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Virtual Browsing Via Deeplinked Catalog Searches

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"Research is formalized curiosity. It is poking and prying with a purpose."

--- Zora Neale Hurston (1891-1960)

Abstract

This project facilitates virtual browsing by means of deeplinked catalog searches based on Library of Congress (LC) subject headings and call numbers. Collocating these searches by discipline in pulldown menus opens up the physical book collection in a seamless online fashion to users lacking LC subject heading knowledge, but possessing *subject* knowledge. Virtual browsing is important because it may aid awareness of and increased use of print collections in large libraries, especially by researchers who rarely visit the library physically.

Introduction

"Knowing" a collection is quite distinct from being able to locate individual titles or works by a particular author. Knowing a collection means understanding its scope and arrangement–where topics begin and end, how extensively they are represented, and where related works might be found. Old-fashioned browsing is a powerful way to gain this familiarity with a print collection. Browsing leads to unexpected discoveries and surprising connections and fosters broader, deeper reading both within a field and across disciplinary boundaries. Browsing, however, is not necessarily

> open-ended searching, with no definite question in mind, in mere curiosity to see "what's available"; rather it has a very definite goal in mind …but the fact being sought is such that a precise source for it cannot be specified in advance, even after exhaustive computer searches. (Mann, p.14).

Systematic browsing fosters a sense of the scale of a field based on the scope and variety of library holdings, something that is notoriously difficult to judge from electronic sources.[1]

Unfortunately, browsing is a skill that is rapidly being lost as fewer faculty members and graduate students visit libraries on a regular basis. The lower gate counts do not mean that browsing book stacks has suddenly become less useful or valuable. "Though more texts become accessible on the Internet each year, advanced research in many disciplines requires that investigators evaluate extensive print collections besides the full range of electronic information." (Thomas, p. 409). A Harvard postdoc captured the importance of browsing for (her) intellectual growth in *The Scientist*:

> [I had] to gain a working knowledge of entomology – and fast. I started with a PubMed search and soon I had a pile of papers on my desk. For a moment, I felt pleased. The feeling faded, though, when I saw what I needed…was not to be found in published papers or reviews. I needed books. At first I searched the online catalog and went right to the book on the shelf. Then I realized it was better to explore. I found books with the words "natural history" in the titles and I didn't let myself get scared away. (Mohr, p. 48)

Ten years ago, LeBlanc wrote that "the maximum value of browsing cannot be ensured, however, without some mediation on the part of the library staff." (1994, p. 295). That mediation does not need to take place face-to-face. This project provides researchers with a way to discover the depth and scale of print collections without actually having to visit the library. The library mediation takes place virtually through stable searches that exploit Library of Congress (LC) subject headings and call numbers. Offering faculty an intuitive way to browse online acknowledges strongly that libraries contain valuable print resources that are not available electronically and makes subject exploration far richer and more versatile than what is possible through keyword searches of the catalog.

An urgent motivation for providing much better, intuitive electronic browsing is that researchers simply no longer travel to the stacks the way they once did. Numerous studies detail declines in faculty and student visits (see Carlson, 2001 and Engle, 2004). Faculty in particular, "are noticeable by their absence from library buildings, even if they are dramatically increasing their use of the library's electronic resources." (Crowley, p. 573). Moreover, "librarians have made it less necessary for faculty and students to visit the physical library to address many of their research and information requirements." (Shill, p. 432). If faculty will not visit the library except when absolutely necessary, how are they to gain a good working knowledge of a research library's holdings in a given area? This dilemma may leave print collections—those bound volumes that occupy so much space and are the *sui generis* of a library— languishing in an underutilized state.

While Engel and Antell's *The Life of the Mind: A Study of Faculty Spaces in Academic Libraries* (2004) draws the conclusion that "the survey of ARL libraries and the interviews with faculty space holders—demonstrate that faculty members have not deserted faculty spaces in academic libraries" (Engel, p. 17), there are several valid reasons why researchers without carrels might stray away.

Reliance upon online journal literature and other e-resources is certainly one such reason and will not be explored at further length here. A second reason is the sheer size of the modern research university campus. Large research universities with several thousand faculty members and thousands of graduate students leave most researchers at a significant distance from the library. Academic departments or research groups that might be interested in the holdings in a given subject area are scattered across campus far from the main library.

What is more, Engel and Antell suggest that the preference they found for faculty to work in the library might be a generational one. "For my generation, you go to the library to do scholarly work…Will future generations of academics, coming of scholarly age in the era of electronic information, continue to view the library building as the primary place for doing research?" (p. 18). Younger librarians, the author included (MLS 2001), may in fact view the absence of faculty from the library as the status quo rather than as a new and depressing development. They would be positively surprised to find faculty from across campus browsing in the bookstacks.

