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Information Technology and Libraries

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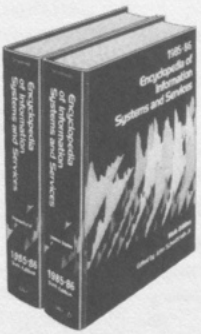

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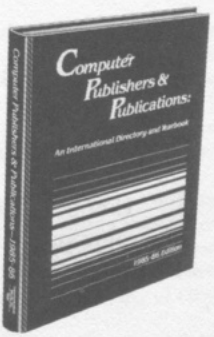

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The Library of Congress Non-Print Optical Disk Pilot Program

Elisabeth Betz Parker

In the Non-Print Project of the Library of Congress Optical Disk Pilot Program, a variety of visual media have been recorded on analog laser videodisks in order to test the ability of this technology to help preserve pictorial materials and to help improve researchers' access to pictorial collections. This arcticle reports on the portion of the Non-Print Project in which still image disks from the Prints and Photographs Division are being linked to a microcomputer database with results that hold great promise not only for preservation and access, but also for collections management and security.

INTRODUCTION

Late in 1982, the Library of Congress embarked on a four-year Optical Disk Pilot Program. The program is divided into "print" and "non-print" experimental projects which explore two broad questions: how can optical disks help *preserve* library materials, and how can optical disks help improve researchers' *abilities to use* library collections?

In the Print Project, textual materials are being scanned onto digital optical disks using newly developed technology. Here the Library of Congress is working with high-use periodicals, government reports, a manuscript collection, selected maps, and sheet music.*

In the Non-Print Project, visual media have been put on analog laser videodisks and sound recordings on compact digital audio disks using off-the-shelf equipment and currently available technology. Three videodisks contain still images: thirteen collections (approximately forty-nine thousand items) from the Prints and Photographs Division and approximately ninety thousand motion picture publicity stills of the 1940s, 1950s, and 1960s from the Motion Picture, Broadcasting and Recorded Sound Division. Three other videodisks include motion images from the Motion Picture, Broadcasting and Recorded Sound Division: seven films or segments of films with special color preservation problems; nineteen titles from the turn-of-the-century paper print collection; and two CBS news broadcasts from the 1976 Bicentennial Fourth of July weekend. The compact digital audio disks offer two concerts recorded in the library's Coolidge Auditorium.

This article reports on one portion of the Non-Print Project, the still image disks from the Prints and Photographs Division, in which videodisk technology is being linked to microcomputer technology.

*For information on the Print Project, contact the Office of Planning and Development, Library of Congress, Washington, DC 20540.

THE LIBRARY OF CONGRESS STILL IMAGE COLLECTIONS

The Library of Congress Prints and Photographs Division has custody of some 12

Elisabeth Betz Parker is picture cataloging specialist, Prints and Photographs Division and manager, Non-Print Pilot Project Operations Phase at the Library of Congress.

million graphic items: original photographs, negatives, fine prints, historical prints, posters, and artistic, documentary, and architectural drawings. They represent all periods and subjects. Researchers (now numbering more than eight hundred per month) who visit the division attest to the increasing use of pictorial materials, not only as illustrations in books and for pleasure, but also as evidential documents to supplement and complement other primary research material in social, political, and cultural studies. Pictures are being sought, for example, for thematic and artistic exhibits, to create props for plays and authentic scenes in films, and to reconstruct historic houses. Pictures convey information that help people to recreate and comprehend the present and past in a way words cannot do by themselves.

The burgeoning multidisciplinary interest in pictorial collections has made it increasingly difficult to serve researchers efficiently. There is limited staff available to provide assistance. The fragile and hard-to-handle collections suffer damage from being transported back and forth from storage to study areas. Moreover, the images are fading and deteriorating at an increasing rate because of the damaging effects of the chemicals from which they were made and the inherent weaknesses in the paper and other support materials. An item may not be available to the researcher because it is not well-enough protected for physical handling or must be kept in cold storage to preserve its color.

Access to these collections is cumbersome because of the vast range of sizes (from billboard posters to 35mm transparencies), because they are hidden from view inside boxes, map cases, and filing cabinets, and because they are usually stored according to size and type of container rather than in a classified manner. An object's value as a cultural, historical, or aesthetic document and artifact may also limit access to it. Or an item may be unavailable because it is out on extended exhibit loan, in the Photoduplication Service or Preservation Office, out of order within a large collection, or simply misfiled. Attempts to view original and historical graphic collections cause institutional anguish—each handling of the material accelerates its destruction. Such circumstances conspire against our desire to satisfy researchers' requests, while we try to preserve these valuable, unique, and irreplaceable resources for posterity. Other libraries, historical societies, archives, and museums feel similar demands and frustrations.

PICTURE RESEARCH

Picture research is conducted in two basic ways. On the one hand, a researcher may have a specific subject in mind. There may be many images to search through, and appropriate ones may be scattered among several collections in greatly separated physical locations. Preservation, collections management, and security considerations, however, force researchers initially to be very selective: they must rely on catalogs and the collective memory of the staff as indirect search and retrieval tools in order to get an idea of what is available and to help them focus the search and assess the material's relevance before requesting its retrieval. The sheer number of items desired and the variety and complexity of queries cry out for automated access.

Unlike books, pictures often do not bear their own identification, or the information on them may be incomplete or inaccurate. Documentation thus tends to change and expand as new information is discovered, and any system of access must allow the records to be easily amended. Even with automation, we are thwarted in our attempt to create an effective tool for intellectual access because the goal of the search—the picture—is not readily available. Words ultimately cannot describe and interpret pictures; the images conjured up from the verbal descriptions can be confirmed only by calling for the pictures themselves.

