking libraries.



6.5. Overall Visibility

The Excel spreadsheet "summary," included as Appendix B, shows all the general summary data on inlinks (representing visibility) and outlinks (representing luminosity) for each site.

For the special collections library Web sites studied, the mean number of inlinks was 77. A standard deviation of 114 shows a wide variation of total in-links per site; the median for inlinks was 28. Three institutions (Oklahoma, Southern Illinois and the State University of New York (SUNY) at Buffalo) had no inlinks, and Yale registered a chart-topping 685. Figure 11 shows the distribution of total number of inlinks for all the libraries (not all university names could be fit on the page).

Figure 11. Distribution of inlinks (total).

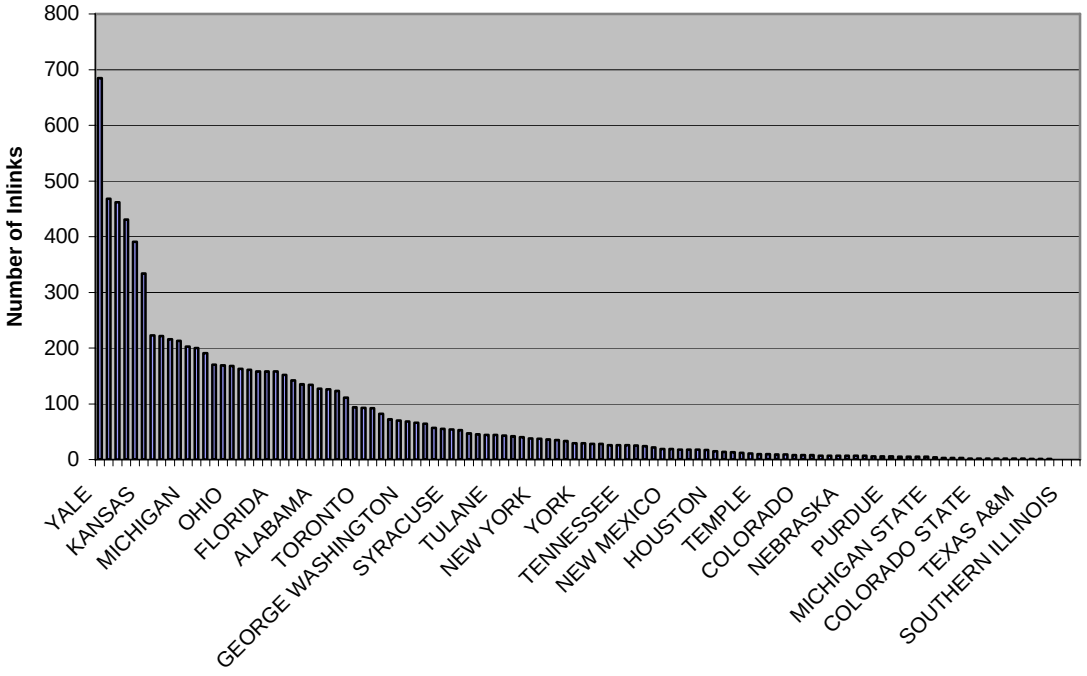
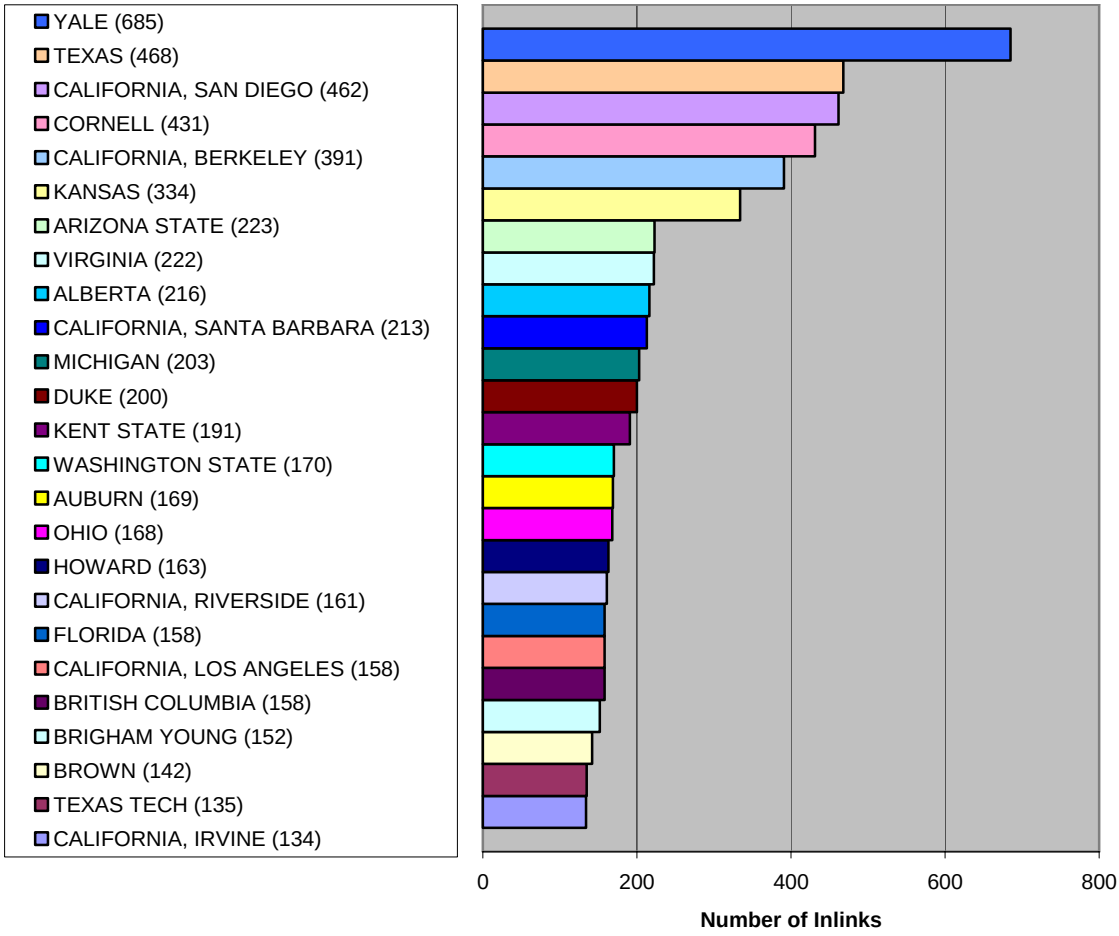


Figure 12, below, shows the top 25 inlinked sites. Yale's Beinecke Library is the clear outlier here; this may be a sign of its prestige in the academic community (Yale ranks comes in second only to Harvard in ARL rankings, though, interestingly, Harvard is not included on this list), a sign of the quality of its web site design, a product of inventive Internet outreach, or some combination of the three.

For all the libraries in this study, ARL ranking of the parent library shows a weak

negative Spearman correlation of -0.27 (p=.0044) with number of inlinks. This shows that rank correlates positively with visibility (albeit slightly), as lower numbers represent higher ranks.

Figure 12. Top inlinked libraries.



6.6. Overall Luminosity

These special collections library sites had a mean value of 60 (total, qualified and unqualified) outlinks each. A standard deviation of 96 again shows a wide range of values, median value for outlinks was 33. Six libraries (Oklahoma, Nebraska, California-Davis, Boston, Auburn and Alberta) did not outlink at all, and Hawaii registered a whopping 832. The chart below shows the distribution of total number of outlinks for all

libraries (though not all library names could fit on the page).

Figure 13. Distribution of number of outlinks (total).

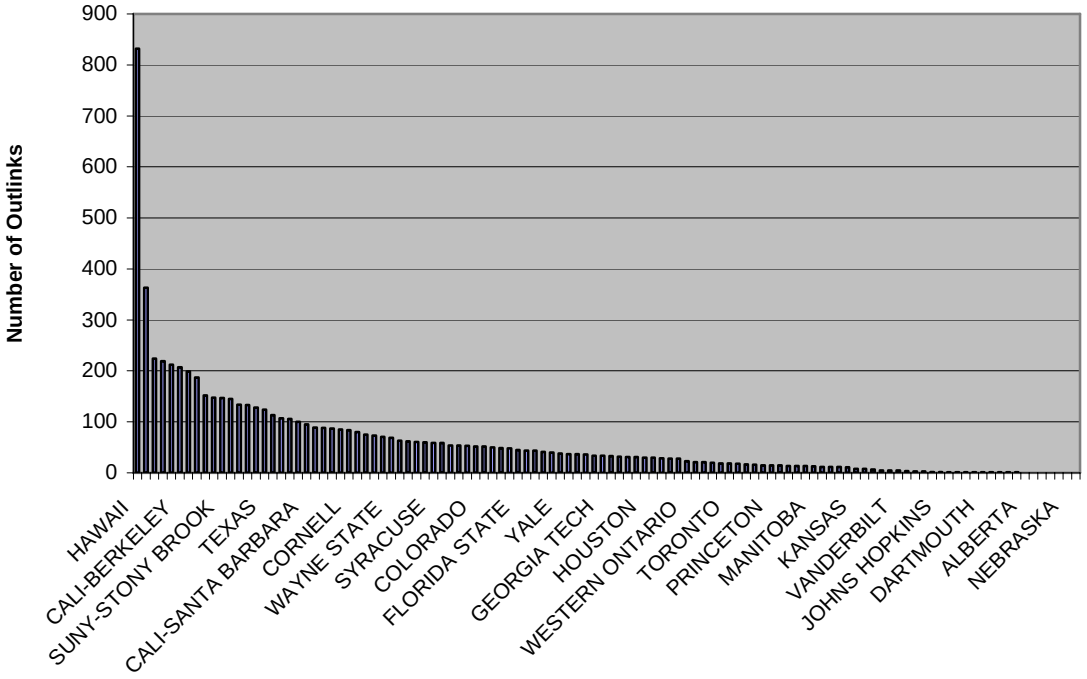
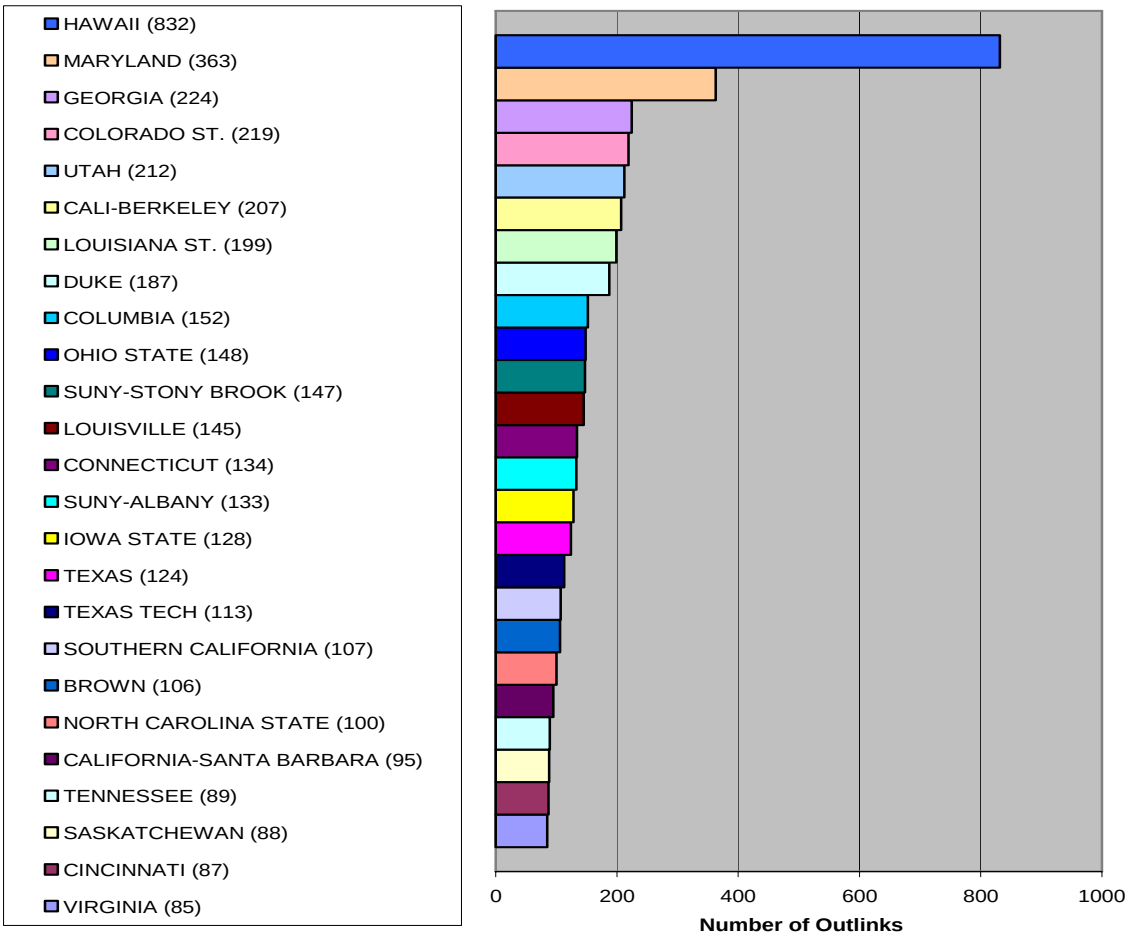


Figure 14, below, shows the Top 25 outlinked special collections libraries. The University of Hawaii's Special Collections Library is the clear outlier here; in fact, most of the library's web site at the time its outlinks were gathered consisted of groups of hyperlinks to outside sources. (Whether or not this is effective web design would be the subject of another study.)