A basic assumption underlying this project is that researchers who are not visiting the library due to the pressures of time and location and new work styles predicated upon desktop delivery still deserve to enjoy a simple and straightforward way to browse large print collections. The question is not how to draw these researchers back into the library to browse, but how to provide them with a similar experience when they remain in their offices. Browsing remains the most unique aspect of visiting a library—one not well replicated by current catalog systems and desktop journal delivery. Librarians have thus far failed to provide a user-friendly interface to the intellectual work they do via "cataloging and classification [that] permits both direct access to known items and various kinds of browsing" (LeBlanc, p. 295).

Virtual Browsing Explored

This project creates an online browsing capability by means of deeplinked catalog searches. Deeplinking refers to bypassing a front Web page and connecting directly into an underlying page that holds desired information. This shortcut spares the patron from having to navigate a site from the main entrance to the desired location. Here the "front page" of the catalog is bypassed via links directly into the LC subject headings and call number authority files. This type of extensive deeplinking into a library catalog provides a novel method for the discovery of printed resources. Deeplinking has previously been used in academic libraries to replace locally scanned articles in e-reserves with direct links to the same articles in electronic journals (Warren, 2004). The

linking described here, however, is not to sources external to the library but to canned searches taking place within the catalog.

Virtual browsing is based on LC subject heading searches and call number searches since "perusing systematically controlled headings in a catalog, scanning classified call numbers in an online catalog, or browsing classified texts on a shelf all constitute a kind of intellectual grazing." (LeBlanc, p. 295). Catalog searches of these two varieties are constructed a priori by a librarian, embedded in dropdown menu systems built from JavaScript and HTML, and placed in regular Web pages for public use (see Figure 3). Compiling numerous deeplinked searches in a menu format makes it easy to construct portals to print collections and gives faculty and students a means to explore large print collections electronically. Finished versions of this work can be seen at http://www.lib.ncsu.edu/risd/guides/mathematics/ and http://www.lib.ncsu.edu/risd/guides/physics/. In both guides, the "Books" and "Journals" sections incorporate virtual browsing capabilities.

Catalogs can easily be used to locate print materials based on title or author information. Catalogs also identify and provide access to individual journals readily enough. The guiding principle in each of these cases, though, is to locate an *already known* resource, be it an author, a book or journal title.

Browsing a bookshelf to see what *might* be held on a topic is, however, poorly replicated by current catalogs and subject guides, and there are several reasons for this. First, aside from looking for known titles and authors, most catalog searching performed nowadays takes the form of keyword inquiries. Keyword searching has become the default search methodology for an academic generation raised on Google searching. Keyword searches often bring back large results sets, but with many ancillary or unrelated titles. The researcher does not develop a sense of the overall number of titles actually about her subject because the results are not sorted by call number or by LC subject heading, nor is their subject distribution reflected in any title counts by call number or heading.

Conversely, title and author searches show only the unique item or small number of items that match the search string while offering no sense of how many related titles there are. Only by using LC subject headings can an individual obtain a number indicating the size of the collection for a topic. Particularly in large research libraries spanning millions of volumes, it is nearly impossible to guess the extent of holdings on a topic without examining the subject headings.

Understanding Browsing: Subject Headings and Call Numbers

Two ideas are crucial for understanding browsing and then replicating it: 1) that a call number is a function that maps subject to location and 2) that LC subject headings group objects based on topic in a way that keyword results do not. Librarians understand these seemingly simple notions; most other people do not fully understand them, if at all.

How many researchers, for example, access a call number authority file to see what books are located in a topical area by call number? Should we expect them to know how to do so? Do librarians expect that mathematicians seeking information on, say, ring theory, will know the call number range primarily associated with ring theory and then figure out how to find the call number authority file in the catalog? If mathematicians do not know how to do this online, and they are not visiting the library in person either, then how do they browse the collection to see if dozens or even hundreds of titles on ring theory are available?

Perhaps a mathematician not familiar with the call number could instead use the LC subject heading for ring theory to find relevant titles. This seems eminently sensible until the subject search process is examined more closely. Does the catalog even indicate that LC subject headings, as opposed to just "subjects," are being searched? If so, what is the correct heading for ring theory? "Rings"? "Rings theory"? "Rings mathematics"? It is actually "rings algebra." LC headings are not written in natural language and frequently feature inversions or departures from the terminology used by researchers themselves. An even more egregious example of non-natural language is "algebras linear," the subject heading for linear algebra. While the correct subject headings are relatively easy to find in these examples, other cases can be more troublesome. Moreover, this whole exercise assumes that a researcher is familiar with the notion of indexing, understands LC subject headings, and will choose subject heading searching over keyword searching in the first place. Just as with call number searching, there is a strong likelihood that a researcher hoping to browse for books on a topic will fail entirely or encounter many challenges. The difficulty of using LC headings restricts most patrons to the semi-randomness of keyword searching and deprives them of the important and added value of indexed terms.

