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Enriching the Library Catalog Record for Subject Access

Carol A. Mandel

This paper analyzes proposals for augmenting library bibliographic records for improved subject searching in online catalogs. Possible fields for enrichment are described and their likely value assessed. The assessment determines that the main value of enriched records would be to provide access to parts of books. The paper presents arguments for and against adding book content indexing to the online catalog and analyzes the feasibility of eleven alternatives for providing such information.

We can view subject access in the online catalog as a system with four interdependent components: (1) the design of the online catalog, (2) the bibliographic records acted upon by the catalog, (3) the users who bring subject searches to the catalog, and finally, (4) the tools we can load into the catalog to facilitate subject searches, such as an online authority file or an online classification schedule. The components of each part interact and interlock, like the pieces in a three-dimensional jigsaw puzzle, with the placement of each one affecting the shape of the other.

The pieces of this puzzle considered here are those derived from the catalog record itself. Specifically, this paper examines ways of enhancing the record to improve the overall system. The record is the most expensive and most difficult part of that system to improve. While creating sophisticated software and online aids is neither easy nor inexpensive, the bulk of such development work is essentially a onetime investment. Record creation is ongoing and requires major continuing expenditures. The magnitude of this effort demands that we take a very hard look at the usefulness of our records in the online catalog and an even harder look at suggestions for expanding these records. We need to address two questions: Can we enhance our standard records to improve online subject searching? And, even if we can, should we?

The concept of enriching standard machine-readable catalog records with additional subject information has been a topic of discussion for at least a decade, yet little new work has been done in this area since Pauline Atherton Cochrane completed her landmark Subject Access Project Edition version of a paper presented at the RTSD/CCS Subject Analysis Committee Program, "Subject Access in the Online Catalog" on June 24, 1984, by Carol A. Mandel, Assistant University Librarian for Access Services, University of California, San Diego.
in 1978. Cochrane developed an efficient method for adding terms from back-of-the-book indexes and tables of contents to MARC records and demonstrated that these enriched records could serve to improve subject retrieval in online searching. The Subject Access Project (SAP) technique extracts an average of thirty terms from each book according to criteria aimed to ensure that both significant subjects and useful search terms are chosen. The method has been tested in an online database at Lund University in Sweden and applied in a database of Swedish government reports, but has yet to be tested in an operational online library catalog.

In 1982, the Council on Library Resources (CLR) brought together twenty-three individuals who had a special interest in subject access and asked them to consider means for improving subject searching for monographs in bibliographic databases. Included among the group’s top-priority actions is the recommendation to “identify and evaluate ways to augment and enhance subject access in newly created bibliographic records.” Several possible methods of enhancement were identified by the conference participants, who also cautioned that “any alternative record enhancement strategy should be pursued only after assessing the cost/benefit to be expected from such enhancements.”

Two years have passed since the CLR group met, and action has been taken on a number of its recommendations. However, we are still not much further along in our thinking about the value and feasibility of augmenting library bibliographic records. This paper aims to advance our consideration of enriched records by seeking answers to several basic questions. The paper describes what an enriched record might contain and assesses the value that is added by such enrichment; it then considers both the desirability and feasibility of providing enhanced records online to library users.

WHAT ARE ENRICHED RECORDS?

The fields that can be used for subject searching in standard MARC records are shown in figure 1. Essentially, we are talking about three kinds of information: (1) classification, (2) keywords in various parts of the record, and (3) subject headings selected from a controlled list or controlled vocabulary. A review of the literature reveals suggestions for enriching or expanding all three kinds of subject information.

First, in the area of classification, suggestions have been made to include fuller, more specific classification notations in records and to add additional class numbers covering multiple aspects of the book’s subject coverage. Standard classification practice has been criticized as inadequate for subject access because we treat class numbers only as location devices and we fail to revise classification assignments when class schedules are changed.

Second, our existing records have been criticized for their paucity of descriptive subject words: not all titles are descriptive, contents and other subject-related notes are rarely added, and foreign-language materials present an obvious problem. Suggestions for adding keywords or uncontrolled terms to the record have included adding words from the table of contents or index; adding descriptors selected by scanning the
Enriching the Library Catalog Record

1. Classification: LC call number; Dewey number; Local call number; Other class numbers

2. Keywords: Titles; Notes (including contents notes); Series statements; Added entries; Juvenile literature summaries.

3. Controlled subject headings: LCSH; MeSH; AC (Annotated Card) headings for children's materials; headings from locally maintained list.

Figure 1
Subject Information in Standard MARC Records

material; or adding an abstract or annotation to the record, such as the contents summaries created for the children's literature Annotated Card Program.

In the third area, controlled subject headings, writers have suggested adding more LC headings to standard records and adding terms selected from specialized thesauri. These suggestions result from concerns that too few controlled headings are found on standard records—the average in the OCLC database is only 1.4 LC subject headings per record—and that LC headings are often not specific enough to satisfy a reader's inquiry.

WHAT WOULD ENRICHED RECORDS PROVIDE?

Before we pursue any of these suggestions for augmenting records, it is essential that we step back and ask ourselves precisely what we really want from a database of expanded MARC records. It was noted earlier that record creation is, in the long run, the most expensive component of our subject access system. For example, in 1982 the Library of Congress classed and assigned subject headings to approximately 160,000 titles. If the subject work, including LC and Dewey classification, on each title costs $15, we are looking at an ongoing annual cost of $2.4 million dollars at LC alone. Therefore, it is important that we do not increase the effort and expense of record creation unless we are gaining enhancements that cannot otherwise be achieved through good online catalog design or through improvements in our subject access tools. We also must distinguish a real need for expanded records from problems which could simply be solved by more careful implementation of our standard library practice. In other words, we should not create enriched records to compensate for improvements better made in the other parts of our whole subject access system.

A number of us have looked to enriched records as a means for correcting a variety of existing limitations in online subject searching. Let us take a look at the four problems in subject searching that are cited most often.

The first is the need to match the searcher's natural inquiry language
to terms indexed in the online catalog. One could achieve this by putting as many terms as possible into each record, but this is not the most cost-effective solution, nor is it the one likely to yield the most precise search results. Instead, this problem is best solved by creating a thorough, up-to-date entry vocabulary, by keeping the controlled vocabulary as full and as timely as possible, by employing systems such as the National Library of Medicine's CITE, which lead the user from keywords found in one record to controlled terms attached to other relevant records, and by permitting subject keyword searches so that exact phrasing and word order are not required of the user.

A second problem often noted is the need for redundant headings, since users often miss relevant materials that are assigned headings broader or narrower than the term used in the search. Rather than loading broader and narrower terms into each record, it is more efficient to enable users to select broader and narrower terms from an online thesaurus or a subject index, to browse a classification schedule and search by class number (using truncation to broaden the search), and to perform a subject keyword search, pulling together the same term used in subdivisions and inverted headings.

A third problem is the need to refine meaning or aspects of a subject to make search results as precise as possible. While extra subject information could help here, we can also do more with standard records by using the Boolean AND to couple a standard subject heading with a class number, with a title word, or with an additional subject term.

The fourth problem, closely related to problem three, is the oft-cited need for more precise or specialized terms than those supplied from the LC list. In responding to this need, we must distinguish between problems in subject analysis policy and problems in practice. It is standard library policy to provide subject headings which are coextensive with topics covered by the entire book. The Library of Congress Subject Headings list (LCSH) can include any term—no matter how specialized—that is needed to describe the subject matter of an entire book. If the specialized term is inconsistent with LCSH editorial policy, it can be used as a cross-reference instead. LC is working to add new headings and references more quickly through its Entry Vocabulary Project. While the case can be made to add subject headings from lists geared to special audiences, such as children, in theory it should not be necessary to enrich standard MARC records just to achieve greater specificity in describing an entire book. Instead, we must add the most precise headings possible when we create a standard MARC record.

If enriched records will not do much to help us retrieve a monograph devoted to the subject we seek, why might we ever want to add more subject terms to bibliographic records? We would if these terms analyzed the contents of books. After all, journal articles of less than ten pages are typically given four or five subject headings in a periodical index. Yet one hundred or more pages of monographic text are accessed by only one or two subject terms. Do monographs contain so much less useful information than journal articles? Many of the suggestions for enriching records seek ways to add back-of-the-book index terms and table of contents terms to MARC records. The new information provided by
these terms is information about subtopics covered within the book—or book content indexing. Providing access to parts of books in the library catalog would be a considerable change from current library policy. Does responsible implementation of the online catalog demand such a change?

**SHOULD LIBRARY CATALOGS PROVIDE ACCESS TO PARTS OF BOOKS?**

Before we can answer that question, we need to explore two issues. The first is to what extent do library users—and of course these users include everyone from schoolchildren to Nobel laureates—need new access tools for discovering information within monographs? The second issue is, even if new tools are needed, does book content indexing belong in the online library catalog? In the hope of stimulating that discussion, either today or in the future, this paper poses some of the arguments on both sides.

Perhaps the most persuasive argument one can make against developing new tools for access to parts of books is the market theory argument. That is—if there were a demand for a book index tool, we would have one. While this sounds a bit like ‘‘if-God-had-intended-man-to-fly’’ sort of reasoning, we must hasten to note that all kinds of special index tools do exist. For example, we do have the *Essay and General Literature Index* for collected works. Journal indexing is neither cheap nor easy, yet we have developed an elaborate system for providing it. Some journal indexes are even commercially profitable; others are supported by the disciplines that rely on them. So it is not unreasonable to wonder why we are not indexing books to a greater extent. A corollary to this argument is that the overall topic of most monographs provides adequate subject collocation. Perhaps even individual journal articles would not need specialized indexing if each journal issue were devoted to a special topic and could be given subject headings as monographs.

There is also a case to be made for the other side. In response to the supply-and-demand argument, one could suggest that online searching is beginning to stimulate the demand now. Just one year ago, the commercial database publisher Superindex, Inc., made a combined reference book index in science and technology available through BRS. The publisher reports that Superindex has moved from ca. four hundred to ca. eight hundred library subscribers in the first year and that plans are under way to expand coverage to include professional reference works in the social sciences.16

While it will take a good bit of real market and library use research to resolve the demand question, we can point to special situations in which book content indexing would clearly fill a need. One example is the case of access to remote collections. Users accomplish their own book indexing now by going to the shelves and thumbing through likely materials. An online tool could substitute for physical handling. Further, many books contain the kinds of concise information users seek in journal indexes—for example, criticisms of individual works of art or literature, or statistical data. An emerging field of research or a new focus on a topic that is coalescing from interdisciplinary work may be discovered only as
sections within books for several years until basic monographs are published on the topic. It should be possible to define criteria for selecting monographs that merit fuller content analysis. One estimate that has been forwarded is that four to five thousand of the more than eighty thousand English-language titles cataloged annually by LC would be candidates for content indexing.\(^7\)

Perhaps these arguments have convinced some of you that there is an important, unmet demand for online databases of book index information, at least in selected subject areas. But why would we want to put this information into the library catalog? Information overload and "false drops" are already becoming significant problems in online catalog searching. Why further clutter search results with index entries?

For over a century, library users have sought information in specialized abstracts and indexes; children are taught to use the Readers' Guide to Periodical Literature along with the library catalog. Many abstracting and indexing services already cover selected monographic literature. If there is a demand, shouldn't A & I services simply expand their coverage? As noted by Lucia Rather and Mary Kay Pieters, "The purpose of subject headings is to serve as a finding device to locate items in a [local] collection."\(^8\) Library cataloging need not duplicate the function of abstracting and indexing services.

The counterargument to this position is that the nature and potential of the online catalog are forcing a fundamental change in the role of the library catalog. Free of the physical limitations of the card catalog, our records can contain more access points. Linked to external databases by a variety of telecommunication technologies, our online catalog terminals can serve as gateways to other catalogs and to abstracting and indexing databases. Our users are, in fact, asking for indexing information in the library catalog. Respondents to CLR's Online Catalog User Study ranked access to book indexes and tables of contents as the second most desired enhancement to the online catalog.\(^9\) Convinced of the computer's omnipotence, users are also hoping to find journal articles in the catalog. Law and medical librarians in the University of California system are looking at ways to provide access to legal and medical periodical indexes through MELVYL, the university's online union catalog. If their proposals are approved, their studies will help us gauge the likelihood that the online catalog will grow from a single store into a bibliographic shopping center.

### ALTERNATIVES FOR BOOK CONTENT INDEXING

We can add another dimension to our consideration of enriched subject access to books by examining whether there are at least viable alternatives for producing and distributing book content indexing information. We also need to consider which alternatives hold the most promise.

Both in the literature and in professional discussions, a considerable number and variety of means have been suggested for providing access to the subject content of books. We can characterize these methods in terms of two aspects: the first aspect is the technique used to derive the index terms; the second is the way in which the records are made available to users. To help analyze the methods, we can form a simple matrix.
for describing the various alternatives and outline a few basic categories (figure 2).

There are essentially two categories for describing techniques for deriving the subject terms—controlled vocabulary indexing on the one hand, and on the other, selecting terms drawn from the books themselves, that is from indexes, tables of contents, or abstracts. These are shown along the left-hand side of the matrix. The methods for record distribution can also fall into two neat categories: either the records are included in MARC format library catalog databases, or they are not. However, in looking at the alternatives pragmatically, it is useful to further subdivide the former category into suggestions for enriching MARC records at the source (i.e., those alternatives requiring action by the Library of Congress) and suggestions for enriching MARC records after LC tapes are distributed. These three categories are shown across the top of figure 2.

Let us look first at the possibilities for creating separate databases of book index information. While these databases would not directly enhance the library catalog, their existence might well obviate the need to augment the MARC records used by libraries. And, if the online catalog of the future becomes a gateway to a variety of abstracting and indexing databases, a separate book index database could supplement searches at the catalog terminal.

The first alternative listed is simply to include monographs in existing abstracting and indexing tools. This already occurs to some extent, but such coverage would have to be greatly expanded before we could say that the content of most appropriate monographic works is as accessible as information found in the journal literature. An obvious advantage of this option is that it builds on our existing system of access to printed information, which does seem to work. It would also place responsibility for selecting the monographs to be covered in the hands of organizations that already serve special groups and subject disciplines.

The next three alternatives are to create a separate new tool, or several tools, to index selected monographs. Like existing journal indexing products, these might be commercially produced or supported by discipline-based organizations. They would be made available through existing database vendors and perhaps eventually linked to online catalogs.

The alternatives are categorized by the different means for creating the index databases. The first of these is to use subject terms selected from a controlled list—the choice of thesaurus would depend upon the coverage of the book database. LC subject terms are even a possibility. This is a labor-intensive way to create the database, but would provide a product comparable in quality to existing journal indexes.

The other two methods rely on terms taken from the tables of contents and indexes of the books themselves. The most direct method is simply to reproduce in a searchable database all such terms from a very select set of monographs. This is the approach taken by Superindex. A well-designed study of the effectiveness of Superindex searches is needed before we can evaluate this method. The fourth alternative suggests using Cochrane’s Subject Access Project (SAP) technique to provide content
<table>
<thead>
<tr>
<th>CREATE SEPARATE DATABASES</th>
<th>INCLUDE IN LC MARC RECORDS</th>
<th>ADD TO UTILITY DATABASES/ONLINE CATALOGS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONTROLLED VOCABULARY</strong></td>
<td>1. Include books in current A &amp; I coverage.</td>
<td>5. LC does content indexing for select set of monographs.</td>
</tr>
<tr>
<td></td>
<td>2. New indexing databases for monographs.</td>
<td></td>
</tr>
<tr>
<td><strong>UNCONTROLLED VOCABULARY</strong></td>
<td>3. SUPERINDEX</td>
<td>6. LC uses SAP technique on select set of monographs.</td>
</tr>
<tr>
<td></td>
<td>4. Use SAP technique to create specialized databases.</td>
<td>7. Publishers supply analytic abstracts which LC includes in bibliographic records.</td>
</tr>
</tbody>
</table>

Figure 2
Alternatives for Producing and Distributing Book Content Indexing
coverage of a selected set of monographs. While a SAP-derived database has never been compared to Superindex, the greater selectivity of the SAP application suggests that it would produce search results superior to the catchall Superindex technique. Of course, both methods are limited by the adequacy of back-of-the-book indexes. A study by Cochran and others revealed that many books, even scholarly monographs, are not indexed at all; others are poorly indexed.

The SAP method was actually developed to enhance MARC records for use in an online catalog. The remaining seven alternatives shown on the matrix suggest options for creating enriched MARC records and for making them widely available to the library community. Some advocates of enriched records have called for LC to produce enhanced MARC records as part of its national record distribution program. They argue that while this approach would be costly for LC, it would be cost effective on a national scale.

Alternatives five through seven describe three different methods for adding book content information to LC records. Controlled vocabulary indexing, using LCSH, would be the most labor-intensive option but would add ten times the number of meaningful LC subject headings to at least a select group of MARC records. A likely side benefit—and cost—would be the addition of more specialized terms to the LC subject headings list.

The next alternative, numbered six on the chart, would also have LC select a group of monographs for content indexing, but proposes the use of the SAP technique rather than actual subject analysis. This option would be less costly to LC, since SAP can be applied more quickly than traditional subject analysis and does not require that the indexer have special subject knowledge. However, it would require that online catalogs be designed to index and retrieve a new set of uncontrolled descriptive terms. The MARC field 653 should be able to accommodate these terms.

Option seven has been put forward as one that would demand little extra labor of LC staff. This is the suggestion that publishers be asked to supply the library with analytic abstracts that could be keyed into a special note field in the MARC record. This could be a quick and easy way to stuff subject information into MARC records, but it is difficult to predict whether more than a few publishers would be persuaded to supply useful abstracts. Like alternative six, this method would require online catalog designers to devise effective ways to manipulate new kinds of catalog information since many online catalogs do not index the notes field.

A question central to considering any of these three alternatives is, Should we expect the Library of Congress to provide book content subject indexing as part of its record distribution service? A reallocation of the LC budget to produce such augmented records would represent a major shift in the policy and mission of LC's Processing Services. The library's MARC records are created to describe and provide access to bibliographic entities which are, for the most part, physical items that must be stored and retrieved. The records are distributed to help other libraries play the same role. While some may view provision of access to the content of these same items as part of that mission, that position is
arguable. We cannot expect LC to take a radically new view of its bibliographic records—especially a view with large dollar signs attached—unless we can present it with a well-documented case for change and a strong demand from the library or library-user community. The hard research evidence needed to make such a case for enriched MARC records does not yet exist.

The critical next step, then, would be to build enriched online catalog databases and test their value to a variety of library users. The four alternatives numbered eight through eleven are possibilities both for developing test databases and for maintaining ongoing distribution of enriched MARC records. They are grouped together because each method would add book content information to MARC records after the records leave the Library of Congress. The first option is one that has been suggested by Brett Butler in his proposal to establish the Book Indexing Group (BIG) project. Briefly, BIG would develop a separate MARC format database of content indexing for a set of selected monographs. The database would use LC subject headings and would be designed to load and merge with MARC databases in online catalogs, matching the individual MARC records by LC card number or ISBN. The indexing could be done by a cooperating group of libraries or through a specially funded project. As online catalogs proliferate, sales of the BIG databases might even make it self-supporting. Butler suggests that the first test development of BIG would be in a narrowly defined subject area so that the database could be as complete as possible for the subject targeted.

The tenth alternative suggests an effort similar to BIG, using uncontrolled descriptors derived from applying the Subject Access Project technique. Options nine and eleven are plans for similar enhancements of MARC records—either with LC term indexing or SAP-derived terms—but the options propose that the enhancement be done online to one or more bibliographic utilities. Libraries could then elect to have enhanced records added to the tapes produced for their online catalogs. A successful model for such enhancement of records in shared utility databases is OCLC’s work with the Association of Research Libraries Microform Project, predicting that these two alternatives are workable.

However, it is probably premature to establish the technical and political apparatus necessary for altering records maintained on the bibliographic utilities. We would first want to observe expanded records actually used in operational online catalogs. Creation of a separate, fully MARC-compatible database for loading into selected library catalogs could be a manageable project, particularly if the subject coverage were narrowly restricted. With regard to the last four alternatives, the most logical next step would appear to be a test of the BIG project. At the same time, further testing and application of the SAP method is warranted—anyone about to build a special database of monographic materials should give this method serious consideration. If we move forward on both of these fronts, we can begin compiling the data needed to answer responsibly to our users’ requests for book content information in the online catalog.

This paper has been an exploration of two questions: Can we, and should we, provide book content indexing in the online catalog? The
verdict is still out. Eventually the decision will be made by a jury of library users. But the librarian’s role is not passive. The possible alternatives suggested in this paper need to be tested and weighed against cost-effectiveness and need. Should we enhance the MARC record to improve subject access? We won’t know until we try.

REFERENCES AND NOTES

5. Ibid., p.71.
12. Cost figure based on estimates provided informally by Mary Kay Pietris, Chief of LC Subject Cataloging Division ($10 to $11 per item, including routine development of new class numbers) and Julianne Beall, Decimal Classification Specialist, LC Decimal Classification Division ($4 to $5 per item for total DDC classification cost).
System Features for Subject Access in the Online Catalog

Gary S. Lawrence

Recent research shows that users of online catalogs find subject searching difficult, that characteristics of subject searches are qualitatively different from those of known-item searches, and that some design features of online catalogs appear to perform better than others for topical searching. It has been recommended that system designers develop different approaches, or interfaces, for different kinds of searching. This paper reviews available design techniques from a subject-searching perspective, including various methods of indexing bibliographic records, processing and correcting user input, searching the database, and displaying search results. The review concludes that there are many alternative approaches, each with strengths and weaknesses, and combining techniques in new ways may have unknown results, but many promising methods are nonetheless available now to make more effective use of the subject information in current bibliographic records.

SUBJECT ACCESS AND CATALOG DESIGN

This paper describes the various ways in which software systems for online catalogs can be designed to enhance subject access. Subject access is a special problem from the point of view of online catalog designers because the requirements of subject access are demonstrably different from those of access by author or title.

A recently completed research project examined more deeply the data from the Public Access Catalog Project of the Council on Library Resources questionnaires to discover whether information reported by each of the participating systems was consistent with the aggregate data, and to see what new information might be uncovered. With respect to subject searching in online catalogs, we discovered two things: first, that subject searching and known-item searching appear to be qualitatively different activities, and second, that some features of online catalogs perform better than others for topical searches.

In this analysis, we first tried to determine what factors most influenced the users' reported success and satisfaction with their online catalog searches and with the online catalog in general. One group of factors was associated with the characteristics of the users themselves, and an-

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other group was linked to the tasks they were performing with the online catalog. Tasks were divided into three types: searches for specific books, for one or more books by a specific author, or for books on a topic. We found that, in a majority of the thirteen systems studied, task variables had more influence on success and satisfaction than user characteristics, and in most cases, users searching by subject were less satisfied with the search results, but more satisfied with the online catalog in general, than users conducting other tasks.

Additional analysis, focusing on differences attributable to user tasks, suggested that certain features of some systems either influenced the relative frequency of subject searching or were associated with increased success and satisfaction in subject searches. Some designs are apparently better for subject searching than others. The nature of the difference was such that the investigators recommended an entirely new principle for the development of user interfaces for the online catalog: that different approaches be provided not only to appeal to users of different levels of experience (an approach that is not uncommon in catalog designs today), but that different approaches be developed for different information needs, and specifically that separate approaches to searching be provided for subject and known-item searches.

In this paper I hope to identify the menu of techniques that can be drawn upon to provide the different access methods that I believe to be required for effective online catalogs. The paper will not deal with the subject information in catalog records, but rather with the techniques available to system designers to use and display the available subject information.