On the other hand, a researcher might want to view images without first consulting verbal descriptions. For example, a particular effect made by the components or composition of an image may be sought (e.g., a *strong* image of the war), or verbal equivalents may be hard to find (e.g., images that show gender bias in education). Naturally, we hope to minimize the number of irrelevant images that must be han-

dled through documentation, but it is often hard to prevent a great deal of sifting and comparing before a picture is found to answer a query. Moreover, even if the researcher's primary interest is the impact of an image, curiosity, scholarliness, or further appreciation of the image will probably cause him to ask for its identification or explanation.

The dilemma for custodians and researchers of graphic collections, then, is that words cannot entirely represent an image, but the image cannot be comprehended entirely without some words of identity. Researchers must verbalize what they are looking for, even if it is very vague. Institutions holding graphic collections must document them in words so that they can be organized, filed, and then retrieved. Unfortunately, documentation is rarely located so that it can be conveniently consulted together with the graphic items: a card catalog is across the room, the finding aid has been microfilmed, associated text is in another part of the institution, etc.

SURROGATES FOR ACCESS

Various attempts to combine images with documentation have been made in response not only to the researcher's needs, but also the institution's problems of preservation, collections management, and security. Familiar examples are microfilm and microfiche filmed with caption strips or accompanied by hard copy text, photocopies of single items in self-indexing browsing files, 35mm slides, and two-by-two-inch copy photos pasted onto catalog cards or inserted into aperture cards. These techniques have not been as successful with researchers as had been hoped, which is disappointing from the institution's point of view because of the cost and labor of making these surrogates.

Microfilm, microfiche, and slides are particularly awkward to handle and require various kinds of equipment for viewing. Image quality, at first usually quite good, deteriorates quickly as the microform is scratched and fingermarked from frequent use. Researchers are frustrated by the lack of rapid, random access, as well as by their inability to hold images side by side for comparison. Institutions often cannot afford multiple copies of an image to file under different access points. As different formats of microforms and reproductions accumulate, they become increasingly difficult to control and handle.

VIDEODISK TECHNOLOGY

The analog laser videodisk offers the same preservation advantages of other microformats: it reduces the risk of loss, theft, and misfiling of original material; eliminates overhandling of fragile, fugitive media; and allows for remote and compact storage of the originals in more stable temperatures and humidity-controlled environments. The videodisk has several other significant advantages: it is more durable and can be handled more easily; it is a very dense information storage medium (over 100,000 individual images can be recorded on a two-sided disk); there is truly rapid and random access; an image can be displayed indefinitely ("freeze-frame") without damage to the disk or the image; both still and motion images can be combined in this one format; and it can be linked interactively to cataloging data. Clearly, the videodisk meets the Non-Print Project's goals for improving preservation and access in ways that other microforms cannot.

Image resolution is often regarded as a drawback to analog videodisk technology. Because they are recorded with the U.S. broadcast television signal, videodisk images cannot show fine detail.* Certainly the greatest degree of resolution is desirable, but at the moment, high-definition television is not a standard in the United States and digitization of color and continuous tone is prohibitively expensive. The question of resolution is almost moot when we consider that no mass information storage medium can faithfully reproduce the original images we hope to preserve. Pictorial material often derives its value from the object itself: much of the message is conveyed through format, design, paper, the subtleties of color and texture, strength of lines, and inscriptions. These qualities are lost on microform reproductions.

*Videodisks do, however, rival the quality of teleproductions, which are originally produced on videotape.

It is a trade-off then. The Library of Congress has proceeded with the current off-the-shelf analog videodisk technology knowing that low resolution is a limitation. It is quite obvious that the goal of preservation could be achieved, because the need to handle the original graphic materials would be significantly reduced through use of the videodisk, and the enormous possibilities it otherwise offered for access, collections management, and security far outweighed the image display problems. Furthermore, once high-definition television is an accepted standard and the exorbitant cost for digitization of color and continuous tone is reduced, the library can make new kinds of disks.

Videodisk technology has been in use for some time, particularly for entertainment, educational, and training purposes. They are fantastic audiovisual aids: as inventory catalogs for manufacturers, as interactive instructional manuals to show how complicated equipment is repaired and maintained, for travelogues and tours, and as entertaining and informative adjuncts to exhibits. In most current applications, however, the visual information is selective and predigested in order to make a "story," and access is often limited to a relatively few predictable options. Some institutions have used the videodisk to present highlights or "treasures" from their collections to sell as a publication. These disks usually cover no more than a few thousand items that are often combined with motion footage of a curator or director providing a tour of the institution or commentary on the collections. In the Non-Print Project, the Library of Congress was interested in creating a fully operational *tool* that would take advantage of the videodisk capabilities in ways not yet fully realized.

THE NON-PRINT PILOT PROJECT IN THE PRINTS AND PHOTOGRAPHS DIVISION

Nearly forty-nine thousand images from the Prints and Photographs Division were included in the videodisk experiment in order to represent many typical preservation and access problems. Complete collections were selected so that there would be a sufficient amount of related material for users to have a true research experience. These collections include turn-of-the-century lithographically colored photoprints and glass negatives of the Americas by the Detroit Publishing Company, color transparencies from the late 1930s and early 1940s from the Farm Security Administration and Office of War Information, hand-colored glass transparencies by William Henry Jackson of a round-the-world trip in the mid-1890s, photographic views and scenes of the Ottoman Empire from the early 1890s, modern political posters from approximately fifty countries, plans and architectural drawings from 1790 to 1980, political cartoon drawings, and illustration drawings executed chiefly between 1880 and 1910. Several of these collections were not previously available to researchers because of their fragile condition, difficulty in handling, or lack of cataloging.