ARL ranking of parent libraries shows no significant correlation with number of outlinks from the special collections library. This could be because the ranking of the parent library does not necessarily correspond to the quality of the special collections library. However, I think a larger factor may be the lack of importance assigned to hyperlinkage to outside sources, in comparison to the value placed on more the more "gee whiz" aspects of library web sites, such as digitized texts and interactive

technologies. Again, the motivation behind (and attitudes toward) special collections hyperlinkage could be the subject of a future study.

Figure 14. Top outlinked libraries.



6.7. Detriments to Luminosity: Broken, Protected, and Non-Scholarly Links.

Of these out-links, an average of 7 were broken or required a password, and an average of 1 was non-scholarly, leaving a mean of 52 qualified links. On average, 84% of the links on a given site were working, freely accessible and useful for scholarly research.

The libraries with the lowest ratio of qualifying links to total links include Wayne State (.42), Princeton (.47), McMaster (.5), and Boston (.57). Of the 106 sites with out-

links, 21 sites contained 100 or more. Of those 21 sites, SUNY-Albany (.98), Connecticut (.96), and Colorado State (.95) had the highest ratio of qualified links to total links and Louisville (.6) and Utah (.65) had the lowest.

6.8. Overall Links Ranking

I compiled rankings for each library for total inlinks, total outlinks and ratio of qualified to total outlinks. I then averaged these rankings, yielding an overall links-ranking for every library. The top eleven libraries are shown in the table below, and these are the libraries most likely to have a high number of inlinks as well as a high number of outlinks, most of which are scholarly, working and freely accessible.

Figure 15. Top Ten Libraries in Overall Links Ranking.

Overall Rank	Institution	Inlinks-Rank	Outlinks-Rank	Qualified-Out Rank	Averaged Ranks
1	CALIFORNIA, BERKELEY	5	6	14	8.3
2	DUKE	12	8	8	9.3
3	TEXAS	2	16	13	10.3
4	CALIFORNIA, SANTA BARBARA	10	21	8	13
5	CORNELL	4	26	14	14.7
6	VIRGINIA	8	25	13	15.3
7	LOUISIANA STATE	28	7	16	17
8	GEORGIA	33	3	16	17.3
9	BRITISH COLUMBIA	19	35	3	19
10	BROWN	21	19	20	20
10	FLORIDA	19	30	11	20

6.9. Visibility and Luminosity Within Special Collections Interlinks

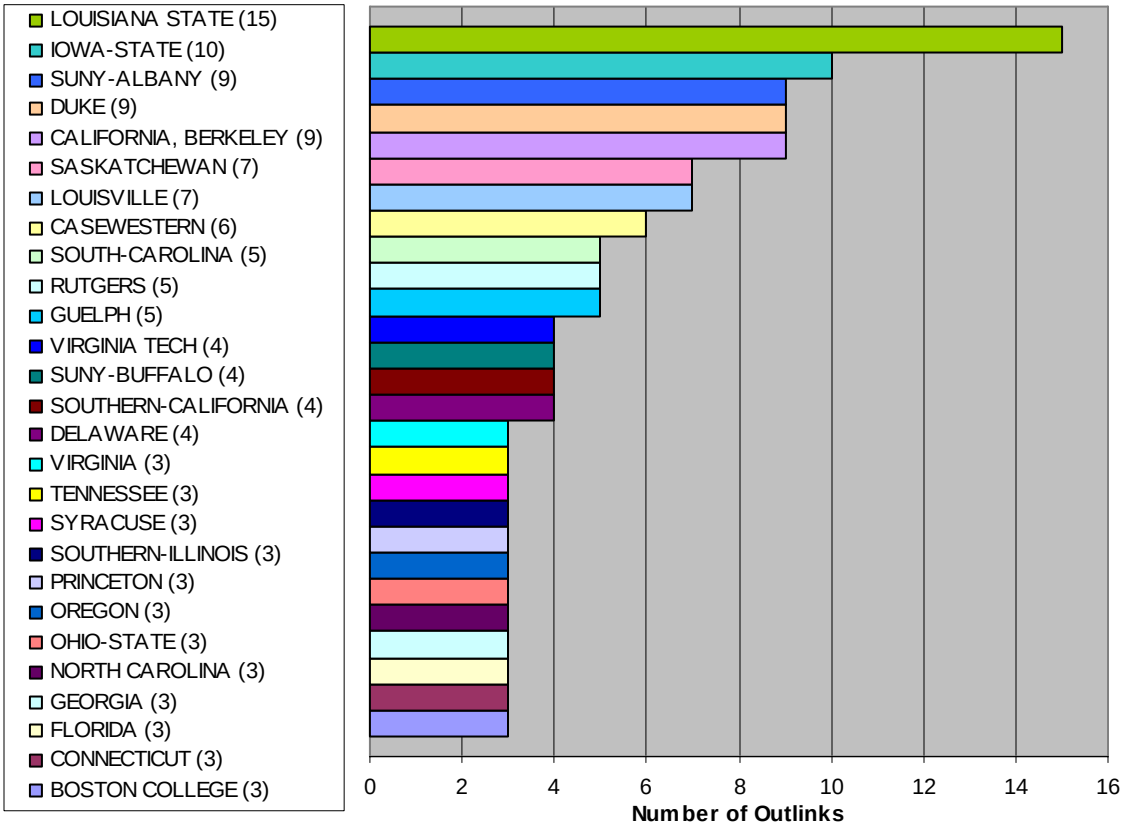
Of the 6737 (non-duplicate) links gathered, 849 (12.6%) were links to other ARL institutions. Of these, 362 were links to other ARL libraries, of which only 175 (2.6%) were links specifically to other ARL special collections libraries.

53 of the 111 libraries studied did link to at least one other ARL special collections library, leaving 50 that did not. 65 of the 111 libraries were linked to from

another ARL special collections library, leaving 48 that were not linked to.

Figure 16 shows the institutions creating three or more links to other ARL special collections libraries.

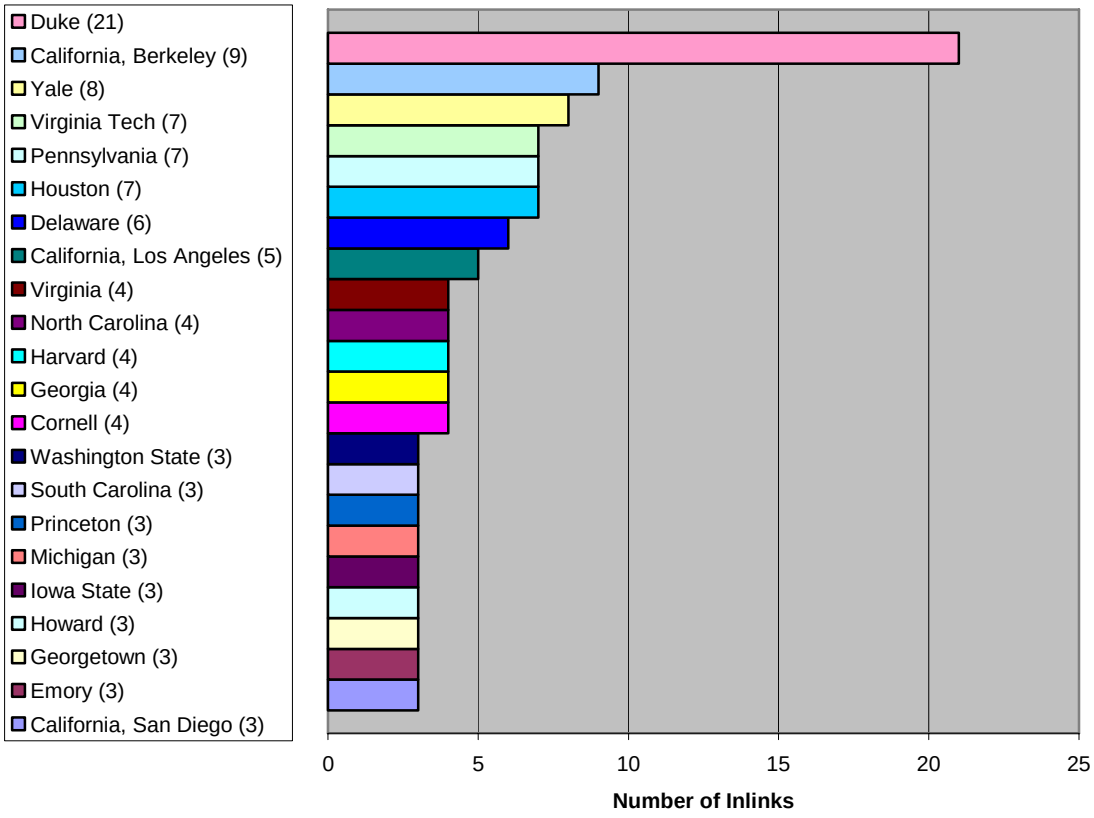
Figure 16. Libraries with the most outlinks to other special collections libraries.



Louisiana State's special collections library is the outlier here. Its fifteen links go to twelve libraries across the country, with the largest number (3) going to Virginia Tech's special collections library. Five links go to special collections library home pages, four more to oral history collections, and three a piece to historical children's literature and university archives.

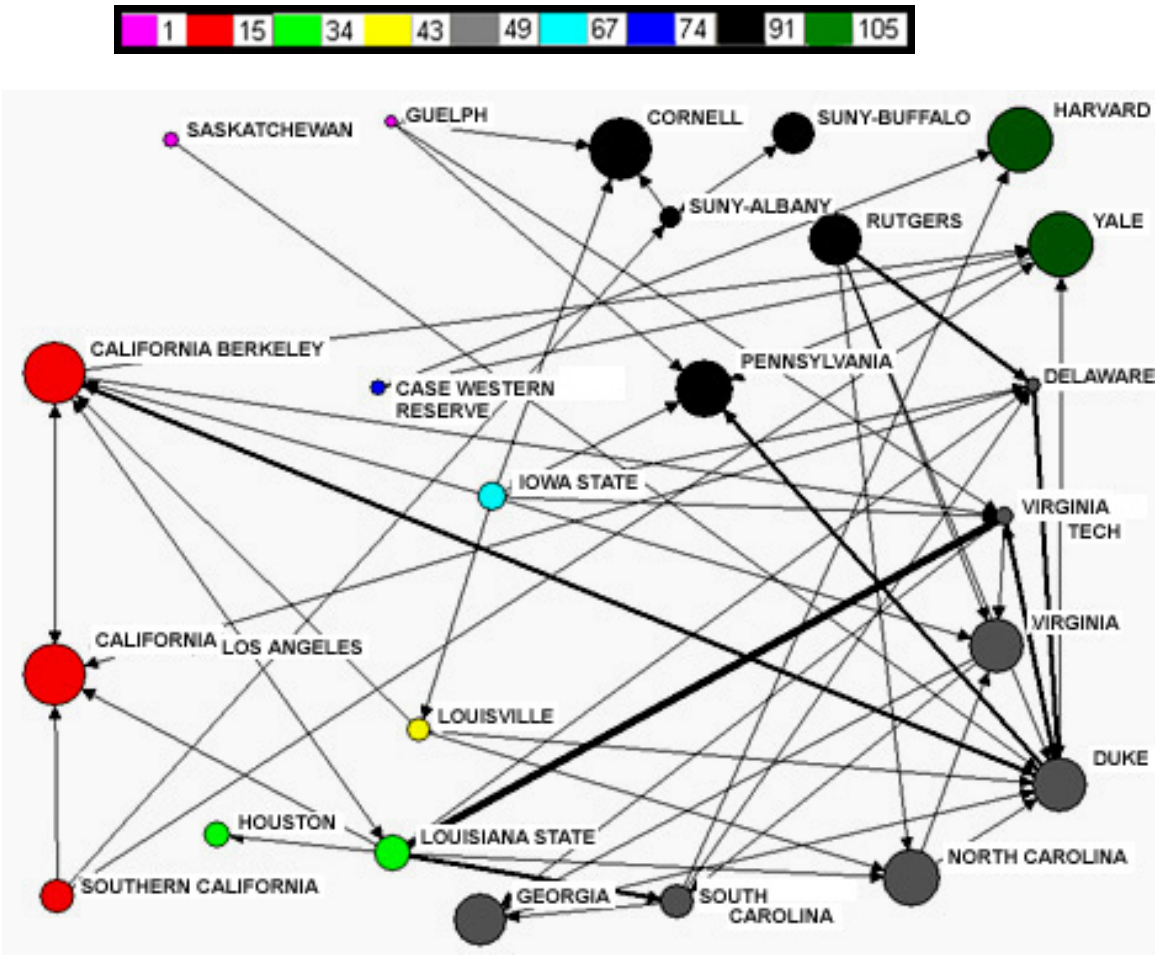
Figure 17, below, shows the institutions linked **to** three or more times from other ARL special collections libraries.