This project opens up LC subject headings and call number authority files to online browsing in a manner that is easy for non-librarians to perform. It works by constructing pull-down menus listing the main topics for a given discipline and attaching scripts to each topic. These scripts are deeplinked catalog searches for either the LC subject heading for a topic or the call number that is most closely associated with the topic. The crucial element of these searches is that they are automated. The researcher does not have to construct them by choosing appropriate/accurate call numbers or subject headings. They are already written in such a way as to provide stable entry points into the catalog.

Mathematics will be used as an example discipline for the remainder of the article since it was the first field for which I built working versions of virtual browsing. Any research area could be approached in a similar manner. To begin, Figure 1 lists some important topics in mathematics. Topics were chosen on the basis of 1) being recognized as major subfields of mathematics, 2) having a minimum of about fifty titles in the primary LC subject heading (usually many more) corresponding to the topic and 3) having numerous S*ee Also* listings. The final requirement was chosen so that each LC subject heading search would act as a major branching point for discovering other subject

headings, i.e., making the *browsing* of LC subject headings within a discipline much easier.

Math Topics
Abstract Algebra
Algebraic Geometry
Algebraic Topology
Algorithms
Analysis
Biomathematics
Calculus
Calculus of Variations
Categories
Chaotic Systems
Complex Variables
Differential Equations
Differential Geometry
Dynamic Systems
Fields

Figure 1. List of important mathematical topics.

Math Topics	**LC Subject Heading**
Abstract Algebra	Algebra Abstract
Algebraic Geometry	Geometry Algebraic
Algebraic Topology	Algebraic Topology
Algorithms	Algorithms
Analysis	Mathematical Analysis
Biomathematics	Biomathematics
Calculus	Calculus
Calculus of Variations	Calculus of Variations
Categories	Categories Mathematics
Chaotic Systems	Chaotic Behavior in Systems
Complex Variables	Functions of Complex Variables
Differential Equations	Differential Equations
Differential Geometry	Geometry Differential
Dynamic Systems	Differentiable Dynamic Systems
Fields	Algebraic Fields

Figure 2. Mathematical topics and their corresponding LC subject headings. The finished menus contain additional topics not shown.

The mathematical terms are not identical to the corresponding LC subject headings. Figure 2 shows the common-sense terms from Figure 1 and the actual LC subject headings corresponding to them. The difference between the two columns is clear. How many researchers would guess most of the entries in the right column? Some have the same word order as those on the left while others are reversed. Still others require adding the term “mathematics” to clarify that the heading is about mathematics.

This requirement would seem redundant and bizarre to a mathematician not used to thinking about library classification schemes. Rewriting the LC headings in an intuitive manner is highly helpful to researchers. The user-friendly terms are the ones ultimately displayed in the pulldown menus used as the public interface (see Figure 3), either alphabetically or by some internal discipline arrangement.

Search Syntax

After mapping familiar terms to LC subject headings, the next step associates the terms with an action: performing a catalog search for the LC subject heading corresponding to each term. URLs with the proper syntax for LC subject heading searches are constructed and placed in a menu that automatically passes the URLs to the catalog, which then performs the searches and returns the appropriate results. The syntax for this type of search varies by ILS, of course, but for the Sirsi Unicorn system at NCSU, the search that leads to the subject headings authority list is formulated in the following manner:

> **LC subject heading search (authority list)**
> http://catalog.lib.ncsu.edu/web2/tramp2.exe/do_authority_search/guest?servers=1home&setting_key=Files&hitlist_screen=hitlist_standard.html&*search_button=subject&index=su&query=algebra

While the syntax is complicated, it is important to note that only the final term after "*query=*" varies from search to search. Altering the search from algebra to linear algebra requires only one change in the URL: replacing "algebra" by "algebras+linear."[2] Thus creating searches is simple. Once one search is constructed, the URL is simply copied again and again with only the LC subject heading edited each time.

LC subject heading searching at the authority level is particularly advantageous in two situations. The first occurs when so many titles (hundreds) appear under a subject heading that dropping the patron directly into such a lengthy list is akin to dropping them into keyword search results. Subjects warranting that many titles have useful *See Also* headings and more refined subsidiary headings to assist in narrowing or redirecting the search.

Unlike keyword searches, canned subject heading searches like this exploit the organizing value provided by the subject authority scheme. Dropping patrons into the subject heading search for *Lie Algebras*, for example, reveals that in addition to the main heading showing 149 Lie Algebras titles, there are subheadings indicating thirty conferences and also that a dictionary focusing specifically on Lie Algebras exists. In addition, eleven *See Also* headings list other pertinent areas for consideration. Exposing the patron to these semantic relationships and cross-references is much more informative than either keyword searching or simply providing the patron with the 149 titles for Lie Algebras where the call numbers vary and the ordering schema is not clear.