It examines features found in systems designed specifically for public users, either as production systems or preproduction prototypes. Systems designed for other purposes, or purely experimental systems, will not be considered here. Examples will be selected from the Ohio State University Library Control System, or LCS; the Mankato State University Catalog Access System; the online catalog of the National Library of Medicine, called CITE; from the University of California's online catalog, MELVYL; and from a few others where necessary, but the paper will not provide a comprehensive comparison of systems. Finally, where possible, some consideration will be given to the effects of these techniques on user satisfaction, but generally the methods will be described rather than evaluated.

A SYSTEMS VIEW OF ONLINE CATALOGS

The first point to keep in mind when considering how to design online catalogs for subject searching is that online catalogs do not simply happen. Data coming into and going out of the online catalog are processed in various ways, and at each processing step events occur that can influence the nature and effectiveness of subject searching (see figure 1).

First, bibliographic records are processed and stored in the system’s database. Most systems create and build indexes containing the words, phrases, and headings extracted from records, along with information linking the index entry to the record or records from which the entry
came. Someone has to decide which parts of each bibliographic record contain subject information to extract for the subject index, or more technically, which fields and subfields of the MARC records to index. The first design decision, then, is what to search.

Just as bibliographic records are processed by the computer, so is the information entered by the user. Typically, the string of letters typed by the user is “normalized,” that is, converted into a standard form that the system understands. For example, the user’s entry might be converted to uppercase, and extra blanks and unnecessary punctuation removed. The results of this processing are used by the system to conduct the actual search, so that processing of user input can have an important, if often hidden, effect on subject searching. Thus, the second design decision involves how to handle the user’s input, that is, what to search with.

The system then executes processes to match the user’s input to the contents of the database. It is in this area that most attention to the system design aspects of subject searching is typically concentrated. Techniques like keyword searching and the use of Boolean operators would be included here. The third design decision, then, concerns how to search.

Finally, the system displays the results of the search to the user. Processes brought into play here reflect decisions about what information to
display and in what format. It may be that the manner in which search results are displayed is as influential to success as the methods by which the results are obtained. The fourth design decision thus revolves around how to display search results. We will consider each of these four decision areas in turn.

**WHAT TO SEARCH**

In creating the database, the online catalog designer has various choices about the elements to include in the subject index. Any or all of the following are eligible: subject headings; titles; notes; authority records; classification numbers.

**Subject Headings**

We can begin at the simplest and most obvious point, with the subject heading fields themselves: presumably, online catalogs that permit subject searching provide access to subject headings. Even at this basic level, however, there is room for diversity. The catalog at Mankato State University includes the National Library of Medicine’s Medical Subject Headings (MeSH) in the subject index when these headings appear in the record, and so does the University of California system. These two systems do not necessarily discriminate as to the source of the subject information when building the index, however. At the University of California, for example, MeSH terms are presently treated like Library of Congress heading terms and other subject information in the subject index. In Northwestern University’s LUIS system, by contrast, MeSH headings enter a separate index. Users wishing to use the MeSH heading system must search the medical headings index separately.

**Titles**

One of the commonly recognized problems in relying on established subject heading schemes is that the subject vocabulary rapidly becomes out-of-date; another is the limitation on the number of subject headings typically assigned to a single title. One way to provide additional access points is to include information from the title of the work, for we may presume, with only a bit of occasional discomfort, that a title, like a subject heading, attempts to say something about the content.

As a purely technical matter, there are several ways to go about adding title information to a subject search: (1) by including title information in the subject index, (2) by using Boolean capabilities to conduct a search of subject and title indexes, or (3) by creating a separate keyword index including both subject and title terms. The University of California system uses the second approach, Boolean searches, and the Minnesota system uses the third, creating a separate keyword index.

Adding title information to the subject search may be a mixed blessing, however, as Pauline Cochrane has pointed out. Among the potential risks are an increase in the number of items retrieved, an increase in the number of “false drops” because title words are not subject to any form of vocabulary control, and increased retrieval times because of the high incidence of relatively common words in titles.
Notes

Just as potentially useful subject information can be found in titles, so might it also be found in notes fields, especially contents notes. However, the potential usefulness of notes fields is limited in practice due to the same considerations that apply to title information. Some information to be found in notes fields is unlikely to be an asset in subject searching, and as a matter of data-processing design, it may be difficult to distinguish between useful and useless information.

Authority-File Records

One of the chief problems experienced by the users of online catalogs is finding the "right" subject term to use in the search. Because a user's vocabulary often does not match the controlled vocabulary of our subject heading systems, and may not conform with the words occurring in titles or notes either, there is an important role to be played in the online catalog by a time-honored professional technique: subject authority control. Subject cross-references, established to guide catalogers and users to authorized or related headings, can be used to guide users from the terms they type into the online catalog to the terms actually used in the database records.

Subject authority records can be used in two ways. The simplest is to search an authority file directly, so that users are informed of the see or see also references associated with the terms they entered. The second approach is more automatic: the online system can directly search the database using the authorized forms taken from the authority file. This approach is used in the University of California MELVYL system. The second approach has the advantages that the user need not type in a new search, nor understand the syntetic structure of the subject access system. However, the user may be surprised and confused when the records retrieved are found to have subject headings that differ from the ones the user entered. In the first approach, at least, the relationship between the terms entered, the authority cross-reference, and the records retrieved is made explicit to the user.

An intermediate approach is used by CITE at NLM, where all headings, including those retrieved by cross-references, are displayed for the user to include or exclude in the search. Similarly, users at Ohio State are shown and can select subject headings linked by see references, but must take an additional step to display and use search terms appearing in see also references.

Classification Numbers and Associated Text

Another, and very promising, source of subject information is the classification system. Most records contain at least one classification number, and records derived from the LC MARC data files typically contain more than one. Unfortunately, a class number, taken by itself, contains little subject information, although a display of retrieved records in classified, or shelflist, order can be a useful browsing technique. The real strength of this approach comes from linking the class number
to the textual information and numerical sequencing of the classification schedule itself. Aspects of this technique are described in a related paper by Karen Markey.16

WHAT TO SEARCH WITH

Once the records are in the database and the indexes updated for use, we must turn our attention to the catalog user and the problems of communicating an information need to the computer. We will not consider the various alternative forms of command languages and menu approaches here, for there is presently little evidence suggesting that differences in this area affect searching specifically. Rather, we will be concerned with some more mundane matters, for example, how to help the user who can neither type nor spell. We will look at two devices for manipulating the user’s raw entries: (1) truncation and stemming and (2) spelling correction.

“RAW” ENTRIES—WORDS AND PHRASES

Let us begin by considering the unprocessed user entry—a string of computer instructions and search words—setting aside for now consideration of menu-driven and touch-screen systems that reduce or eliminate the amount of information typed in by the user. After normalizing this string of text, and identifying its component parts, the system will attempt to match the user’s search words and phrases against the contents of the indexes. If everything goes well, the user who is a master of the library’s subject vocabulary, understands the syntax rules and command language of the catalog, and is a flawless typist may discover whether the library holds anything on the topic of interest.

Problems arising from failure to understand search syntax or from typing errors are not endemic to subject searching but afflict all interactions with online catalogs. Problems of vocabulary are not limited to subject searching, but are nonetheless predominant when we consider the relationship between the user’s expression of a topic and its representation in the controlled vocabulary of most subject heading systems. In any case, anything the system can do to help minimize these problems or ameliorate their effects will be helpful.

TRUNCATION AND STEMMING

All too often, the word entered by the user is close to an existing index entry or authorized subject term but varies for purely grammatical reasons. For example, the user may enter the singular form of a word for which the authorized term is plural. Many systems provide for this possibility by permitting explicit truncation (figure 2). In such systems, the user can enter a special symbol, typically at the end of the term, directing the system to match the user’s entry with any index terms beginning with the letters typed by the user.

An important variation of explicit right truncation is middle truncation, as offered in the Minnesota State University system,11 for example (figure 2). In systems with middle truncation, or “wild card” symbols, as they are often called, the user might type in the letters “wo m ? n” to
1. Right truncation

WO M #
matches
WOMAN
WOMEN
WOMBAT

2. Middle truncation

WO M ? N
matches
WOMAN
WOMEN

3. Stemming

COMMUNICATION

generates the terms

COMMUNICATE
COMMUNICATION
COMMUNICATIONS
COMMUNICABLE
etc.

Figure 2
Truncation and Stemming

match either the singular "woman" or the plural "women." With right truncation, this retrieval can only be accomplished by typing in the letters "w o m" and the truncation symbol, which will also retrieve such delightfully relevant terms as "wombat."

The system can automatically apply truncation rules to the user's input. Automatic right truncation is relatively common, especially in systems that permit searching only on full subject headings. If a user enters only a single subject word, for example, the system will retrieve all headings beginning with that word, not merely headings consisting of the word alone. It is possible to extend automatic truncation to every word in a phrase entered by the user, but this technique could lead to some large retrievals with spectacularly interesting "false drops."

A more sophisticated version of automatic truncation is a technique known as stemming. Automatic stemming can work in either of two directions. First, it can improve the results of ordinary truncation by generating both regular and irregular plurals and variants. More important, stemming techniques can "take apart" the words entered by the users, identify the appropriate stem words, and then generate the associated
singular, plural, and variant words. For example, if I were searching in
the University of California catalog for books about communications
companies, I might enter the truncated term “communicat,” with a
truncation symbol, in order to match “communicate,” “communication,”
or “communications.” In a system with a stemming program, I
might be relieved of the onerous responsibility of thinking of all the vari-
ants of “communication” under which materials might be indexed. In-
stead, if I entered the word “communications,” the system itself would
work back to the root word and generate the variations for me (figure 2).
The CITE system at NLM makes extensive use of stemming tech-
niques.\"}

**Spelling Correction and Variation**

These techniques to link the user’s terms to the catalog’s vocabulary
will be helpful only if the user’s terms are entered correctly in the first
place. Whether through occasional typing errors or spelling problems,
the user’s search terms are often simply incorrect. Some of the tech-
niques described earlier can help. If the user knows that he or she cannot
reliably spell certain words, middle truncation can be helpful. If, for ex-
ample, you are not sure whether “i” comes before or after “e,” enter
the word “receive” with two “wild cards” after the “e” (i.e., “re-
c??ve”). You will, unfortunately, retrieve a number of words other than
“receive,” but you will at least not be hampered by a spelling problem.
Automatic stemming can serve a similarly useful function, at least as
long as the error occurs toward the end of the word, and the stemming
algorithm is capable of identifying the root when the suffix is in error.

We can go beyond these techniques to formal methods for spelling
 correction, and some currently operational systems in fact go this extra
distance. One method is to pass user entries (especially those retrieving
zero records) through a standard spelling-correction program of the sort
available on many mini- and microcomputers. Because most such pro-
grams are dependent on an external dictionary of words and common
misspellings, they are often slow and expensive to run and are of no par-
ticular help if the user’s entries happen not to be in the dictionary.

A more robust and less expensive technique is exemplified by the on-
line catalog at the Washington University School of Medicine, where,
“if nothing is found under the term entered, the system drops trailing
s’s, double consonants, and vowels, then attempts to match the remain-
ing consonants with terms in the indexes.” This method, called the
“keyword approximation search” by the designers, is relatively fast and
easy; like truncation, which it resembles, it may retrieve more than was
intended, however. In figure 3, we see that the method effectively re-
trieves the term “railroad” from an egregiously misspelled version, but
also retrieves “piano” when the user input “pony.”

Another processing method that can be used to catch erroneous en-
tries and try out likely alternates is the use of a Soundex algorithm.
Soundex algorithms are programmed routines that attempt to identify
words that, if pronounced aloud, would sound like the term entered by the
user. The effect is somewhat different from the “keyword approxima-

\[\text{System Features for Subject Access} \]
Keyword Approximation
(Washington University, St. Louis)

RALERODE
becomes
RLRD
and matches
RAiLROAD

** but **
PONY
becomes
PN
and matches
PIANO

Figure 3
Spelling Correction Techniques: Keyword Approximation

tion search,” because alternative spellings are generated according to specific grammatical rules, but the principle involved is similar. This method is used by the ADLIB system developed by Advanced Library Concepts. In figure 4, for example, we can see how the letter combination “gh” can be programmed to match the letter “w” in specified circumstances, to retrieve the word “bough” from the input “bow.”

**HOW TO SEARCH**

So far, we have on the one side constructed an ordered database, with appropriate indexes, and on the other side have received and processed a user’s search request. There remains before us the question of how to match the user’s request with the indexed information. Search strategies involve the use of (1) headings, (2) keywords, (3) Boolean operators and search limiters, and/or (4) mixed approaches.

**HEADINGS**

There are two somewhat extreme approaches to search methods in online catalogs and a variety of techniques in between. At one extreme, subject headings are searched from left to right, much as a user might find them arranged in the card catalog. The most rigorous version requires users to enter LC subject headings exactly as they would appear on a catalog card, including punctuation and spacing: one mistake, zero
Soundex Algorithms  
(Advanced Library Concepts, Inc.)

B O W
becomes
B W

and can be programmed to match

B o u G H

Figure 4
Spelling Correction Techniques: Soundex Algorithms

hits. A somewhat more generous approach offers right truncation, as described above: the system matches all headings that begin with the word or phrase entered by the user. This is the technique used by the Ohio State system.

This approach presents several problems. First, the subject terms entered by the user may not correspond to the controlled vocabulary of the subject heading system. To some extent, of course, this problem can be addressed by an authority control system, which will in some cases direct the user from the terms entered to the vocabulary actually used in the catalog. However, the user may choose terms that are valid modifiers or subdivisions, but never appear in the first position in a heading. In these cases, the authority control system may sometimes be of help, and we might be reassured that at least the user is no worse off than when using the card catalog.

Assuming that we want to improve subject searching, however, we should take little consolation in that point. The structure of LC subject headings causes some words to be initial words in some headings, but modifiers and subdivisions in others. Consider the various locations of the word "library" in these headings, extracted from records in the University of California online catalog (figure 5). The entry of a particular word or phrase will retrieve some relevant records, but not necessarily all. Conversely, the same word is used in different ways in LCSH, and the sense of the word may be associated with its position. Some headings from MELVYL demonstrating uses of the words "film" and "films" are shown in figure 6. Note that users wanting information on the chemical and optical properties of thin films or metallic films are apparently out of luck if they enter only the word "film" in a heading-search system. All they will retrieve is material on motion pictures.
Search request: FI SU LIBRARIES
Search result: 2411 records at UC libraries

Public libraries -- Addresses, essays, lectures.

Data libraries -- United States -- Directories.

Libraries, University and colleges -- Administration -- Statistical methods -- Case studies.

Acquisitions (Libraries)

Karachi (Pakistan) -- Libraries

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Figure 5
Some Subject Headings Using "Libraries"

KEYWORDS

At the other extreme, system designers may attempt to overcome the limitations of heading-based searching by providing keyword searching. In this approach, an index entry is made for each significant word in the indexed fields, rather than just one entry for the entire heading. With a keyword search technique, the user’s terms will retrieve records regardless of where the terms appear in the heading. Keyword searching overcomes some of the problems of heading searches, but imposes its own costs. For one thing, keyword indexing results in much larger indexes, increasing disk storage and computer capacity requirements and sometimes slowing response time. From the user’s point of view, the cost of keyword searching is in the form of very large retrievals and numerous “false drops,” where the user’s search term retrieves records using the term with a different meaning or in a different context. We referred earlier to two different meanings of the word “film.” If we inspect these headings once again, we see even more differences. In figure 6, for example, is a heading on X-ray films; the book it references deals with the economics of medical radiology and prospects for recycling silver from used X-ray films. Figure 6 also contains a heading having to do with the preservation of photographic film. A user entering the term “film” in a keyword system will retrieve records involving all these meanings of the word “film,” as well as those scientific and engineering texts having to do with thin films and the like.

Consequently, keyword searching should always be accompanied by simple and effective means of search limiting, that is, methods by which the user can discover which records are relevant and reduce the search result on the basis of that information.
Search request: FI SU FILM#
Search result: 748 records at UC libraries

Moving-picture film collections -- Washington (D.C.)
Safety film -- Preservation.
Radiography -- Films
Metallic films
Thin films -- Optical properties.

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Figure 6
Uses of the Word "Film" in LC Subject Headings

**Boolean Operators and Search Limiting**

The method in common use for making keyword searching manageable is the set of Boolean search operators, *and*, *or*, and *not*. Using these operators, users can combine keywords to expand or limit results, or to search multiple indexes simultaneously. In principle Boolean capabilities can effectively deal with the endemic problems of the keyword approach, but they do so at some cost in terms of computer system size, disk space, and response time. Of more importance, the system must be designed to help users find information that they can use to conduct the search, and it should be recalled that Boolean logic is not necessarily human logic: there is some evidence that catalog users, applying Boolean operators as if they were English conjunctions, wind up applying them incorrectly. 15

**Mixed Approaches**

Alternatives are preferable to dilemmas, and so it would be nice if there were something between the extremes of heading and keyword searching from which designers might choose. Fortunately, there are some other techniques warranting consideration. Let us examine some approaches that lie between heading and full keyword searching on the spectrum of search methods.

**User-Delimited Phrases.** If false drops are a problem, one way to help is to let the user establish the context in which the keyword is used. One way to accomplish this is to permit "phrase searching," in which the user can enter a string of words that must be matched, word for word, in the order specified—a capability provided by the online catalog at Dartmouth. Returning again to our example of the various uses of the word "film" in LC subject headings (figure 6), we can see clearly that the us-
er's ability to enter the phrase "thin film" would be of great assistance in narrowing the search. Phrase searching is more precise than keyword searching, but more flexible than heading searching, because the user's phrase need not be at the beginning of the heading. Also, phrase searching can be designed so that the problems of entering exact spacing and punctuation, which may afflict heading-search systems, are avoided.

**Adjacency.** Adjacency searching is a straightforward extension of phrase searching. In this technique, the user specifies that two or more words must be present in the record, in the order indicated, but not necessarily next to one another; as long as they are within two or three words of each other, or some other value specified by the user, the record will be retrieved. No production catalog now uses this method, and we can conjecture about the potential difficulties of training users to take advantage of this capability and should question its relevance when searching files composed of cataloging information, which tends to have relatively limited textual variability compared to the contents of the abstract and full-text databases for which adjacency searching was designed.

**Selectively Rotated Subject Headings.** One provocative approach to this problem, which is not, to the best of my knowledge, used in any operating catalog, was a proposal by William Mischo to selectively manipulate subject headings and titles in order to present important words and word pairs at the beginning of the index entry in a heading-based retrieval system. Mischo's proposal would provide new index entries that would be searched left to right, just as in conventional heading-search systems. The new index terms are created by selectively rotating the headings, taking account of structural characteristics of LCSH headings and the contents of defined subfields. By extension, words from title fields could be extracted and indexed along with subject terms, under the same selective control. This approach may have an advantage over keyword searching, in that the algorithm could avoid bringing irrelevant terms to the first position and could assure that pairs of terms are not brought together inappropriately. According to Mischo, the result should provide many of the benefits of Boolean keyword searching, but reduce the number of false retrievals. One might think of this approach as "prepackaged" Boolean searching, with Boolean operations controlled by library and system staff, rather than by catalog users, to minimize the incidence of erroneous coordination of terms.

**Giving the User the Choice.** Finally, some systems give the user the responsibility of dealing with the dilemma, by providing both heading and keyword searching capabilities. The Minnesota State system, for example, permits users to choose between a subject heading search and a keyword search that accesses multiple fields. Another approach is that used by CITE, the National Library of Medicine system, which uses keywords, but shows the user the headings retrieved by the keywords and allows the user to select the headings that will be included in the search.

**HOW TO DISPLAY RESULTS**

Now that the computer has completed its search, it's time to show the user what he or she has found: to display the search results. For author/
title searching, this is a relatively straightforward matter, although there are important issues of display format and record content to be considered. In subject searching we can presume that the user faces a more complicated task: determining which, if any, of the citations retrieved is relevant. The challenge for designers, then, is not only to display results clearly and concisely, but to do so in a way that helps the user identify relevant records and refine or redirect the search. Lists of matching subject headings and lists of class numbers in shelflist order have been used to facilitate selection. Even with these techniques the content of the bibliographic records and the order in which they are displayed affect the efficiency of retrieval.

Headings Lists

One way to help the user find relevant information is to display the subject headings that match the search request, before displaying the records that are indexed under those headings. Figure 7 shows the subject headings matching the search term “communications” in the MELVYL system. We can see that first of all, there are numerous subject headings containing this term: more than one thousand in the catalog at present. Secondly, the term does not appear as the first word in these headings in a significant number of cases. Finally, the term is used in a great variety of ways, only some of which may be of interest to the user.

What are some of the advantages of displaying headings in a subject

AC Search request: ACF SB COMMUNICAT#
AC Search result: 1062 records found in the authority file

Airports -- Communication systems.
Communication
Communication in agriculture
Communication in housing policy
Communication in management
Communication in medicine.
Communication in politics
Communication of technical information
Emergency medical services -- Communication systems.
Microwave communication systems
Mine communication systems.
Mobile communication systems
Nonverbal communication (Psychology)
Optical communications

Figure 7
A Headings Display for “Communications”
search? First, because there are generally fewer subject headings than associated records, the user can scan the list more rapidly. In the example in figure 7, there are 1,062 subject headings using the term “communications” but almost 3,000 records indexed under those headings (2,985 on June 15, 1984, to be exact). Second, if the system permits the user to select only one, or perhaps a few, of the matching headings for record display, significant numbers of “false drops” can be eliminated early in the search process. In figure 7, the headings describe technical, social, and psychological approaches to the topic. If our searcher were interested in the psychological aspects of nonverbal communication, this display would be especially valuable. Of the 2,985 records indexed under headings using the word “communication,” only 155 use the terms “nonverbal communication.” The headings display permits the user to identify the correct terms and narrow the search much more rapidly than would be possible through a review of all records.

The promised benefits of headings display are supported by empirical findings. In the recent re-analysis of data from the Council on Library Resources Public Access Project, discussed earlier, we examined six systems that use this practice, comparing them to seven systems that display only records. We found that the heading-display systems were rated by users as particularly effective in subject searching and generally displayed higher average levels of user satisfaction than the other systems.

**Classification Lists**

Two other techniques can be considered related to headings display as a user aid. One is a shelflist search, in which users can enter the call number for a relevant item and see a sequential display of items with call numbers appearing on either side of the number entered. This capability is offered, for example, by the “shelf-position search” in the Ohio State University LCS system. The problem with the shelf-position search is that it requires the user first to know at least one relevant call number or part of a call number, and second, to enter it correctly in order to generate at least one “hit.” A more promising, if more complex, approach is to display information derived from the hierarchical structure of the classification system itself. Markey’s paper reviews the potential of classified display in greater depth.

**Bibliographic Records and Their Parts**

Whether or not headings are displayed first, eventually we get around to the display of the bibliographic records themselves. I presume here that displays will follow good general principles of video display design and that several levels of display options, showing successively greater amounts of information about each record, are available to the user. The most important point to remember, and one often overlooked in current designs, is that subject searches should display subject information. Especially when retrieval sets are large, the user is not helped to narrow or redirect the search when confronted by several screens of one-line records containing only authors and truncated titles. When possible, sub-
System Features for Subject Access

Subject searches should display subject data: complete titles, subject headings, and notes, for example.