Figure 17. Libraries with most inlinks from other special collections libraries.



Duke University's Rare Books, Special Collections and Manuscripts Library is the outlier here, with 21 links coming from 14 different special collections libraries from across the country, including five from SUNY-Albany. Ten of these links are related to the history of the American South, including slavery, the civil war, and African-American women's history. Four links relate to feminist scholarship, including two to a lesbian pulp fiction collection. I found it surprising that only two links went to Duke's papyrus collection and one each to their historical advertising and American sheet music collections, though these materials may be more heavily linked by research units outside other universities' special collections libraries. The remaining three links simply led to the special collections home page.

Figure 18. Social network diagram showing connections between top interlinked libraries



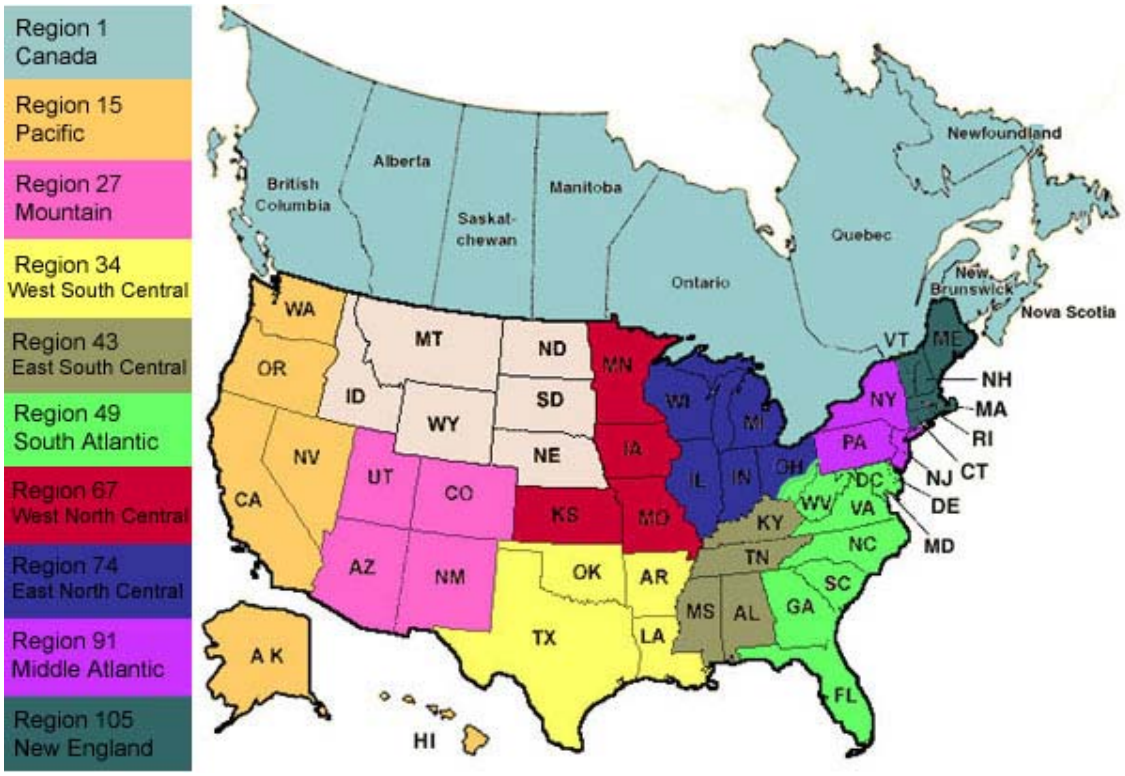
The network diagram in Figure 18, above, shows the connections between the top interlinking libraries, found by combining the columns for libraries linked-from and libraries linked-to, and counting the occurrences of each library. The larger the size of the node, the higher the rank of the library. The thicker the line between two nodes, the more hyperlinks between the two libraries. A color-coded key is provided for regions.

The higher ranked universities located along the east coast of the United States look to be the most interlinked, although there are several libraries of lower rank included in the diagram, and California, Berkeley shows multiple connections to and from other libraries in this selection. Regions 49 and 91 have the most nodes represented, with 7 and

5 respectively. Region 49 is the most heavily interlinked, a phenomenon which will come up again later in this paper. Both Canada and the middle United States are only sparsely represented, but I was more surprised to see the sparse representation of the west coast and Ivy League schools (located mostly in Region 105).

6.10. Interlinks by Region

Figure 19. Map of Geographic Regions Assigned by the ARL.



The map in Figure 19, above, illustrates the ARL-assigned regions for these libraries, and a table naming the libraries in each region is included as Appendix D.

Figure 20, below, offers a comparison of hyperlinkage by region. The regional interlinks tabulated in this table include all links from the special collections libraries in this study to other ARL universities in a library's region; these links are not necessarily to a university library. I think it is useful to look at interlinkage at different levels, since, as

stated before, some parts of a special collections online library, including digital exhibits, appear outside of the special collections' base URL. I will take a look at regional interlinks confined to those between special collections libraries later in this paper.

Figure 20. Comparison of Regional Hyperlinkage.

Region	**Avg # Inlinks**	*Inlinks Standard Deviation*	**Avg # Total Outlinks**	*Outlinks Standard Deviation*	**Total # Interlinks**	**Total # Regional Interlinks**	**% of Interlinks that are Regional**
1	48	*67*	30	*26*	54	31	57%
15	121	*153*	120	*232*	119	18	15%
27	145	*88*	71	*100*	30	7	23%
34	62	*151*	62	*69*	78	23	29%
43	86	*68*	48	*57*	54	1	2%
49	63	*69*	77	*94*	163	58	36%
67	76	*117*	42	*44*	64	7	11%
74	72	*72*	44	*36*	113	29	26%
91	53	*111*	58	*54*	111	28	25%
105	56	*217*	36	*50*	60	3	5%

Region 15 (Pacific) had the highest average number per Web site of inlinks and outlinks, while Region 1 (Canada) has the lowest average number of both; however, Region 105 (New England) offers the second highest number of in-links but second *lowest* number of out-links, so these totals do not necessarily correlate.

Canada has the highest percentage of regional interlinks to total interlinks (over half), which may be because it is the only region that makes up its own country. Region 1 is followed by Region 49, which includes a number of libraries with collections devoted to the history of the American South, and shows slightly more than one third of interlinks to be regional. New England, which includes most of the Ivy-League universities, and Region 43 (East South Central) have the lowest percentages of regional interlinks to total interlinks. Perhaps the competitive nature of the Ivies keeps them from interlinking; as stated previously, a study of the motivations behind special collections

hyperlinkage (or lack thereof) could be an area for future research.

Of the 175 total *special collections* interlinks, 57 (33%) were regional matches. However, only Regions 1, 15, 34, 49, 74 and 91 contained any regional interlinks. Regions 27, 43, 64, and 105 had none.

To see which libraries in the six regions listed above inter-link with each other, it is useful to use social network diagrams. Diagrams for each region are included as **Appendix E**. For each diagram, the size of each node relates to its ARL ranking (the larger the node, the higher the rank). Also, the thickness of the connecting lines indicates the strength of the connection (number of times inter-linked), meaning that the more times one library links to another, the thicker the line between them will be. The arrows show the direction of the linkage; therefore institutions that link reciprocally to each other will show connecting lines with arrows on each side.

Region 1 shows eight out of thirteen nodes connected, though Saskatchewan is doing the lion's share of the linking (six out of seven of the connections). Region 15 shows three small sets of linked nodes, two of which contain libraries from the same state (though only three of the eight California universities are connected to each other). Five out of the twelve libraries remain unconnected. Region 34 shows five of eight libraries connected, including three of the five Texas libraries and both Louisiana libraries.

Region 49 shows the densest Web of regional inter-linking. Twelve out of eighteen libraries are connected, and those twelve show an average of almost three connections each. This may be due to an intense scholarly interest in the history of the American South, which would give the libraries reason to link to one another based on subject strength. However, perhaps libraries in this region tend to form stronger research

partnerships. This would be an interesting subject for future research.

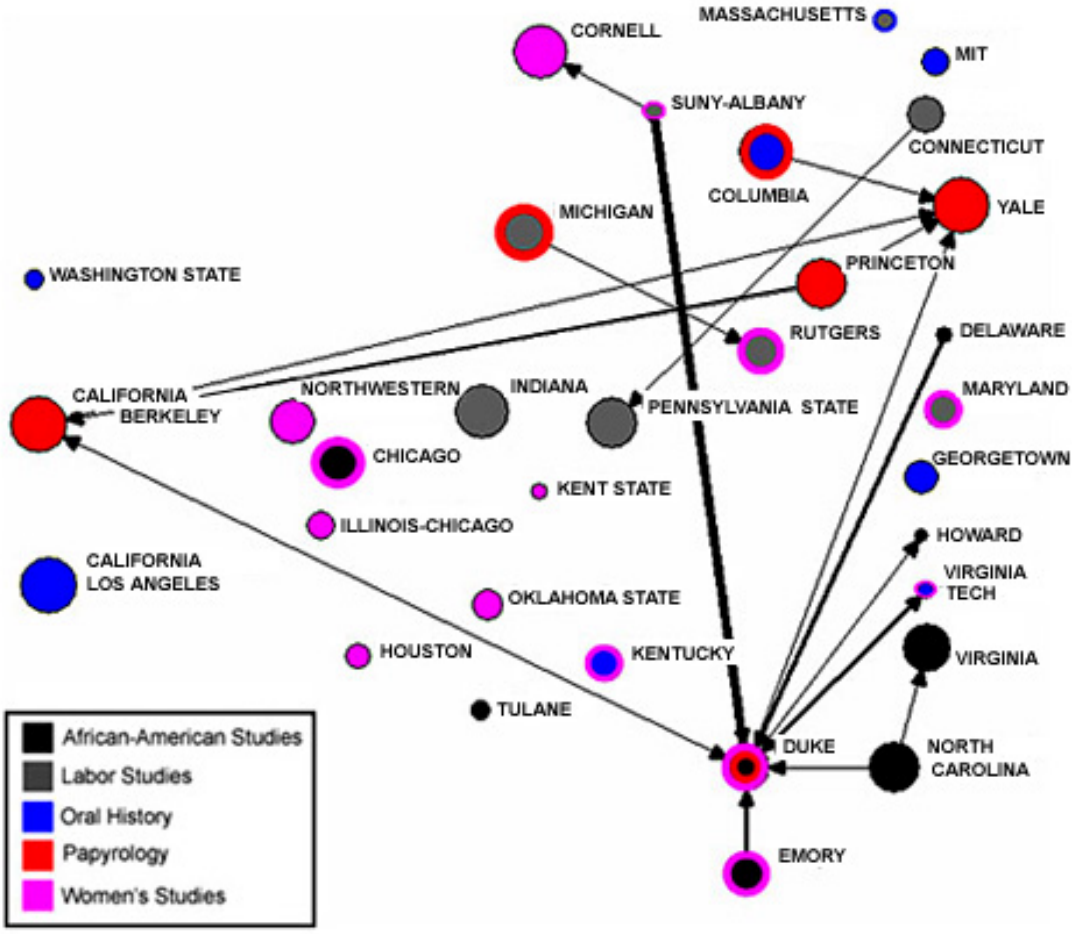
Regions 74, like Region 15, shows three small sets of linked nodes, including one that contains three out of five Illinois libraries, one that contains two out of four Indiana libraries, and one that contains four out of six Ohio links (plus one from Michigan). In Region 91, eight out of fourteen libraries are connected, with most of the New York libraries (7 out of 8) included.

These diagrams seem to show that in regions where the libraries do interlink, the majority of interlinkage is between libraries in the same state (for U.S. libraries). However, not all libraries in the same state interlink, and libraries from different states do interlink, particularly in Region 49. Interestingly, rank of university does not seem to have a predictable effect on the likelihood of being included in a regional Web of hyperlinks, though in Region 15 higher ranked libraries have a slightly better chance of being linked to from another library in the region.