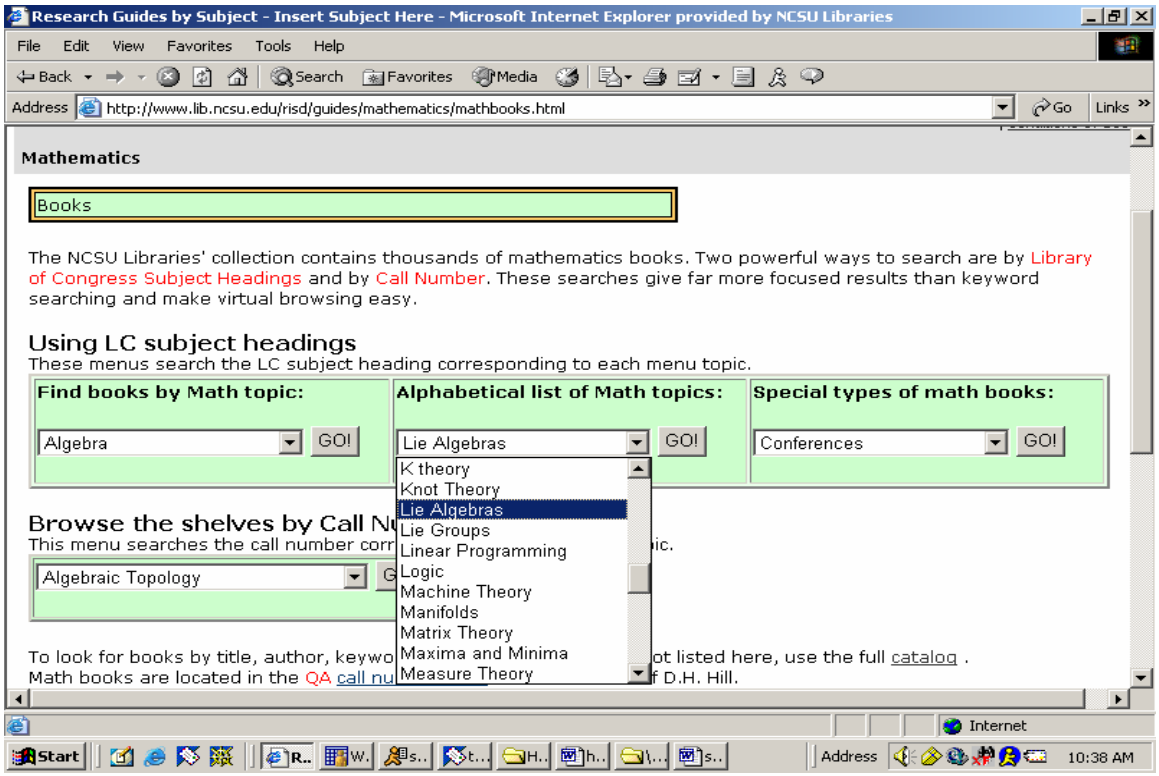

Figure 3. A list of mathematical topics for browsing. All topics are rewritten LC subject headings. The researcher has selected "Lie Algebras." The search result is seen in Figure 4.