In addition to incorporating subject information into the display formats, it is possible to add subject-oriented features to the display command itself. In MELVYL, for example, users can ask for specific fields of retrieved records to be displayed, including subject fields. Figure 8 shows the result of entering a "display subjects" command after completing a search on the subject term "franchise." Note that the term is used in three different ways in these three records: as a synonym for suffrage in the first, as a proper name for a government entity in the second, and as a business term in the third. This kind of display not only shows the different usages and allows the user to select the relevant ones, but also displays other subject headings assigned to potentially relevant books, permitting the user to redirect the search to more appropriate and productive terms.

Order of Presentation of Records

Not only is the content of displayed records important, so is the order in which the records are displayed. Conventional alphabetical sorting

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**USER ENTERED: display subjects**

Search request: FI SU FRANCHISE
Search result: 3 records at UC libraries

   - Actresses' Franchise League.
   - Women in the theater
   - One-act plays, English -- Women authors.
   - Women -- Suffrage

   - California. State Board of Equalization.
   - California. Franchise Tax Board.
   - Administrative law -- California.

   - Success.
   - Franchise (Retail trade)

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Figure 8
A Display of Subject Headings from Retrieved Records
orders may have no particular value for the user scanning large retrieval results for relevant items, especially when the sort is based on the main entry, an element that usually has no subject content at all.

One alternative is to present results in order by date, with the most recent publications listed first. The Ohio State system is one that follows this practice. This technique has the virtue of presenting the most recent publications on a topic first, which should be a significant convenience for many users. It should be noted, however, that date ordering would be most beneficial when the search is as precise as it can be and still retrieves numerous records. If the user has entered an overly broad or inappropriate subject term, date ordering may not be particularly useful in locating relevant records.

Another potentially useful order of presentation is by classification number. This technique resembles the Ohio State shelf-position search, but does not require the user to enter a call number; rather it orders by call number the records retrieved by subject term. This technique has the virtue of bringing together for display records that are related by classification, a method that could help users locate clusters of relevant records, as well as suggest stack locations that might be fruitful for at-shelf browsing. No system uses this sort method now, and we can imagine that a display so sorted might be confusing to users, and also difficult to manage if the number of records was very large and distributed among several classification areas.

**CONCLUSIONS**

From this review of design options for subject searching, I would like to draw four points that are of special importance to those designing or dealing with online catalogs.

First, numerous techniques are currently available for use in developing approaches to all four areas of design: indexing, processing of user input, searching, and display.

Second, each of these techniques, examined by itself, has both strengths and weaknesses. There is no self-evidently “right” approach to improving subject access.

Third, assembling a search method from this menu presents new risks, because the various techniques can interact with and influence each other and can do so in ways I cannot describe today because not all possible combinations are in existence in currently operational catalogs.

Finally, despite these risks, we can be reassured that methods are indeed available to make effective use of subject information in existing bibliographic records. Although the challenges are formidable, I am convinced that it is currently possible to design systems that can deliver on the enormous potential of online catalogs as subject access tools for library users.

**REFERENCES AND NOTES**


3. Ready, "Mankato State."


5. Ready, "Mankato State."


7. Matthews, Lawrence, and Ferguson, Using Online Catalogs, p.126.


9. Logan, "Ohio State."


11. Ready, "Mankato State."

12. Kozuma, "National Library of Medicine"; Doszkocs, "CITE NLM."


17. Ready, "Mankato State."

18. Kozuma, "National Library of Medicine"; Doszkocs, "CITE NLM."

19. Of these seven systems, one (University of California) featured heading display as an option, and the CLSI touch-screen system was classified as a "quasi-heading" system, because CLSI displays only a partial list of headings in a limited alphabetical range. See Lawrence and Matthews, Detailed Data Analysis.

20. Lawrence and Matthews, Detailed Data Analysis.

21. Logan, "Ohio State."


23. Logan, "Ohio State."
Subject-Searching Experiences and Needs of Online Catalog Users: Implications for Library Classification

Karen Markey

When the findings of the Online Catalog Evaluation Projects have been presented at public forums and meetings, the researchers have emphasized the importance of subject access to online public access catalogs. Survey and interview responses and transaction log analyses provide evidence that there is much more subject searching of online catalogs than expected, given the findings of traditional catalog use studies. Research into online catalog use reveals that users have problems with subject searching, particularly in the selection of subject vocabulary. And, when asked to identify desired improvements to online catalogs, library users select those that will expand and enhance subject searching. Subject searching, therefore, deserves much emphasis and attention in terms of online catalog improvement. This paper describes an experiment in the use of the Dewey Decimal Classification in online catalogs to introduce the classed approach to the subject searching of library collections, enhance the subject terminology indexed in the online catalog, and provide possibilities for search strategies not possible through the alphabetical approach of subject headings and/or keywords.

On January 21, 1982, an audience of approximately 125 convened at the University of Denver to listen to the preliminary findings of the Online Catalog Evaluation Projects. The findings were presented at a public forum by the principal investigators, whose five organizations had been funded by the Council on Library Resources (CLR). Edwin Brownrigg of the University of California began his presentation by asserting that "sacred cows are being strewn all over the landscape." With that remark, Brownrigg underlined that the findings were challenging, if not altogether negating, commonly held beliefs about searching the library catalog, especially the assertion that library users perform


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more known-item searches than subject searches. More recently, Brett Butler used the phrase, "the sleeping beast awakens," to describe the "ground swell of interest," among both library staff and patrons, around the phenomena of public access systems.

Such terms—sacred cows and sleeping beasts—applied to our shattered beliefs about searching library catalogs and to the new form of library catalogs imply our perplexity and confusion about the use of online public access catalogs. Yet, users have provided us with a host of recommendations for harnessing these beasts to build improved systems and system features. In this paper, we will review users' subject-searching experiences and needs and describe how a library classification, when incorporated into an online catalog, can improve their searches.

**Preponderance of Subject Searching in Online Catalogs**

The results of surveys and transaction log analyses in the online catalog use studies supported by CLR underlined the fact that subject searches are the predominant approach to searching online catalogs. Library patrons were asked to record the type of search(es) they had just made in the online catalog. This question was used to obtain their answers:

**User survey question 3. I searched for what I wanted by:**

- a. A complete author's name
- b. Part of an author's name
- c. A complete title
- d. Part of a title
- e. A topic word or words
- f. A subject heading or headings
- g. A complete call number
- h. Part of a call number

The online catalogs of fifteen libraries in the CLR-sponsored survey offered subject searching. The largest group of respondents at nine of these libraries—Syracuse University, Dallas Public Library, Iowa City Public Library, University of California, Dartmouth College, Library of Congress, Claremont Colleges, Stephen F. Austin University, and Mission and West Valley Community Colleges—checked the category "subject heading(s)." The largest group of respondents at the Mankato State University library checked the category "topic word(s)." There were only five libraries—the Ohio State University Libraries, Stanford University library, Northwestern University library, Pikes Peak Library District, and Evanston Public Library—where most users chose a response category representing a known-item search approach.

Researchers who have conducted surveys of library patrons independent of the CLR-sponsored Online Catalog Evaluation Projects have reported similar findings. Moore surveyed users of four different online catalogs; two offered subject-searching features. In one, most users had performed subject searches. In a system where subject access was not available, 20% of survey respondents reported that they had tried to per-
form subject searches by searching for titles.

Pawley surveyed an unreported number of users at the University of Guelph’s online catalog, a system without a subject search capability. Yet, 40% of the online catalog users in that survey reported that they had been looking for information on a subject. Alzofon and Van Pulis surveyed more than 575 users of the online catalog LCS (Library Control System) at the Ohio State University and found that the largest group of respondents (42%) had performed subject searches. They also reported that known-item searches were more successful than subject searches, but they failed to describe the criteria for determining a successful search. Steinberg and Metz found that 58 of the 85 surveyed users (69%) of the online catalog at the Virginia Polytechnic Institute had performed subject searches.

Siegel used the same instrument as the one used in CLR-sponsored research to survey more than 500 users of two prototype online catalogs at the National Library of Medicine and determine their prototype preference. Again, most users had performed subject searches.

At the Library of Congress (LC), Pritchard surveyed approximately 120 online catalog users of the SCORPIO system and found that 76% had done subject searches. When Pritchard identified types of searches by users’ affiliations (e.g., undergraduate student, member of Congress, private researcher), subject search was still the predominant approach by SCORPIO users regardless of affiliation. In a similar analysis of data gathered through the CLR-sponsored survey at the Ohio State University and Syracuse University, Markey reported that faculty and graduate students frequently employed known-item access points in online catalog searches, while undergraduate students employed subject access points. The results of similar analyses by Pritchard and Markey are inconsistent with each other; Pritchard’s results question the commonly held truth that, as catalog users increase their years of formal schooling, they are likely to perform more known-item searches than subject searches in the traditional library catalog.

The survey method has been criticized as a means of finding out the types of searches made by catalog users because it confounds the analysis of results. However, transaction log analysis and activity log statistics offer us additional approaches to determine the types of searches by online catalog users and to compare survey results.

The computer has the ability to record not only every system response, but also every user action entered into the online catalog. Thanks to technology, we have a very accurate record of exactly what people input into the library’s online catalog. Some systems, such as Mankato State University’s MSUS/PALS and University of California’s MELVYL, regularly record and tally every command and present these frequencies in the form of an activity log. Other systems, such as Syracuse University’s SULIRS and Northwestern University’s NOTIS, record every system response and user action entered into the online catalog. Additional software must be written to tally frequencies of individual commands for an activity log analysis and to determine the probabilities of entering commands for a transaction log analysis.
Table 1 lists in decreasing order the percentages of subject searches and other search approaches entered into seven different online catalogs. In each of the seven systems, the percentage of subject searches was greater than any other type of search; the majority of searches at West Valley Community College, University of California (using the look-up mode), Dallas Public Library, and Mankato State University were subject searches.¹⁶

TABLE 1

<table>
<thead>
<tr>
<th>% Subject Searches</th>
<th>Author</th>
<th>Library Studied</th>
<th>% Other Access Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>Larson</td>
<td>West Valley Community College</td>
<td>16, author</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>18, title</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1, author/title</td>
</tr>
<tr>
<td>61</td>
<td>Larson</td>
<td>University of California (look-up mode)</td>
<td>16, author</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8, title</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15, other</td>
</tr>
<tr>
<td>60</td>
<td>Tolle</td>
<td>Dallas Public Library</td>
<td>15, author</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16, title</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5, call no.</td>
</tr>
<tr>
<td>59</td>
<td>Barnett</td>
<td>Mankato State University</td>
<td>4, author/title</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>13, author</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>21, title</td>
</tr>
<tr>
<td>47</td>
<td>Larson</td>
<td>University of California (command mode)</td>
<td>26, author</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>21, title</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7, author/title</td>
</tr>
<tr>
<td>46</td>
<td>Tolle</td>
<td>Syracuse University</td>
<td>24, author</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>21, title</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3, call no.</td>
</tr>
<tr>
<td>40</td>
<td>Larson</td>
<td>Northwestern University</td>
<td>5, other</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1, series</td>
</tr>
<tr>
<td>34</td>
<td>Borgman</td>
<td>Ohio State University</td>
<td>25, author</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>35, title</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>19, author</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30, title</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14, author/title</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3, shelflist</td>
</tr>
</tbody>
</table>

SOURCE: Markey, Subject Searching in Online Catalogs, p. 77.

The University of California's analysis of the types of searches on MELVYL involved the capture of user-entered commands and access points on a transaction log followed by online administration of user questionnaires.¹⁷ The researchers of MELVYL could then compare what the users said they had entered into the online catalog (through the survey) with what they had actually entered into the catalog (through analysis of the transaction log). The result of this comparison was that the majority of MELVYL users perform subject searches.

The results of surveys and transaction log analyses provide evidence that library patrons are doing a lot of subject searching at the online cata-
log. At this point, we are tempted to say, "So what?" However, this preponderance of subject searching has been accompanied by difficulties expressed by users and identified by our methods of analysis.

**USERS' SUBJECT-SEARCHING DIFFICULTIES**

In the CLR-sponsored survey, a Likert scale was employed to measure online catalog users' degree of agreement with statements about online catalog features. Users at all twenty-nine surveyed libraries were very much in agreement with the following three Likert-scaled questions:

- User question 13: A computer search by subject is difficult.
- User question 17: Finding the correct subject term is difficult.
- User question 19: Increasing the results when too little is retrieved is difficult.

Two of these three questions refer to subject searching directly. The quantitative nature of the survey method precludes finding out from users exactly what makes subject searching difficult. Fortunately, the analysis of focused-group interviews provided us with descriptive accounts of users' difficulties. These difficulties were grouped into a general category of users' comments, named "Problems finding the right subject heading." Users' comments in focused-group interviews disclose the specifics of the problem they had finding the right subject heading.

Although some patrons were able to express verbally the topic they were looking for, they were unable to match their terms with those indexed in the online public access catalog. Nonusers indicated that they had the same problem when searching the library's traditional catalog. Here is an example of a focused-group interview participant's comment about this problem:

- Sometimes you can't find a thing you're looking for. I was looking for "medieval battles" and all I could find was World War II stuff.
  After ten minutes, I had to go ask the librarian. It's a hassle looking for specific stuff. (Iowa City, sixth-grade school users)

Patrons noted that their search terms might be too specific or too general. In their attempts to match terminology with that of the computer catalog, patrons related that they carried the burden of conjuring up broader or narrower terms:

- I am usually too specific. In a search for "teenage pregnancies," I had to use "pregnancies," look through a lot of books, a few of which mentioned teenage pregnancies. Then I took down the books' numbers, went to the stacks, and found more books. (Syracuse, undergraduate users)

Library patrons recognized their reliance on the library staff to help them find the right subject heading; library staff gave accounts of the assistance they provided to patrons who were having problems finding subject terminology:

- Sometimes I have to use the dictionary to make sure a word is spelled right. A lot of times, the patron just isn't using the right word, so we'll suggest others. (Mankato State, library student supervisors)
Patrons' comments on their efforts to use the printed volumes of Library of Congress Subject Headings (LCSH) were especially gloomy. They found a term or phrase in LCSH that was not in the library's online catalog. They didn't understand the "x", "xx", or "s.a." references. The volumes of LCSH were not near the patron's terminal, and leaving the terminal momentarily meant giving it up to another user. Subdivision practice was confusing to patrons.

The user problem of "increasing the results when too little is retrieved" has been connected to subject searching, since transaction log analyses have shown that a large number of subject searches result in no retrievals (i.e., zero postings). Researchers have found that between 35% and 57% of these subject searches produced no output. Johnson performed a failure analysis on keyword (i.e., Boolean) searches with subject access points that resulted in zero postings in the BACS online catalog at the University of Washington School of Medicine. Of the total number of 263 failed subject access points, Johnson determined that the major reason for failure was the user's entry of a term that was not a Medical Subject Heading (MeSH). Using failure analysis, he identified five reasons why users' searches resulted in no retrievals:

1. A non-MeSH heading (88%)
2. A spelling error (3%)
3. An incorrect MeSH (4%)
4. A quote or typographical error (3%)
5. An abbreviation (2%)

In a survey of SCORPIO users at LC, Pritchard asked respondents who had performed a subject search to identify the source of their subject terminology from the following list:

a. LC Subject Headings List (large red volumes)
b. Legislative Indexing Vocabulary
c. LC classification number
d. Retrieve command
e. Browse randomly under a word you know

Of the 123 searchers responding to this question, half answered that they had browsed randomly under a word they knew.

Steinberg and Metz also surveyed users about their knowledge of the online catalog's controlled vocabulary. Only 29% of the 85 users of the VTLS online catalog knew that subject searching would require the entry of an assigned LCSH. Forty-two percent of respondents plainly did not know the source of subject terms for searching VTLS.

Using data collected for CLR-sponsored online catalog research, Markey analyzed 859 access points entered by 188 searchers of the SULIRS online catalog at Syracuse University. Checking users' subject access points with the printed LCSH, she categorized the terms entered into the following eight categories:

1. Exact match of LCSH
2. Exact match of LCSH cross-reference
3. Close variant of LCSH or LCSH cross-reference
4. Terms of access point match two or more whole or partial LCSH
5. Spelling error
6. Known-item access point
7. Entry error, e.g., unacceptable truncation sign or unacceptable field label
8. Whatever popped into the searcher's mind

Her analysis indicated that most access points were categorized as "whatever popped into the searcher's mind," i.e., 36% of the total 859 access points. Interestingly, 65% of the access points so categorized resulted in no retrievals. Only 18% of users' access points were exact matches of LCSH; however, 7% of these access points resulted in no retrievals.

In our existing online catalogs, patrons are saddled with the job of finding the right subject heading to represent their topic of interest. Few searchers know about LCSH. A large proportion of online catalog users enter different terms until they match indexed subject terminology or deplete their supply of terms and give up the search. Instead of placing the burden of subject searching on library patrons, online public access catalogs must be enhanced with online user aids to assist in the selection of subject vocabulary, facilitate browsing, and provide additional information for making relevance assessments.

**Users' Subject Searching Needs**

In the CLR user questionnaire, patrons in twenty-nine libraries were asked to select as many as four additional features they would like in the online public access catalog. The most frequent of the 21,793 responses was "ability to view a list of words related to my search words." The next five in order of frequency were as follows: (2) "ability to search a book's table of contents, summary, or index"; (3) "ability to know if a book is checked out"; (4) "ability to print search results"; (5) "searching by any word or words in a subject heading"; (6) "providing step-by-step instructions." Note that three pertain to subject searching and that the most frequent response underlines the great need for cross-references and lists of related terms in online public access catalogs.

The need for cross-references and related-term lists also emerged in a number of focused-group interviews when participants were asked what aspects of the traditional library catalog should be carried over to the online catalog and what new features they would like added. The following interview responses reveal the desire for cross-references and related-term lists:

- Need cross-references online; in a search for "children and apes," I took twelve tries before I found apes under some form of monkey or chimpanzee. If this help was in the computer, it would be especially helpful for foreign students. (Syracuse, faculty users)
- I'd want the LCSH online. (Mankato State, undergraduate users)

In response to the survey question on additional features, online catalog users ranked second the ability to search a book's index, table of contents, or summary. Atherton's Subject Access Project demonstrated a method for enhancing bibliographic records with tables of contents and back-of-the-book indexes. 23 Appending terms and phrases from indexes
and/or tables of contents to MARC records, processing these terms and phrases into the searchable indexes of the online catalogs, and displaying them in lists of retrieved records would increase patrons' likelihood of matching their subject terms with those contained in the searchable indexes of the catalogs and would help patrons assess the relevance of retrieved items.

Library patrons were eager for the addition of any data to MARC records that would give them information about the subject contents of books. Many participants in focused-group interviews wanted additional subject information included in bibliographic records. Below are their suggestions for sources:

- Annotations, summaries, or abstracts of books
- Titles of essays in volumes of collected works or festschriften
- Individual musical pieces on sound recordings
- Introductions of books
- Book-jacket material
- Evaluative information, such as book reviews, intended audience(s)
- Assignment of more subject headings to books

In focused-group interviews, library patrons noted that they missed the browsability of the traditional library in the online public access catalog. Here is a typical comment:

- I can do browsing with alphabetical proximity, e.g., find "Human Relations Area Files," when I don’t know which of its terms is plural; the computer catalog doesn’t let me do this. (Syracuse, faculty users)

Library patrons described how they used the online catalog to find additional materials on their topic of interest by recording a class number and then browsing the particular location in the bookshelves. In libraries whose online catalog did not offer call or class number searches or a shelflist browsing capability, users suggested such capabilities.

- I use the CN (call number) command to scan the bookshelves at the terminal. (Syracuse, faculty users)
- The library classification scatters books. You'll be walking through the shelves and see something on "architecture" and wonder what those books are doing there. Maybe the computer could help you find these scattered things in a more productive way. (Iowa City Public, adult users)

When asked to suggest improvements to existing online catalogs, library users selected improvements to subject searching. In surveys and focused-group interviews, they expressed their wishes to increase the amount of subject information included in bibliographic records and to incorporate lists of related terms into the online catalog. Evidence from traditional catalog use studies suggests that catalog searchers do not make use of passes, i.e., "the act of exploiting either alphabetical proximity to a matched entry of conceptually related entries or the cross-references which link them to additional entry vocabulary."

Online catalogs at LC, Dallas Public Library, and the Ohio State University Libraries respond with lists of subject headings in alphabetical proximity to the users' entered terms, allowing them to browse for-
ward and, sometimes, backward in the lists of terms. The study of state transition diagrams from transaction log analyses shows that users are browsing these lists to find indexed terminology expressing their topics of interest.  

Our review of online catalog users’ needs for online catalogs has shown that they want additional subject information about the contents of materials included in bibliographic records, presumably for two purposes: to find out what the book is about and to improve their chances of matching the online catalog’s indexed terms. Library users would like lists of related terms and cross-references to the catalog’s indexed vocabulary. Focused-group interview participants remarked that they missed the browsability of the traditional library catalog. Transaction log analysis has provided evidence that users browse lists of subject headings in the alphabetical proximity of their entered terms.

In the remainder of this paper, we will see how a library classification incorporated into the information retrieval environment of an online catalog can enhance subject access to bibliographic records, improve browsability during subject searches, and provide additional subject information in bibliographic records about content to aid online searchers in assessing the relevance of retrieved output.

**Library Classification as a User’s Tool in an Online Catalog**

Library classification can be a user’s tool for subject access, browsing, and display in an online catalog. The importance of introducing a classification scheme into the information retrieval environment of online catalogs lies in its potential for introducing a logical approach to subject searching and for increasing the amount of subject information included in bibliographic record displays. Furthermore, library classification can make possible search strategies that are not presently supported by online public access catalogs.

The four features of a library classification that can aid online searchers match their subject terminology with the online catalog terminology and browse for better terms to express their topics are:

1. The subject terminology in classification schedules, e.g., headings, scope notes, etc.
2. The subject terminology in the index to the schedules.
3. The arrays of terminology enumerated in the schedules, whose relationships to each other are evident from indentions in printed schedules or the notation of class numbers.
4. The class numbers listed in the schedules and index.

Through these subject terminologies, users can have much more subject information to match their search terms and to search for better terms to express their topics than is presently available in online catalogs.

In American libraries, classification has chiefly been the domain of catalogers or classifiers behind the closed doors of technical processing departments. Classification has been visible to library users as a device for shelf arrangement of library materials. Typically, patrons record a call number from the library catalog, search for the book bearing the re-
corded number, then browse the bookshelves for other books similar to the one just found. We will now show in this discussion how library classification can be integrated into an online public access catalog to enhance subject access to its contents, to help users browse for terms related to their entered search terms, and to provide additional subject information in bibliographic records about content to aid online searchers in assessing the relevance of retrieved output.

Selection of the Dewey Decimal Classification for a Research Study

Research on the application of classification schedules for information retrieval purposes was first conducted by Freeman and Atherton, who demonstrated the feasibility of the Universal Decimal Classification (UDC) as an entry vocabulary for online subject searchers in a bibliographic retrieval system. At the time of their study, there were few operational retrieval systems available for searching by end users.

In fall 1981, thirteen years after the study of the UDC for online information retrieval, a number of factors converged in the OCLC Office of Research to rekindle interest in classification and mechanization. Collectively, these factors provided the impetus for the Office of Research to pursue a study of how library classification could serve online catalog users and improve their subject-searching experiences. The four factors listed below, which emerged as a result of ongoing research at OCLC and other library-related institutions and recommendations from CLR-sponsored endeavors, are most important to the consideration of adding a classification scheme to online catalogs:

1. The preponderance of subject searching in online catalogs, users’ subject-searching difficulties, and their needs for improvement to subject searching, which surfaced in CLR-sponsored research and independent studies of online catalog use.
2. The growth in the design and implementation of online public access catalogs, which emerged from the CLR-sponsored Dartmouth Conference of library administrators involved in the planning or development of this type of catalog.
3. Exciting potential for improving and enhancing this new form of catalog—an opportunity that was absent from the traditional library catalog because of its medium.
4. The recommendation from Mandel, in a report on subject access prepared for CLR, that terms from a classification schedule could be appended to libraries’ bibliographic records to enhance subject access, and the recommendation, from a CLR-sponsored invitational meeting on subject access, that the design and distribution of a library classification in machine-readable form should be explored.