6.11. Interlinks by Collection Strength

I considered collection strengths in five collection areas: African-American Studies, Labor History, Oral History, Papyrology and Women's Studies. It is important to note that for this section of my research, the page linked to was visited and a brief description noted in the Excel spreadsheet included as Appendix C. The page linked from was not noted, and by the time I commenced with my analysis many of the links no longer existed, so while I do have evidence of one end of the link being related or unrelated to the subject area under scrutiny, I do not have the information on both ends of the link.

Figure 21. Social network diagram showing connections between special collections libraries with similar collection strengths.



Of the 29 matches between libraries with similar collection strength matches, four were to the home page of the special collections library, nineteen looked to be subject-related, and six looked not to be. However, the women's studies links to African-American collections links could be relevant if the links were for information on African-American women. Of the six matches for African-American studies collections, four were related and two were to a library home page. Of the two matches for Labor collections, both were related. There were no matches for Oral history, which may be because this is more of a method for collecting information than a subject in and of itself. Of the eight matches for Papyrus collections, one was unrelated (an advertising

collection) and seven were related. Of the eleven matches for women's studies collections, one was a library home page, five were not related (though two of these were to general African-American or slavery collections) and five were related.

The social network diagram in Figure 21, above, shows all the libraries with collection strengths in one or more of these areas, and the connections between them. For this diagram, I included the links to library home pages and the women's studies links to African-American collections, but did not count the other links that were classified as unrelated.

Figure 22, below, shows the total number of libraries with the specified collection strength, the portion of those libraries that are connected to each other, and the average number of outlinks from each of the libraries in each subject grouping.

Figure 22. Connections to other ARL special collections libraries by collection strength.

Subject	Total # Libraries	# Libraries Connected	Percent Connected	Avg. # Subject Outlinks	Total Possible Outlinks
African-American	8	6	75%	0.63	7
Labor	8	4 (2&2)	50%	0.25	7
Oral History	8	0	0%	0	7
Papyrology	6	5	83%	1.5	5
Women	14	5	36%	0.36	13

One can see from both the network diagram and the table above that papyrology is the most strongly interlinked discipline of the five, with 83% of libraries connected at an average of 1.5 outlinks each. This higher level of interlinkage may be partially explained by the sampling frame used – the six university members of the Advanced Papyrological Information System. It may be wise in future research to use this more formal determination of subject strength (membership in an organization) as opposed to

large lists compiled via opaque methods for university library web sites. Papyrology is followed by African-American studies, with 75% of libraries connected, though with an average of a mere.63 outlinks compared to 7 possible. As stated above, oral history is not interlinked at all; labor shows only a 50% connection rate, and women's studies a little over one third.

It may be useful to include subject-based interlinks that go to the larger ARL university library, since some web pages of Special Collections libraries may not fall under the Special Collections URL. Figure 23, below, shows the connections between libraries with similar collection strengths when links to the larger parent library are included.

Figure 23. Connections to other ARL university libraries by collection strength.

Subject	Total # Libraries	# Libraries Connected	Percent Connected	Avg. # Subject Outlinks	Total Possible Outlinks
African-American	8	7	88	1.3	7
Labor	8	7	88	1.1	7
Oral History	8	3	38	.25	7
Papyrology	6	6	100	3.5	5
Women	14	6	43	.5	13

Here we see an even stronger level of interconnection for papyrus collections, with all of the libraries connected and an average of 3.5 out of 5 possible outlinks. While oral history is still the lowest scorer, there are at least some connections at this level. Both African-American and labor history show an improved portion of connected libraries, with 88 percent each, though scores remain low with regard to the ratio of average number of outlinks to possible number of outlinks.

All in all, subject strength connections vary by subject, and are not nearly as strong as I had thought they would be. Special collections libraries should be doing a

better job of introducing their online users to other libraries with related collections.

7. Limitations

The general difficulties of conducting webometric research discussed in the literature review section of this paper affected my study as well. First, the Alta Vista search engine, used for gathering inlinks, has a limited scope (as any search engine does). Therefore, it is likely I missed some inlinks to these libraries. (Also, due to time constraints I did not have time to sort the inlinks for duplicates.) Second, the web is always changing, and these sites are not the same as they were when I gathered links from them. I tried to limit the effect of changes over time by gathering all my links from one specific library in a one day time period. Third, the data I collected is both ponderous in size and complex in make-up: other researchers might code the links in ways different from the ones I proposed. In order to address this concern, I tried to make my categorizations of organization and page types as transparent as possible by providing definitions and examples.

There are also additional limitations specific to my study: for reasons stated above, I chose to study predominantly English-speaking members of the American Research Libraries group, which may or may not be representative of other special collections libraries in North America in terms of size, funding and institutional goals. However, I think this population is large enough and diverse enough to make some tentative generalizations. Also, I did not analyze password-protected content, as I was interested instead in following paths any Web user might take. Finally, and perhaps most importantly, are the questions of library ranking and subject strengths. A ranking of the university (parent) library is not the same as a ranking of the special collections library

itself, and it is possible that some highly ranked university libraries have less prestigious special collections, and vice versa. However, current rankings on special collections libraries are hard to come by. As for determining libraries to include on lists of subject strengths, the three lists obtained from university library web sites were most likely not exhaustive -- it may be better to use membership in subject-based scholarly organizations or some other more formal basis in order to determine these sets of libraries.

8. Implications

I hope this paper will convince other library science researchers to include hyperlinkage in their studies of libraries/archives and the World Wide Web, in addition to existing inquiries into interface design and metadata. This paper also raises the need for more extensive research into the possible correlations, already hypothesized in the webometric literature, between institutional quality ratings, geographic proximity, and hyperlink counts. Furthermore, I introduce the new variable of collection strength similarity into the study of inter-institutional hyperlinkage. Finally, I hope this paper might nudge practicing special collections librarians who are creating Web sites for their collections to devote a portion of their energies to finding and creating more links to related materials on the Web.

9. Future Research

Any researcher who could build a working, semi-automated system of gathering hyperlinks would speed the research process, thus alleviating the problem of sites changing over time, and even more helpfully, allowing more time for data analysis.

A more detailed look at the inlinks to these library web sites, including the

elimination of duplicates and sorting for referring sites, would provide a better idea of how visible these sites are and to whom.

A multi-researcher exercise in the classification of hyperlinks from special collections libraries could help in establishing a set of agreed-upon categories for institution and page types.

Should current rankings for special collections libraries become available, a comparison of those rankings with total numbers of inlinks and outlinks might prove more telling than comparisons with the ARL rankings of parent libraries.

Analyses of the interlinkage between special collections libraries based on more formal proof of common collection strengths would also be an interesting area for further research.

In addition to the above, the following questions are ripe for investigation: Why do libraries in some geographic regions interlink more than libraries in other regions? What are the motivations behind the hyperlinkage (or lack thereof) from and between special collections web sites? Do any of these libraries actively pursue high inlink counts? Does a large number of links, after a certain point, hinder rather than help the researcher (and if so, what is that point)? And finally, what kinds of links do users of special collections web sites find most useful?

Works Cited

Abraham, Terry. Repositories of Primary Sources. [Online] Available at http:www.uidaho.edu/special-collections/Other.Repositories.html, August 8, 2006.

Aguillo, I.F. (1998). STM information on the web and the development of new Internet R&D databases and indicators. In Online information 98: Proceedings (pp. 239-243). Medford, NJ: Learned Information.

Almind, Tomas (1995). Informetrisk undersogelse af den danske del af World Wide Web. Masters Thesis, Danmarks Biblioteksskole, Copenhagen.

Almind, Tomas and Peter Ingwersen (1997). "Informetric Analyses on the World Wide Web: Methodological Approaches to 'Webometrics'". Journal of Documentation, 53(4):404-426.

American Library Association, Reference and User Services Association. Guidelines for Behavioral Performance of Reference and Information Service Providers. [Online] Available at http://www.ala.org/ala/rusa/rusaprotools/referenceguide/guidelinesbehavioral.htm, August 8, 2006.

Association of Research Libraries. E-Metrics: Measures for Electronic Resources. [Online] Available at http://www.arl.org/stats/newmeas/emetrics/, August 8, 2006.

Bao, Xue-Ming (2003). "A Study of Web-Based Interactive Reference Services via Academic Library Home Pages." Reference & User Services Quarterly 42(3):250-

256.

Chen, Chaomei, Julian Newman, Rhona Newman, and Roy Rada (1998). “How did university departments interweave the Web: A study of connectivity and underlying factors.” Interacting with Computers, 10, 353-373.

Chu, Heting, Shaoyi He and Mike Thelwall (2002). “Library and Information Science Schools in Canada and the USA: A Webometric Perspective.” Journal of Education for Library and Information Science, 43(2):110-125.

Conway, Paul (1996). “Understanding the Users of Traditional Archival Collections: Implications for Digital Library Design.” Digital Libraries Workshop, online at http://is.gseis.ucla.edu/research/dl/conway.html.

Craig, Barbara (1998). “Old Myths in New Clothes: Expectations of Archives Users.” Archivaria 45:118-126.

Cronin, Blaise (2000). “Bibliometrics and beyond: some thoughts on web-based citation analysis.” Journal of Information Science, 27(1):1-7.

Davidsen, Susanna and Everill Yankee. Web site design with the patron in mind. American Library Association: Chicago, 2004.

Drabenstott, Karen (2003). “Do nondomain experts enlist the strategies of domain experts?” Journal of the American Society for Information Science and Technology, 54(9):836-854.

Duff, Wendy and Penka Stoyanova (1998). "Transforming the Crazy Quilt: Archival Displays from a Users' Point of View." Archivaria 45:45-67.

Harpel-Burke, Pamela (2006). “Medium-sized Universities Connect to Their Libraries: Link on University Home Pages and User Group Pages.” Information

Technology and Libraries, 25(1):12-23.

Hill, Amanda (2004). "Serving the Invisible Researcher: meeting the needs of online users." Journal of the Society of Archivists 25(2): 139-148.

Larson, Ray (1996). "Bibliometrics of the World Wide Web: An Exploratory Analysis of the Intellectual Structure of Cyberspace". Proceedings of the 59th ASIS Annual Meeting, Baltimore, Maryland. http://Sherlock.berkeley.edu/asis96/asis96.html.

Overture Services, Inc. Alta Vista USA. [Online] Available at http://www.altavista.com, August 8, 2006.

Payette, Sandra and Oya Reiger (1998). "Supporting Scholarly Inquiry: Incorporating Users in the Design of the Digital Library." Journal of Academic Librarianship, 24:121-129.

Prom, Christopher (2004). "User interactions with electronic finding aids in a controlled setting." The American Archivist 67:234-268.

Roth, James M (2001). "Serving up EAD: An exploratory study on the deployment and utilization of Encoded Archival Description finding aids." The American Archivist 64:214-237.

Rousseau, Ronald (2003). "Sitations: an exploratory study". Cybermetrics, Volume 1, Paper 1. Online at http://cybermetrics.cindoc.csic.es/pruebas/vlilpl.htm

Szary, Richard (2004). "Encoded Finding Aids as a Transforming Technology in Archival Reference Service." Journal of Internet Cataloging 4, no. 3/4:187-197.

Thelwall, Mike (2001). "Exploring the link structure of the Web with network diagrams." Journal of Information Science, 27(6):393-401.

Thelwall, Mike (2002). "Conceptualizing Documentation on the Web: An

Evaluation of Different Heuristic-Based Models for Counting Links between University Web Sites." Journal of the American Society for Information Science and Technology, 53(12)995-1005.

Thelwall, Mike (2006). "Interpreting Social Science Link Analysis Research: A Theoretical Framework." Journal of the American Society for Information Science and Technology, 57(1):60-68.

Tibbo, Helen (1995). "Interviewing Techniques for Remote Reference: Electronic Versus Traditional Environments." The American Archivist, 58(3):294-310.

Tibbo, Helen (2002). "Primarily History: Historians and the Search for Primary Source Materials." JCDL, July 13-17, Portland, Oregon, USA. Copyright 2002 ACM.

United States Census Bureau (1994). Geographic Areas Reference Manual, Chapter 6: Statistical Groupings of States and Counties. Online at http://www.census.gov/geo/www/GARM/Ch6GARM.pdf, August 8, 2006.

Weare, Christopher and Wan-Ying Lin (2000). "Content Analysis of the World Wide Web." Social Science Computer Review, 18(3):272-292.

Wilkinson, David, Gareth Harries, Mike Thelwall and Liz Price (2002). "Motivations for academic web site interlinking: evidence for the Web as a novel source of information on informal scholarly communication." Journal of Information Science, 29(1):49-56.

Wilkinson, David, Mike Thelwall and Xuemei Li (2003). "Exploiting Hyperlinks to Study Academic Web Use." Social Science Computer Review, 21(3):340-351.