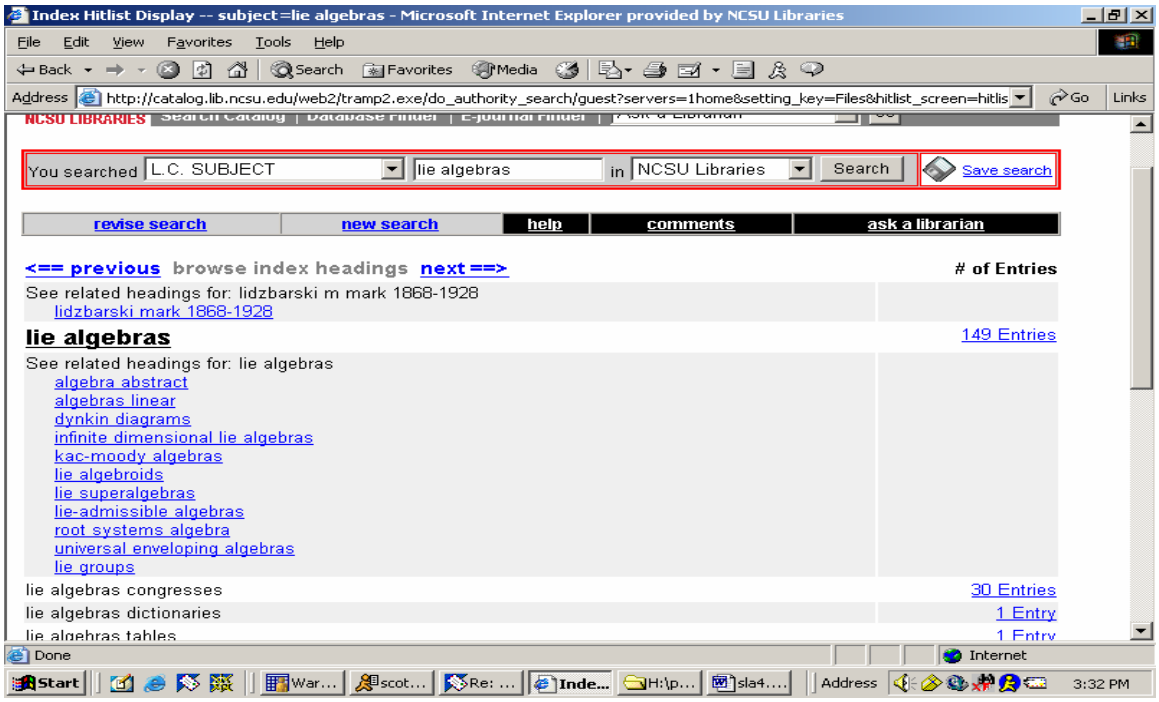

Figure 4. LC Subject Heading authority file for a canned search on "Lie Algebras."

The second situation for which LC subject heading links are useful is for the exploration of special types of books. Mathematics, for instance, has categories such as handbooks, encyclopedias, theses, LaTex printing guides, conferences, and others that might be particularly interesting. These types of books *span* mathematics as a whole regardless of the particular subtopic involved. Figure 5 shows mathematics resources that have LC subject headings worth placing in a separate category list.

Math Topics	**LC Subject Heading**
Conferences	Mathematics Congresses
Dictionaries	Mathematics Dictionaries
Encyclopedias	Mathematics Encyclopedias
Formulas	Mathematics Formulas
Handbooks and Manuals	Mathematical Handbooks and Manuals
NCSU Theses	Theses mathematics North Carolina State University
Popular Works	Mathematics Popular Works
Problems and Exercises	Mathematics Problems Exercises Etc
Printing and Fonts (LaTex)	Mathematics Printing Computer Programs
Study and Teaching	Mathematics Study and Teaching
Tables	Mathematics Tables

Figure 5. Important types of mathematics books and their LC subject headings.

These eleven categories contain useful reference material as well as dissertations, problem sets, and information about mathematics conferences. The format-based LC subject headings are again unintuitive and unlikely to be found by patrons. Figure 6 shows the menu for searching these categories.

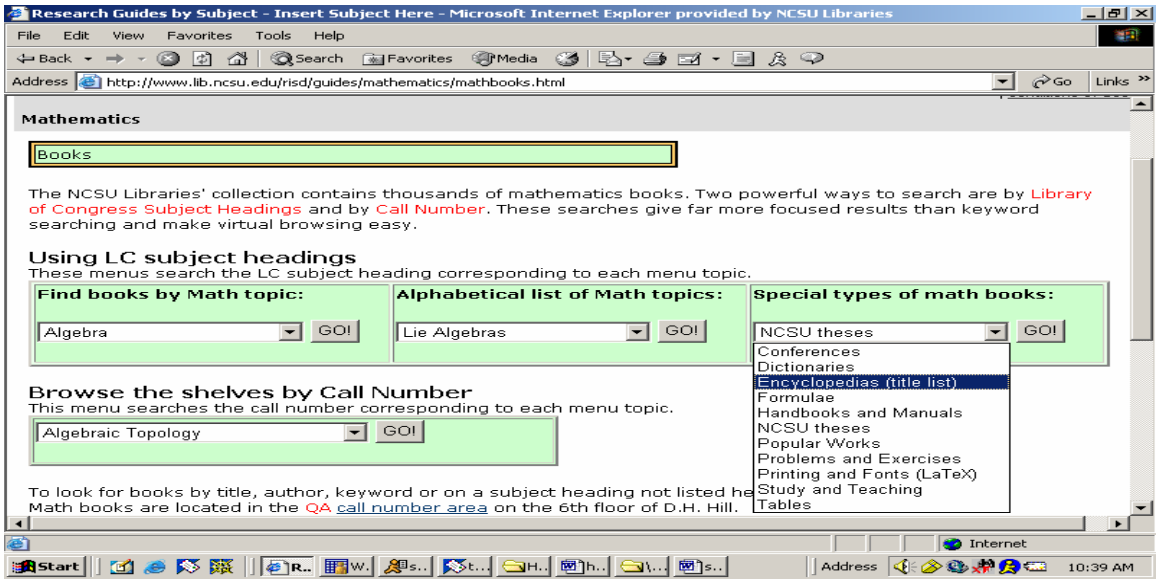

Figure 6. Options in the "Special Categories" menu. The options are the reworded LC Subject Headings from the right column of Figure 5.