These factors played a major role in shaping the ideas of the Office of Research staff regarding the potential of classification in the environment of an online public access catalog. The realization that the nineteenth edition of *Dewey Decimal Classification* (DDC) was produced by computerized photocomposition prompted the Office of Research to
make inquiries to the publisher, Forest Press, about the availability, for research purposes, of the print tapes. In January 1984, the Office of Research, with the support of CLR and Forest Press, embarked on a study of DDC as a user’s tool for subject access, browsing, and display. The machine-readable DDC that is used in this study was converted from print tapes that originally served to produce the nineteenth edition.

**THE DEWEY DECIMAL CLASSIFICATION ONLINE PROJECT**

The four objectives of the DDC Online Project are to

1. Use the consensus of DDC experts to determine strategies for searching and displaying DDC in an online catalog.
2. Demonstrate DDC as an online searcher’s tool for subject access, browsing, and display in an online catalog.
3. Test the effectiveness of DDC as an online searcher’s tool.
4. Evaluate the demonstration and test results of DDC as an online searcher’s tool and disseminate the results of the research project.

The demonstration of DDC as an online searcher’s tool will employ the four features of a library classification that can aid searchers in matching their terminology with the catalog terminology and in browsing for better search terms to express topics. These four features are

1. The subject terminology in DDC schedules.
2. The subject terminology in the DDC relative index.
3. The hierarchical arrays of related terminology in DDC schedules.
4. The class numbers in DDC schedules.

The Library of Congress, the New York State Library, the Public Library of Columbus and Franklin County (Ohio), and the University of Illinois at Urbana-Champaign are participating in the project by helping to determine strategies for searching, browsing, and displaying DDC in an online catalog; by submitting bibliographic records in selected classification areas to the DDC Online Project; and by testing the effectiveness of the method in retrieval experiments with library patrons and staff.

OCLC’s Developmental Online Public Access Catalog (DOPAC) is the foundation for the development of an experimental system in which DDC has been implemented as such a user’s tool. DOPAC is command-driven and performs operations typically found in online catalogs and bibliographic retrieval systems, e.g., entry of search terms, display of bibliographic records, review of created sets, and Boolean combinations and, or, and not. DOPAC allows truncation; it also produces a list of indexed terms or names, in alphabetical proximity to the ones entered, from which the user can select those of interest.

DOPAC will be enhanced with capabilities that enable its users to use DDC for subject access, browsing, and display. How DDC will be implemented in DOPAC is described below.

**SUBJECT ACCESS THROUGH THE DDC**

There are two sources of subject-rich information in DDC that are not already contained in libraries’ bibliographic records:
1. The headings in DDC schedules
2. The entries in the DDC relative index.

The links between bibliographic records and headings from the DDC schedules and relative index entries are DDC class numbers. A machine-readable cataloging record, whose class number matches or almost matches a class number in the machine-readable DDC schedules and relative index, will be augmented with headings from the schedules and entries from the relative index. Figure 1 shows a bibliographic record bearing two additional subject fields composed of subject terms taken from the DDC schedules and relative index. In the Dewey subject field, the heading at DDC class number 796, i.e., *Athletic and outdoor sports and games*, and the heading at DDC class number 796.3, i.e., *Ball Games*, are concatenated to make a single heading. The inclusion of the heading for the general number 796 is intended to place the heading of the specific number 796.3 in context. There are many examples in the DDC schedules of headings that do not make sense unless accompanied by a heading at a more general number. The Dewey index field contains an entry from the DDC relative index found under the initial term *Ball* that directs users to the class number 796.3.

<table>
<thead>
<tr>
<th>CALL NO.:</th>
<th>796.3.C83H</th>
</tr>
</thead>
<tbody>
<tr>
<td>TITLE:</td>
<td>An Historical Analysis of Competitive Rubber Ball Games in Mesoamerica</td>
</tr>
<tr>
<td>DEWEY SUBJECT:</td>
<td>Athletic and outdoor sports and games—Ball games</td>
</tr>
<tr>
<td>DEWEY INDEX:</td>
<td>Ball—Games—Outdoor and general—Sports</td>
</tr>
<tr>
<td>LC SUBJECT:</td>
<td>Ball Games—Central America</td>
</tr>
<tr>
<td>LC SUBJECT:</td>
<td>Ball Games—Arizona</td>
</tr>
<tr>
<td>AUTHOR:</td>
<td>Cox, Allan Elton</td>
</tr>
<tr>
<td>PUBLICATION:</td>
<td>Edmonton, Alba.: University of Alberta, 1967</td>
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</table>

Figure 1
Display Fields in a Bibliographic Record Enhanced with the Dewey Decimal Classification

Subject information in these enhanced bibliographic records is indexed in DOPAC in two ways:

1. Subject contents of Dewey index fields are indexed as precoordinated phrases and contain pointers to the bibliographic records in which the phrase occurs. This type of indexing will allow users to search alphabetically for subjects. In response to user-entered terms, the system produces a list of entries from the DDC relative index. This approach is similar to existing online catalog treatment of precoordinated LC subject headings, e.g., LCS at Ohio State, CLSI/PAC at Iowa City Public, and NOTIS at Northwestern University. In these online catalogs, the system response to user-entered terms is a list of assigned subject headings in the alphabetical “neighborhood” of the user-entered terms. The difference between these online catalogs and the experimental system in this study is that the latter is composed of entries from the DDC relative index.
2. Subject contents of subject-rich fields of enhanced bibliographic records, i.e., subject headings, Dewey index, and Dewey subject fields, are indexed as keywords and contain pointers to the class number of the bibliographic records in which the keyword occurs. This second approach will allow users to search systematically and receive direction from the system as to fruitful areas of the classification where there are items matching their entered keywords. Then users can browse the hierarchical arrays of headings in DDC schedules. The contents of subject-rich fields in bibliographic records, i.e., subject heading, Dewey subject, and index fields, are indexed as keywords—much as subject-rich fields are handled in a number of online catalogs such as Syracuse’s SULIRS, Mankato State’s MSUS/PALS, and LC’s MUMS. The difference is that DOPAC will direct users to areas of the classification, for browsing the hierarchical arrays of terminology in DDC schedules as an intermediary step, before retrieving a set of bibliographic records containing their entered search terms.

**BROWSING AND THE DDC**

DDC will enable a user to browse the online catalog using the traditional alphabetical approach of displays of indexed, precoordinated subjects in response to the user’s entered terms. The user’s entered terms are matched with indexed relative index entries, and the system produces an alphabetical list of DDC relative index entries. Selection from this list will direct the user to bibliographic records. Figure 2 shows a display of DDC relative index entries in response to the searcher’s query *Ball Games*. The searcher can elect to browse forward and backward to

<table>
<thead>
<tr>
<th>SUBJECT:</th>
<th>Ball Games</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINE ITEMS</td>
<td>TOPICS—ASPECTS</td>
</tr>
<tr>
<td>1</td>
<td>1 Badminton—sports</td>
</tr>
<tr>
<td>2</td>
<td>3 Bait casting—angling—sports</td>
</tr>
<tr>
<td>3</td>
<td>17 Ball—games—indoor—recreation</td>
</tr>
<tr>
<td>4</td>
<td>5 Ball—games—outdoor and general—sports</td>
</tr>
<tr>
<td>5</td>
<td>3 Ballroom—dancing—recreation</td>
</tr>
<tr>
<td>6</td>
<td>2 Balls (dances)—recreation</td>
</tr>
<tr>
<td>7</td>
<td>23 Balls (recreation equipment)—athletic—American football</td>
</tr>
<tr>
<td>8</td>
<td>18 Balls (recreation equipment)—indoor</td>
</tr>
<tr>
<td>9</td>
<td>58 Baseball—players—biography and work</td>
</tr>
<tr>
<td>10</td>
<td>16 Baseball—players—sports</td>
</tr>
</tbody>
</table>

**OPTIONS:**
- BF Browse forward
- BB Browse backward
- BT Browse topics
- SS Search systematically for “Ball Games”
- DI Display items
- SO Start over

**USER’S RESPONSE:** SS

*Figure 2*

Alphabetical Subject Searching Using the Dewey Decimal Classification
view terms in alphabetical proximity to those listed.

The primary importance of incorporating DDC into an online catalog lies in its potential for introducing a logical approach to subject access for library catalog searchers. In this regard, the experimental online catalog developed for this study closely resembles Cutter’s concept of the combined catalog, which features both dictionary and systematic parts of a library catalog and gives information “all about general subordinate subjects and classes of subjects like the classed catalogue, with the advantage of having an alphabetical index of subjects to assist in finding the places where they are entered.”

Initially, searchers have options to search alphabetically or systematically for subjects. Selection of the alphabetical approach results in a list of relative index entries in alphabetical proximity to user-entered terms. If searchers’ entered terms do not match indexed relative index entries, they can select an option for a systematic search. Or, in the example of figure 2, the searcher who was dissatisfied with the contents of displays of alphabetically arranged, precoordinated terms could choose to search systematically, whereupon the system performs a keyword search and responds with a list of the general areas in which bibliographic records containing the entered keywords are classed. Then, the system will guide users through hierarchical arrays of headings from DDC schedules and allow them to select headings of interest to display bibliographic records.

In figure 3, a continuation of the interaction initiated in figure 2, the user has selected option SS, i.e., a systematic search, and DOPAC has responded with a list containing DDC headings from the general areas of the classification (i.e., 794 and 796) where items on Ball Games are assigned. Selection from this display directs the user to the specific level of DDC where bibliographic records contain the search terms entered by the user. The user can choose headings from this second screen to display bibliographic records or to browse more specific or general headings than the ones listed.

Class-number searching in existing online catalogs is handled differently from one online catalog to another. In general, there are three approaches. In the first, the user enters a class number, and the system responds with the number of items assigned the exact number entered; then the user typically enters a display command to display retrieved items. The second approach is the same as the first except that the system retrieves records beginning with the class number entered, i.e., the system performs an implicit truncation of the entered class number. Then the user can display retrieved items. In the third approach, the class-number search allows the user to browse the shelflist of the library; Ohio State’s LCS is the best example of such a shelflist search.

Searching for class numbers in DOPAC directs users to lists of headings in DDC schedules. In figure 4, the user enters the class number 796.3 and DOPAC responds with a list of class numbers more specific than 796.3 (i.e., 796.31, 796.32, 796.33, and so on) and the cumulative totals of items assigned the listed class numbers. The user can choose captions from the screen to display bibliographic records in shelflist or-
SYSTEM: Ball games is treated from 2 perspectives
LINE PERSPECTIVE
1 Indoor games of skill
2 Athletic and outdoor sports and games
OPTIONS:
SP Select a perspective
SO Start over
USER'S RESPONSE: SP
SYSTEM: Enter line number
USER'S RESPONSE: 2
GENERAL TOPIC: Ball Games
LINE AREA TOPICS
1 796.31 Ball thrown or hit by hand. Examples: handball, lawn bowling
2 796.32 Inflated ball thrown or hit by hand. Including netball
3 796.33 Inflated ball driven by foot
4 796.34 Racquet games. Including court tennis, paddle tennis
5 796.35 Ball driven by club, mallet, bat
OPTIONS:
BS Browse more specific topics
BG Browse more general topics
GI Get more information about a topic
DI Display items
RP Return to perspectives list
SO Start over

Figure 3
Systematic Subject Searching Using the Dewey Decimal Classification

der or browse more specific or general captions than the ones listed. This approach to searching by call number is very different from the approaches presently implemented in online catalogs. It exploits the value of the headings in DDC to explain the meaning of listed class numbers. In two of the three approaches implemented in existing online catalogs, searchers find out the meaning of a class number only after they begin to display retrieved bibliographic records. However, class-number search-

CALL NUMBER: 796.3
GENERAL TOPIC: Ball Games
LINE AREA TOPICS
1 796.31 Ball thrown or hit by hand. Examples: handball, lawn bowling
2 796.32 Inflated ball thrown or hit by hand. Including netball
3 796.33 Inflated ball driven by foot
4 796.34 Racquet games. Including court tennis, paddle tennis
5 796.35 Ball driven by club, mallet, bat
OPTIONS:
BS Browse more specific topics
BG Browse more general topics
GI Get more information about a topic
DI Display items
RP Return to perspectives list
SO Start over

Figure 4
Class Number Searching Using the Dewey Decimal Classification
ing in all operational online catalogs requires users to know the general meaning of class numbers before they enter them into the catalog.

**THE DDC FOR DISPLAY**

The display of DDC in an online catalog entails displays of bibliographic records enhanced with headings from DDC schedules and entries from the relative index. Figure 1 is an example of such an enhanced bibliographic record. Including this additional subject information from DDC in intermediate and full bibliographic record displays will increase the amount of subject information about retrieved items and will help subject searchers make relevance assessments, since more subject information than merely the title and subject headings will be detailed in individual bibliographic record displays.

**SIGNIFICANCE OF THE DDC AS A USER’S TOOL**

Research findings on subject-searchers’ experiences with, and needs for, online catalogs have played a major role in inspiring us to formulate the research project; envision the capabilities of DOPAC for transforming the DDC schedules and relative index into a user’s tool for subject access, browsing, and display; and to test DDC as a user’s tool. As a means of enhancing subject access to bibliographic records, providing lists of terms related to the search terms entered by users, and displaying additional subject information about the contents of books, DDC can fulfill a number of user needs for online catalogs and support search strategies which are impossible to provide in our existing alphabetical online catalogs.

Library classification is valuable information already existing in machine-readable bibliographic records. Enhancing bibliographic records with subject information from DDC is a relatively simple process in comparison to adding users’ suggestions, such as tables of contents and back-of-the-book indexes, to bibliographic records because DDC is already in machine-readable form.

Research on DDC will result in an understanding of subject-searchers’ problems with online displays of DDC schedules, online bibliographic record displays, and manipulation of online lists of related terminology, all of which will help system designers in future implementations of DDC specifically, and in future enhancements of online catalogs generally. The results of our research on DDC as a user’s tool in an online catalog can open up a new horizon for the future of the DDC specifically and library classification in general.

**REFERENCES AND NOTES**

3. Executive summaries of the final reports of the online catalog use studies supported by CLR are in Davis B. McCarn, ed., “Online Catalogs: Requirements, Charac-


14. An example of an activity log from Mankato State’s MSUS/PALS is provided by Markey, Subject Searching in Library Catalogs, p.30.


17. University of California, Division of Library Automation and Library Studies and


20. Millard F. Johnson, "An Analysis of the Log of an Online Public Access Catalog" (St. Louis, Mo.: Washington Univ. School of Medicine, 1982 [?]), unpublished and unpaged manuscript.


22. Millard F. Johnson, "An Analysis of the Log of an Online Public Access Catalog" (St. Louis, Mo.: Washington Univ. School of Medicine, 1982 [?]), unpublished and unpaged manuscript.


32. The methods used to test DDC as a user's tool in an online catalog are similar to those employed in the retrieval experiments done by Siegel at NLM to evaluate two prototype OPACs. Details are available in Elliot R. Siegel and others, "Research Strategy and Methods Used in Conducting a Comparative Evaluation of Two Prototype Online Catalog Systems," in National Online Meeting Proceedings—1983, April 12-14, 1983, New York, Martha E. Williams and Thomas H. Hogan, comps. (Medford, N.J.: Learned Information, 1983), p.503-11.


34. See Markey, Subject Searching in Online Catalogs, p.126, for an example of the shelf-position search on Ohio State's LCS.
Changing AACR2 to Accommodate the Cataloging of Microcomputer Software

Sue A. Dodd

The packaging rather than the content of microcomputer software issued by commercial publishers makes these files appear to be different in composition from the earlier files represented in chapter 9 of the second edition of the Anglo-American Cataloguing Rules. The issuance of microcomputer files by established book publishers has brought a demand for rules for descriptive cataloging that resemble those for other commercially produced materials. Chapter 9 has already undergone some changes and more are forthcoming. The purpose of this paper is to examine the rules affected by revisions approved by the Joint Steering Committee and those covered in the new Guidelines for Using AACR2 Chapter 9 for Cataloging Microcomputer Software and to suggest changes still needed to provide adequate bibliographic control.

When the rules for machine-readable data files (MRDF) were first formulated, everyone involved in that task was fully aware that there would be a need for a change to parts of the code, especially as bibliographical control was applied to these files and as new advances were made in technology. Very little time has elapsed since this medium came into popular use. Much of the bibliographical control that is visible today is the direct result of earlier efforts applied to those first files used with mainframe computers. Now there is another generation of computers and their files—microcomputer files. The issuance of microcomputer files by commercial producers makes these files appear to be different from the earlier files in composition. However, it is the packaging of the files that contributes to these differences rather than substantive differences in the files themselves. Put another way, a computer file—whether it runs on a mainframe, a minicomputer, or a microcomputer—is basically the same, but in terms of cataloging, the issuance of microcomputer files by established book publishers has brought with it a demand for descriptive rules that resemble those for other commercially produced materials. Many of the existing rules in

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chapter 9 will remain as is, but others are in the process of being reinterpreted or revised. This is the way it should be, as we try to construct rules and guidelines for a medium that is new to most of us and that is constantly changing. As the current rules stand, there is a need for change for the following reasons: (1) existing errors in statement, fact, or example; (2) out-of-date terminology or technical applications; (3) the issuance of computer files by commercial publishers; and (4) new applications based on new technology (i.e., microprocessors).

The first category is currently being addressed through the appropriate channels of the ALA/RTSD Cataloging Committee: Description and Access (CC:DA) and the Joint Steering Committee for Revision of AACR2 (JSC), but additional revisions need to be recommended. The second category deals with content or concepts within the code that are no longer viable or in use by the practitioners. Examples are “internal user label” and “object program.” The third category deals with changes brought about by the issuance of microcomputer files by commercial producers rather than by local, government, or academic producers. An example of a change required in this category is a revision in the order of “prescribed sources” of information to reestablish the validity of external labels on physical carriers. The fourth category necessitates additions to the code to accommodate microcomputers and their special needs in terms of hardware and software. Many of the changes related to microcomputers have been addressed by CC:DA and the subsequent ALA publication: Guidelines for Using AACR2 Chapter 9 for Cataloging Microcomputer Software (cited hereafter as Guidelines).

Optimally, a single chapter on the cataloging of computer files should stand for all generations of computers and for both types of files (i.e., data files and program files). In terms of the user, programs are different in scope and purpose from data files, but to the computer it makes little difference. Nonetheless, programs are designed to work in conjunction with data files, and thus it makes little sense to have one set of cataloging rules for programs or software and another for data files. Because it is becoming increasingly difficult to keep track of and coordinate all suggested changes to chapter 9, including recommendations for JSC and the new Guidelines, it would be extremely helpful if all recent changes could be brought together in one document for consideration. The purpose of this paper is to examine the rules in chapter 9 that have been affected by JSC revisions or the new Guidelines and to suggest those changes still needed to provide adequate bibliographical control.

**Specific Recommendations**

9.0A Scope

The definition and text describing MRDF had their foundation in the state of the art of the 1960s and 1970s, when many punched cards were still in use. Both data and program files were first punched on cards, then sorted, and finally “read” into the computer. Today, the use of cards is almost nonexistent, and most of the machines associated with cards are gone as well. Data and program statements are now read into the computer electronically via telecommunication lines. Consequently,
terminology associated with the definition of MRDF, such as punched cards, aperture cards, and paper tape, no longer reflects current technology. Thus the definition and accompanying text for machine-readable data file should be changed to be more in line with current technology.

On the other hand, data processing machines associated with computers are still in existence, such as the optical character reader and the Kurzweil text scanner. Both of these machines are examples of computer-related equipment that prepares information for "reading" by the computer. In other words, information is not always read into the computer as a matter of course. Certain preprocessing routines have to be performed first. Thus, the use of the phrase machine-readable, as it applies to such preprocessing machines, remains valid. However, "machine-readable" should not be confused with other types of machines that are not associated with computers or basic data processing. Any definition of MRDF should reflect the use of the term data processing machine.

Data file is a term that was chosen on the basis of its usage and its dictionary definition as any "information in machine-readable form." Information in this context meant characters, numbers, symbols, or any combination of same. Instructions to the computer (i.e., programs/software) were also included in this defined body of information. Terms such as automated data processing (ADP) and electronic data processing (EDP) included program files as well as data files. In the past, there was no reaction to the fact that such terms indicated that data were equated exclusively with numbers nor that they excluded programs. The reactions came about when a new audience of users was introduced to microcomputers. Data set name (DSN), for example, continues to represent both data files and program files in most IBM mainframe systems.

With microcomputers a new terminology emerged, giving rise to suggested changes in the current general material designator (GMD). A redefinition of machine, for example, or a more narrow interpretation of data may result in a new GMD or a modification of the existing one. No such change has been adopted as yet, and none is recommended here. What is recommended is a change in the definition of MRDF, a change that would clarify the use of the term machine and include an associative definition of computer. A modification of the definition and scope of MRDF is recommended as follows:

A machine-readable data file is defined as a body of information encoded and formatted in such a way that it requires the use of a data processing machine or computer to be properly interpreted. A computer is a machine that receives, stores, manipulates, and communicates coded information. The computer accepts as input two types of files: data files and program files. Thus the term machine-readable data file embraces both the data stored in machine-readable form and the programs used to process those data.

Currently, there are at least three types of digital computers (defined for the most part by their size): the mainframe, the minicomputer, and the microcomputer. All current developments in computers point to ways that these computers can interact with each other, and thus a new use of the microcomputer has come about. The microcomputer is being
thought of in terms of a terminal that can communicate with the mainframe. The terms *up-loading* and *down-loading* are indicative of these trends. Such trends must be considered when defining the scope and environment of any computer system. In a very general sense, the scope of MRDF should be broadened to include any and all basic computing (i.e., access to programs and data files) regardless of the *mode of access*. Computing can be local to an individual work station or remote via telecommunications devices.

### 9.0B1. Chief source of information

The wording, *internal user label*, has been interpreted as an equivalent of an internal *user header label*, which is an optional standard for magnetic tapes (ANSI Z39.27-1978). However, this option of a "user header label" has rarely, if ever, been used to create bibliographic information that would resemble a title page for a book. In addition, it applies only to magnetic tapes, and not to other formats such as hard or floppy disks, cassettes, cartridges, etc., used with microcomputer files.

There is also the problem of compatibility with labeled tapes. Different computers use different operating systems and labeling devices which often are not compatible. Because of this possibility, many systems simply bypass labeled tapes. This practice, of course, defeats the purpose of using the labels in the first place.

The concept of having the chief source of information as part of the file (either data or program) itself should be preserved. However, the reference to a *user label* or *user header label* should be dropped from the code. The resulting change and recommendation here is similar to that recommended in the Guidelines. Whereas the Guidelines describe programs only, the recommendations here will include wording to describe both program files and data files using the term *file* to stand for both.

The preferred source of bibliographic description is information recorded *internally* on the file itself. Title information may be recorded internally as the first item to be displayed, as part of the file's description, or as part of the listing of the file's statements.