The Sony Corporation of America was contracted to make the twelve-inch analog laser videodisks. The original items were first captured on individual frames of 35mm color negative motion picture film (Kodak 5247) by Image Premastering Services, subcontracted by Sony. The photographers, who came to the Prints and Photographs Division to do the filming, ingeniously designed equipment and developed procedures to do the job safely, quickly, and efficiently. After review by the division's curatorial staff, the film was transferred to videotape, at which time approximately one thousand text frames (collection titles and section targets) were added to guide researchers viewing sequences of related images on the disk. The videotape "premaster" was then used to make metal disk master, from which copy disks were pressed.

By the time a videodisk is made, an image is three generations away from the original. The first-generation film is the most important version, for it provides us with a high-quality copy that can be used to make another videodisk when high-definition television is available. (This film is in cold storage for safekeeping.) The videotape version would not serve as well for this purpose because it has inferior resolution and is less permanent than film. Thus, the film intermediate also supports the goal of preservation, as we will not have to handle all of the original items again for filming.

ACCESS TO THE VIDEODISK

When someone views a videodisk, identifying text that may be present on the original image can often not be read because it is illegible on the television screen or is hidden on the back of the item. Collection titles and section targets are signposts, but the researcher must have data readily at hand in order to orient himself and to know what he is looking at as he scans thousands of images. Otherwise, he will continually test staff memory or request original items in order to check the information on them. This would defeat the purpose of the videodisk. A computer link with the data is thus an essential component of the system.

Videodisks can be made to operate at three levels of automation. A Level One disk runs on any consumer videodisk player and requires no programming. One can step through it an image at a time ("still-frame") or scan images and go to particular frame numbers by using the keypad on the player. Documentation must either be filmed on the disk or exist in some hard copy form that the user can consult in order to key in specific frame numbers.

In addition to the basic Level One features, a Level Two disk holds some programming and must therefore be run on an industrial player that contains a small microcomputer. The user selects from tables of contents and indexes filmed as text on the disk itself, bringing up the desired section of the disk almost instantaneously.

Level Three is the only viable alternative for large collections of still pictures, as the programming space available on Level Two cannot accommodate enough branching to provide effective access. Here the difference is an external computer that actually drives the videodisk player. Because the Level Three database would not be available immediately, Level One and Two menus were prepared as an interim measure for access on either consumer or industrial players. Once Level Three is operational, the Level Two programming can be switched off.

Since the videodisk cannot be changed in any way once it has been made, it is highly impractical to try to film catalog records as part of the disk. The computer provides the necessary flexibility to expand, change, and manipulate information and access to the pictures. With the library's Level Three disk, we will be greatly aided in preservation, collections management, and security, while researchers will have available the two common methods employed in picture research: browsing images and searching data for specific images.*

THE VIDEODISK IMAGE CAPTION RECORD

A file of captions for the images on the Prints and Photographs Division's videodisk did not exist, nor was there any automated system in the division to employ. Given the project's time limit, it was tempting to devise a data format and specifications that would simply satisfy our most immediate needs. National standards for cataloging original and historical graphics were not yet settled, and although the MARC Format for Visual Materials had been drafted, the schedule for its implementation was unknown. The basic form and principles of the developing standards were clear, however, and the scope and quantity of images on the videodisk made it a wonderful opportunity to test these guidelines and to refine and enhance them by practical application. At the same time, we could study the effect of machine-readable records on picture research, preservation, collections management, and security.

Another practical matter had to be considered. Since full MARC records were deemed inappropriate for the project's videodisk/microcomputer-based system, alternatives to mainframe computer control were considered. The aim was to develop a system that would not only function locally for the Non-Print Project but would also be applicable for pictorial collections in institutions that were unable to support complex cataloging systems. Simultaneously, we wanted to provide the conceptual links to a communications format that would pave the way to integration into the library's mainframe computer and eventu-

*For comparison, the motion picture publicity stills disk was made at Level One with the 6,700 titles and frame numbers filmed as rolling text at the beginning of the disk. A hard copy list of the movie titles and frame numbers also includes copyright information.

ally to national communication systems.

Building on widely accepted library communication and retrieval systems would help guarantee the transportability of our methodology and would also contribute substantially to the support and further development of these national standards as they relate to pictorial collections.

It was decided to use a shortened version of a MARC record. The videodisk image "caption" consists of fields from the MARC Format with a concentration on the controlled vocabulary access point fields most useful for picture searching. The powerful retrieval software available for micros allows us to reduce the number of fields so that input can proceed expeditiously, and the record does not need the extensive coding the MARC format requires.

The "captions" are structured descriptions that list, for example, the creator, title, date, copyright information, medium, reproduction copy, negatives and transparencies, storage location, proper name and topical subjects, and the picture's videodisk frame number. The purpose of these records is to provide bibliographic control appropriate to pictorial collections: a mechanism to find particular images from among nearly forty-nine thousand and to identify them adequately. In contrast to the cataloging done for material not on videodisk, lengthy descriptions are unnecessary because the picture is readily available. The records can also be updated easily when new information about a particular image is found, revised when an error has been discovered, or enhanced with a new copy negative or transparency number for reproduction orders.

In addition to a full-level record, we have defined a "preliminary-level" record (analogous to a MARC status) that allows us to input captions without verifying or completing all of the data. This option is necessary for collections with little or no documentation for which research would be too time-consuming within the limits of the project. Each record is clearly marked as unverified and loaded into the database for access by the public. The records will gradually be updated and verified.