Appendix A: Dates Links Were Collected

University Name	Date		University Name	Date
ALABAMA	27-Mar		MIAMI	19-May
ALBERTA	27-Mar		MICHIGAN	26-May
ARIZONA	27-Mar		MICHIGAN STATE	15-May
ARIZONA STATE	27-Mar		MINNESOTA	18-May
AUBURN	27-Mar		MISSOURI	5-May
BOSTON	27-Mar		MIT	18-May
BOSTON COLLEGE	28-May		NEBRASKA	24-May
BRIGHAM YOUNG	27-Mar		NEW MEXICO	24-May
BRITISH COLUMBIA	25-May		NEW YORK	22-May
BROWN	26-May		NORTH CAROLINA	23-May
CALIFORNIA, BERKELEY	23-May		NORTH CAROLINA STATE	17-May
CALIFORNIA, DAVIS	2-Apr		NORTHWESTERN	25-May
CALIFORNIA, IRVINE	25-May		NOTRE DAME	23-May
CALIFORNIA, LOS ANGELES	23-May		OHIO	15-May
CALIFORNIA, RIVERSIDE	28-May		OHIO STATE	5-May
CALIFORNIA, SAN DIEGO	2-Apr		OKLAHOMA	14-May
CALIFORNIA, SANTA BARBARA	25-May		OKLAHOMA STATE	23-May
CASE WESTERN RESERVE	26-May		OREGON	23-May
CHICAGO	26-May		PENNSYLVANIA	23-May
CINCINNATI	26-May		PENNSYLVANIA STATE	24-May
COLORADO	3-Apr		PITTSBURGH	17-May
COLORADO STATE	26-May		PRINCETON	5-May
COLUMBIA	25-May		PURDUE	14-May
CONNECTICUT	22-May		QUEEN'S	15-May
CORNELL	10-Apr		RICE	24-May
DARTMOUTH	3-May		ROCHESTER	26-May
DELAWARE	3-May		RUTGERS	15-May
DUKE	24-May		SASKATCHEWAN	25-May
EMORY	22-May		SOUTH CAROLINA	14-May
FLORIDA	23-May		SOUTHERN CALIFORNIA	25-May
FLORIDA STATE	22-May		SOUTHERN ILLINOIS	14-May
GEORGE WASHINGTON	23-May		SUNY-ALBANY	4-May
GEORGETOWN	5-May		SUNY-BUFFALO	17-May
GEORGIA	18-May		SUNY-STONY BROOK	23-May
GEORGIA TECH	22-May		SYRACUSE	14-May
GUELPH	19-May		TEMPLE	15-May
HARVARD	5-May		TENNESSEE	19-May
HAWAII	23-May		TEXAS	24-May
HOUSTON	24-May		TEXAS A&M	23-May
HOWARD	26-May		TEXAS TECH	17-May
ILLINOIS, CHICAGO	15-May		TORONTO	23-May
ILLINOIS, URBANA	3-May		TULANE	5-May
INDIANA	15-May		UTAH	25-May
IOWA	24-May		VIRGINIA	23-May
IOWA STATE	23-May		VIRGINIA TECH	26-May
JOHNS HOPKINS	22-May		WASHINGTON	24-May
KANSAS	15-May		WASHINGTON STATE	5-May
KENT STATE	22-May		WASHINGTON U.-ST. LOUIS	23-May
KENTUCKY	18-May		WATERLOO	4-May
LOUISIANA STATE	5-May		WAYNE STATE	19-May
LOUISVILLE	15-May		WESTERN ONTARIO	23-May
MANITOBA	5-May		WISCONSIN	23-May
MARYLAND	15-May		YALE	24-May
MASSACHUSETTS	15-May		YORK	23-May
MCGILL	25-May			
MCMASTER	4-May			

Appendix B: Summary Data

Library	Home Page	ARL Rank	Region	Total Inlinks	Total Outlinks	Broken/ P-word	Non-Schol.	Qualified Outlinks	Percent Qualified
ALABAMA	http://www.lib.ua.edu/libraries/hoole/index.htm	90	43	127	29	2	0	27	0.93
ALBERTA	http://www.library.ualberta.ca/specialcollections/index.cfm	28	1	216	0	0	0	0	n/a
ARIZONA	http://dizzy.library.arizona.edu/branches/spc/homepage/index.html	30	27	18	1	0	0	1	1
ARIZONA STATE	http://www.asu.edu/lib/speccoll/	36	27	223	1	0	0	1	1
AUBURN	http://www.lib.auburn.edu/sca/	89	43	169	0	0	0	0	n/a
BOSTON	http://www.bu.edu/archives/	63	105	123	0	0	0	0	n/a
BOSTON COLLEGE	http://www.bc.edu/libraries/centers/burns/	78	105	8	7	2	1	4	0.57
BRIGHAM YOUNG	http://sc.lib.byu.edu/	44	27	152	1	0	0	1	1
BRITISH COLUMBIA	http://www.library.ubc.ca/spcoll/	22	1	158	60	1	1	58	0.97
BROWN	http://www.brown.edu/Facilities/University_Library/libs/hay/index.html	80	105	142	106	19	4	83	0.78
CALI-BERKELEY	http://bancroft.berkeley.edu/	4	15	391	207	28	2	177	0.86
CALI-DAVIS	http://www.lib.ucdavis.edu/dept/specol/	46	15	18	0	0	0	0	n/a
CALI-IRVINE	http://www.lib.uci.edu/libraries/collections/special/special.html	65	15	134	31	3	0	28	0.9
CALI-LOS ANGELES	http://www.library.ucla.edu/libraries/special/scweb/	5	15	158	21	1	1	19	0.9
CALI-RIVERSIDE	http://library.ucr.edu/?view=collections/spcol	94	15	161	12	0	1	11	0.92
CALI-SAN DIEGO	http://orpheus.ucsd.edu/speccoll/	41	15	462	1	0	0	1	1
CALI-SANTA BARBARA	http://www.library.ucsb.edu/speccoll/index.html	60	15	213	95	6	2	87	0.92
CASE WESTERN RESERVE	http://library.case.edu/ksl/speccoll/	108	74	2	75	12	0	63	0.84
CHICAGO	http://www.lib.uchicago.edu/e/spcl/	18	74	57	20	2	0	18	0.9
CINCINNATI	http://www.libraries.uc.edu/libraries/arb/archives/index.html	47	74	3	87	6	0	81	0.93
COLORADO	http://ucblibraries.colorado.edu/specialcollections/index.htm	64	27	8	52	5	0	47	0.9
COLORADO ST.	http://lib.colostate.edu/archives/	98	27	2	219	8	3	208	0.95
COLUMBIA	http://www.columbia.edu/cu/lweb/indiv/rbml/	7	91	42	152	15	0	137	0.9
CONNECTICUT	http://www.lib.uconn.edu/online/research/speclib/ASC/	55	105	2	134	5	0	129	0.96
CORNELL	http://rmc.library.cornell.edu/	9	91	431	84	7	5	72	0.86
DARTMOUTH	http://www.dartmouth.edu/~speccoll/	67	105	36	1	0	1	0	0
DELAWARE	http://www.lib.udel.edu/ud/spec/	105	49	72	44	2	0	42	0.95
DUKE	http://library.duke.edu/specialcollections/	25	49	200	187	14	1	172	0.92
EMORY	http://marbl.library.emory.edu/	34	49	25	34	1	7	26	0.76
FLORIDA	http://web.uflib.ufl.edu/spec/	38	49	158	71	8	0	63	0.89
FLORIDA STATE	http://www.fsu.edu/~speccoll/	51	49	28	45	5	0	40	0.89

Appendix B: Summary Data

GEORGE WASHINGTON	http://www.gwu.edu/gelman/spec/	91	49	68	12	3	0	9	0.75
GEORGETOWN	http://gulib.lausun.georgetown.edu/dept/speccoll/	59	49	66	1	0	1	0	0
GEORGIA	http://www.libs.uga.edu/hargrett/speccoll.html	31	49	70	224	33	2	189	0.84
GEORGIA TECH	http://www.library.gatech.edu/archives/	107	49	18	34	0	1	33	0.97
GUELPH	http://www.lib.uoguelph.ca/resources/archives/index.html	113	1	43	50	2	0	48	0.96
HARVARD	http://hcl.harvard.edu/libraries/#houghton	1	105	26	2	0	0	2	1
HAWAII	http://www2.hawaii.edu/~speccoll/welcome.html	68	15	9	832	54	4	774	0.93
HOUSTON	http://info.lib.uh.edu/sca/index.html	86	34	15	30	3	1	26	0.87
HOWARD	http://www.founders.howard.edu/moorland-spingarn/	112	49	163	1	0	1	0	0
ILLINOIS, CHICAGO	http://www.uic.edu/depts/lib/specialcoll/	77	74	8	14	1	0	13	0.93
ILLINOIS, URBANA	http://www.library.uiuc.edu/rbx/	6	74	55	33	8	0	25	0.76
INDIANA	http://www.indiana.edu/~liblilly/	12	74	126	30	2	6	22	0.73
IOWA	http://www.lib.uiowa.edu/spec-coll/	26	67	53	36	3	1	32	0.88
IOWA STATE	http://www.lib.iastate.edu/spcl/index.html	79	67	47	128	33	0	95	0.74
JOHNS HOPKINS	http://www.library.jhu.edu/collections/specialcollections/	35	49	5	2	0	0	2	1
KANSAS	http://spencer.lib.ku.edu/	42	67	334	8	0	1	7	0.88
KENT STATE	http://www.library.kent.edu/page/10300	103	74	191	54	6	0	48	0.89
KENTUCKY	http://www.uky.edu/Libraries/lib.php?lib_id=13	56	43	7	19	3	0	16	0.84
LOUISIANA ST.	http://www.lib.lsu.edu/special/	62	34	94	199	25	6	168	0.84
LOUISVILLE	http://www.louisville.edu/library/ekstrom/special/	88	43	11	145	58	0	87	0.6
MANITOBA	http://umanitoba.ca/libraries/units/archives/	101	1	1	13	1	0	12	0.92
MARYLAND	http://www.lib.umd.edu/ARCV/	50	49	1	363	20	0	343	0.94
MASSACHUSETTS	http://www.library.umass.edu/spcoll/spec.html	92	105	19	3	0	0	3	1
MCGILL	http://www.library.mcgill.ca/rarebook/cube.htm	49	1	24	17	4	0	13	0.76
MCMASTER	http://library.mcmaster.ca/archives/readyweb.htm	110	1	7	54	1	26	27	0.5
MIAMI	http://www.lib.muohio.edu/libinfo/depts/spec/	48	49	6	15	2	0	13	0.87
MICHIGAN	http://www.lib.umich.edu/spec-coll/	8	74	203	14	0	0	14	1
MICHIGAN STATE	http://specialcollections.lib.msu.edu/	39	74	4	18	3	2	13	0.72
MINNESOTA	http://special.lib.umn.edu/rare/	19	67	28	16	0	0	16	1
MISSOURI	http://mulibraries.missouri.edu/specialcollections/bookcol.htm	83	67	2	44	2	0	42	0.95
MIT	http://libraries.mit.edu/archives/	72	105	44	37	11	0	26	0.7
MONTREAL	http://www.bib.umontreal.ca/CS/ ---FRENCH language	43	1	7	0	0	0	0	n/a
NEBRASKA	http://www.unl.edu/libr/libs/spec/	85	67	7	0	0	0	0	n/a