If adequate bibliographic information is not available internally or if the cataloger does not have access to a microcomputer that can display the data, use in this order of preference:

a) label on the storage medium itself, such as a disk, cassette, cartridge, tape, etc.;

b) label on the container such as a folder or box (if there are several items in the container, and only the label on the container has a collective title, use it rather than the labels on the individual items);

c) accompanying documentation issued by the producer or distributor of the program such as a teacher's guide, student manual, etc. (Exercise care in distinguishing between information applying to the accompanying documentation and that pertaining to the file itself);

d) other published descriptions such as a bibliography, etc. Note: Throughout these guidelines other published descriptions should not be held to include advertising because the terminology used in advertising is often imprecise.

In addition, the prescribed sources of information for MRDF as they now exist in chapter 9 must be modified to include commercially pro-
duced microcomputer files. The only real change would be in the order of the prescribed sources and the inclusion of external labels. The recommendation here is to take the wording as set forth in the Guidelines:

The prescribed source(s) of information for each area of the description is set out below. Enclose information taken from outside the prescribed sources in square brackets.

<table>
<thead>
<tr>
<th>AREA</th>
<th>PRESCRIBED SOURCES OF INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title and statement of responsibility</td>
<td>Chief source of information</td>
</tr>
<tr>
<td>Edition</td>
<td>Chief source of information, labels on the carrier and its container, accompanying documentation issued by the producer or distributor of the file, and other published descriptions</td>
</tr>
<tr>
<td>Publication, production, distribution, etc.</td>
<td>Chief source of information, labels on the carrier and its container, accompanying documentation issued by the producer or distributor of the file, and other published descriptions</td>
</tr>
<tr>
<td>File description</td>
<td>Any source</td>
</tr>
<tr>
<td>Series</td>
<td>Chief source of information, labels on the carrier and its container, accompanying documentation issued by the producer or distributor of the file, and other published descriptions</td>
</tr>
<tr>
<td>Note</td>
<td>Any source</td>
</tr>
<tr>
<td>Standard number and terms of availability</td>
<td>Any source</td>
</tr>
</tbody>
</table>

9.1B2.

It is recommended that the wording of this rule remain as is with the exception that file name be added to the code. The term data set name is tied mostly to IBM mainframe machines, and although it stands both for program files and data files, it is not used with microcomputer files. File name is the term used for microcomputer files. One solution would be to change the wording to include file name. It would read as follows:

Do not treat a locally assigned data set name or file name as a title proper, unless the creator, etc., of the file has assigned a data set name or file name that is also the title of the file. If desired, record a data set name or file name in a note (see 9.7B4).

9.1B3.

This rule would be changed only if the reference to internal user label was changed for 9.0B1. If this were the case, then the wording for 9.1B3 would read:

If neither the internal information, the label, the container, nor the documentation supplied by the creator, etc., of the file contains a title for the file, supply a brief descriptive title (see 1.1B7) and enclose it in square brackets.

9.1G ITEMS WITHOUT A COLLECTIVE TITLE

Unlike the other rules in chapter 9, the term item in this rule has been interpreted to mean the physical carrier rather than the file. However,
multiple files can be copied to a single carrier and be totally independent of each other and of the carrier on which they are recorded. Even the earlier commercially produced files were not issued on a permanent or titled carrier. The fact that data files and program files were recorded on a single carrier did not mean that they must be related in some way. On the contrary, each had its own documentation and was considered to be an independent or separate work. Thus the presence of a carrier containing two or more works would not necessarily constitute a collection nor be covered by this rule as written. If the current interpretation of the file serving as the “item in hand” prevails, then this rule dealing with “items without a collective title” should be revised. The same would apply for other related rules such as 9.1G2 and 9.2B6.

9.2B. Edition statement

Since program edition statements are normally phrased in terms of versions, releases, and levels, there should be some examples of program edition statements in the examples cited under 9.2B1. Examples of such statements are:

Rev. ver.
Version 3.5M
Release 2.30

It is also recommended that abbreviations for the terms versions and release (e.g., ver., rel.) be considered for inclusion into the authorized abbreviations in AACR2 (appendix B).

9.4D. Name of publisher, producer, distributor, etc.

JSC approved the insertion of the word producer in the rule as follows:

9.4D. Record the name of publisher, producer, distributor, etc., and of any agency responsible for the production or dissemination of a machine-readable data file (data archives, project groups, etc.) as instructed in 1.4D.

It is further recommended here that the parenthetical remarks or explanation be dropped (i.e., data archives, project groups, etc.). This deletion would give the rule a broader scope and make it apply more readily to microcomputer files. The examples should also be reexamined in terms of microcomputer files.

9.4F. Date of publication, production, distribution, etc.

Because most commercially produced microcomputer files are copyright, it is recommended here that some wording and/or ruling on the transcription of copyright dates be added to this area. Often, the copyright date is the only date given in the sources of information.

9.5B. Extent of file
(including specific material designation)

Normally, this area in the descriptive record is reserved for description of the physical characteristics of the carrier plus other attributes of the items on the carrier such as sound, color, etc. Chapter 9 departed
from this practice. The characteristics of the intellectual item (i.e., computer files), rather than the carrier, are described in this area. A file is broken down into two types: a data file and a program file, and because the carrier is not described in terms of its physical dimensions, the “extent of file” is given in terms of logical records for a data file and in terms of program statements plus the programming language for a program file. The characteristics of the physical carrier (e.g., 1200 ft. tape reel) or the formatting characteristics (e.g., 9 track, 6250 b.p.i., etc.) is given in a note or as part of a separate record-keeping system since most would vary from one computer facility to another.

In practice, however, the task of determining the “extent of file” in terms of logical records, program statements, and programming language has become increasingly difficult. The determination of the extent of the file is less of a problem for logical records than for program statements. Although the sources of information may not always give such information in the required terminology (i.e., logical records), it is usually given in some variation, such as number of cases, number of respondents, etc. Even with this problem of terminology, many users of computer files still think that such information is helpful in terms of indicating the possible size or extent of a data file.

The extent of file for a program file, on the other hand, is rarely given in terms of program statements in the sources of information. In the case of microcomputers, the sources of information indicate the size of a file (whether data or program) in terms of bytes. In addition, the program statements for microcomputer program files (when listed) are not numbered consecutively so that the total number of statements is not easily determined.

Determining the appropriate programming language(s) for a program file presents other problems. With microcomputer programs, the programming language may not be stipulated in the sources of information; rather the language may be implied by the operating system or even by the make and model of machine. Dialects of programming languages are even harder to determine, especially when two or more languages are present within a single program.

It is recommended here that the determination of the extent of file be an optional consideration. It is further recommended that when given, it should be given in terms of logical records and/or bytes (as appropriate) for data files and in terms of program statements and/or bytes (as appropriate) for program files. It is also recommended that the designation of programming language not be given here but rather placed in the appropriate note outlining the required hardware and software for the file being described.

With regard to the specific material designations prescribed by rule 9.5B, object program has been a source of much confusion. It is a term that is rarely used in the sources of information. More frequently used terms include machine code, fully compiled program, or binary code. Most, if not all, catalog records of MRDFs have used either data file or program file exclusively, and the experience to date indicates that the two terms are sufficient.
For all reasons stated above, it is recommended here that "object program" be dropped from the code and that the specific material designations be limited to the two remaining terms. Subtypes of data files (e.g., hierarchical data files) or subtypes of program files (e.g., object programs) could be described in another area such as the note area. This method would represent a change from what was recommended previously by the CC:DA and partially approved by JSC. Rule 9.5B1 would be modified accordingly to read:

9.5B1. Record the number of files making up a machine-readable data file by giving the number of parts in arabic numerals and one or both of the following terms as appropriate:

- data file
- program file

Before commercially produced microcomputer files with permanent carriers came along, data and program files (even if copied on a single carrier) were treated and cataloged separately, or they could be linked through the use of the provision for accompanying material. Given this approach, there was no problem in making a choice of the appropriate specific material designation. However, with microcomputer files being issued with collective titles and with the possibility of both a data file and a program file being issued under a single title, the cataloger may have to record both data and program files simultaneously (e.g., 1 data file, 4 program files). This means that the examples given in rule 9.5B1 have to be changed to read:

1. data file
2. program files
1 data file, 6 program files

This arrangement for microcomputer files is introduced in the Guidelines. The remaining rules (9.5B2 through 9.5B5) and subsequent examples would also have to be modified to reflect the recommendations cited above. Rule 9.5B2 should be modified to read:

9.5B2. Optionally, add in parentheses to the designation for a data file the number of logical records and/or bytes and for a program file the number of program statements and/or bytes.

1 data file (1600 logical records, 6210 bytes)
1 program file (2260 program statements)
1 data file (5640 bytes), 2 program files (8473, 6210 bytes)

Unfortunately, computerized information is currently described in more than one way, including records, program statements, and bytes. However, by making the extent of file "optional," it could be omitted without further consideration when the information is not readily provided in the sources of information.

It should be pointed out here that the number of bytes designated in this area would be the exact number of bytes required per file. Such information is given internally in the "directory" or "catalog listing" of hard or floppy disks. It may also be given in the accompanying documentation. However, this item of information is a different measure.
from the number of bytes required for RAM or programmable memory. Programmable memory is usually given in an abbreviated form (e.g., K for kilobytes, M for megabytes, etc.). One K equals 1,024 bytes or characters. Instead of listing that a program will require approximately 16,384 bytes of memory, it is listed as requiring "16K."

For reasons of space and clarity, rule 9.5B3 should probably be limited to transcribing not more than three parts or files. Keeping track of more than three files in the "extent of file" area is difficult. Separating file sets with commas is also confusing, especially when commas are used within the numerical designations. It is recommended that no commas be given in the numerical designations. This practice would coincide with the way that bytes are given numerically. For rule 9.5B3, parts not numbering more than three parts (or files) should be given in sets. If they cannot be described in this manner, then omit the information and, if appropriate, explain in a note (9.5B5). Rule 9.5B3 would be modified to read:

9.5B3. Optionally, add to the designation for a multipart work not numbering more than three, the number of logical records and/or bytes for each file or the number of sets of files per work.
   2 data files (1500, 2500 logical records)
   3 program files (5500 bytes each)
   1 data file, 3 program files (7260, 3490, 5076 bytes)

The following modification of rule 9.5B5 is recommended, and it is suggested also that the rule be renumbered and introduced before rule 9.5B4.

9.5B5. If the number of logical records and/or bytes in a large file is unknown, optionally give the approximate number of records or bytes, or if this cannot be done, omit such information and give a note (see 9.7B10).
   13 program files (ca. 1200 bytes each)
   or
   51 data files.
   *Note* Each file represents one state plus D.C.

If "object program" is dropped from rule 9.5B1, then the associative rule 9.5B4 would no longer be needed. Even though this rule has been applied to earlier catalog records for microcomputer files, more recent experience indicates that separating the make and model of the machine from the rest of the hardware and software requirements is too confusing and requires that similar information be given in two distinct sections of the record. Such information might better be placed in a single area, and since the file/physical description area would be too complicated and hard to control with the inclusion of hardware and software requirements in it, the other designated area would be the note area.

**Suggested Additions to Rule 9.5B**

The *Guidelines* allow optional additions to describe the physical carrier and the associative characteristics. The "item in hand" continues to be the appropriate computer file, but the physical carrier of the file can be described if desired. This option might very well be incorporated into
the code in some such rules as the following.

9.5B6. Optionally, use Arabic numerals and one of the following terms to record the physical medium on or in which the file is recorded:

- 1 data file (200 logical records) on 1 computer disk
- 2 program files in 1 computer cartridge
- 1 data file, 2 program files (3460, 5283 bytes) in 1 computer cassette

If none of the terms listed above is appropriate for designating the physical medium on or in which the file is recorded, use the most appropriate specific term, qualified if practicable by the word “computer.”

For computer cartridges, if the information is readily available, indicate the kind of physical medium the cartridge contains by qualifying the word “cartridge.”

- 2 program files (4319, 5408 bytes) in 1 computer tape cartridge
- 1 program file in 1 computer chip cartridge
- 2 data files (1500, 3500 logical records), 5 program files (ca. 2400 bytes each) in 1 computer disk cartridge

9.5B7. If the file is encoded to produce sound, or to display in two or more colors, indicate this by adding the term “sd.” or “col.” or “b&w” following the designation of the files and the media on which they are recorded. Precede the designation of sound, color, or black and white with a colon preceded and followed by a space. If the file is encoded for both sound and color, use “sd., col.”. Specify in the system requirements note anything needed to permit the display of color or the production of sound (e.g., color card, color monitor), provided this requirement is given in the prescribed sources of information.

- 3 program files on 1 computer disk : col.
- 2 data files (2500 logical records each), 5 program files in 1 computer disk cartridge : sd., col.
- 2 program files (4672, 8003 bytes) in 1 computer cassette
- 6 program files in 1 computer chip cartridge : col. ; 3½ in.

If the decision is made to record information pertaining to the physical carrier and other associative characteristics in a note, then rule 9.5C1 should be changed to include the appropriate details, and the referenced note should be changed in terms of its order within the note section of the rules. It is recommended here that the “system requirements” note as outlined in the Guidelines be the first note and the details for the description of the physical carrier be the second note. The latter note would be introduced by “on” or “in” as appropriate:

- On: 1 computer disk : double sided, double density ; 5 1/4 in.
- In: 1 computer chip cartridge : col. ; 3½ in.

9.5D. Accompanying material

This rule is not easily applied to commercially produced microcomputer files on/in a permanent carrier. Relationships between or among files are often not clear nor well documented. For earlier MRDFs, programs and data files were rarely if ever mixed. For example, a work could be made up of several parts (e.g., 3 data files or 3 program files), but only rarely as mixed parts (e.g., 1 data file and 3 program files). As mentioned earlier, program files and data files on the same carrier were usually cataloged separately, or, if not, they would be linked by the use of this rule for accompanying material or cited in a note.
However, with microcomputer files the distinction between a data file and a program file may be purely arbitrary. What would normally be considered data within a program in a mainframe environment may be separated out as a file in a microcomputer environment because of limited space in memory. Even though such a distinction is made in terms of file structure, in a logical sense (and thus a cataloging sense) they are considered to be one work.

Nonetheless, there are microcomputer packages that include supplementary files, and such files could be considered as accompanying material or they could be described in a note. Examples would include test files, documentation files, utility files—all are supplementary in their relationship to the main files. Such files may be issued on separate disks, or they may be part of a single disk. If they are recorded on a single disk, then rule 9.5D1 should be changed to something similar to that recommended in the Guidelines:

9.5D1. If a multipart file consists of both data file(s) and program file(s), and it is clear from internally encoded information, from labels, or from accompanying documentation that one component is subordinate to the other, record the number of subordinate files as accompanying material. Optionally, add to the designation the number of logical records or bytes in such accompanying program or data files.

2 data files (253, 1200 logical records) in 1 computer cassette + 1 program file (5573 bytes)

If the file(s) are described in the sources of information as having a unique role, then this role should be incorporated into the designation.

1 program file (6786 bytes) on 1 computer disk; 5 1/4 in. + 1 sample data file.

9.5D2.

The example would need to be changed provided all the previous recommendations are carried out.

1 program file (4509 bytes) + 1 manual (100 p.; 25 cm.)

9.5D3

The wording of this rule should be changed to reflect a broader interpretation of documentation, as opposed to only one type (i.e., codebook). The change might read:

9.5D3. If a file is accompanied by both a hard copy and a machine-readable copy of the documentation, give details of both.

1 program file (3982 bytes) + 1 manual (24 p.; 25 cm.) + 1 machine-readable manual (990 logical records)

9.7B Notes

The Guidelines recommends the so-called system requirements note that would be used to capture all the requirements necessary for compatibility and use. Items that could be included in such a note are make and model of computer, memory size, operating system, peripherals, hardware (internal) modifications, software required, and auxiliary equipment.
Because the determination of machine compatibility is so important in the selection process, and because it is not feasible to place all required information in the file/physical description area, it is recommended here that the system requirements note be the first note and that the order of the remaining notes be changed. There are three possible options: (1) that a new system requirements note be created and become the first note; (2) that the existing first note—the nature and scope note—be dropped and replaced with the system requirements note; and (3) that the existing 9.7B10 note (file description and physical description) be modified to become the system requirements note. It is recommended here that system requirements become a new note and be placed as the first note in the order of notes. It is further recommended that the existing 9.7B10 note be modified and moved to the position of the second note. The latter note could then be used to describe the physical carrier of the files instead of recording the physical carrier in the file/physical area as per the Guidelines. Combining the rules in chapter 9 with the Guidelines for the file/physical description area, the cataloger has no less than seven decisions to make regarding information that may be recorded in this area. By placing the description of the carrier and other related details in a note, the file description area becomes less cumbersome and less technical. As a note such information is easier to control, more information can be included, and the information can be captured just as it is given in the sources of information. It would also bring together all related information on the physical carrier rather than scattering some of it in the file/physical description area and some in the note area (e.g., an independent note for "disk characteristics" as per the Guidelines). Examples of the recommended notes are as follows:

System requirements: Apple II; 32K; DOS 3.2; 2 disk drives (double density), micro music DAC board, speaker or earphones, video monitor or TV with RF modulator.
On: 1 computer floppy disk: col.; double sided, double density, soft sectored; 5½ in. + 1 backup disk.


This note has not been clearly interpreted for MRDF, and it is usually bypassed altogether. Although relevant for other media, it is recommended here that it be deleted from chapter 9 and that the summary and contents notes be used for describing the nature and content of a computer file.

9.7B2. Language, etc.

For most chapters in AACR2, this note refers to the written and spoken languages. It would include those languages with special characters or diacritical marks. Since many printed texts have been converted to a machine-readable text, this is a legitimate note for computer files. However, the inclusion (as one of the examples) of a standard for machine language, "ASCII characters," has only confused catalogers. Combining machine languages with written languages might be equated with mixing apples and oranges. It would be clearer if the two examples were
separated and if the machine code requirements were placed with the note dealing with hardware and software, respectively. It is recommended here that the first example in this note area be deleted.

9.7B3. Source of Title Proper.

The word "data" should be deleted from the text of this rule. Examples should be reexamined in terms of microcomputer files such as:

Title from disk label.


The option (as described in the second sentence of this rule) has been deleted as per the recent JSC decision. The second example was also deleted.

9.7B8. Program.

This note needs to be deleted. Program versions and levels are legitimate "edition statements" and should be included as examples in rule 9.2B1. There is no real need for a separate note just for programs, as all notes should refer to program files and data files equally.

9.7B10. File Description and Physical Description.

This note should become the second note and immediately follow the system requirements note. The wording of the text plus the examples should be changed to reflect microcomputer files and their carriers. Reference to program statements should be combined with bytes if earlier recommendations are carried out.


The term codebook in the second sentence of this rule should be replaced with documentation. The same would be true for the second example.


Delete term data from this rule. Provide examples relevant to microcomputer files such as:

Intended audience: Ages 3 to 5.

9.7B15. Mode of Use.

This note has been interpreted as "mode of access" rather than "mode of use." It is recommended that this note be changed to "mode of access" with the wording changed to read:

If the file can only be accessed in a particular mode (e.g., batch, on-line, etc.), indicate this fact.

9.7B18 Contents.

Change wording to reflect recommended option of adding number of bytes as well as the number of logical records or program statements.
CONCLUSION

It would have been better to have had the luxury of more time before considering such dramatic changes to the existing rules. However, given the changing technology and the importance of microcomputers, such changes must be made and made quickly. Michael Gorman has asked that ALA and others prepare a statement for JSC on the cataloging of microcomputer software and that some specific rule revisions be included. It is hoped that this document may serve as background material and a start towards a draft statement. Any and all comments are welcome.

REFERENCES

5. AACR2 Revisions 1983 (see “Instructions and Contents”).
6. Ibid., rule 9.5B1.
8. Ibid., p.9.
9. The first use of this note is attributed to Ann Fox and had its genesis in the forthcoming text by Sue A. Dodd and Ann M. Sandberg-Fox entitled: “Cataloging Microcomputer Software” (to be published by the American Library Assn., spring 1985).
11. Ibid., p.9.
12. AACR2 Revisions 1983 (see “Instructions and Contents”).
Although there has been a great deal of discussion in the literature of the problems of cataloging microcomputer software, the focus has been almost exclusively on descriptive cataloging. In January 1984, the ALA/CCS Subject Analysis Committee appointed a subcommittee to study subject access to microcomputer software. This subcommittee has now identified a preliminary set of objectives. This article discusses these objectives and reports on the problems of subject access to microcomputer software and on the work of the subcommittee to date.

Perhaps the greatest problem catalogers face in dealing with subject analysis and classification of microcomputer software is the lack of guidelines and examples to follow. Several works have been published recently that discuss the cataloging of microcomputer software, but the main emphasis has been on descriptive cataloging and little attention has been given to the problems of assigning subject headings and classification. Sue Dodd’s Cataloging Machine-Readable Data Files does not treat subject analysis or classification of microcomputer software.1 Guidelines for Processing and Cataloging Computer Software for Schools and Area Education Agencies contains cataloging examples but does not discuss subject headings or classification in detail. 2 Nancy Olson’s Manual of AACR2 Examples for Microcomputer Software and Video Games briefly mentions subject analysis and classification by pointing out a few existing useful headings and urging the use of Library of Congress (LC) or Dewey decimal classification (DDC).3 Naturally, the new guidelines on descriptive cataloging contain no advice on subject analysis, although the excellent glossary may be of assistance to subject catalogers.4

In addition to the lack of guidelines or examples in the literature is the absence of a national model for subject access to microcomputer software. LC is not presently collecting or cataloging this material. The LC Cataloging-in-Publication Division (CIP) is planning a pilot project to catalog one thousand microcomputer software titles, but it is not slated to start until sometime in 1985.5 Although the new MARC format for machine-readable data files (MRDF) has been approved, it has been im-

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implemented by OCLC only since October 1, 1984, and is not yet implemented by all of the other utilities.

The need for guidelines on subject access to microcomputer software to complement the new guidelines on descriptive cataloging prompted the ALA/CCS Subject Analysis Committee (SAC) to appoint the ad hoc Subcommittee on Subject Access to Microcomputer Software at the 1984 Midwinter Meeting. The subcommittee has been asked to propose guidelines on subject analysis and classification of microcomputer software. This article discusses some of the problems confronting the subcommittee and reports on its work to date.

To gain an understanding of what people think subject analysis should encompass and to learn from the experiences of those libraries already cataloging and classifying this type of material, the subcommittee held an open hearing at the 1984 ALA Annual Conference in Dallas. Sheila Intner of Columbia University School of Library Service was invited to address the group with a brief talk on the problems of providing subject access to microcomputer software. She began her talk by stating that the problems of subject analysis for microcomputer software are really no different from other kinds of materials, even books, but especially other nonbook materials.

Intner outlined the practical and intellectual problems surrounding the provision of subject access to microcomputer software. She sees six practical problems:

1. Unavailability of hardware to inspect the software during cataloging.
2. Absence of documentation for software, requiring of the cataloger some familiarity with the reference works for microcomputer software.
3. Unfamiliar terms.
4. Difficulties of dealing with a rapidly changing field.
5. General lack of hands-on experience with microcomputers in the library profession.
6. Lack of well-established policies for the subject analysis of all materials in some libraries.

In addition to the practical problems, Intner sees the following intellectual problems surrounding the cataloging of microcomputer software:

1. Is a subject heading preferable to a form heading?
2. Is a subject heading preferable to a genre heading?
3. Is it preferable to deal with new terminology by (a) using established subject headings with many see references or (b) by establishing subject headings using the new terminology with choices carefully documented?
4. How should the cataloger deal with hardware information, e.g., how to distinguish between data appropriate for a 600 field and that appropriate for a 700 field?
5. Should classification distribute microcomputer software among other types of material on the same subject or group it by format?

In discussing the intellectual problem of classification, Intner urged distributing the material where it would logically fall if it were a book. She
summed up her approach by saying "mainstream at all costs."