Individual images within collections often have identical data in several fields (creator, date, medium) and vary only in title or specific subject. In an effort to minimize the number of separate, largely repetitive records in the database and to economize on data input, we are also experimenting with a group record ("subunit-level" as defined in the MARC Format for Visual Materials) that contains a contents note listing the individual items and their videodisk frame numbers.

The level and fullness of records is determined for each collection before input begins, depending on the extent and reliability of existing caption information and the coherence of images within the collection. By using various cataloging levels (full item-level, preliminary item-level, and subunit-level), we will test ways to enter data as expeditiously as possible (see figures 1, 2 and 3). Economy is an important consideration not only for the project but also in light of the huge cataloging backlogs found in most graphic collections.

To further strengthen ties with national standards and to exercise their application in the area of pictorial control and retrieval, conventions for recording data strictly follow existing guidelines. The descriptive cataloging portion of the record and name-added entries are formulated according to the *Anglo-American Cataloguing Rules* (AACR2) and its supplementary manual, *Graphic Materials: Rules for Describing Original Items and Historical Collections*. Proper name headings are searched in the Library of Congress Name Authority File or, when necessary, are established according to AACR2 and Library of Congress cataloging policies. Topical headings are drawn from the division's new edition (in progress) of a *Thesaurus for Graphic Materials*, which will be published in 1986.* New policies and proce-

*This publication will supersede *Subject Headings Used in the Library of Congress Prints and Photographs Division*. It will contain more than five thousand main terms and cross references, most of which are taken directly from or derived from *Library of Congress Subject Headings*. The list has been developed according to current ANSI standards for thesaurus construction (for example, use of broader terms, narrower terms, and related terms, and direct form of heading). Scope notes and cataloger's notes are included to help picture searchers and picture catalogers.

DOCN 000003856
VFID 1A–39522 – 39528 [subunit-level record]
REPR [see notes below]
LOCA ADE 3 / HABS MS–17–3 / HABS MISS, 45–MAN.v,1–
TITL Chapel of the Cross, Mannsdale vicinity, Madison County, Mississippi
DATE 1934 Jan.
PHYS 7 drawings : pen and ink on paper ; 45 x 58 cm.
NOTE Title devised by cataloger.
NOTE Accompanied by 1 photograph and 4 pages of documentary material.
NOTE Contents:
Cover sheet. With sketch map by Jay T. Liddle (b. 1906), Daniel A. Finlayson, Harry E. Weir (b. 1907) and Charles Dabbs Krouse (1A–39522)
Sheet 1. Floor plan by Weir, Harry W. Phillips, A. Hays Town (b. 1903) and Liddle (1A–39523)
Sheet 2. East and west elevations by Weir, Finlayson and Town (1A–39524)
Sheet 3. North elevation by Krouse, Weir, Town and Liddle (1A–39525)
Sheet 4. South elevation by Weir, Liddle and Town (1A–39526)
Sheet 5. Detail sheet of cornice, corbel and baptismal font by Weir and Town (1A–39527)
Sheet 6. Iron work details by Liddle and Town (1A–39528); LC–USZA1–784 (b&w neg.)
NOTE HABS/HAER Database Control No. MS0058.
NOTE B&w reference copies available in Prints & Photographs Reading Room; full size reproducible drawings also available.
NOTE Transfer, Historic American Buildings Survey, Department of the Interior.
COLL HABS–18
DESC CHAPEL OF THE CROSS (MANNSDALE, MISS.)
DEST ANGLICAN CHURCHES
DESG MISSISSIPPI—MANNSDALE
DESG MISSISSIPPI—MADISON COUNTY
DESF ARCHITECTURAL DRAWINGS
DESF MEASURED DRAWINGS
DESF MAPS
CASN Historic American Buildings Survey, funder/sponsor
PHYC Measured drawings
PHYC Ink drawings
CATD mi / 850509

Fig. 1. Subunit-Level Record with Full Contents Note

dures are being recorded in a manual that will serve both the project and regular cataloging activities.

The library's mainframe computer has an important role in all this. A two-tiered system is contemplated, whereby full MARC records representing whole collections and discrete units within collections will be input into the mainframe computer when MARC for Visual Materials is implemented in late 1985. Thus, the public will have pointers to the visual collections as they search for books and other bibliographic formats on terminals throughout the library. They then can search the microcomputer/videodisk database in the Prints and Photographs Division just as they would a book's index for a more detailed approach. These mainframe records will be distributed on MARC tapes and will be available in the National Union Catalog for Audiovisual Materials. Eventually, microcomputer captions for items warranting full MARC cataloging could be completed and put on the mainframe computer.†

†This "conversion" would affect approximately 32 percent of the current videodisk material; that is, certain unique drawings and other items having great individual intrinsic documentary and aesthetic value for which item-level access is desirable through a national database.