If the holdings for a given subject heading are slim, a second type of catalog deeplinking is preferable. In that case it may make more sense to bypass the authority files and point the patron directly to the title list for that subject heading. The number of encyclopedia titles in a given discipline, for example, is probably small enough not to overwhelm a patron, plus there are no other *See Also* headings. This type of search calls for a slightly different linking syntax.

LC subject heading search (title list for given heading)
http://catalog.lib.ncsu.edu/web2/tramp2.exe/do_keyword_search/guest?servers=1home&setting_key=Files&hitlist_screen=hitlist_standard.html&*search_button=subject&index=su&query=mathematics+encyclopedias

Call Number Browsing

Researchers can use call number browsing to see exactly what is on the shelf on a given topic and judge the content of nearby books. This form of browsing exactly mirrors the real-world counterpart. Much like the LC subject heading searches, virtual call number browsing is built on authority searches, but requires yet another syntax.

Call Number search
http://catalog.lib.ncsu.edu/web2/tramp2.exe/do_authority_search/guest?setting_key=files&*search_button=callno&servers=1home&index=LC&material_filter=all&language_filter=all&date_filter=all&query=qa612

As with the subject heading searches, all subsequent call number searches are built by copying the first URL and then changing the last few characters into the new call number range. The construction of searches can be expedited by truncating the call number. To enter the authority file at the point where algebraic topology begins, the alphanumeric sequence "QA612" is sufficient. The search defaults to the first title beginning with that call number string.[3]

Call number browsing closely simulates shelf reading, encourages serendipitous discovery of print resources, and helps to develop a sense of the breadth of a collection. It has actually been possible to browse online via call numbers in catalogs for years, but this new interface does not require the patron to understand the LC call number system, discover relevant call numbers before searching, guess at how to enter call numbers correctly into a catalog, or truncate them to search at a desired point.

Most mathematicians, for example, would not be able to predict that the call number for "Hilbert Spaces" is QA322.4. Choosing the topic "Hilbert Spaces" from a menu is easy, though (Figure 7). Clicking GO places the patron in the call number file at the beginning of the QA322.4 range (Figure 8). The patron then moves forward (or backward) through title screens and notes what is actually on the shelf, even though he or she is not really pacing through the library stacks.