From the experiences of those already dealing with microcomputer software collections, subcommittee members learned that some use accession numbers, while others apply LC classification or DDC to microcomputer software. Most provide subject access through a heading for the topic of the software, subdivided by Computer programs. Several libraries also reported adding subject headings for the model of microcomputer on which the software runs.

In answer to the more important question of the kinds of access users need, librarians consider several desirable: title, author, producer, programming language, operating system, model or family of microcomputers, and topic. It is clearly the responsibility of the catalog to provide all these access points. The problem for the subcommittee, however, is to differentiate those provided by the descriptive cataloging from those to be supplied by means of subject analysis and classification.

Having considered these points, the subcommittee has now identified the following objectives to guide its recommendations:

1. The entire record (descriptive cataloging, subject cataloging, and classification) should provide the access needed by the user.
2. Sound practices of subject analysis and classification should be followed to avoid unwieldy files or useless shelf arrangements caused by grouping materials together by form alone.
3. One must ensure that adequate subject headings and linkages exist in Library of Congress Subject Headings (LCSH) and that LC classification and DDC have adequate provisions for the subjects covered by microcomputer software.

To accomplish the first objective, the subcommittee began by studying Guidelines for Using AACR2 Chapter 9 for Cataloging Microcomputer Software to ascertain the access provided by descriptive cataloging. Looking back at the list of desirable access points, one finds that provision has been made in the descriptive cataloging for nearly everything except the topic of the software. For instance, the rule governing the system requirements note (Rule 9.7B15) instructs the cataloger to identify the make and model on which the software runs, the amount of memory required, the operating system, the software requirements, and the kind and characteristics of any peripherals that are needed or recommended if the information is available with the software. Nearly all of the items on this list have been suggested as candidates for subject heading access, but it is not clear that subject access is necessary in each case. As online catalogs become more widespread in libraries, and as most online catalogs reach the level of sophistication already found in some, note fields will be easily searched as an access point. Furthermore, the new 753 field recently approved by the ALA joint committee on Representation in Machine-Readable Form of Bibliographic Information (MARBI) as part of the MRDF format has subfields for the make of computer, programming language, and operating system. There is interest at least on the part of RLIN in making this field searchable. If this information already exists in the record, does it make sense to assign subject headings routinely for the computer model, programming language, and operat-
Subject Access to Microcomputer Software

ing system associated with every piece of microcomputer software one catalogs?

With regard to the second objective, the subcommittee is of the opinion that the subject content of microcomputer software should be viewed no differently from that of other materials. The criteria for assigning subject headings and classification to microcomputer software should be the same as those for the subject analysis of other works in the collection. A form subdivision may be added to indicate the medium of microcomputer software, but the main heading should indicate the subject of the material. Likewise, a standard subdivision (in the case of DDC) may be added to the class number to indicate the form, but the main class number should be determined from the content of the software rather than from the fact that it is software.

There are three questions to ask about subject headings for microcomputer software in conjunction with the second objective:

1. What should be the main heading?
2. What form subdivision should be applied to microcomputer software?
3. How should the machine or operating system be incorporated into the subject analysis?

In determining the main heading, it is helpful to refer back to Intner’s first two intellectual problems. The main heading should be the topic of the microcomputer software and not the form the software takes (i.e., not Computer programs). Likewise, the main heading should reflect what the software is about rather than what it is. For instance, the software for VisiCalc should receive the main heading Electronic spreadsheets. The software to teach one how to use VisiCalc should have the main heading VisiCalc (Computer program).

The only heading presently in LCSH that is appropriate as a form subdivision for microcomputer software is the free-floating subdivision Computer programs. Applying this subdivision to microcomputer software blurs the distinction between books containing listings of programs and the software itself. As an alternative, Hennepin County Library has adopted Computer software as the form subdivision for the actual software. When Computer is included in the primary heading, Software alone is used as the subdivision. The subcommittee is considering a formal recommendation to adopt the Hennepin County form subdivision.

The subcommittee also is considering a model for subject entry that will be consistent with standard subject heading practice yet provide some access to the machine or operating system used by the microcomputer software. The model under consideration is of the following form:

Topic—Form subdivision—Computer model or Operating system.

If the software were labeled as suitable for three or more machines, a shorter heading would suffice, i.e.,

Topic—Form subdivision.

Let’s look at a fictitious piece of software as an example. Suppose we have a disk entitled Adventuron, an Adventure Game for the IBM PC. Accord-
ing to the suggested model, the heading for this piece of software would be Adventure games—Computer software—IBM Personal Computer. A heading would not be created for Adventuron, since this is what the item is, rather than what it is about. A separate subject entry would not be made for the IBM Personal Computer because this also is not what the software is about. The application of such a heading indiscriminately would probably create a file too large to be of any use in the card catalog, and possibly too ambiguous to be of use in the online catalog. For the same reason, a separate entry would not be made under Computer software. A subject entry would not be made under the programming language in which the software is written just as one would not routinely make an entry under the language in which a book is written.

Classification of microcomputer software should not be approached any differently from the classification of other materials. To choose an accession number arrangement instead of LC classification or DDC may not seem wrong when the collection is small. As the collection grows, however, ignoring the shelf arrangement reduces overall access to the material. Within LC classification or DDC, it is important to classify the software according to topic or subject in the same manner as it would be classed if it were printed material. Classifying solely on the basis of form would require the user to browse through large sections of dissimilar subjects shelved together simply on the basis that they were all microcomputer software.

The third objective of the committee is to ensure that the headings and syntetic structure found in LCSH are adequate for the subject analysis of microcomputer software. One of the challenges to be faced, as Intner noted, is that of integrating new terminology into subject access. Will LCSH provide the new headings needed for microcomputer software in a timely manner? Will LCSH provide adequate see and see also references to guide users from synonymous terms and through the hierarchical structure of LCSH?

There are two new developments in the LC Subject Cataloging Division that may have some impact on the answers to these two questions. The first is that LC has begun to issue the L.C. Subject Headings Weekly Lists, the working subject heading guide used in the LC Subject Cataloging Division. Since the Weekly Lists do not suffer from the publication lags of the printed or microfiche LCSH and Supplements, it is possible to see very recent headings applied by the Library of Congress together with their syntetic structure. Given the prospects of the CIP software cataloging project and the fact that the literature seems to mirror the topics produced as software, the Weekly Lists should certainly help keep catalogers aware of recent LC decisions on new terminology.

The second development is the recent formulation by LC of a policy on see also references. This policy, begun in October 1984, clearly defines the hierarchical structure of LCSH. The new policy on see also references prohibits unlinked (orphan) headings in most instances. One of the subcommittee members, Pat Luthin, has done a preliminary study of LCSH terms and the linkages among terms in computer science.
Luthin has identified many unlinked terms ("orphans" in LC parlance) that can be a serious block to access for catalog users. For example, LC often omits see also references from the heading Computer programs to each specific instance of a program. The new LC see also policy should improve the situation by providing a link from Computer programs to each specific program. Unfortunately, no retrospective evaluation of the existing reference structure in LCSH is planned.

In the area of classification, the complete revision of the Dewey computer science schedule (004–006) should prove very helpful to classifiers of microcomputer software. For microcomputer software of general applicability, there is provision in the computer science area for arrangement by type of computer, programming language, computer model, or specific program. A standard subdivision for computer software has been included, so that classifiers may class software with the appropriate subject and add the form subdivision to indicate that it is software. The new Dewey schedule should be available in 1985.

The ALA/CCS/SAC ad hoc Subcommittee on Subject Access to Microcomputer Software hopes to issue guidelines on subject headings and classification for microcomputer software before the 1985 ALA Annual Conference. In the meantime, those faced with cataloging collections of software would be well advised not to make special allowances in subject headings or classification just because of the form of this material. If one takes into account the access provided in the entire record, and one follows Intner's advice to "mainstream at all costs," then the resulting subject analysis and classification should be compatible with the guidelines when they are issued.

REFERENCES

6. Sheila S. Intner, presentation at the open hearing on subject access to microcomputer software at the ALA Annual Conference, Dallas, June 25, 1984.
10. Susan Nesbitt, information given at open hearing (see ref. 6).
13. “See Also References” (proposed final draft), presented at the ALA SAC Meeting, June 24, 1984; to be published as H-370 in Library of Congress, Subject Cataloging Division, Subject Cataloging Manual: Subject Headings (Washington, D.C.: Library of Congress, 1984–).
Microcomputer Use in Collection Development

Erwin K. Welsch
with Nancy L. Crossfield and Kenneth L. Frazier

The article describes different applications of microcomputers for acquisitions and collection development in three of the university libraries at the University of Wisconsin–Madison. It emphasizes differences in hardware and software for similar tasks, describes utilization problems, and concludes with generalizations about strategies for effective microcomputer use in collection development, especially the importance of individual training.

During the past year, three librarians at the University of Wisconsin–Madison have used microcomputers for collection development and acquisitions. The activities in which they were engaged, such as managing order files and producing acquisitions lists, seemed suitable for microcomputer application, and they wished to test several assumptions about microcomputer use. The most important was to evaluate the degree to which microcomputers would make it easier, as several sources have suggested, to eliminate time-consuming technical chores and enable them “to concentrate on the content of the collection, due to the time savings and control of information.” Another was to find out whether it would be possible to utilize readily available and comparatively inexpensive packaged programs with different microcomputers to generate new products that were acceptable within the library system and usable by the public. A third was to determine levels of staff acceptance and the best method for teaching microcomputer use. The librarians responsible for the projects believed in microcomputers but had little or no computer experience. Without released time, they learned the computer programs, taught staff to use them, and incorporated the new operations into daily routines. They were employed in libraries of varying sizes and budgets and with different missions: a central university library, a professional library, and a specialized science library. The following describes their experiences and concludes with observations derived from them that are generally applicable to the use of microcomputers.

Erwin K. Welsch, Social Studies Librarian, and Kenneth L. Frazier, Assistant Director, Steenbock Library, are members of the staff of the University of Wisconsin–Madison, General Library System. Nancy L. Crossfield, formerly Geology and Geophysics Librarian there, is at present Medical Librarian, St. Agnes Medical Center, Fresno, California.
MEMORIAL LIBRARY

The Memorial Library has used an Apple IIe with 128K of internal memory, an Epson RX-80 printer, and a Hayes Smartmodem 1200, as a communications link with OCLC, to assist in collection development in the field of Scandinavian literature and for an exchange program with libraries in the German Democratic Republic. The library has a distinguished collection of contemporary Danish, Norwegian, and Swedish literature and an active current acquisitions program that includes the use of approval plans. During a period of reduced funding in the 1970s, many books were not acquired. In rebuilding the collection, the best method was found to be the preparation of lists of holdings of important authors, which were then used for both retrospective and current acquisitions. A typed list of the Danish collection had been prepared in 1982 and was used effectively during an acquisitions trip to Denmark. Because literary works are frequently reprinted, a list also facilitated reading of the current national bibliography. But updating the typed list was impractical, and since titles were constantly being added, it quickly became unwieldy. Using Applewriter software to prepare similar lists of Norwegian and Swedish literary holdings was the solution that turned a difficult task into an easy one. A student copies the appropriate shelflist sections, adds other titles by checking the card catalog, and enters the information. The program and printer have the flexibility to print correctly in the three languages, a characteristic not shared by all word-processing or data-management programs, and to update as needed.

Applewriter has several features that save time when entering data. For example, Library of Congress call numbers for literary authors repeat all but the final Cutter number for each book. With the program’s “find and replace” function, the typist substitutes an abstract symbol for the call number and with a few commands the computer makes the substitution, thereby avoiding repetitious typing and errors. It is possible to use this same routine, linked through a short program to the built-in word-processing language, to save typing of any other frequently repeated text. When instructed, the computer will automatically fill in the correct form and text for a number of authors at the same time. The library uses this feature to avoid repetitious typing of lengthy publishers’ names, e.g., just typing AX75 and using the “find” routine will cause printing of Almqvist och Wiksell, 1975.

The program has relatively few problems and can be easily learned. The most effective method of teaching the program was to have one person take the time to learn it and the printing techniques thoroughly and teach others individually. It was found that such a person could have a student entering data in less than an hour, and it was then possible to introduce more complicated techniques gradually as they were needed. Having someone for troubleshooting was also important.

The library has tried, with mixed success, to use the Quickfile data-management program for preparing order slips, maintaining the files, and issuing acquisitions lists for Scandinavian literature and for ex-
Microcomputer Use

The program was designed to handle relatively small, uniform data elements, such as addresses, and is therefore somewhat unsuited for order slips. Since the program loads the entire file into memory, it has the advantage of being able to manipulate data, including range and Boolean search routines, very rapidly, but the disadvantage is that file length is then determined by the size of the computer’s random access memory (RAM). With the length of form needed for Scandinavian books, the Apple’s 128K could accommodate only two hundred entries. Since printer control characters differ for each language, that division was a natural solution. Once the text has been entered, it is easy to print order forms in any format, do claims, or issue lists of recently acquired titles. The claiming feature is particularly important in managing the approval plan since it enables the library to enter books that the dealer, by marking the national bibliography, has indicated would be sent and to check arrivals later. But the program only works because the files are small, and even then it has been difficult to include in the regular work routine because inadequate storage is a continuing problem.

The same program has been used for managing an exchange program with libraries in Europe. The library uses Quickfile to generate orders for books requested on exchange and claims for nonarrivals and also to prepare lists of books to be offered on exchange. These lists, which had previously been typed, can now be rearranged by subject and can be easily purged as books are used.

The Hayes Smartmodem 1200 and the Data Capture IIe program for access to OCLC have been the least successful components and a continuing frustration to their users, particularly when compared with the dedicated terminals elsewhere in the building. Even though the equipment is from a reputable manufacturer, it is cumbersome—requiring eight easily forgotten steps to access OCLC—and has problems even after the connection is made. It is impossible to erase a search key, so a typing error means starting the process over; the information scrolls by and cannot be temporarily halted for reading; the character transmission is overly sensitive, resulting in frequent “message not clear” responses; and there are problems related to writing overflow data from the capture buffer onto the disk. Loss of the staff member who set up the system, and might have been able to solve these problems, was a demonstration of the need to have such skills readily available.

Geology-Geophysics Library

For the past year the library has been using an Apple III, with 128K of internal memory, together with PFS (File and Report) software for miscellaneous library-related jobs, such as maintaining online searching accounts and student payrolls, and as a word processor for thesis lists and patron-requested bibliographies, but its major use has been in acquisitions and collection maintenance. The system prints orders, assists in producing budget reports, helps monitor collection development through checking on titles by LC classification numbers, and provides the data for a monthly acquisitions list. In addition, it is used for budget
control for a serials collection of six hundred titles, including cost estimates, current expenditures, and holding lists.

Experience has demonstrated the importance of meticulous care in designing a system. For example, the order slip format must be carefully done to include all the data elements that will be needed in the proper sequence. Although the PFS software is flexible and allows variable field lengths for each bibliographical element—it is possible, for example, to include even complicated addresses for obscure publishers—the fields cannot be rearranged to print in a different sequence. If range searching of numerical fields is required, extra spaces must be included in the field for command characters. The system was designed to use conventional, form-feed three-by-five-inch card stock, but after some problems with jamming, the library changed to three-part carbonless forms.

The library makes extensive use of the system’s rapid and flexible sorting and rearranging functions to produce management and collection information. PFS will alphabetize up to the first ten characters in each data element and has a limited Boolean search capability which makes it possible to link any multiple data elements, date acquired and call number for example, in producing lists, or for housekeeping functions such as claiming. It is also possible to do a “range search,” that is, to search records having certain characteristics, but only on numerical and not alphabetical fields. Since only the first field in any record can be searched quickly with the PFS program, a search of several fields may take four minutes or more for the full disk of five hundred entries and proportionately less time for smaller bodies of data.

The system is designed to allow frequent updating, but batch processing data twice each week did not affect patron service, since there was a paper backup, and was more efficient. After checking a traditional catalog, a file of potential orders, and the actual out order file, a typist enters the data, proofreads them, and produces the order forms. Adding data to the files and maintaining them are not faster, and may even be slower, than traditional methods, but increased control over the acquisitions file compensates for the time lost. It is possible to total data in the “price” part of the entry for monthly expense reports, combine data from several columns to produce average book or serial costs, generate claims lists, and print lists of books recently received.

There are a few disadvantages to the system. Of relatively little importance, since most ordering is for English-language titles, is the inability of PFS to produce diacritical markings. This would be a serious handicap for libraries ordering many foreign-language titles. Another problem is inadequate storage capacity. Since the library orders about one thousand titles each year and a disk accommodates only five hundred, files must be broken down into segments. It is sometimes necessary to search more than one disk to find a specific record or produce a report. Since searching can be slow, this can become an important problem as files increase. Although the system provides the data for producing the monthly acquisitions list, it is not possible to reformat the output with PFS so that it can be used directly in a list. The data must still be retyped
for distribution, although the file may be printed to disk and a word processing program used to reformat and print it.

**STENBOCK MEMORIAL LIBRARY**

Steenbock, the university’s agricultural and life sciences library, has developed a microcomputer acquisitions system using KnowledgeMan software on an IBM PC/XT. In contrast to the operations described above, the system was not developed to utilize already available equipment. Instead, with the aid of a library science student, the library’s needs and procedures were thoroughly analyzed before either hardware or software was purchased and installed. This outside help, together with administrative support, was crucial to the system’s success. In retrospect, and with continuing advances in microcomputer technology that render any system quickly obsolete, it may be true that this analytical process is more important and beneficial to a library than the system itself.

System analysis demonstrated that there were several areas, such as file maintenance, in which automation offered possibilities for increased efficiency. Selection of the IBM PC as hardware was quickly made since it offered local compatibility and other important features. Understanding system goals made it possible to assess software capabilities more clearly and provided the insight that the library’s needs were close to those of a business and demanded software sufficiently flexible to maintain a file of potential orders, produce order forms and the current acquisitions list without retyping, while at the same time providing statistical and financial reports to be used for collection management. KnowledgeMan, a fully integrated management system, met these requirements and had an impressive number of additional features, such as unlimited files open in memory and number of indexes per file, screen forms for both record creation and modification, and an internal programming language similar to Pascal which allows high-level database commands to be mixed with standard programming statements.

The acquisitions file consists of three parts: a central order file containing standard bibliographic data; a requestor’s file with addresses; and a publishers’ address file. Screen forms for each file were created to facilitate data entry and update. As requests are received, a staff member checks for duplication (by author, title, or title code) and adds new entries which the acquisitions librarian reviews each day. Monthly, the program is used to generate a list of books to be considered in the selection committee meeting. Citations for nonselected books are purged, and the others are ordered on standard forms. As items are received, the file is updated and, subsequently, a monthly acquisitions list is created and distributed. Periodically, a claims routine is used to search and file and produce slips for books not yet received.

The acquisitions system is currently meeting the library’s goals and is providing management information not readily available previously, but it is not without problems and limitations. Checking for books not yet received is slower than in a manual file; numerous printing problems
have had to be solved, a new printer eventually had to be purchased; and ongoing support for the system will need to be adjusted in the future. But it is now clear that the library will achieve its objective of automating its acquisitions with a concomitant improvement in its services.

CONCLUSIONS

One of the attractions of microcomputer technology is its steadily decreasing cost. For comparatively little—none of the systems described above cost more than $5,000 and most considerably less—a library can now acquire a flexible system able to manage various collection-development activities. But libraries must be certain that their systems have adequate memory storage. "How much disk space do you need?" Small Computers in Libraries once asked, and gave its own correct answer: "More than you think. Library tasks are probably the most notorious space-grabbers of any microcomputer application." A library needs to make a commitment to purchase adequate storage—and a hard disk with tape backup can cost more than the microcomputer itself—if it is to be used in regular library operations and not merely for training or student use. Inadequate computer memory is inefficient and leads to a trade-off with staff time to manage files. Those systems at Wisconsin that had sufficient memory resulted in superior products at a considerable savings. Conversely, experience showed that any system that forces the user to accommodate to it, rather than accommodating to the user, must be regarded as unacceptable.

Training staff members in computer use is a frequently debated topic. One view has been that it is "no longer necessary to know how to program, only to follow instructions and spend a little time practicing," while a contrasting, perhaps more realistic, attitude is that "clerks and librarians, hard-pressed for time and energy, in an institutional setting, with anxiety levels probably higher than when relaxing at home, are not going to pick up the skills in ten minutes." Wisconsin's experience has been that individualized training specifically targeted to a job routine, which enables a staff member to see relationships immediately, is an effective technique that overcomes fears and leads quickly to staff competence. This method of having a few individuals responsible for instruction has also been adopted in other libraries and was found to be more efficient than classes. It is more important to have one staff member thoroughly trained in a program or a computer than to have several who know a little, for that person can in turn quickly teach other staff and trouble-shoot, a frequently needed and often undervalued skill. Since "with most microcomputer systems the work of selection, design and implementation" must be done by local staff with little consultative help, the development of local staff competencies must be encouraged. Perhaps because of the personal system used, staff resistance or unwillingness to use the computer has rarely been a problem. In fact, frequently clerical staff learn programs very quickly and meaningfully contribute to their successful application. Desire to do nothing but computer work once it is mastered has been more of a problem than staff fear.
The rush to use microcomputers in library operations is on, "often," as one writer said of corporate applications, "with more enthusiasm than planning." As we have seen, almost any good commercial program and computer can be used in a variety of collection development activities, but only those systems that have been carefully designed and satisfactorily take into account the microcomputer's limitations, as well as its ability to meet specific goals, will be successful.

REFERENCES

The Rise and Fall and Rise of Cooperative Projects

Nancy E. Gwinn

Preservation microfilming began in earnest in the United States in 1938, a year that also marked the beginning of cooperative filming projects. World War II gave impetus to great foreign acquisition projects cosponsored by the Library of Congress (LC) and other scholarly organizations, but other patterns of cooperation also developed. The American Library Association (ALA) and the Association of Research Libraries (ARL) began the first of a series of efforts to achieve national consensus on filming priorities in the 1950s; the earliest and most long-lasting involved newspapers. Start-up projects and planning efforts rose steadily in the 1960s, as funding from the Council on Library Resources (CLR) helped establish tools and methods to support a nationwide effort. By the early 1970s, multi-institutional cooperative activity began to diminish, although a firm foundation of informal bilateral agreements, standards definitions, and mutual consultations was in place. The 1980s have brought a new wave of cooperative preservation microfilming projects. Examples are the U.S. Newspaper Project, and projects coordinated by the American Theological Library Association, the Research Libraries Group (RLG), and the American Philological Association.

Picture if you will a typical graph whose horizontal axis measures a fifty-year period. The points plotted on the graph show a typical "rise and fall" pattern, similar to automobile production or the stock market. The rise and fall of cooperative preservation microfilming projects can also be loosely plotted on such a graph. The horizontal axis measures, in decades, the years from the mid-1930s to the mid-1980s. However, the vertical axis is, unfortunately, much less specific—in fact, it measures an intangible, impressionistic quantity called cooperative activity, a term that should be defined to include not only specific cooperative projects, but also serious planning efforts to coordinate multi-institutional preservation microfilming. Beginning in 1938, the graph will show a steady rise to the late 1940s, then a small dip in the 1950s. The line turns sharply back upward through the fifties and sixties, then declines again in the

Rise and Fall and Rise in the early 1970s. By the end of that decade, it is again clearly on an upward slant.