DOCN 000003457
VFID 1A–03187
REPR [NONE]
LOCA W7–808
PCRE Jackson, William Henry, 1843–1942, photographer
TITL Warrior in ceremonial armor, holding triton
DATE [1895]
NOTE Appears to be a Kiribati (Gilbert Islander).
COLL WTC–29
DEST WARRIORS
DEST COSTUME
DESG OCEANIA
DESF PORTRAIT PHOTOGRAPHS
CASN Field Museum of Natural History, funder/sponsor
PHYC Lantern slides—Colored
CATD hz / 850321
TEMP UNVERIFIED

Fig. 2. Unverified Item-Level Record

DOCN 000001927
VFID 1A–34765
REPR [NONE]
LOCA USW36–876
PCRE Delano, Jack, 1914– , photographer
TITL Co-op orange packing plant, Redlands, Calif.
DATE 1943 March
NOTE Title continues: . . . Workman is doing the preliminary sorting, picking out the discards. Santa Fe trip.
NOTE B&W photoprint in Lot 12002–10.
COLL OWI–10
DESC SOUTHERN CALIFORNIA FRUIT EXCHANGE
DEST WORLD WAR II
DEST CITRUS FRUIT INDUSTRY
DEST COOPERATIVES
DEST ORANGES
DESG CALIFORNIA—REDLANDS
CASN United States. Office of War Information, funder/sponsor
PHYC Transparencies—Color
CATD mi / 850404
TEMP UNVERIFIED

Fig. 3. Unverified Item-Level Record

THE MICROCOMPUTER

The library has purchased a Fortune 32:16 microcomputer with a sixty megabyte hard disk, a word processing package (Fortune:Word) that is used for data entry, and BRS retrieval software familiar to many mainframe commercial database users. BRS/Search is now available in a version for micros and minis running on the UNIX Operating System. Because complex subject searches limited by date, creator, and physical format occur far more frequently than known-item searches in picture research, we have designed the system so that there is online access to the entire record. Vague verbal queries about pictures are thus greatly compensated for by the researcher's ability to do combined free-text and controlled vocabulary searches along with the rapid retrieval of the matching pictures.

The crucial last step is to link the microcomputer to the videodisk player. After

DOCN 000000297
VFID 1A–31696
REPR LC–USZ62–45678 (b&w film neg.)
LOCA Lot 12004, p. 9
CCRE Detroit Publishing Company, publisher, copyright holder
TITL Indians fishing at the "Soo"
DATE c 1901
NOTE Detroit Publishing Co., no. 51340.
COLL DCA–2
DEST FISHING
DEST INDIANS OF NORTH AMERICA
DESG MICHIGAN—SAULT SAINTE MARIE
CASN Colorado Historical Society, donor
PHYC Photoprints—Colored
CATD jj / 850115

Fig. 4. Verified Item-Level Record

finding one or more relevant captions in a data search, this interface will enable the user to press a function key to bring up the matching images on the video monitor. Because the pictures on the videodisk were filmed as collections and in logical sequence within them, the researcher can also simply browse through the images on the videodisk and press another function key to retrieve the matching captions. Simultaneous access to images and data will then be achieved!

CURRENT STATUS AND DISSEMINATION

The videodisk has been available in the Prints and Photographs Reading Room since June 1984* operating on Level Two. Three professional catalogers and a library technician were hired in July 1984 to prepare the database. A data display terminal for caption searching was placed next to the videodisk unit in March 1985. The interface between the micro and videodisk player is expected in January 1986. A thermal video image printer has been attached so that black-and-white scratch copies of the videodisk images can be obtained for ready reference. Color copies of the videodisk monitor screen can be made with an instant print camera. A printer for the caption records will be added in 1986.

Staff and researchers alike are already profiting from having nearly eleven thousand captions on the system. For example, we have been able to check quickly on the existence of Detroit Publishing Company glass negatives that are stored in another building (see figure 4). A researcher interested in recent political posters came expecting to spend a week with the curator laboriously going through mapcases of posters—his search was completed in two days by using the videodisk. In time for the anniversary of the end of World War II, nearly one thousand color transparencies by the Office of War Information are readily available for viewing. Previously, a researcher had to make an appointment so that the material could be brought from cold storage and allowed to acclimatize; then each transparency had to be removed from its storage envelope and put on a light table—an exhausting prospect for the researcher and an undesirable one for us.

The videodisk/microcomputer database has captured the interest of individuals, groups, and institutions who are all considering its applicability to their own collections and work including: librarians, curators, and archivists, magazine and book publishers, commercial stock photo companies, preservation organizations, and historical societies, military agencies and medical archives.

The Library of Congress wishes to make the videodisk and the associated data avail-

*The motion picture publicity stills disk has been available in the Motion Picture, Broadcasting and Recorded Sound Reading Room since January 1985. It was also a popular addition to the exhibit "Books and Other Machines" in the library's Great Hall between December 1984 and June 1985.

able outside of the library as well. However, some of the material is protected by copyright law and other material may be restricted by gift agreement with the donor. To deal with this problem, the Prints and Photographs Division collections were divided into two disks. One disk contains public domain material and is available for public view in the division's reading room. The other contains material restricted in some way; before the disk can be made available to the public, the status of each image must be determined and, where appropriate, permissions sought and received.

As part of the Pilot Program, the library is assessing the copyright implications of optical disk storage and public access. Where feasible, permissions have been sought for material subject to copyright protection.* In the meantime, difficulties in determining copyright status and owners are being documented. The library must establish appropriate and administratively feasible procedures to secure permissions for reproduction, public display, and distribution. To this end, the library will be developing proposals on model agreements and suggestions on how the copyright law may need to be adjusted to accommodate new technologies such as this. Meanwhile, none of the videodisks, including those containing only public domain materials, will be sold or distributed during the Pilot Program. A method for distributing the associated data will also have to be determined in the course of the coming year.

Questionnaires and interviews will be used in the evaluation of the system's operation. Physical testing of the disks will be done in the library's Preservation Office. Concluding reports will be shared outside of the library, as will documentation of methodology and procedures.

Manual systems for original and historical visual collections have proven to be inefficient, one-dimensional, and far from cost effective. Videodisk/microcomputer technology is showing us how the multiple goals of preservation, access, collections management, and security of pictorial collections can be achieved systematically in a single system. The completion of the Pilot Program and its evaluation will help answer more concretely the questions of the costs and requirements of making such a system operational at the Library of Congress. This experience, its evaluation, reports, and procedures will provide a model for other institutions facing massive preservation and access problems with their valuable visual research resources.