Appendix B: Summary Data

NEW MEXICO	http://elibrary.unm.edu/cswr/	69	27	19	11	0	0	11	1
NEW YORK	http://www.nyu.edu/library/bobst/research/fales/	17	91	37	12	3	0	9	0.75
NORTH CAROLINA	http://www.lib.unc.edu/mss/	16	49	92	31	1	0	30	0.97
NORTH CAROLINA STATE	http://www.lib.ncsu.edu/specialcollections/	27	49	7	100	9	1	90	0.9
NORTHWESTERN	edu/spec/index.html	32	74	35	1	0	0	1	1
NOTRE DAME	http://www.library.nd.edu/rarebooks/collections/manuscripts/	58	74	3	37	11	0	26	0.7
OHIO	http://www.library.ohiou.edu/libinfo/depts/archives/index.htm	82	74	168	28	2	0	26	0.93
OHIO STATE	http://library.osu.edu/sites/rarebooks/	21	74	9	148	6	3	139	0.94
OKLAHOMA	http://libraries.ou.edu/info/index.asp?id=23	54	34	0	0	0	0	0	n/a
OKLAHOMA STATE	http://www.library.okstate.edu/scua/index.htm	70	34	12	5	1	0	4	0.8
OREGON	http://osulibrary.oregonstate.edu/specialcollections/	100	15	5	41	5	1	35	0.85
PENNSYLVANIA	http://www.library.upenn.edu/collections/rbm/	20	91	7	3	1	0	2	0.67
PENNSYLVANIA STATE	http://www.libraries.psu.edu/speccolls/index.htm	14	91	26	53	4	4	45	0.85
PITTSBURGH	http://www.library.pitt.edu/libraries/special/special.html	23	91	6	14	1	1	12	0.86
PRINCETON	http://www.princeton.edu/~rbsc/	15	91	45	15	0	8	7	0.47
PURDUE	http://www.lib.purdue.edu/spcol/	76	74	6	63	3	2	58	0.92
QUEENS	http://library.queensu.ca/webmus/sc/menu.htm	93	1	2	4	0	0	4	1
RICE	http://www.rice.edu/fondren/woodson/index.html	104	34	5	21	1	0	20	0.95
ROCHESTER	http://www.lib.rochester.edu/index.cfm?page=169	81	91	3	8	0	0	8	1
RUTGERS	http://www.libraries.rutgers.edu/rul/libs/scua/scua.shtml	29	91	82	73	4	2	67	0.92
SASKATCHEWAN	http://library.usask.ca/spcoll/	106	1	17	88	4	0	84	0.95
SOUTH CAROLINA	http://www.sc.edu/library/spcoll/rarebook.html	66	49	64	80	12	0	68	0.85
SOUTHERN CALIFORNIA	http://www.usc.edu/isd/archives/arc/libraries/index.html	71	15	14	107	23	1	83	0.78
SOUTHERN ILLINOIS	http://www.siue.edu/~skerber/	74	74	0	49	11	0	38	0.78
SUNY-ALBANY	http://library.albany.edu/speccoll/	95	91	38	133	1	1	131	0.98
SUNY-BUFFALO	http://ublib.buffalo.edu/libraries/specialcollections/	52	91	0	52	1	0	51	0.98
SUNY-STONY BROOK	http://www.stonybrook.edu/libspecial/	109	91	2	147	12	1	134	0.91
SYRACUSE	http://libwww.syr.edu/information/spcollections/index.html	84	91	54	59	11	1	47	0.81
TEMPLE	http://library.temple.edu/collections/special_collections/	87	91	10	1	0	0	1	0.76
TENNESSEE	http://www.lib.utk.edu/spcoll/	45	43	26	89	20	1	68	0.76
TEXAS	http://www.cah.utexas.edu/	10	34	468	124	3	13	108	0.87

Appendix B: Summary Data

TEXAS A&M	http://library.tamu.edu/portal/site/Library/menuitem.4671eb1f54acfda343aecb5419008a0c/?vgnextoid=5b5ec35b248c0010VgnVCM1000007800a8c0RCRD	33	34	2	5	0	1	4	0.8
TEXAS TECH	http://swco.ttu.edu/	57	34	135	113	24	5	85	0.75
TORONTO	http://www.library.utoronto.ca/fisher/index.html	3	1	93	19	2	0	17	0.89
TULANE	http://specialcollections.tulane.edu/	99	34	44	59	8	0	51	0.86
UTAH	http://www.lib.utah.edu/spc/	40	27	13	212	72	1	139	0.65
VANDERBILT	http://www.library.vanderbilt.edu/speccol/	53	43	40	5	0	2	3	0.6
VIRGINIA	http://www.lib.virginia.edu/small/	24	49	222	85	10	1	74	0.87
VIRGINIA TECH	http://spec.lib.vt.edu/	102	49	111	62	8	0	54	0.87
WASHINGTON	http://www.lib.washington.edu/Specialcoll/	13	15	10	40	11	0	29	0.73
WASHINGTON STATE	http://www.wsulibs.wsu.edu/holland/masc/masc.htm	97	15	170	48	7	2	39	0.81
WASHINGTON U.-ST. LOUIS	http://library.wustl.edu/units/spec/	37	67	33	61	6	2	53	0.87
WATERLOO	http://www.lib.uwaterloo.ca/discipline/SpecColl/Special1.html	111	1	22	28	1	0	27	0.96
WAYNE STATE	http://www.lib.wayne.edu/resources/special_collections/index.php	73	74	1	69	40	0	29	0.42
WESTERN ONTARIO	http://www.lib.uwo.ca/archives/	75	1	5	23	1	0	22	0.96
WISCONSIN	http://www.library.wisc.edu/libraries/SpecialCollections/	11	74	29	15	1	0	14	0.93
YALE	http://www.library.yale.edu/beinecke/	2	105	685	38	4	4	30	0.79
YORK	http://www.library.yorku.ca/ccm/ArchivesSpecialCollections/index.htm	96	1	29	32	2	1	29	0.91

Appendix C: Special Collections Interlinks

Geog Match	Subj Match	Library From	Library To	Geog 1	Geog 2	Subj 1	Subj 2	Link Address	Notes	Match ?
*	*	CHICAGO	Illinois-Chicago	74	74	AW	W	http://www.uic.edu/depts/lib/specialcoll/services/rjd/cop.shtml	international exposition records	N
*	*	DELAWARE	Duke	49	49	A	APW	http://scriptorium.lib.duke.edu/williamson/	woman's civil war diary	Y
*	*	DELAWARE	Duke	49	49	A	APW	http://scriptorium.lib.duke.edu/harris/	african-american woman	Y
*	*	DUKE	Howard	49	49	APW	A	http://www.founders.howard.edu/moorland-spingarn/	(african-american univ) special collections homepage	Y
*	*	DUKE	Virginia Tech	49	49	APW	OW	http://spec.lib.vt.edu/cwlove/seeper.html	civil war love letter	Y
*	*	EMORY	Duke	49	49	AW	APW	http://scriptorium.lib.duke.edu/women/cwdocs.html	civil war women	YY
*	*	NORTH CAROLINA	Duke	49	49	A	APW	http://library.duke.edu/specialcollections/	special collections home	?
*	*	NORTH CAROLINA	Virginia	49	49	A	A	http://www.lib.virginia.edu/small/	special collections home	?
*	*	SUNY-ALBANY	Cornell	91	91	LW	W	http://rmc.library.cornell.edu/HSC/default.htm	human sexuality collection	Y
*	*	VIRGINIA TECH	Duke	49	49	OW	APW	http://scriptorium.lib.duke.edu/collections/african-american-women.html	African-American Women	Y
*	*	VIRGINIA TECH	Duke	49	49	OW	APW	http://scriptorium.lib.duke.edu/women/cwdocs.html	civil war women	Y
	*	CALI-BERKELEY	Duke	15	49	P	APW	http://scriptorium.lib.duke.edu/papyrus/	papyrus archive	Y
	*	CALI-BERKELEY	Duke	15	49	P	APW	http://scriptorium.lib.duke.edu:80/adaccess/	historical advertisements	N
	*	CALI-BERKELEY	Yale	15	105	P	P	http://beinecke.library.yale.edu/papyrus/	papyrus database	Y
	*	COLUMBIA	Yale	91	105	OP	P	http://www.library.yale.edu/beinecke/	special collections home	?
	*	CONNECTICUT	Pennsylvania State	105	91	L	L	http://www.libraries.psu.edu/speccolls/hcla/	labor archives	Y
	*	DUKE	Cali-Berkeley	49	15	APW	P	http://tebtunis.berkeley.edu/	papyrus research center	Y
	*	DUKE	Yale	49	105	APW	P	http://beinecke.library.yale.edu/papyrus/	papyrus database	Y
	*	MICHIGAN	Rutgers	74	91	LP	LW	http://www.libraries.rutgers.edu/rul/libs/scua/modern_school/modern.shtml	history of anarchist school	Y
	*	PRINCETON	Cali-Berkeley	91	15	P	P	http://tebtunis.berkeley.edu/	papyrus research center	Y
	*	PRINCETON	Duke	91	49	P	APW	http://scriptorium.lib.duke.edu/papyrus/	papyrus archive	Y
	*	PRINCETON	Yale	91	105	P	P	http://beinecke.library.yale.edu/papyrus/	papyrus database	Y
	*	RUTGERS	Duke	91	49	LW	APW	http://scriptorium.lib.duke.edu/sheetmusic/	historic american sheet music	N
	*	SUNY-ALBANY	Duke	91	49	LW	APW	http://library.duke.edu/specialcollections/	special collections home	?
	*	SUNY-ALBANY	Duke	91	49	LW	APW	http://odyssey.lib.duke.edu/franklin/collections.html#guides	african-american collection	N
	*	SUNY-ALBANY	Duke	91	49	LW	APW	http://scriptorium.lib.duke.edu/sgo/start.html	William Grant Still (african-american musician)	N
	*	SUNY-ALBANY	Duke	91	49	LW	APW	http://scriptorium.lib.duke.edu/slavery/	"slave voices"	N
	*	SUNY-ALBANY	Duke	91	49	LW	APW	http://scriptorium.lib.duke.edu/women/pulp.html	lesbian pulp fiction	Y
*		CALI-BERKELEY	Cali-Los Angeles	15	15	P	O	http://www.library.ucla.edu/libraries/special/ohp/ohpindex.htm		
*		CALI-LA	Cali-Berkeley	15	15	O	P	http://bancroft.berkeley.edu/ROHO/		

Appendix C: Special Collections Interlinks

*		CASEWESTERN	Cincinatti	74	74			http://www.libraries.uc.edu/libraries/arb/		
*		CASEWESTERN	Kent	74	74		W	http://speccoll.library.kent.edu/		
*		CASEWESTERN	Ohio State	74	74			http://library.osu.edu/sites/speccoll/		
*		CORNELL	Pennsylvania	91	91	W		http://www.library.upenn.edu/exhibits/rbm/petrarch/		
*		FLORIDA	Florida State	49	49			http://www.fsu.edu:80/~speccoll/index.html		
*		FLORIDA	North Carolina	49	49		A	http://www.lib.unc.edu/mss/		
*		GEORGIA	Duke	49	49		APW	http://scriptorium.lib.duke.edu/collections/civil-war-women.html		
*		GEORGIA	Emory	49	49		AW	http://info.library.emory.edu/Special/		
*		GEORGIA TECH	Emory	49	49		AW	http://marbl.library.emory.edu/		
*		GUELPH	Toronto	1	1			http://www.library.utoronto.ca/fisher/		
*		HAWAII	Cali-San Diego	15	15			http://orpheus.ucsd.edu/speccoll/testing/html/mss0181a.html		
*		LOUISIANA STATE	Texas	34	34			http://www.cah.utexas.edu/		
*		LOUISIANA STATE	Tulane	34	34		A	http://specialcollections.tulane.edu/		
*		MICHIGAN	Ohio State	74	74	LP		http://library.osu.edu/sites/rarebooks/		
*		NORTH CAROLINA	North Carolina State	49	49	A		http://www.lib.ncsu.edu/archives/		
*		NOTRE-DAME	Indiana	74	74		L	http://www.indiana.edu/~liblilly/printingtext.html		
*		RICE	Houston	34	34		W	http://info.lib.uh.edu/sca/		
*		RICE	Texas	34	34			http://www.cah.utexas.edu/		
*		SASKATCHEWAN	Alberta	1	1			http://www.library.ualberta.ca/specialcollections/		
*		SASKATCHEWAN	Manitoba	1	1			http://www.umanitoba.ca/libraries/units/archives/		
*		SASKATCHEWAN	McGill	1	1			http://www.library.mcgill.ca/rarebook/cube.htm		
*		SASKATCHEWAN	McMaster	1	1			http://library.mcmaster.ca/archives/readyweb.htm		
*		SASKATCHEWAN	Queens	1	1			http://library.queensu.ca/webmus/sc/		
*		SASKATCHEWAN	Toronto	1	1			http://www.library.utoronto.ca/fisher/		
*		SOUTH-CAROLINA	Delaware	49	49		A	http://www.lib.udel.edu/ud/spec/exhibits/hemngway/paris.htm		
*		SOUTH-CAROLINA	Emory	49	49		AW	http://marbl.library.emory.edu/		
*		SOUTH-CAROLINA	Georgia	49	49			http://www.libs.uga.edu/hargrett/speccoll.html		
*		SOUTHERN-CALIFORNIA	Cali-Los Angeles	15	15		O	http://www.library.ucla.edu/libraries/special/scweb/calif.htm		
*		SOUTHERN-ILLINOIS	Chicago	74	74		AW	http://www.lib.uchicago.edu/e/spcl/home.html		
*		SUNY-ALBANY	SUNY-Buffalo	91	91	LW		http://ublib.buffalo.edu/libraries/e-resources/special.html		
*		SUNY-ALBANY	Syracuse	91	91	LW		http://libwww.syr.edu/information/spcollections/index.html		
*		SUNY-BUFFALO	Rochester	91	91		W	http://www.lib.rochester.edu/index.cfm?page=169		
*		SUNY-BUFFALO	SUNY-Albany	91	91		LW	http://library.albany.edu/speccoll/uarchive.htm		
*		SUNY-BUFFALO	SUNY-Stonybrook	91	91			http://www.stonybrook.edu/libspecial/		