THE YEARS FROM 1930 TO 1940

Nineteen thirty-eight was a tumultuous year on the world scene; the Germans annexed Austria, and war suddenly loomed. A much less well known fact is that microfilming began in earnest in the U.S. that same year—and so did cooperative filming projects. Harvard, LC, and the New York Public Library all established photoduplication services, and all began photographing newspapers. Four patterns of cooperation emerged, patterns that exist to this day. The first is fiscal. LC worked with the publishers of the Washington Post and Evening Star to film early back files; in the case of the Star, LC, the publisher, and the District of Columbia Public Library agreed to share the funding up front. Second, the New York Public Library filmed the Freedman's Journal, the first black newspaper in America, with portions contributed by Cornell, Boston Public, and LC—an example of cooperation by contributing materials to complete a run. Harvard initiated the third type—cooperation by agreement to purchase or subscribe—when it began foreign-newspaper filming using seed money from the Rockefeller Foundation and the Harvard Corporation. By selling copies to others and putting the proceeds into a revolving fund, Harvard continued to finance its operation for 17½ years. And finally, there is the “traveling camera” concept. The Mormon church began its extensive filming of archives and records both in the U.S. and abroad, a process alive and well today. Less well known was filming undertaken as part of the Historical Records Survey. The central survey office supplied the camera and labor, while the state offices or sponsoring institutions supplied raw negative film and processing. Unfortunately, not much of what the survey filmed survives.

World War II gave impetus to the great foreign acquisition projects cosponsored by LC and many scholarly organizations, whose representatives helped identify the materials to be filmed. Preservation was certainly an important element, but equal to it, and soon to surpass it in importance, was the desire to acquire copies of unique materials, such as archives, manuscripts, and rare books, and make them more accessible in the U.S.

The five-year-old British Manuscripts Project provides a good example of perseverance under difficult conditions. Those who worry about the hazards of improper storage of microfilm can at least be grateful that they no longer face more serious problems: in a perfect understatement, LC reported in 1941 that “although the period was one of active submarine warfare, . . . the losses to the Project from this hazard were small.”

In the latter part of the decade, LC-coordinated cooperative acquisitions projects spread beyond the European theater to Japan and Mexico. This pattern was also useful at home. In 1941, LC joined with the University of North Carolina to assemble a complete official record of the proceedings of all legislative bodies of the American colonies, territories, and states. Using another traveling camera, the project continued for almost ten years. With the American Council of Learned Societies, LC
also began "assembling in the form of microfilm copies, . . . the vestiges of Negro journalism from the earliest times to 1900."

In 1947, ARL entered the picture with its first committee on the subject of microfilming cooperation. The committee’s concentration on nationally known, domestic newspapers resulted in the first edition of *Newspapers on Microfilm.* At ARL’s behest, LC immediately assumed publication of this continuing series and also established the Microfilm Clearinghouse in 1949. This appears to be the first of ARL’s efforts to orchestrate a large-scale cooperative preservation activity and to devise a means of data exchange, so that everyone would know what everyone else was doing. Thirty-five years later, we are all still working on it!

In the late 1940s, the points plotted on our "activity" graph show the first downward dip. LC suspended its microfilming program in 1948, while it reconsidered its policies on participation in large-scale projects. The line turns sharply back up in 1950, when LC announced a marked expansion of its microfilming program, appointed Lester K. Born as special assistant, and sent him to Paris, after consultation with the American Historical Association, for a new round of microform acquisitions.

**THE 1950s**

Cooperative microfilming activities in the 1950s developed along three lines. First, LC continued to organize its foreign acquisitions projects, which required assistance from foreign governments and scholarly institutions, the U.S. State Department, and individual and commercial filmers. One of the more creative aspects was LC’s use of Fulbright Fellows, who, once they received their assignments, were trained, outfitted with portable cameras, and empowered to microfilm documentary materials in a variety of foreign repositories.

Second, both ALA and ARL set up national committees to achieve national consensus on priorities. In 1953, the ALA committee published a statement of principles to guide large-scale acquisition and preservation of library materials on microfilm. Interlibrary cooperation, they said, would be most usefully applied to: (1) domestic newspapers of the wood-pulp period, (2) disintegrating periodicals, and (3) out-of-print books, in that order. Possibly ALA’s list was prepared with the knowledge that ARL was busy at the same time carving out a program centered on foreign newspapers.

Newspapers were definitely the category of choice. Checklists and union lists of foreign and domestic holdings began to appear; scholarly groups and other organizations with special interests in Slavic, Latin American, and Chinese materials helped determine which titles were most important and who had what portions. The cooperative newspaper filming projects that evolved from this activity acquired both stability and longevity.

One clear example is the Foreign Newspaper Microfilming Project, established by ARL in 1956 at what is now the Center for Research Libraries and still in existence today. Harvard turned its films over to the center, along with the balance of its revolving fund, while LC transfer-
red several foreign-language, domestic newspapers. It was a subscription service, with each participant (now numbering seventy-four) paying for access to a substantial body of unique material. The same year, the New York Public Library took a unilateral initiative in its National and Local Gazette Microfilming Program, which became a bilateral agreement with LC in 1974.

**THE 1960s**

The line on our "cooperative activity" graph continues upward in steady motion during the sixties. Cooperative work on completing files of newspapers burgeoned, thanks to LC's commitment and expansion of its program. By 1963, LC reported that of all the foreign newspapers being filmed in the U.S., it handled almost 87 percent, although much filming of domestic papers took place elsewhere. But thanks in part to William J. Barrow's experiments with book paper, combined with the educational efforts of Verner Clapp, first president of CLR, research libraries began to see that newspapers, and other journals printed on paper whose poor quality was easily detected, were not the only endangered species. CLR began to collaborate vigorously with ARL and LC to develop the tools and methods that would support what was hoped to be a nationwide, coordinated effort extending well beyond newsprint. The sixties were a busy ten years, the fruit of which included the *National Register of Microform Masters*, a survey of the *National Union Catalog* to discover the quantitative measure of the situation, a 1964 study by Gordon Williams that suggested a centralized, national preservation collection, and the Brittle Books Project at LC. Much was learned, but a national, coordinated program did not emerge.

Meanwhile, back in the Midwest in 1963, the Center for Research Libraries responded favorably to a group of African area studies bibliographers, who proposed what became CAMP, for Cooperative African Microform Project. Joined eventually by three similar efforts directed to South Asian, Southeast Asian, and Latin American materials, the microform projects were all designed to acquire and maintain centralized pools of unique, hard-to-get, and in some cases expensive, materials from developing nations. The Center for Research Libraries copied the successful subscription funding pattern of the ARL newspaper project; similarly, CAMP, LAMP, SAMP, and SEAM are still in operation. These projects are cooperative on a number of levels. Participants join in both funding and selection of materials to film; arrangements to film in the field require cooperation of repositories and occasional intermediaries in the form of visiting faculty or governmental offices; and finally, the center brings together files from a variety of sources to film at home, just as LC and other libraries do.

**THE 1970s**

The points on our graph have been maintaining an upward bend for two decades. Based on start-up projects and active national planning, the line that connects the points probably reached its zenith in the 1960s, but by 1970 began to descend.
A frustrated ARL turned back to newspapers, where it could already measure substantial progress, and worked with LC to create a national program centralized at LC with a full-time coordinator of foreign newspaper microfilming. The same year ARL published a report prepared by Warren J. Haas that tried once more to move activity beyond newsprint. As an alternative to the centralized preservation collection proposed earlier by Williams, Haas suggested "the creation of a coordinated system of collections in a national plan, each with a distinctive and specific research orientation or, in certain cases, a format orientation." A "preservation consortium" was what he had in mind. Its members would agree to meet specified minimum standards for physical storage of preserved items, to set up controls governing use, and to concentrate on discrete subject areas. They would add to this a planned program of microfilming, including collective ownership of master negatives. Although for several years it appeared that this idea also would come to naught, in fact, the seeds were simply a little slow to germinate.

Our graph line could not descend too far, however, for over the thirty years that had passed, research libraries had established a foundation of important, productive, yet informal cooperative activity: mutual consultations and help in completing long serials files and filling in missing pages, standards definitions, bilateral agreements, etc. By this time several research libraries set up regular filming programs. Cards and reports flowed to the National Register, and LC was ever willing to search records not yet published. But except for narrowly focused projects or attention to specific titles, the possibilities for major, multi-institutional cooperative actions seemed as far away as ever. This problem was recognized in 1976, when LC held a Preservation Planning Conference, where, it was noted, "It is also clear that the research library community, as a group, working with the Library of Congress and the other national libraries, must somehow join forces not just by one cooperating with one another, but by actually meshing their respective programs very carefully."

In some ways, Canada scooped the U.S. when, in 1977, the Canada Council, a funding agency of the Canadian government, established the Canadian Institute for Historical Microreproductions to identify, locate, and preserve on microfiche pre-1900 Canadiana. But there was movement in the U.S. as well.

**THE 1980S**

Clearly, with the advent of the 1980s, the points on our graph show a definite upward turn. This advance is due to a confluence of events, in some cases unrelated to preservation, in addition to a lot of hard work on the part of a fairly small number of library professionals. The growth of shared cataloging systems, the rising number of preservation professionals, the restructuring of libraries to create preservation departments, and the increasing attention of foundations and university administrators all play their part.

There is a new wave of cooperative preservation microfilming projects in this decade, and the following paragraphs will briefly describe
four of them. Unlike many past efforts, which focused on acquisitions as much as preservation, these are true preservation projects. Their targeted materials are items in general collections, some of which may be unique, but all of which are reaching the end of their natural life span. Access is still an important feature, but more often billed as “continued access” to something that may disappear, or “increased access” to materials that would otherwise have to be locked away. The projects all focus on discrete and clearly defined classes of material, and, with one exception, have moved well beyond newsprint. They all enjoy strong, centralized, managerial coordination. And, finally, they have, in three cases, good financial backing in the form of foundation support and, in the other, a promising return to a subscription-based structure.

The U.S. Newspaper Project comes first. With antecedents in the 1970s, it came alive as a cooperative effort when the National Endowment for the Humanities (NEH) took it over in 1979. In 1982, NEH awarded grants to six institutions with national holdings of U.S. newspapers to prepare bibliographic records and enter them into the CONSER database managed by OCLC. In 1983, NEH provided eighteen more grants to states and territories to plan similar projects for local U.S. newspaper holdings. Although no monies have yet been granted for preservation, that is intended to be the final phase.

The second project, planned by the American Theological Library Association, is concerned with theological monographs published between 1860 and 1929. The association has been filming theological serials for years with subscription funds and now plans to combine preservation of both types of material under the management of a single Preservation Board. Libraries will be invited to subscribe to the monograph series, thus continuing a traditional, generally successful funding structure.

The third project, the RLG’s Cooperative Preservation Microfilming Project began in 1983 after two years of planning. RLG members selected U.S. monographs published between 1876 and 1900 as a target, then further subdivided by broad subject. The RLIN system plays an important role. When a decision is made to film a title, the participant enters a record of that decision into the database; the record is upgraded when the filming is completed. The master negatives are stored centrally in an RLG-leased vault. Participants agree to adhere to mutually derived filming standards and preparation procedures. For institutions that have no ready access to the RLIN system, RLG has issued a microfiche union list of twenty-five thousand master negative and “decision” records. The project costs are shared by the participants and two funders: NEH and the Mellon Foundation.

Viewed as a model, the RLG project is already beginning to have an impact on preservation planning nationally. For one thing, LC has agreed to participate, and records for LC’s own master negatives will soon find their way into the RLIN database through the MARC distribution service. For another, the fourth project has been constructed specifically to complement the RLG effort.

The American Philological Association has also been funded by NEH
and Mellon to preserve on microfiche printed materials published between 1850 and 1918 in the field of classical studies. An editorial board will select items for filming, which will encompass both serials and monographs. Columbia University will undertake the filming, using materials in its own collections, but also drawing from other members of RLG. Because of Columbia's RLG connection, the project will use the RLIN database and the RLG storage facility, standards, and costing formulas. The new element is the direct involvement of a scholarly society.

Is a national plan slowly emerging? Are we ready for it? And what is the appropriate role for LC, which has shouldered so much of the work for so many years—to its credit and our gain? Since you may find the answers in the next two papers, I shall conclude with one further thought.

Once there was a wealthy Arabian sheikh who died and left his vast holdings to his only son. Among his treasures was a large palace containing a harem filled with the loveliest of creatures. However, months went by, and the son studiously avoided this part of the palace. His closest advisers became concerned and questioned the young man as to the reason for this behavior. "I know perfectly well what I am supposed to do," he replied. "I just don't know where to start!"

Fortunately, we no longer suffer from that malady.

REFERENCES

The Library of Congress: A More-Than-Equal Partner

William J. Welsh

What is the role of the Library of Congress (LC) in cooperative preservation microfilming activities in the United States? What has it been? What is it now? And what is it likely to become in the future?

To answer these questions in context, let me begin with a few general observations about the Library of Congress itself and its relationship to the rest of the library community:

- Like every other library, we acquire, catalog, house, and provide reader services for materials which meet the reference and research needs of our clientele.
- The collections of LC, like those of every other library, are deteriorating, and so we have a variety of behind-the-scenes programs for maintenance, environmental control, binding, repair, reproduction, and conservation treatment.
- Like every other library, we grapple with questions about what to acquire and preserve: How much can we do with the money we have? What selection criteria are most appropriate? What priorities should be observed?

But two things (at least!) make LC different from every other library:

- First, the Library is enormous. Our collections now number some eighty million items. We employ more than five thousand people. By any standard of comparison, LC is many times larger than any other library in this country, or in the world. And sheer size makes our operations different from those in other libraries, because even the simplest routines are big business for us.
- Second, although LC is not officially called the "national library," we have been authorized over the years to provide many services to other libraries, in addition to direct reader services "to Congress and the nation." Therefore, some of our operations have no counterparts in other libraries. We do them so you don’t have to.

This paper, reproduced here with minor editorial revisions, was presented at the RTSD Preservation Microfilming Committee program, "Cooperation in Preservation Microfilming—Past, Present, and Future," on June 25, 1984, by William J. Welsh, Deputy Librarian of Congress.

No copyright is claimed on this article, which the author wrote as part of his official duties as an employee of the United States government.
These two factors—the size of the Library of Congress and our responsibility to support certain activities in other libraries—have shaped the role it has played in preservation microfilming through the years. Let me give you some examples:

- It is more than fifty years since we first started microfilming, and we do it on a scale many times greater than that of any other library. Last year our Preservation Microfilming Office prepared more than six million pages for filming.

- When we began, there were no standards, no conventions, no established procedures. Because our Photoduplication Service, and its much younger companion unit, the Preservation Microfilming Office, are such large-volume operations, their daily procedures had to be developed with precision and documented extensively to insure consistent staff training and uniformly high-quality production. Through the years the competent and dedicated staff have played a professional leadership role, sharing their knowledge and experience in the preparation of the technical standards, specifications, and guidelines which now govern preservation microfilming.

- Library of Congress representatives have served on the ALA committees that shepherded into print such things as the 1966 Microfilm Norms, Hawken’s Copying Methods Manual, and Allen Veaner’s Evaluation of Micropublications. They have also served actively on ANSI PH-5 committees, which develop laboratory standards for microfilm manufacture, processing, and storage.

- Recognizing that our procedures could serve as a guide for others, the Photoduplication Service, in 1964, published Specifications for Library of Congress Microfilming, which was subsequently revised and expanded into two publications, Specifications for the Microfilming of Newspapers in the Library of Congress (1971) and Specifications for the Microfilming of Books and Pamphlets in the Library of Congress (1973). The Preservation Microfilming Office’s manual of procedures for screening, collation, and preparation of materials for the camera has been distributed on request to a number of libraries, even though, in its ever-evolving format, it is not a formal publication.

These accomplishments represent one facet of LC’s role in preservation microfilming: that is, sharing the technical expertise and procedural experience gained in a large and sophisticated program with those managing or planning to undertake similar work on a smaller scale.

A second facet may be found in the actual filming, which gave rise to all those procedural guides and technical standards:

- LC today has almost three hundred thousand reels in its master negative collection, containing nearly three hundred million pages of information, which might otherwise have been lost along with the crumbling paper on which it was printed. These materials have already been preserved, not just for the Library of Congress but for everyone else as well. Last year three million feet of film copied from those masters were purchased by others, at a fraction of the cost which would have been involved had they filmed their own copy instead.

- Most of the titles we have filmed were selected in response to our
own internal priorities. Newspapers and serials constitute the largest segment, but we have also consistently included brittle monographs in all subject areas, as well as manuscript and other special collection materials. A small but growing number of titles are part of cooperative projects with one or more libraries. Notable among them is the long-standing arrangement with the New York Public Library for filming foreign official gazettes, and our expanding attention to heavily used, nineteenth-century genealogical materials, in cooperation with the Research Libraries Group project.

- There are millions of volumes still waiting to have their contents rescued on film. But we ought not to overlook the already very considerable number which have been saved. Because of its large-scale operation, the Library of Congress can continue to produce vastly more than the microfilming programs of any other library. In fact, we probably produce more than all other libraries put together, although we’ll have to wait for the results of this spring’s ARL survey to know what those actual numbers are.

- This creates a situation analogous to that of bibliographic control: The Library of Congress can’t catalog everything, but “LC copy” does account for about 60% of the titles which appear in the National Union Catalog and about 50% of those in New Serial Titles.

Similarly, LC can’t preserve everything, but we are a “more-than-equal partner” in the preservation filming effort, running our cameras against the clock in the race to save as much as possible.

Such busy filming at the Library of Congress, of course, is of practical use to the rest of you only if you know what we are filming, an observation that brings me to the third major fact of the Library’s role in preservation filming: the struggle to achieve adequate bibliographic control for preservation microforms—indeed, for microforms of any kind.

This is not the time nor place for a lengthy discussion of cataloging codes and automation. But I want to mention a few key issues. The more carefully we can define and agree upon the kinds of bibliographic control that will best support preservation filming activities, the more likely that LC’s efforts can be shaped to meet the needs of the preservation community.

What do we need to know, who needs to know it, in what form, when?

There are two major possibilities here:

- **Case I**

  Information about what has been preserved on microfilm is needed in order to reduce the possibility of expensive duplicate filming. 

  Every library (and commercial micropublisher) engaged in selecting titles for archival-quality preservation microfilming needs access to the facts about what has already been filmed. Those facts about the existence and creator of master microforms need to be organized into standard bibliographic entries which can readily be compared to the catalog entries for brittle books a library is seeking to preserve. 

  This information is needed at the time a library is making a decision about whether to film an item.
Case 2

Information about what is available on microfilm is needed to support acquisitions processes, both for collection building and for replacement.

Every library which purchases microforms to add to its collections or to replace items in its collections, in order to save space or because the originals are deteriorated, needs access to information about what is available.

These facts about the existence and source of service copies of microforms need to be organized so that they can be readily compared with the library's record of the title to be acquired or replaced.

This information is needed at the time a library is making a decision about whether to purchase an item.

The differences between these two cases are subtle:

- Case 1 calls for information about masters, while case 2 wants to know about service copies.
- Case 2 only wants to know who sells the service copies, so that an order can be placed. Case 1 wants to know who made the master, as a clue to judging whether it is a properly made, archivally stored microform which might be considered part of an informal, decentralized "national collection of masters." If so, available preservation filming funds can be spent on other titles, confident that this one has been preserved.

Virtually every library is a "case 2" library now and then, since virtually every library buys some microforms. Very few are "case 1" libraries, actively engaged in preservation microfilming.

Efforts to meet the "case 1" need have a long and complex history:

- LC began annual publication of Newspapers in Microform in 1948, including records for masters as well as service copies. A cumulation for 1948-83 was published in 1984. This publication will be superseded in 1985 by NUC Newspapers, which will include newspaper reports for hard copies as well as microform masters and service copies. It will also contain all reports contributed as part of the NEH-funded U.S. Newspaper Project.
- In 1949 LC established the Microfilm Clearing House, which sought to collect and disseminate information on microfilming projects. In 1951 the "Microfilming Clearing House Bulletin" first appeared as an irregular appendix to the L.C. Information Bulletin.
- In 1965 the Library began annual publication of the National Register of Microform Masters, which included records for both monographs and serials. One cumulation covering 1965-75 was produced, with annual volumes continuing through 1983. Records for monographs received from 1984 are being included in the automated National Union Catalog, while serial reports are being included in New Serial Titles.
- Both Newspapers in Microform and the Register have been manually produced catalogs, hailed as essential and decried as inevitably slow. Editorial work and publication schedules could mean a delay...
of as much as two years between completion of filming and appearance of a report in the Register. Finding a title in the Register was reasonable assurance that it had been filmed (despite the occasional "ghost" or incorrect entry that plagues every large bibliographic project). Not finding a title in the Register, however, is no guarantee that it has not been, or is not now being filmed.

The possibility of costly duplicate filming still exists. And the volume of preservation filming around the country is on the rise, as research libraries begin to take seriously the challenge of preserving millions of deteriorating volumes. Thus the need to avoid duplication is more acute: we have, collectively, only so many dollars to spend. We can't afford to waste them.

Two important factors, absent when we first began addressing the needs of the "case 1" libraries, have now emerged. They are interrelated and offer at last a genuine chance to solve this vexing problem.

The first lies in the realization that the actual information needed by both "case 1" and "case 2" libraries is not dramatically different. A report for a master microform provides reasonably reliable clues to the source of a service copy. A report for a service copy provides reasonably reliable evidence about the existence and location of the master.

As the bibliographic treatment of microforms has become less discriminatory—by which I mean that libraries in recent years have accepted our responsibility to catalog them—tens of thousands of reports for service copies have poured into the National Union Catalog. This, together with the second factor, alters the environment in which the "case 1" libraries' need for information about masters must be addressed.

That second factor, of course, is the automation of cataloging functions and the phenomenal growth of the bibliographic databases over the last decade. Long, hard, sometimes stormy, but almost always good faith, collaborative efforts have produced a cataloging code and machine-manipulable formats which make it possible to link the information needed by both "case 1" and "case 2" libraries to a single entry.

The implications of this fairly simple fact are tremendous and exciting. They also present us with many fresh questions having to do with search strategies, file structures, the need or desirability of separate databases and search tools—questions which we are still very much engaged in answering.

By "we," in that last sentence, I mean all of us. I don't need to tell you about the more-than-equal role the Library of Congress has played in cataloging and automation through the years. You know, too, that LC by itself cannot determine what is "best" for the library community, either in general or in this particular area of bibliographic support for preservation microfilming activities which, practically by definition, are fundamentally cooperative activities.

I have dwelt on the subject of bibliographic control because it offers a striking example of the particular way in which the Library of Congress works with, and on behalf of, the rest of the library community, in general and in the area of preservation particularly. Three things characterize our role:
First, we work to preserve our own collections. Insofar as that involves microfilming, our efforts contribute directly to the common enterprise, whether they are formally part of a larger cooperative project or not.

Second, because of our facilities and large specialized staff, we are able to develop and share a broad array of tools which enable and support the work of others, from technical specifications for preparation and camera work through the distribution of bibliographic data relating to preservation decisions.

Third, and flowing out of the first two, we undertake some things that no other library can do—and I refer here especially to the research and development of new technological solutions to preservation problems.

The three-year Optical Disk Pilot Program, for example, is investigating the use of new laser technologies—analog video disks, compact digital audio disks, digital optical disks, and, of course, computers—for the storage, retrieval, and display or playback of a wide variety of library materials. It is divided into two parts: a print project, to capture, preserve, and provide access to text materials; and a nonprint project involving photographs, architectural drawings, motion pictures, and television programs.