*The library has obtained all of the permissions necessary for the reproduction and display of the motion picture material.

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Microcomputer-Based Faculty Profile

Vladimir T. Borovansky and George S. Machovec

A database management system on a microcomputer is used to monitor the curricular, research, and professional subject interests of faculty in a major university. A profile of each faculty member is created and indexed to monitor the expertise of individual faculty as well as trends in university programs. The faculty profile is useful in improved referrals, collection development activities, orientation for new staff, and public relations for the library. Interdisciplinary studies are easily identified. A computer-based list of in-house expertise could be useful in many organizations and different types of libraries.

One of the primary responsibilities of an academic library is the support of the teaching and research needs of the university community, the faculty, staff and students. A microcomputer-based faculty profile using an off-the-shelf database management system has been developed in order to monitor the curricular, research, and professional subject interests of faculty. This allows library subject specialists to closely monitor the expertise of individual faculty as well as trends in university programs to improve referrals, collection development decisions, and orientation for new staff.

At present, in many U.S. college and university libraries, the system of the reference librarian/subject specialist is used. The subject specialist is a professional librarian with a background—educational or experience—in one of the disciplines he or she serves. A subject specialist's responsibilities commonly include reference work, online searching, collection development, and bibliographic instruction. In addition to that, academic librarians are becoming more involved in direct support of research like their colleagues in special libraries and information centers. In some European countries, librarians/information specialists are actually part of the research team—the eyes and ears of the researchers.

In order to be informed about clientele needs it is important to have detailed knowledge about ongoing research (funded and unfunded), instructional activities, and professional subject interests. Although the university catalog can provide limited information along these lines, it is not complete and up-to-date.

HISTORY OF THE FACULTY PROFILE AT ARIZONA STATE UNIVERSITY

In the early 1970s at Arizona State University (ASU), the first attempt was made to collect and review faculty teaching and research interests.[1] A questionnaire was mailed to science and engineering faculty to obtain information on their research, teaching, and consulting. This information was then put on cards and was filed by name and department. If a faculty member did not respond to the questionnaire, a record was still established with publicly available information that could be culled from class schedules and from the University Office of Grants and Contracts. Updating and weeding was done once a year, before the fall semester, although new grants

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and contracts were added to the individual cards throughout the year as monthly reports from the Office of Grants and Contracts were received.

The faculty profile was fulfilling its purpose for a time. The cards were arranged in two basic subfiles—alphabetically by name and by department. Although many questions could be answered by remembering who was doing what or guessing which department would be involved with a particular problem, the file was of limited use to new librarians who had little knowledge of where to look. An early attempt to improve subject access to the faculty profile was through an optical coincidence (peeka-boo) system. Since the advent of microcomputers, and with increased emphasis on engineering and the sciences at Arizona State University, it was decided to computerize the faculty profile in the early 1980s. This coincided with the 1983 completion of the ninety-eight thousand square foot Daniel E. Noble Science & Engineering Library that houses over three hundred thousand volumes, more than four hundred forty thousand microforms, thirty-five hundred current periodicals. It is also U.S. Patent Depository Library. The Noble Library has seven reference librarians/subject specialists serving over five hundred faculty (about one-third of the total number on campus) in engineering, the sciences, and nursing on a campus of over forty thousand students. Studies indicate that libraries usually know little about how and why they are used for informational purposes.[2] The availability of a computer-based subject listing of user needs could substantially change this perception.

Obviously, the ASU faculty profile was an ideal candidate for putting on a database management system on a microcomputer.

MICROCOMPUTER DATABASE MANAGEMENT

Database management systems (DBMS) have a great variety of uses in libraries because of their ability to store, update, and sort data.[3] The library literature has documented DBMS use for applications such as serials management,[4] administrative management,[5] creation of in-house databases,[6,7,8] circulation control,[9] union serial list,[10] storing and manipulating of downloaded records from online searches,[11] cataloging,[12] and many other areas.[13] However, DBMS use in academic libraries for monitoring faculty teaching, research, and professional subject interests has not previously been reported.

In late 1981, it was decided to automate the faculty profile cards using the PFS database management system on an Apple III. PFS was chosen because of its low cost, simplicity of use, and ability to search and sort data with any of the fields in each record. New questionnaires were mailed to all of the science and engineering faculty at Arizona State University as had been done previously, except that we explained the file would be automated. The response was about 70 percent.

The PFS File program was used to create a database with the following fields: name, department, phone, courses taught, professional subject interests, and research projects (funded and unfunded). A special indexing field was also created to take all of the significant keywords (minus a stop word list that was taken from the *Science Citation Index*) from all of the above fields. A unit record (profile) for each faculty member was created and printed as shown in figure 1.

The PFS Report program was used to print an index of all keywords in the indexing field along with each person's name and department. Therefore, to find out who was doing what on campus, keywords or phrases could be looked up to identify individuals or departments as shown in tables 1 and 2. A person's name could then be consulted in the complete profile on each faculty to obtain a full record on the individual.

In order to save time and simplify input in the indexing field, it was decided not to use controlled vocabulary, but the actual words and phrases supplied by the respondents. This has proved quite adequate since, in most cases, faculty provided meaningful wording that accurately reflected their interests. Student assistants were trained to input data to minimize costs on creating and updating the file.