Appendix C: Special Collections Interlinks

*		SUNY-BUFFALO	Syracuse	91	91			http://libwww.syr.edu/information/spcollections/		
*		SYRACUSE	Columbia	91	91		OP	http://www.columbia.edu/cu/libraries/indiv/rare/images/		
*		TEXAS	Houston	34	34		W	http://info.lib.uh.edu/sca/index.html		
*		TEXAS	Rice	34	34			http://www.rice.edu/fondren/woodson/index.html		
*		VIRGINIA	Georgia	49	49	A		http://www.libs.uga.edu/darchive/hargrett/maps/maps.html		
*		VIRGINIA	South Carolina	49	49	A		http://www.sc.edu/library/spcoll/hist/gwar.html		
*		VIRGINIA TECH	Georgia	49	49	OW		http://www.libs.uga.edu/darchive/hargrett/maps/civil.html		
*		VIRGINIA TECH	Virginia	49	49	OW	A	http://www.lib.virginia.edu/small/vhp/		
*		WASHINGTON	Washington State	15	15		O	http://www.wsulibs.wsu.edu/holland/masc/xmaps.html		
		ALABAMA	Georgia	43	49			http://www.libs.uga.edu/darchive/hargrett/maps/maps.html		
		BOSTON COLLEGE	Delaware	105	49		A	http://www.lib.udel.edu/ud/spec/congress.htm		
		BOSTON COLLEGE	Houston	105	34		W	http://info.lib.uh.edu/sca/index.html		
		BOSTON COLLEGE	Houston	105	34		W	http://info.lib.uh.edu/sca/related/index.html		
		BRITISH COLUMBIA	Yale	1	105		P	http://www.library.yale.edu/mssa/tutorial/tutorial.htm		
		BROWN	Northwestern	105	74		W	http://www.library.northwestern.edu/spec/siege/		
		BROWN	Washington State	105	15		O	http://www.wsulibs.wsu.edu/holland/masc/imagedatabases.htm		
		CALI-BERKELEY	Kent	15	74	P	W	http://speccoll.library.kent.edu/4may70/		
		CALI-BERKELEY	Kentucky	15	43	P	OW	http://www.uky.edu/Libraries/Special/oral_history/		
		CALI-BERKELEY	Louisiana State	15	34	P		http://www.lib.LOUISIANASTATE.edu/special/williams/index.html		
		CALI-BERKELEY	North Carolina State	15	49	P		http://www.lib.ncsu.edu/specialcollections/		
		CALI-BERKELEY	Virginia Tech	15	49	P	OW	http://spec.lib.vt.edu/specgen/oralindx.htm		
		CASEWESTERN	Harvard	74	105			http://hcl.harvard.edu/libraries/#houghton		
		CASEWESTERN	Miami-Ohio	74	49			http://www.lib.muohio.edu/libinfo/depts/spec/		
		CASEWESTERN	Yale	74	105		P	http://www.library.yale.edu/beinecke/brblhome.htm		
		COLUMBIA	Harvard	91	105	OP		http://hcl.harvard.edu/libraries/#houghton		
		CONNECTICUT	Cali-San Diego	105	15	L		http://orpheus.ucsd.edu/speccoll/collects/seuss.html		
		CONNECTICUT	Minnesota	105	67	L		http://special.lib.umn.edu/clrc/		
		DELAWARE	Cali-Los Angeles	49	15	A	O	http://www.library.ucla.edu/libraries/special/childhood/fore.htm		
		DELAWARE	Princeton	49	91	A	P	http://libweb2.princeton.edu/rbsc2/portfolio/portfolio.html		
		DUKE	Alabama	49	43	APW		http://www.lib.ua.edu/libraries/hoole/digital/overthere/index.htm		
		DUKE	British Columbia	49	1	APW		http://www.bc.edu/libraries/centers/burns/services/irishmusic/		

Appendix C: Special Collections Interlinks

		DUKE	Pennsylvania	49	91	APW		http://www.library.upenn.edu/collections/rbm/keffer/index.html		
		DUKE	Pennsylvania	49	91	APW		http://www.library.upenn.edu/exhibits/rbm/anderson/index.html		
		DUKE	Washington-St. Louis	49	67	APW		http://library.wustl.edu/units/music/spec/sheetmus.html		
		FLORIDA	Cornell	49	91		W	http://dlxs.library.cornell.edu/m/mayantislavery/		
		GEORGIA	Tennessee	49	43			http://www.lib.utk.edu/spcoll/		
		GUELPH	Cornell	1	91		W	http://rmc.library.cornell.edu/food/default.htm		
		GUELPH	Iowa	1	67			http://www.lib.uiowa.edu/spec-coll/Bai/szathmary.htm		
		GUELPH	Pennsylvania	1	91			http://www.library.upenn.edu/exhibits/rbm/aresty/aresty1.html		
		GUELPH	Virginia Tech	1	49		OW	http://spec.lib.vt.edu		
		IOWA	Iowa State	74	67			http://www.lib.iastate.edu/spcl/cia/listserv.html		
		IOWA-STATE	Cali-Berkeley	67	15		P	http://bancroft.berkeley.edu/ROHO/ohonline/suffragists.html		
		IOWA-STATE	Cornell	67	91		W	http://rmc.library.cornell.edu/homeEc/		
		IOWA-STATE	Delaware	67	49		A	http://www.lib.udel.edu/ud/spec/exhibits/hort/		
		IOWA-STATE	Duke	67	49		APW	http://scriptorium.lib.duke.edu/collections/african-american-women.html		
		IOWA-STATE	Louisville	67	43			http://www.louisville.edu/library/ekstrom/special/girls/girls.html		
		IOWA-STATE	MIT	67	105		O	http://libraries.mit.edu/archives/oral-history/index.html		
		IOWA-STATE	Pennsylvania	67	91			http://www.library.upenn.edu/exhibits/rbm/aresty/aresty1.html		
		IOWA-STATE	Virginia	67	49		A	http://www.lib.virginia.edu/small/exhibits/hearts/		
		IOWA-STATE	Virginia Tech	67	49		OW	http://spec.lib.vt.edu/spec/iawa		
		IOWA-STATE	Wisconsin	67	74			http://www.library.wisc.edu/libraries/SpecialCollections/womennature/		
		KENT	Iowa State	74	67	W		http://www.lib.iastate.edu/spcl/exhibits/online.html		
		LOUISIANA STATE	Cali-Berkeley	34	15		P	http://www.lib.berkeley.edu/BANC/ROHO/		
		LOUISIANA STATE	Cali-Los Angeles	34	15		O	http://www.library.ucla.edu/libraries/special/ohp/ohpindex.htm		
		LOUISIANA STATE	Delaware	34	49		A	http://www.lib.udel.edu/ud/spec/exhibits/child/		
		LOUISIANA STATE	Florida	34	49			http://web.uflib.ufl.edu/spec/baldwin/baldwin.html		
		LOUISIANA STATE	Houston	43	34		W	http://info.lib.uh.edu/speccoll/speccol.htm		
		LOUISIANA STATE	Kentucky	34	43		OW	http://www.uky.edu/Libraries/Special/oral_history/		
		LOUISIANA STATE	North Carolina	34	49		A	http://www.lib.unc.edu/mss/		
		LOUISIANA STATE	South Carolina	34	49			http://www.sc.edu/library/spcoll/kidlit/kidlit/kidlit.html		
		LOUISIANA STATE	South Carolina	34	49			http://www.sc.edu/library/spcoll/rarebook.html		
		LOUISIANA STATE	Vanderbilt	34	43			http://www.library.vanderbilt.edu/speccol/vuvoices/		
		LOUISIANA STATE	Virginia Tech	34	49		OW	http://spec.lib.vt.edu/archives/blackhistory/		

Appendix C: Special Collections Interlinks

		LOUISIANA STATE	Virginia Tech	34	49		OW	http://spec.lib.vt.edu/archives/diversity/		
		LOUISIANA STATE	Virginia Tech	34	49		OW	http://spec.lib.vt.edu/blackwom/		
		LOUISVILLE	Cali-Berkeley	43	15		P	http://www.lib.berkeley.edu/BANC/ROHO/ohonline/suffragists.html		
		LOUISVILLE	Cali-San Diego	43	15			http://orpheus.ucsd.edu/speccoll/findaids/literary/oneill		
		LOUISVILLE	Duke	43	49		APW	http://scriptorium.lib.duke.edu/women/article.html		
		LOUISVILLE	Georgetown	74	49		O	http://gulib.lausun.georgetown.edu/dept/speccoll/clt4.htm		
		LOUISVILLE	North Carolina	43	49		A	http://www.lib.unc.edu/mss/index.html		
		LOUISVILLE	Rochester	43	91		W	http://www.lib.rochester.edu/rbk/women/women.htm		
		LOUISVILLE	Waterloo	43	1			http://www.lib.uwaterloo.ca/discipline/SpecColl/archives/womsuff.html		
		MARYLAND	Princeton	49	91	LW	P	http://libweb2.princeton.edu/rbsc2/aids/msslist/maindex.htm		
		MINNESOTA	Howard	74	49		A	http://www.howard.edu/library/moorland-spingarn/default.htm		
		MISSOURI	Brown	67	105			http://www.brown.edu/Facilities/University_Library/libs/hay/focus/cuneiform/		
		MISSOURI	Yale	67	105		P	http://www.library.yale.edu/special_collections/copyright.html		
		MIT	Cali-Berkeley	105	15	O	P	http://bancroft.berkeley.edu/ROHO/ohonline/		
		MIT	Iowa State	105	67	O		http://www.lib.iastate.edu/spcl/wise/neh.html		
		NOTRE-DAME	Cali-Berkeley	74	15		P	http://bancroft.berkeley.edu/banccoll/inquisition.html		
		OHIO-STATE	Cali-Los Angeles	74	15		O	http://www.library.ucla.edu/libraries/special/scweb/archives.htm		
		OHIO-STATE	Georgetown	74	49		O	http://gulib.lausun.georgetown.edu/dept/speccoll/index.htm		
		OHIO-STATE	Harvard	74	105			http://hcl.harvard.edu/libraries/#houghton		
		OREGON	Duke	15	49		APW	http://scriptorium.lib.duke.edu/wlm/		
		OREGON	Michigan	15	74		LP	http://www.lib.umich.edu/spec-coll/labadie/		
		OREGON	Princeton	15	91		P	http://www.princeton.edu/~rbsc/department/scheide/		
		PENNSYLVANIA STATE	Washington State	91	15	L	O	http://www.wsulibs.wsu.edu/holland/masc/MSAccessions.htm		
		PITTSBURGH	Miami-Ohio	91	49			http://www.lib.muohio.edu/mcguffey/		
		PURDUE	Cali-Berkeley	74	15		P	http://sunsite.berkeley.edu/CalHeritage/		
		PURDUE	Duke	74	49		APW	http://library.duke.edu/specialcollections/		
		RUTGERS	Delaware	91	49	LW	A	http://www.lib.udel.edu/ud/spec/exhibits/child/		
		RUTGERS	Delaware	91	49	LW	A	http://www.lib.udel.edu/ud/spec/exhibits/tradecat/index.htm		
		RUTGERS	North Carolina	91	49	LW	A	http://www.lib.unc.edu/mss/uars/		
		RUTGERS	Virginia	91	49	LW	A	http://www.lib.virginia.edu/small/exhibits/popup/theme.html		