Many things might be said about the technological possibilities, retrieval and service potential, copyright implications, and economic factors—the latter ranging from the cost of necessary equipment to a possibly major restructuring of the publishing market. Let me confine myself to the preservation aspects of this powerful new tool, of which three in particular deserve mention:

1. Like microfilm, the disk can serve as a secondary preservation format for information or images originally recorded on an unstable or deteriorating medium. Materials for the print project will be prepared by our Preservation Microfilming Office, with the same attention to completeness and bibliographic integrity that is given to items selected for filming. Disk storage is attractive because it is very much more compact than film—ten to twenty thousand pages on one side of a twelve-inch disk, compared to about a one-thousand-page capacity on a single reel of film; and it is attractive because the extremely high resolution of the electronic scanning process improves the accuracy of the captured image, even making it possible to improve the readability of a faded or discolored original.

2. The digital process employed in the print project enables us to separate concern for the preservation of the information itself from the issue of preserving the storage medium. It is possible to monitor the condition of data on the disk's surface and to transfer the digitally encoded information rapidly to a new disk without loss of quality, should any problems develop.

3. The integration of retrospective with prospective materials in a growing "electronic library" improves the likelihood that such preserved information will actually be found and used in the
future—an accepted good in itself and a vital factor in justifying the enormous costs of preservation.

For several decades now the library profession has struggled to find ways of meeting the tremendous challenge posed by the deterioration of library materials. From the start, "cooperation" has been recognized as essential to success, but we have found it difficult to define and implement effective cooperative programs.

The maturing of preservation as a field, the growth of local institutional programs, the establishment of bibliographic networks, the application of newer technologies to the solution of preservation problems, and the development of collaborative attitudes and mechanisms among libraries, as a result of automation and continuing economic pressures, have all combined to bring us together.

Today we can speak with optimism and confidence about cooperative preservation microfilming as a major element in a national response to the challenge of preserving our collections. Today we not only know that we need each other to meet the challenge, we can also recognize the nature of the partnership—the different roles to be played by individual libraries, by consortia, regional centers, and networks, and by the Library of Congress.

Cooperative preservation microfilming has a somewhat checkered past, a rapidly expanding present, and a very promising future.

REFERENCES

The Future of Cooperative Preservation Microfilming

Margaret S. Child

When one begins to survey the history of the paper preservation movement in this country, it is soon noticeable that the Council on Library Resources (CLR) has played an important, if somewhat sporadic, role in the development of that movement. CLR's involvement goes back to its support of the pioneering research on paper deterioration by the Barrow Laboratory in the 1950s. An article by Nancy Gwinn in the March 1981 issue of College & Research Libraries provides an overview of that involvement. Most recently CLR has been instrumental in convincing the Exxon Education Foundation to provide a grant of $1.2 million to establish a cooperative facility in the Mid-Atlantic states for replicating deteriorating materials, with additional funds for planning national preservation initiatives and educating a broader public about the issue.

More recently, although the main thrust of the council's funding has been directed toward the solution of other basic problems confronting American libraries, the preservation issue has not only not been forgotten, but some basic strategic thinking has been done, with council support, about ways to tackle it. The first major initiative was the formation of a task force in 1981, jointly sponsored by CLR and the American Association of Universities, to examine the dimensions of the preservation problem in research libraries and to suggest possible remedial measures. Its unpublished report served as one of the background papers for a conference held a year later at Wingspread to discuss an overall agenda for research libraries and their users as they moved toward the twenty-first century. That in turn was followed by another meeting, at the Wye Center in Maryland in October 1983, which focused exclusively on the collection and preservation of library materials. The two papers resulting from these conferences have been published and are available from the council, and I hope that many of you have read them.

The latest manifestation of the council's interest in preservation is its invitation to me to serve as a part-time consultant, to provide staff sup-

port for an effort to identify and facilitate both short- and long-term projects, which will bring us to a point ten years from now where we can say that the content of the bulk of our collections has been saved for posterity. Initially, most of my time was spent catching up on what has happened in the field of library preservation in the last two years. Here are a few of the points that have emerged from that review.

First of all, I want to stress the fact that the idea of "cooperative preservation microfilming" derives from the premise that libraries must soon transfer their holdings to a medium less fragile than the nineteenth-century version of paper which was the fatal by-product of the enormous growth of literacy of that period. I know all the objections that can be raised about microforms, and I feel most of them acutely, but I do not intend to rehearse them here. That would be an exercise in futility, for the fact remains that, at this time, there really is no other practical choice open to us.

Microform is currently the best option we have because, technically, it is relatively straightforward to produce, because standards are available and generally accepted about what kind of film to use and how to process and store it, because there are evolving bibliographic procedures for describing it and mechanisms in place which could potentially provide access to those descriptions, because it can be copied cheaply and easily, and because its per-item cost is moderate. In addition, silver halide film has proved its viability as a long-lived medium if one adheres to production and storage standards. Hovering on the technological horizon are alternative mechanisms, which might be more comfortable to use and which offer the possibility of higher-quality replication. But some of their qualities are as yet untested, and they are not yet available at an affordable cost.

I feel very strongly that we must not delay filming because we are waiting for some wonderful technological breakthrough, which will enable us to continue to fill our shelves with comfortable, convenient books. Fortunately, it seems likely that the microforms created today will be relatively easily replicated by the next stage of technology. In short, our current efforts will probably not be wasted no matter what follows microfilming. Moreover, whatever comes next, everything I am about to say concerning the conditions necessary to mount a successful national preservation microfilming campaign is equally applicable to another technology, such as optical disk.

Secondly, I would like to suggest that there is very little reason to continue contemplating the extent of the problem in order to justify beginning a massive national microfilming program. We already know, from the surveys done at Stanford, Yale, the New York Public Library, and the Library of Congress (LC), that, at the very least, 25 percent of the collections in any research library in this country will be brittle and are therefore candidates for immediate transfer to another medium. It is also abundantly clear from the results of these surveys that the problem is rapidly going to become very much worse, because all but perhaps 10 percent of the remainder of the collections needs to be considered for prompt deacidification, or it too will have reached a stage of embrittle-
ment where copying is the only solution. Faced with statistics, no matter how gross, which indicate that a task of such magnitude confronts us, we would be foolish to expend any more manpower or funds to refine or confirm them with further surveys. The only exception would be the cases where it is necessary to provide local data to convince administrators of the need to budget for remedial measures. In all other instances, it seems a more practical use of limited resources to turn our energies and ingenuity to devising action strategies and developing the infrastructure to sustain them.

I do not wish to suggest, however, that I am advocating plunging blindly ahead in the happy conviction that microfilming is a universal panacea for the preservation problem. If a national preservation strategy is to be successful, microfilming should constitute but one element within a complex of comprehensive, systematic preservation programs undertaken individually by every repository in the country holding significant research material. Such programs must ensure that all documentary resources are housed under proper climate-controlled conditions and protected from damage by light, dirt, and careless handling, that binding standards are carefully thought out and applied, that small repairs are made promptly, and that more seriously deteriorated materials are appropriately protected until they can receive remedial treatment or be filmed. I need not repeat all the details of such an in-house preservation program here because they are admirably outlined in the Association of Research Libraries' (ARL) and the Society of American Archivists' manuals on preservation administration. I do, however, want to emphasize that microfilming is only one of the treatments at our command for dealing with the plague of paper deterioration, just as radiation therapy is but one of the options to be considered by an oncologist confronted by a malignancy. To carry the analogy a bit further: microfilming may not be an ideal or very pleasant method of treatment—as a treatment it should be used in combination with a whole range of therapies including preventive care; nonetheless, in the last analysis, its value as a treatment is indisputable in those cases in which without it the patient would die.

There is ample evidence that certain key elements are already in place, upon which a national program for the preservation of deteriorating materials can be erected. Like the developing nations, we have slowly been building an infrastructure of trained personnel, viable technologies, available equipment, and operational methodologies to a level which will permit "take-off." We are not there yet, however, because there are still some gaping holes in the infrastructure. As a result, we need massive infusions of "foreign aid"—subsidies from government and private foundations, direct funding by local and national governments, and the diversion of institutional funding to preservation programs of all kinds—in order to put in place those missing links and pay for the start-up costs of actual filming projects.

Nonetheless, despite these deficiencies, it can be argued that a national preservation filming program is already under way, thanks primarily to the efforts of the Research Libraries Group (RLG), the Ameri-
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can Theological Libraries Association (ATLA), and individual libraries, such as LC, New York Public Library, and Harvard, which have a long tradition of filming their deteriorated materials in large numbers. Indeed, these efforts suggest very clearly that the national program is not only already in being but that it is and will of necessity be a distributed rather than a monolithic campaign. If it looks rather like the distributed bibliographic network with which we have all become familiar, that should not be very surprising because that is the model which seems to work best in a large, diverse, and decentralized country such as ours.

However, the fact that a national filming program in this country will be simply the sum of myriad individual or cooperative programs means that a systematic effort will be needed to ensure that everyone is playing by the same rules and to create a structure within which all efforts can be coordinated to prevent overlap, wasteful repetition of effort, or tangential undertakings. Some rules are already in place: standards have been developed which deal with the production of films and with storage environments. Andrew Raymond of the Northeast Document Conservation Center is currently at work for ARL, with funding from the National Historical Publications and Records Commission (NHRPC) and the Mellon Foundation, to produce a manual which will provide clear, comprehensible guidelines to library or archival staff wishing to strengthen an existing program or to develop a microfilming program for their institutions, either in-house or by contracting out.

In another area, RLG has developed standards for the bibliographic description of preservation microforms by utilizing the potential of the 007 field of the MARC format. It offered the definitions of each element to LC, and these were eventually revised and approved by the joint committee on Representation in Machine-Readable Form of Bibliographic Information (MARBI). RLG has also made it mandatory for all its members to state, when cataloging a microform, whether a film is a preservation master, another master, or a service copy. In addition, the Research Libraries Information Network (RLIN) software has been enhanced to permit the generation information to be displayed more obviously, as well as to allow easier searches for master negatives. Finally, RLIN users can record in a new field for "queueing date" the fact that they have decided to film an item and have agreed to do the actual filming within a year of that decision. Unfortunately, OCLC has as yet made no policy decisions about the use of the 007 field and, as far as I can tell, has provided no specific encouragement to catalogers in its member libraries to record data on microforms. As a result, such data are not being systematically collected from those libraries either on a current basis or as part of a retrospective effort. Another impediment to easy access to all bibliographic records for microforms is caused by the slowness with which the linked systems project is being completed and particularly by OCLC’s lack of participation to date.

Other major gaps in the bibliographic infrastructure remain at LC, although there is serious commitment there to moving forward on a number of fronts, and thus it seems likely these will soon be plugged.
First of all, LC has recently started to do machine-readable minimal level cataloging for the microforms that it adds to its collections and to produce tapes of this data for distribution. This process is now being extended to the preservation films currently produced by the library itself. Moreover, there are plans to go back and retrospectively enter records for films in those areas covered by the RLG projects. Easy access to data on all the master microfilms that have ever been created by LC should eventually be provided both online and in COM. In yet a third area, LC has subsumed the National Register of Microform Masters within the National Union Catalog (NUC) and plans to accept records in machine-readable form from contributing libraries and publishers. However, because of OCLC’s reluctance to agree to LC’s redistribution of such records from its member libraries in machine-readable form, they are currently available only on COM. A similar strategy is being followed for serial records, including newspapers, with distribution within New Serial Titles. Finally, a project to produce a retrospective cumulation of the National Register of Microform Masters from 1976 will begin shortly.

All this somewhat confusing and rather tedious detail has been included simply to emphasize that the bibliographic infrastructure is as yet far from ideal. Indeed, the goal of having a single source search capability for microforms seems at the moment an almost impossible dream, but we must nonetheless continue to press towards it. Individual institutions, such as Harvard, which have steadfastly pressed forward with filming over the years should be helped to make the bibliographic data on their retrospective files of master negatives generally available through the bibliographic utilities as well as through the National Register of Microform Masters section of NUC. There must also be a parallel commitment on the part of all filmers to provide copies of the films to other libraries as needed.

Standards and a solid bibliographical base are not the only prerequisites for a national preservation filming program to become a reality. Also required are more cooperative structures to organize segments of the effort. These have waxed and waned over the years, but they are still an essential organizational device if filming is to go forward both coherently and reasonably quickly. Cooperative structures can have a geographic basis, such as the preservation program currently being developed by SOLINET, which could eventually include a filming component. They can also have a subject basis, as in the ATLA project or the effort to preserve Indian tribal records now being considered by NHPRC. They could also be linked to a RECON cataloging project; something of the sort now seems to be under consideration for published musical scores and/or sheet music. Or, they can simply be based on an existing cooperative organization of institutions with similar purposes and interests, such as RLG, the Center for Research Libraries, or a self-selected group of ARL libraries. There are also undoubtedly other models which could be identified, but I think I have made my point.

I do not wish to suggest, however, that all filming must be channeled through a cooperative program. The current programs of individual repositories to film deteriorating materials as they are discovered and de-
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Terminated to be bibliographically significant, yet not already available as a reprint or in film, are to be applauded. These over-the-counter, ad hoc efforts should certainly continue and indeed should be increased, with the proviso that bibliographical information for the newly created films must be input to the appropriate database and be reported to NUC as promptly as possible. Similarly, the efforts of commercial microform publishers should be encouraged, with the same caveat that such projects must include making the bibliographic records available online.

A fourth requirement of an effective national program is the establishment of additional regional centers dedicated to preserving library and archival materials. In addition, our one existing center, the Northeast Document Conservation Center, should be strengthened in order to handle the high volume of filming generated by an increased number of cooperative programs and stepped-up institutional efforts. Filming, even the high-quality archival filming we are talking about here, is a mechanical process, very well suited to a high-volume mode of production. Despite the additional costs of transporting materials to a regional center, it seems to me the most efficient way to process the millions of volumes which will need to be filmed in the next decade. This opinion is confirmed by the positive endorsement of regional centers in the returns received thus far in the ARL survey. Such centers could ensure the quality of the film initially, could devise methods for periodic sampling to guard against deterioration, and could potentially also provide mass de-acidification treatment for books not yet so brittle they must be filmed. At the moment, the one regional center with such a microfilming capability is seriously hampered by inadequate space, insufficient staff, and lack of equipment. These deficiencies need to be remedied so that the Northeast Document Conservation Center can indeed serve its region effectively. In addition, new centers should be set up, especially in areas where there is a high concentration of research institutions with voluminous collections to feed into them.

One segment of the infrastructure in which significant progress has been made in recent years is training. That effort must be continued and even stepped up. Since a cooperative national preservation filming program is only one element in an overall effort by every repository to preserve its collections, additional preservation administrators are needed to run institutional, regional, or cooperative programs as are additional conservators to treat those items which should be retained in their original format. In addition, specific training is needed for those who will manage and staff filming programs and centers, and it is good to know that plans for such training are going forward under the aegis of RTSD.

As part of the effort to construct a solid framework of preservation awareness within which filming programs can be organized, a broader training program should also be mounted and aimed at library and archival administrators, faculty of library schools, and the entire staff of libraries and archives. Some of this can be in-house training by the preservation administrator. Some should be specialized programs such as those now given by the New York Botanical Garden or Johns Hopkins conservation laboratories staff. Some should be basic workshops such as
those offered by the Society of American Archivists or the Northeast Document Conservation Center field services officer. Some should be seminars for middle managers, such as the one recently offered jointly by ALA and LC. Also needed are opportunities for on-the-job training by means of internships like those offered some years ago by Yale, as well as the more advanced kind currently being underwritten by the Mellon Foundation.

In addition to bringing the library and archival professions up to speed with a variety of kinds of expertise in the preservation field, a national program will also have to include a public education element in order to muster the broadest possible understanding of, and support for, a national campaign to solve the preservation problem. A number of publics need to be targeted by this effort, especially scholars, who are the primary users of the materials endangered, who have the most to gain from such a program, but who remain remarkably unsupportive of any kind of reformatting. University and other institutional administrators also need to be persuaded that there is indeed a crisis serious enough to demand diversion of substantial amounts of funding to preservation from other purposes or to give top priority to grant applications for preservation. Members of boards of trustees, friends groups, historical societies, and other similar bodies must become enthusiastic advocates in their communities for the campaign to preserve our intellectual heritage. And finally, the general public needs to be alerted that the threatened loss of our collective memories has at least as commanding a claim to its attention and its tax dollars as the deterioration of historic buildings or the natural environment.

Closely allied to training and education is information exchange. In order to maximize scarce resources, more needs to be done to develop mechanisms for the lateral dissemination of information. The current proliferation of guidelines and manuals, training materials, information packets, and fact sheets on specific preservation issues is very wasteful. As LC’s National Preservation Reference Program gears up, it is to be hoped that it will assume the responsibility for collecting the documentation developed so far, distributing copies of the truly useful, identifying models deserving of emulation, circulating the results of product testing, and in general playing a key role in getting the best possible information out to those who need it.

How are all these initiatives going to be coordinated? In part, as I have already suggested, by making use of existing standards, organizational structures, and institutional programs; in part by expanding upon what already exists; and in part by creating new rules or entities as they are needed. As with the Bibliographical Services Development Project, CLR stands ready to facilitate this effort, to sponsor meetings for making decisions on critical issues, and to underwrite research such as the development of cost data needed to support administrative decisions. CLR is also particularly concerned about the need to mount a public education campaign. In addition, it will exert its good offices toward increasing the amount of public and private money flowing to the preservation of documentary resources.
However, in conclusion I want to stress that neither CLR, as an organization, nor its president nor I, as individuals, has an overall strategy to offer. Neither are we advocates of a particular governance structure. For better or worse, there is no grand design, no overarching plan, which tells us all where we should be and what we should do at any given moment. I personally think that is just as well. I hope this paper has identified most of the basic elements which must be in place to give a national preservation microfilming program the momentum needed to reach “take-off,” namely, (1) an affordable, well-understood, and generally accessible technology; (2) commitment from librarians, archivists, administrators, and scholars to transferring the information content of large parts of collections to another medium in order to save it; (3) adequate funding from individual repositories, institutions, foundations, and state and local governments; (4) accepted standards and procedures; (5) rapid and easy access to bibliographic data on what has already been filmed; (6) cooperative structures to organize and accomplish the work; (7) trained personnel; and (8) public understanding and support.

There is certainly more than enough to do, and there should be something to suit the skills and interests of almost everyone. So all we have to do is set to.

References

IN MEMORIAM:
MARIETTA DANIELS SHEPARD, 1913–1984

Marietta Daniels Shepard, retired chief of the Library Development Program of the Organization of American States, died on August 21, 1984, in an automobile accident near her home in Bedford, Pennsylvania. She was a fifty-year member of the American Library Association, in which she was active in many areas. Her particular interest in the development of Latin American libraries led to her active participation in RTSD and its predecessors.

Marietta's membership in ALA/RTSD was always one of active and vocal involvement. She served on the ALA Executive Board from 1969 to 1972. As a member of Council from 1971 to 1974, she participated in several committees and task forces, some of which continued into the later seventies. Always an enthusiastic RTSD member, she was its representative on the ALA Promotion Task Force. She wrote many articles and book reviews for library and other periodicals.

Her involvement in ALA/RTSD was typical of her interest in all aspects of librarianship, including technical services and automation, library education, bibliography, services for Spanish-speaking minorities and children, and international cooperation. Her indefatigable energy and enthusiasm in her post as chief of the Library Development Program, and her additional activities, produced so many programs and developed so many projects that Marietta's is by all odds the best-known name of this century in Latin American library circles.

She believed that the most effective means of progress was through direct contact and discussion, and was a successful organizer and collaborator in many conferences under the auspices of the Library of Congress, UNESCO, many individual Latin American governments, and the OAS. She was the founder of SALALM, the Seminar on the Acquisition of Latin American Library Materials, which began with what was intended as a one-time conference in 1957 and which has become the most productive and influential of area-studies organizations. For sixteen years, until 1973, Marietta organized each annual conference and served as its secretary. Subsequently she was made an honorary member of SALALM and a permanent member of its executive board.

Marietta’s professional accomplishments will remain a permanent influence on libraries in the Western Hemisphere. By the many hundreds of friends she made in a lifetime of travel and correspondence, she will be remembered for her imaginative approach to problems, her cheerful energy, and her generous and hospitable nature.—Alice D. Ball, Retired.
Two styles of annual review appeared in the July/September 1984 issue as an experiment. The letters of readers who responded to the invitation for expressions of preference and comments are excerpted and/or summarized below.

From: Jane L. Hammond, Professor of Law and Law Librarian, Cornell Law Library. —“The format that Joe Hewitt used . . . is much superior to the traditional reviews. . . . An intelligent writer's impressions of major events and trends are much more useful than the over-footnoted reviews of the literature. . . . Please turn the Hewitt format into a tradition.”

From: John Sheridan, Head Librarian, Charles Learning Tutt Library, Colorado College. —The writer’s initial reaction to the Hewitt article was that “this more synthetic approach might be a worthwhile supplement to the traditional annual review,” but he found the Nadeski and Pontius article more informative, perhaps because he is less familiar with the literature of micrographics. “I then
thought of the uses to which I have put the LRTS annual reviews. As I have moved from cataloging to acquisitions to administration, I have used the reviews for a history of the area. Usually I pursued several citations. I have also assigned them as reading to new librarians or those assuming new responsibilities. Former support staff members who were attending library school greatly appreciated my pointing out the existence of the reviews. So my conclusion is to recommend continuing the traditional format. . . . I hope your request for opinion receives the good response it deserves. LRTS is a valuable journal with a fine tradition of seeking better ways to inform its readers."

From: Ruth E. Shipp, Director, Technical Services Division, Seattle Public Library.

"Each year I welcome the receipt of this issue and read it carefully to review the developments of the previous year. I have found it very convenient to have such information packaged in this fashion with a wealth of references to articles elsewhere in the literature. Since the old format invited objectivity, the references often led me to articles expressing differing views on a given subject." Finding the other style of article parochial and subjective because it evaluates the news, the writer concludes: "I sincerely hope you will . . . reinstate the objective literature survey articles of the past."

From: Luke Swindler, Social Sciences Bibliographer, University of North Carolina Library at Chapel Hill. — "I am writing to express my concern over the elimination of the annual review articles. I find them useful, and their elimination would greatly reduce the utility of LRTS."

These carefully considered responses make it apparent that there should be a place for both types of articles in LRTS, and your opinions will most certainly be taken into account in planning for future issues under my editorship. Because the July/September 1985 issue will be dedicated to a series of articles on technical services "then"—in the 1905 era—and "now"—1985, no annual reviews will appear this year. These letters, along with comments from colleagues, have made it clear that the selective bibliographies that are a feature of the annual reviews are of value to our readers and, if plans can be translated into accomplishment, you will find them again, in some form, in future issues. To those who took the time to write these thoughtful letters, my sincere thanks. — Elizabeth Tate, Editor.
INSTRUCTIONS TO AUTHORS

Please follow these procedures for manuscripts to be submitted to Library Resources & Technical Services:

1. Submit original, unpublished articles only. Do not submit manuscripts being considered for publication elsewhere. Articles of four to six thousand words on subjects of interest to technical services librarians are preferred.

2. Write the article in a grammatically correct, simple, readable style. Remember that the author is responsible for the accuracy of all statements in the article.

3. Give the article a brief title; if the title is not descriptive of the content, add a brief subtitle. On a separate page give the title, the name(s) of the author(s), and the title and affiliation of each. If the paper has been presented at a conference (the proceedings of which will not be published), identify the conference by name and date on the cover page.

4. On a separate page, type the title and subtitle, followed by a brief abstract, typed doubled-spaced. Do not identify the author(s) here or elsewhere in the manuscript.

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The fictitious examples below illustrate the preferred style.


2. Neville A. Fisher and others, Publishing Patterns of the Next Decade, Li-
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3. Ibid., p.194.
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