Although the database could be searched

Name: Pinkava, Donald J.
Rank: Professor
Department: BOT MIC
Phone: 965-3719
Courses Taught: BI0441 BI0442 Cytogenetics BOT591 Cacti And Succulents BOT370 Arizona Flora BOT470 Taxonomy Of SW Vascular Plants BOT591 Aquatics Of Arizona SW US BOT475 Angiosperm Taxonomy BOT576 Experimental Plant Taxonomy
Professional Subject Interest: Floras-Arizona Floras-New-Mexico Floras-US Biosystematics-Cactus Biosystematics-Sunflower-Families Cactus Sunflowers Cytotaxonomy Hybridization
Research Projects: Update-Flora-Of-Arizona-(unfunded)
Chromosomes-Of-Cowania-And-Related-Genera-(funded)
Chromosomes-Of-Ruluy-(funded)
Hybridization-Of-Hymenobrix-(unfunded)
Cytotaxonomy-Of-Opuatiz-Subgen-(unfunded)

Fig. 1. Unit Record

Table 1. Life Science Faculty: Keyword Index.

Subject & Research Keywords	Name	Department
Specific	Birge, Edward A.	MIC
Speech	Dorman, Michael F.	SHS
	Hannley, Maureen	SHS
Spermatology	Fouquette, M. J.	ZOL
Spores	Towill, Leslie R.	BOT MIC
Squirrels	Brock, John H.	AGB
SRP	Marsh, Paul C.	Ctr. Envir. Studies
States	Torok, Steve	AGB
Statistics	Collins, James	ZOL
	Gerking, Shelby D.	ZOL
Storage	Aronson, Jerome M.	BOT
Stream	Marsh, Paul C.	Ctr. Envir. Studies
Streams	Fisher, Stuart G.	ZOL
		ZOL
Stress	Gerking, Shelby D.	ZOL
	Szarek, Stan R.	BOT
		BOT
Structure	Church, Kathleen	BIO
	Fisher, Stuart G.	ZOL
	Smith, Andrew T.	ZOL
Studies	Patten, Duncan	Ctr. Envir. Studies
	Robinson, Daniel O.	AGB
Stuttering	Mowrer, Don	SHS
Subgen	Pinkava, Donald J.	BOT MIC
Sucrose	Towill, Leslie R.	BOT MIC
Sunflower	Pinkava, Donald J.	BOT MIC
System	Hannley, Maureen	SHS
	Patterson, Robert	ZOL
Systematic	Minckley, W. L.	ZOL
Systematics	Fouquette, M. J.	ZOL
Systems	Alcock, John	ZOL
	Hadley, Neil F.	ZOL
Taxonomy	Clark, Dennis W.	BOT
Teaching	Moody, E. G.	AGB
Techniques	Birge, Edward A.	MIC

Table 1. Continued.

Subject & Research Keywords	Name	Department
Technological	Edwards, Mark	AGB
Technology	Ashoor, S. H.	AGB
	Edwards, Mark	AGB
Teenage	Vaughan, Linda	FON
Temporal	Fisher, Stuart G.	ZOL
Tertiary	Canright, James E.	BOT MIC
Testing	Prather, Elizabeth	SHS
Thermal	Gerking, Shelby D.	ZOL
	Walsberg, Glenn E.	ZOL
Thermoregulation	Walsberg, Glenn E.	ZOL

Table 2. Science Faculty: Professional Subject Interests.

Professional Subject Interest	Name	Department
Behavioral–Ecology	Alcock, John	ZOL
	Smith, Andrew T.	ZOL
Bifurcation–Theory	Keyfitz, Barbara L.	MAT
Biochemical–Genetics	Doane, Winifred W.	ZOL
Biochemical–Molecular–Genetics–of–Drosoph	Doane, Winifred W.	ZOL
Biochemistry	Allan, Bieber	CHM
	Cronin, John R.	CHM
	Justus, J. T.	ZOL
Biochemistry–Enzymes–and–Carbohydrates	Lucksinger, Wayne W.	CHM
Biogeography	Faeth, Stanley H.	Zoology
Biological–Oxidations	Cronin, John R.	CHM
Biological–Productivity	Fisher, S. G.	ZOL
Biology	McGaughey, Robert W.	ZOL
Biomedical–Engineering	Guilbeau, Eric J.	CHE
Biosonics–in–Anurans	Fouquette, M. J.	ZOL
Biosystematics–Cactus	Pinkava, Donald J.	BOT MIC
Biosystematics–Sunflower–Families	Pinkava, Donald J.	BOT MIC
Biotechnology	Raccach, Moshe	AGB
Birds	Walsberg, Glenn	ZOL
Botany	Swafford, James	BOT MIC

online, it was decided to create printed reports for use by the subject specialists, since the microcomputer was not available at the reference desk.

A major limitation on the Apple III system at our disposal was that we did not have a hard disk. This forced us to break the faculty profile into segments that would fit on one disk (engineering, nursing, life sciences, and physical sciences).

In early 1985, ASU obtained several IBM PC/XTs with ten megabyte hard disks. The faculty profile is being redone using dBase III with essentially the same elements as before. However, two new fields have been added—language ability and whether a person is willing to do consulting. The dBase III files will be structured differently than those with PFS but with the same goals. Unfortunately, electronic transfer of the old records from the PFS database on the Apple to the dBase III database on the IBM has not been possible so that data will need to be rekeyed. However, with the hard disk the database will no longer have to be artificially segmented. In addition, the program will be broadened to include all faculty on campus (over fifteen hundred) rather than just the science and engineering faculty as had been previously done.

USES OF THE FACULTY PROFILE

The computer-based faculty profile has proven useful for information and referral, collection development, orientation of new librarians, and public relations for the li-

brary. The faculty profile also allows us to identify who in different departments are working in the same areas. Interdisciplinary studies are easily identified. Quite often faculty themselves are unaware of related research or interests of their colleagues on campus.