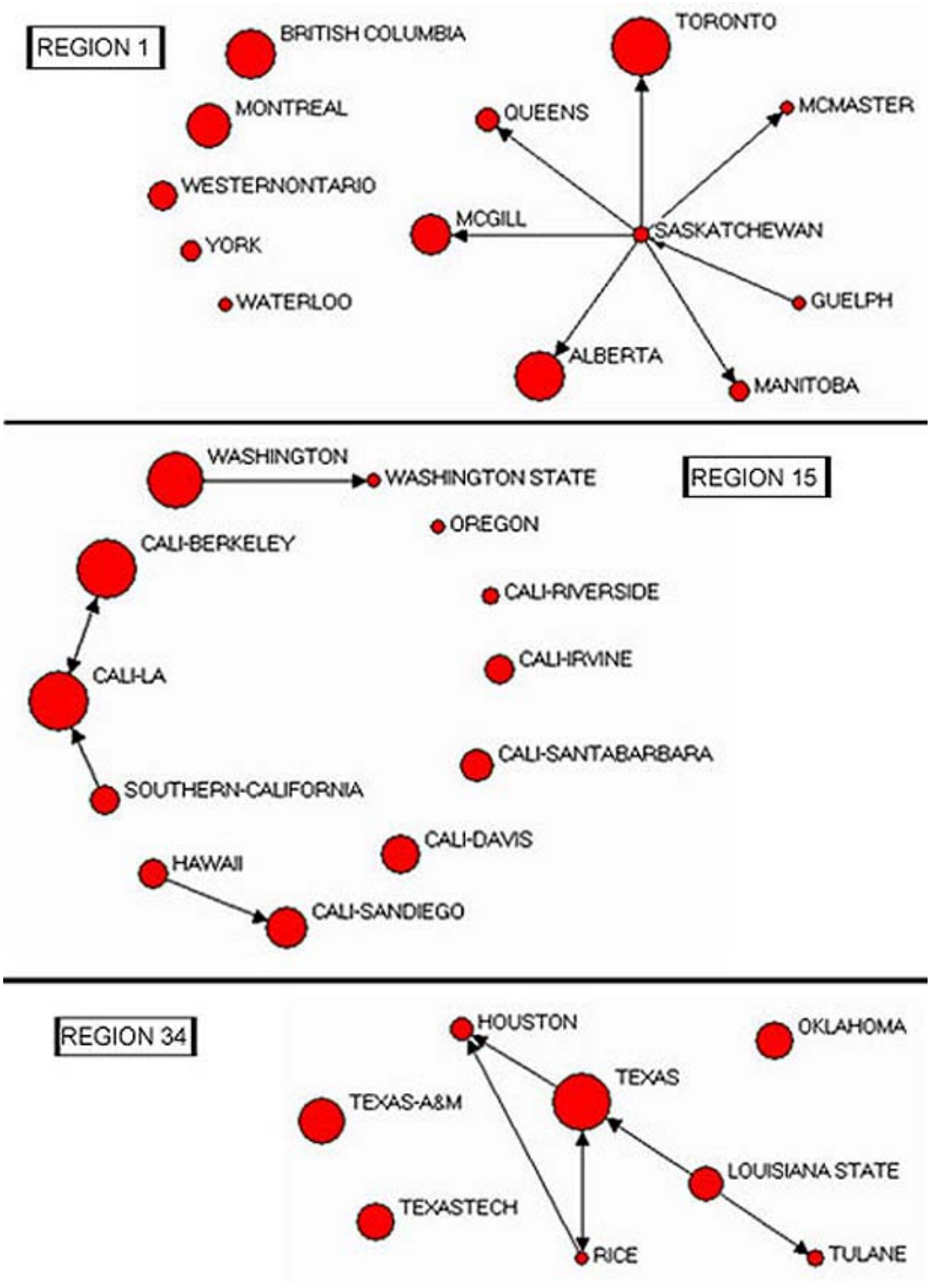
Appendix C: Special Collections Interlinks

		SASKATCHEWAN	Duke	1	49		APW	http://odyssey.lib.duke.edu/women/pulp.html		
		SOUTH-CAROLINA	Harvard	49	105			http://hcl.harvard.edu/libraries/#houghton		
		SOUTH-CAROLINA	Indiana	49	74		L	http://www.indiana.edu/~liblilly/lforms/chapbook.html		
		SOUTHERN-CALIFORNIA	Georgetown	15	49		O	http://gulib.lausun.georgetown.edu/dept/speccoll/cl58.htm		
		SOUTHERN-CALIFORNIA	SUNY-Albany	15	91		LW	http://library.albany.edu/speccoll/emigre.htm		
		SOUTHERN-CALIFORNIA	Yale	15	105		P	http://www.library.yale.edu/mssa/vha/		
		SOUTHERN-ILLINOIS	Houston	74	34		W	http://info.lib.uh.edu/speccoll/specres.htm		
		SOUTHERN-ILLINOIS	Washington-St. Louis	74	67			http://library.wustl.edu/units/spec/archives/aslaa/directory/		
		SUNY-ALBANY	Howard	91	49	LW	A	http://www.founders.howard.edu/moorland-spingarn/		
		SYRACUSE	Illinois-Urbana Champaign	91	74			http://www.library.uiuc.edu/rbx/hoursdb/overview.htm		
		SYRACUSE	Illinois-Urbana Champaign	91	74			http://www.library.uiuc.edu/rbx/hoursdb/search.htm		
		TENNESSEE	Louisiana State	43	34			http://www.lib.LOUISIANA STATE.edu/special/lnp.html		
		TENNESSEE	Michigan	43	74		LP	http://www.lib.umich.edu/spec-coll/index.html		
		TENNESSEE	Pennsylvania	43	91			http://www.library.upenn.edu/collections/rbm/photos/theater/		
		VIRGINIA	Brown	49	105	A		http://www.brown.edu/Facilities/University_Library/libs/hay/index.html		
		WASHINGTON	Michigan	15	74		LP	http://www.lib.umich.edu/spec-coll/labadie/		
		WISCONSIN	Houston	74	34		W	http://info.lib.uh.edu/sca/related/dealers.html		
		YALE	Pennsylvania	105	91	P		http://www.library.upenn.edu/exhibits/rbm/petrarch/petrarch.html		

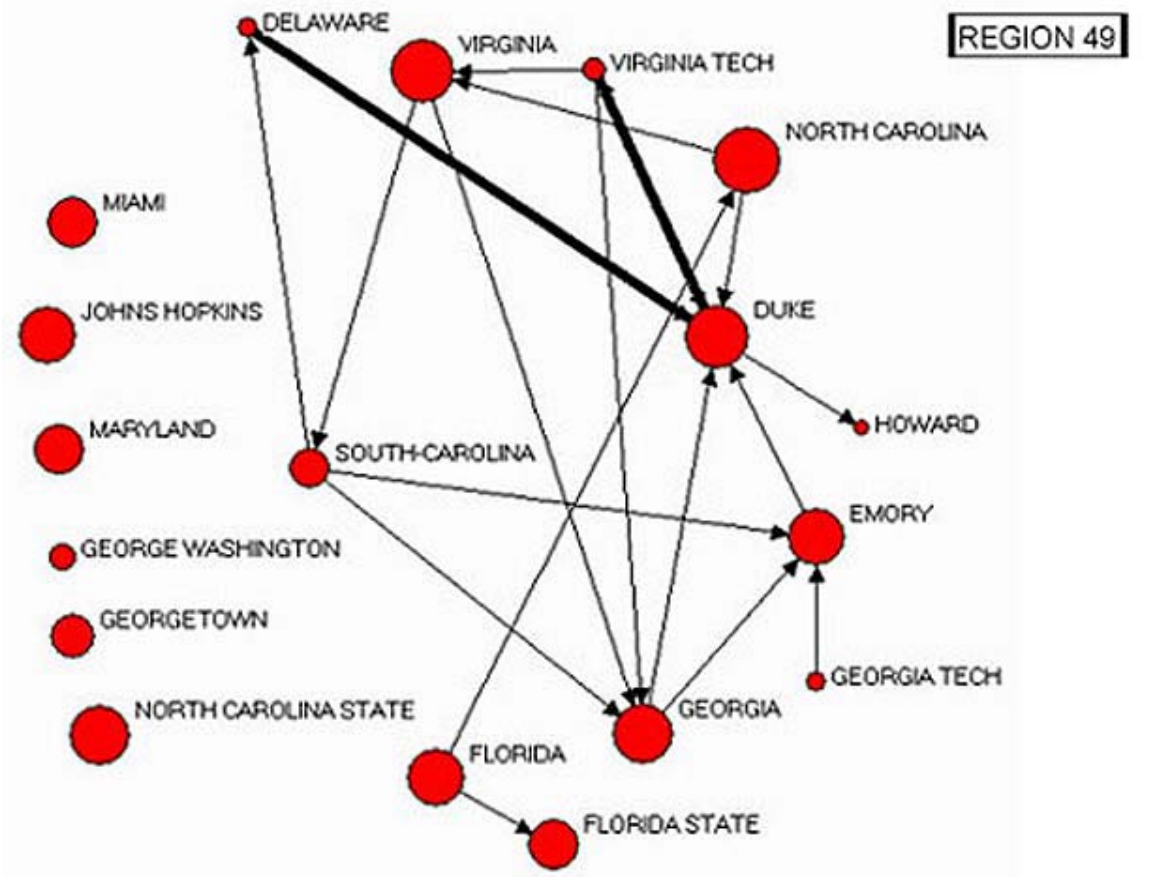
Appendix D: Libraries Included in Each Region

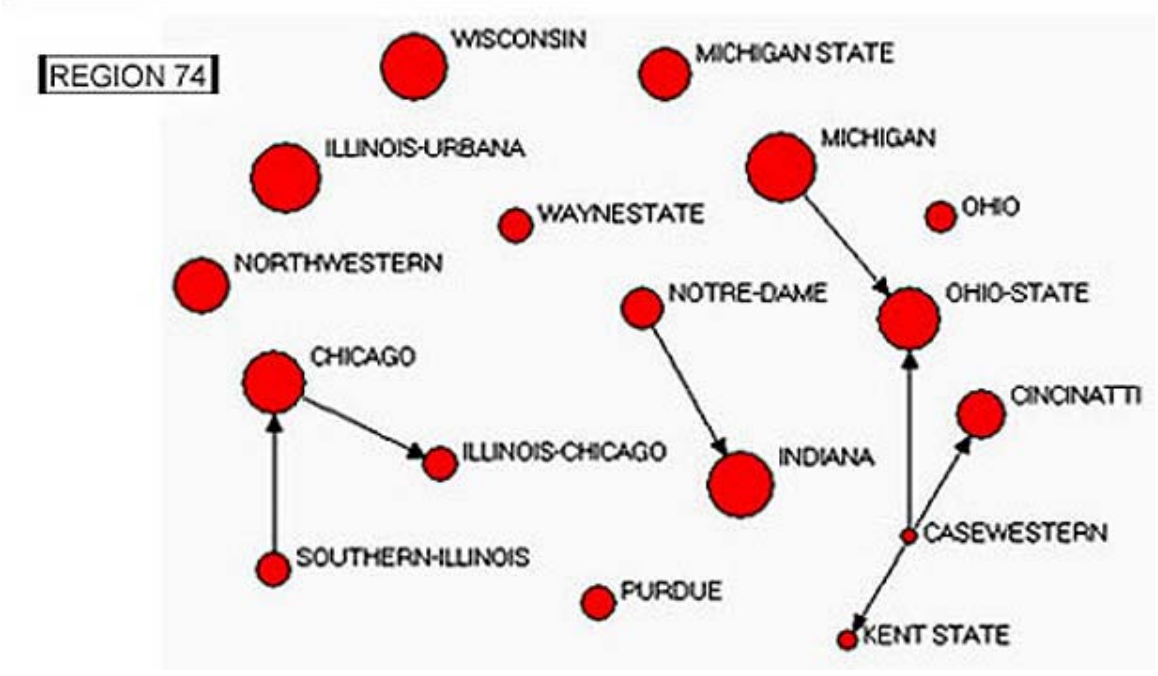
REGION 1	REGION 15	REGION 27	REGION 34	REGION 43
ALBERTA BRITISH COLUMBIA GUELPH LAVAL MANITOBA MCGILL MCMASTER MONTREAL QUEENS SASKATCHEWAN TORONTO WATERLOO WESTERNONTARIO YORK	CALI-BERKELEY CALI-DAVIS CALI-IRVINE CALI-LA CALI-RIVERSIDE CALI-SANDIEGO CALI-SANTABARBARA HAWAII OREGON SOUTHERN-CALIFORNIA WASHINGTON WASHINGTON STATE	ARIZONA ARIZONA STATE BRIGHAM YOUNG COLORADO COLORADO STATE NEW-MEXICO UTAH	HOUSTON LOUISIANA STATE OKLAHOMA OKLAHOMA STATE RICE TEXAS TEXAS-A&M TEXASTECH TULANE	ALABAMA AUBURN KENTUCKY LOUISVILLE TENNESSEE VANDERBILT
REGION 49	**REGION 67**	**REGION 74**	**REGION 91**	**REGION 105**
DELAWARE DUKE EMORY FLORIDA FLORIDA STATE GEORGE WASHINGTON GEORGETOWN GEORGIA GEORGIA TECH HOWARD JOHNS HOPKINS MARYLAND MIAMI NORTH CAROLINA NORTH CAROLINA STATE SOUTH-CAROLINA VIRGINIA VIRGINIA TECH	IOWA IOWA-STATE KANSAS MINNESOTA MISSOURI NEBRASKA WASHINGTON-STLOUIS	CASEWESTERN CHICAGO CINCINATTI ILLINOIS-CHICAGO ILLINOIS-URBANA INDIANA KENT STATE MICHIGAN MICHIGAN STATE NORTHWESTERN NOTRE-DAME OHIO OHIO-STATE PURDUE SOUTHERN-ILLINOIS WAYNESTATE WISCONSIN	COLUMBIA CORNELL NEW-YORK PENNSYLVANIA PENNSYLVANIA STATE PITTSBURGH PRINCETON ROCHESTER RUTGERS SUNY-ALBANY SUNY-BUFFALO SUNY-STONYBROOK SYRACUSE TEMPLE	BOSTON BOSTON COLLEGE BROWN CONNECTICUT DARTMOUTH HARVARD MASSACHUSETTS MIT YALE

Appendix E: Regional Network Diagrams



Appendix E: Regional Network Diagrams, Continued





Appendix E: Regional Network Diagrams, Continued