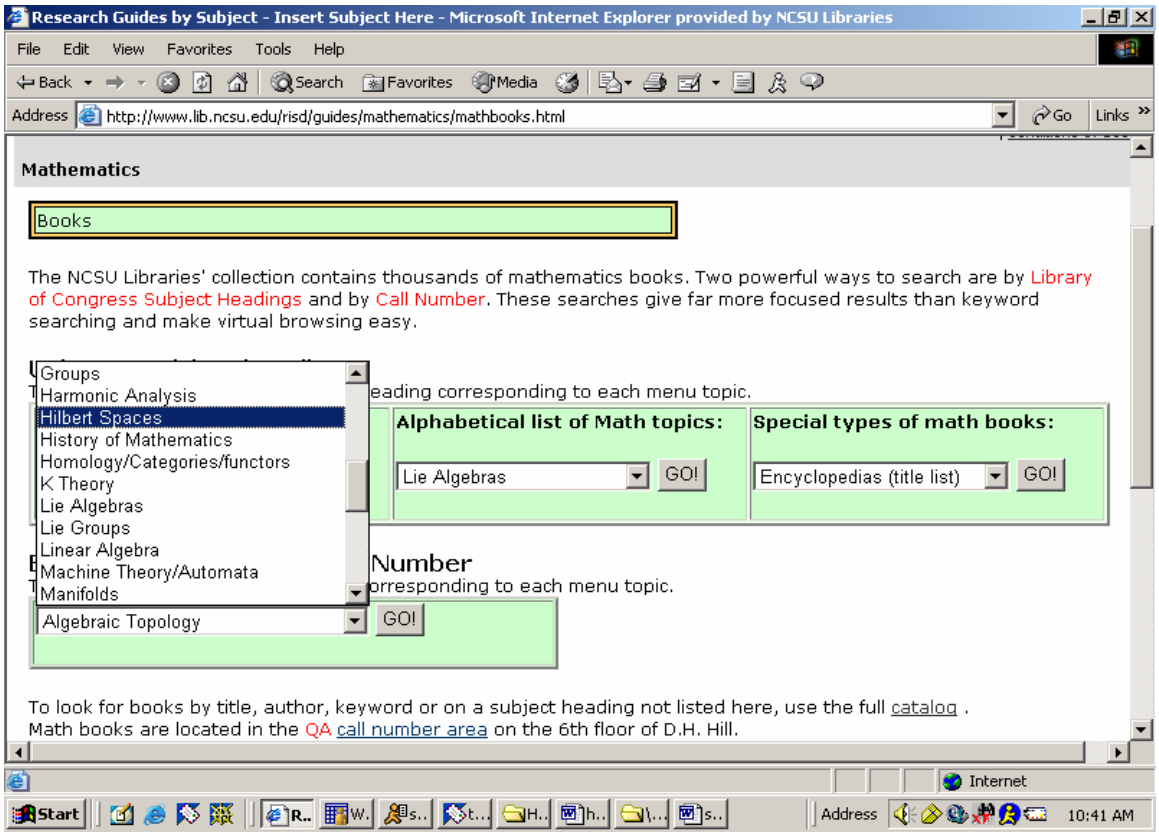

Figure 7. Selecting "Hilbert Spaces" as a Call Number Search.

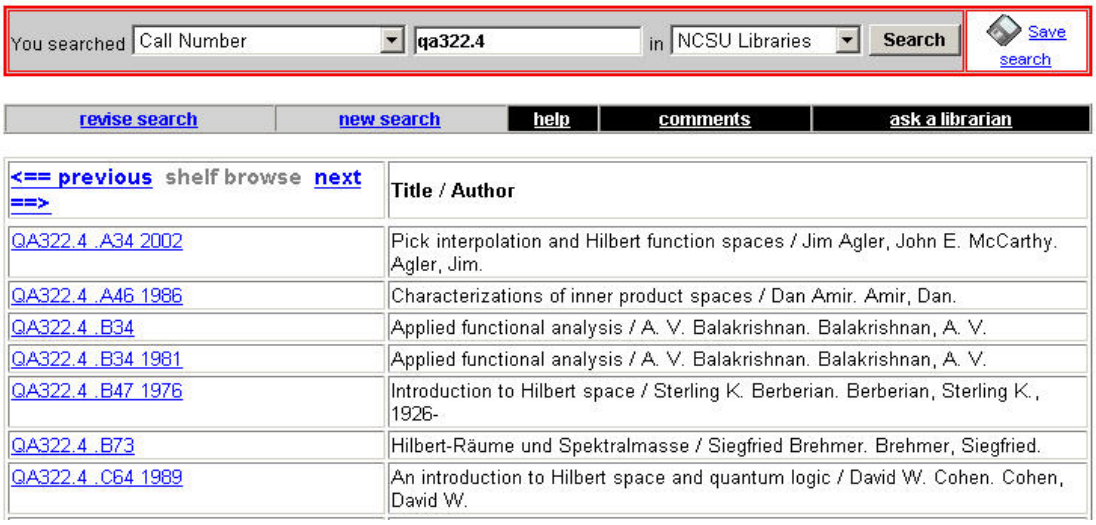

Figure 8. The call number authority location where the canned search places a researcher clicking on "Hilbert Spaces." The search locates "QA322.4."

Constructing the Menus: Putting It All Together

The dropdown menus seen in the illustrations are constructed from simple JavaScript and provide a clean way to assemble LC subject headings, prewritten catalog searches associated with them, and common-sense words linked to each LC heading in a patron-accessible format. In each menu, users only see a list of natural language terms plus a GO button. Clicking the GO button after highlighting a menu topic triggers the catalog search associated with that topic, pointing the patron either to the LC subject authority file, to the title list for that LC subject heading, or to the call number authority file at the beginning of the call number range for the topic.

JavaScript endows the menus with their dynamic search ability and allows for quick editing. Crafting additional menus is accomplished simply by copying the "function…}" block of code (Figure 9) and changing the number in it. This script can appear anywhere in the HTML of the page on which the menus are located. However, inserting the script for all menus at one point regardless of their location on a page is the easiest way to organize the code.

```
<script language="JavaScript">
  <!-- Hide from old browsers

        function surfto1(form) {
        var myindex=form.select1.selectedIndex
        location=form.select1.options[myindex].value;          this is menu 1
    }
        function surfto2(form) {
        var myindex=form.select2.selectedIndex
        location=form.select2.options[myindex].value;          menu 2, etc.
    }
  //-->
</SCRIPT>
```

Figure 9. JavaScript for pulldown menus[4].

Writing the HTML that forms each catalog search is easy once the menu script has been accomplished. Figure 10 shows the actual catalog search syntax and the surrounding HTML that exists behind each menu topic. Each search is enclosed within the option tags. Generating this code is easier than it might appear, thanks to Dreamweaver's "edit menus" feature. The code in Figure 10 is automatically written when a topic and its associated URL are added to the menu-editing tool. The menu-editing tool permits quick topic addition and deletion and rapid up-and-down arrow style sorting of menu topics without the need to work directly with the HTML code. The finished product seen in Figure 10 offers two searches, one on algebra and the other on abstract algebra.[5]

```
<FORM NAME="form1">
                <SELECT NAME="select1" SIZE=1>
        <option
value="http://catalog.lib.ncsu.edu/web2/tramp2.exe/do_authority_search/guest?servers=1
home&amp;setting_key=Files&amp;hitlist_screen=hitlist_standard.html&amp;*search_b
utton=subject&amp;index=su&amp;query=algebra">ALGEBRA
        </option>

        <option
value="http://catalog.lib.ncsu.edu/web2/tramp2.exe/do_authority_search/guest?servers=1
home&amp;setting_key=Files&amp;hitlist_screen=hitlist_standard.html&amp;*search_b
utton=subject&amp;index=su&amp;query=algebras+linear">LINEAR ALGEBRA
        </option>
                </SELECT>
        <INPUT TYPE="BUTTON" VALUE="GO!" onClick="surfto1(this.form)">
 </FORM>
```

Fig. 10. HTML code for two LC subject heading authority searches.

Conclusion

This project offers librarians a way to replace their jargon-ridden LC subject headings and anonymous call numbers with common-sense terms, to link those terms with canned catalog searches, and to display it all in a user-friendly fashion. Rather than placing the onus on patrons to familiarize themselves with library organization and indexing theory, we can enable them to choose familiar terms and browse subjects and shelves virtually.

Researchers browsing virtually can find new titles in the print collection as of the moment they appear in the catalog instead of waiting for their subject liaison librarian to update a list of new books. Librarians themselves may discover and collocate hidden collections by engaging in intense exploration of subject headings, call numbers, and the print holdings. For example, while constructing a physics guide, I discovered a call number range (QC 595.5) for Piezo/Ferro-electric theory, an important topic within electrical engineering and solid-state physics, a field in which the NCSU Libraries boasts strong holdings. A separate call number range exists for Piezo/Ferro-electric devices (TK 7872.P54). The call number search menu allowed me to juxtapose these two related topics, making it easier for researchers to discover that books on both theory and practice exist, even though they are not located on the same floor of the library.

Furthermore, subject guides that are supposed to help students and researchers discover important resources in their areas of interest can be improved by incorporating virtual browsing. Such guides generally give short shrift to the scope and depth of local print holdings, often consisting of little more than static lists of electronic journals and web sites found via Google. When books are included, it is usually only a short list of a

few key titles that does not allow for further exploration. However, "subject guides were conceived of as…starting points for research in a discipline or on a topic." (Reeb, p. 123). Providing user-centered, dynamic, browsable menus to the major topics of a discipline does patrons much greater service than listing a handful of titles. In this way, LC subject heading and call number searching provides a much-needed direct hotline between subject guides and the print collections that are built to reflect a university's research endeavors.

Organizing information in this way is an example of object-oriented information display. Object-oriented information display focuses on: 1) more re-use of information, 2) easier maintenance, and 3) greater conceptual clarity of the product (Bist, p. 49). For librarians, this system results in dynamic content requiring minimal editing. Adding new searches is very easy since most of the necessary information and formatting is used repetitively. Maintenance becomes an occasional rather than a constant chore. Clearly this system offers superior access to the print collection compared to typing individual titles onto a page. Furthermore, in the worst-case scenario of an ILS changing its search syntax for an updated version, a single global find-and-replace in the canned search string HTML for each menu suffices to replace the old syntax with the new. All told, "this is system design from the user's, not the system's perspective; it is the hallmark of designing usable systems." (Bist, p. 51).

With this system, researchers may find that the library's holdings are more extensive than they realized, and locate the books and conference literature they need—on their own. Increased discovery and use of materials are, of course, the most important and desired outcomes of this work. Guides incorporating deeplinked menus offer researchers a new, robust way to examine collections without requiring librarian mediation for deeper, more complex subject searching.

Faculty members even stand to benefit intellectually from the rediscovery of browsing. It is eye-opening to realize how useful "grazing" can be as a method of inquiry. The Harvard postdoc quoted in the beginning of this article summed up her browsing experiences by saying, "The library is the perfect place to brush up on a field, learn the basics of a new one, or gain an appreciation of how insightful our forebears could be." (Mohr, p. 48). Providing that experience to all researchers, regardless of their location, is what this project accomplishes.

Endnotes

[1] Showing someone who has only ever used SciFinder Scholar a complete printed set of Chemical Abstracts is a good illustration of this principle.

[2] The plus sign must be inserted between the words in order for the searches to work in Netscape.

[3] This condition is true in the Sirsi Unicorn system.

[4]The source for this JavaScript was the free code site "JS made Easy.com." The original version of the script can be found at http://www.jsmadeeasy.com/javascripts/Pull%20Down%20Surfing/2%20Pull%20Down%20Surfing%20Menus/index.htm.

[5] Technically, the search is on the subject headings "algebra" and "algebras abstract."

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