A copy of the faculty profile is kept at the science reference desk for referring patrons to appropriate faculty members when library resources will not answer the question. Although subject specialists at ASU usually know the faculty in the departments for which they are responsible, that specialist is not always available at the reference desk. Who is the expert on snakes? Who is working with electron microscopes? Who is working on active solar cooling systems? Is there research on campus in petroleum engineering? All of these types of questions are easily answered with the faculty profile.

Even the largest academic libraries have limited funds for acquiring new materials. The faculty profile has proven to be a useful aid to subject specialists in identifying interdisciplinary fields of study (especially useful if your library has allocated funds to determine from which budget money might be taken), as well as fringe subjects. The profile can help identify new trends in research to build collections in a logical manner, rather than by hunch. Since the ASU profile also asked faculty to identify unfunded research, it is possible to know where future funding may appear on campus. In addition, in some fields where outside funding is rarely obtained, the library can still direct acquisition money to research areas where there will be demands on the collection. The faculty profile can also be a useful aid (but not the only criteria) for such projects as weeding and establishing or modifying approval plan profiles.

When new subject specialists are hired, the DBMS can be manipulated to have a subset spun off to orient the librarian to the specific programs, classes, research, and professional interests of the departments for which they are responsible. This can aid the librarian in liaison duties as well to become more quickly attuned to collection development needs. New administrators to the library can use the system to get a broad view of one segment (the faculty) of their primary library clientele.

Obviously, the faculty profile has many uses outside the library. At ASU, for example, the new engineering dean wanted the section on his college to identify areas of faculty interest of which he was unaware. The news bureau on campus also wanted a copy so that they could identify experts for the local media. One reason that the new edition of the faculty profile at ASU will contain whether a person will do consulting is that it would be relatively easy to publish a directory. A subject listing of expert consultants on campus would be of great use to local businesses, industry, clubs, lawyers, and many other organizations.

CONCLUSION

A computer-based list of research expertise could be useful in many organizations and different types of libraries. In the past, libraries often played a rather passive role in the identification of specific user needs. Libraries were simply repositories of information rather than active facilitators of research. However, this trend is being reversed. The advance of modern information technology has radically been changing our abilities to provide information quickly, accurately, and effectively. The goal should be to build relevant library collections while directing the right person to the right resource at the right time. In order to improve the "accessibility component" described by Gerstberger [14] librarians must come to users and make services available. The computer-based faculty profile can play a major role in improving library resources and services.

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EDITOR'S NOTE

The annual index for volume 4 originally scheduled for publication in the December issue of *ITAL* will appear in the March 1986 issue.

Special Section: In Depth—The Online Catalogue of the University of Illinois at Urbana-Champaign

The Online Catalogue at the University of Illinois at Urbana-Champaign: A History and Overview

Michael Gorman

The story begins approximately ten years ago. In the mid-1970s, the library of the University of Illinois at Urbana-Champaign (UIUC) was the very model of the traditional American research library, with the traditional problems of those libraries magnified by the sheer size of the UIUC Library—then as now the largest library of a state-supported institution in the United States and the largest library in the world that is more than one hundred miles from a major city. It had a card catalogue (containing then over eight million cards) of some antiquity and of great complexity. It had a major cataloguing and processing backlog that showed no sign of decreasing. It was organized in a traditional and traditionally unresponsive manner. Finally, the only major national innovation in the field of library automation at that time—OCLC shared cataloguing based on the MARC record—was woefully underused in the UIUC Library.

Looking closer at the card catalogue of the time, one finds an even more distressing story. Not only was there a massive cataloguing backlog—to the extent that few or no materials acquired in the last two years were available for use—there was also a massive filing backlog. Hundreds of thousands of cards were arranged in "supplements" that were neither more nor less than organized filing backlogs. These organized backlogs developed their own formal and informal backlogs, and the result was akin to that of a hall of mirrors in which the catalogue user was reduced to chasing after bibliographic shadows that were at times tantalizingly close, at times far away, and that eluded all but the most persistent grasp. This shadow world was made even more difficult to deal with by the peculiar (in both senses) nature of the filing rules used in the catalogue. Every bibliographic pilgrim needed a Great-heart to find what he or she was seeking. The maintenance of this ever-failing system was labor-intensive and absorbed up to $250,000 each year. Such, such were the joys!

The first comprehensive response to this situation, and to the host of attendant problems in circulation, binding control, acquisitions, etc., was the installation of the short-record system known as LCS. This system, which was developed by IBM in the late 1960s, was transplanted from the library of Ohio State University. There were two significant differences between the system as used in Illinois as contrasted with its use at OSU. The first was that the software was almost entirely rewritten, partly for technical reasons. The second was the other cause for the extensive rewriting — the use of LCS as the basis for the statewide resource sharing network. Initially, LCS was installed at the library of the University at Urbana-Champaign, it was then extended to the libraries of the campuses of the university in Chicago and then to other college and academic libraries in the state. Today, the LCS network encompasses more than

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twenty-five libraries and is used to enable the most extensive automated resource sharing enterprise of any of the states.

LCS, despite its smashing success, is designedly limited in its potential. Those limitations have been misunderstood even, at times, by those who use it. The limitations are not those that result from the fact that the system was originally designed as a single-library circulation control system. As is commonly understood by those with an understanding of the history of technology in libraries, systems that have worth almost invariably have values and capabilities beyond those for which they were originally intended. The true limitations, in this case, were those of content of the LCS record and of the consequent limitation of access. LCS contains a number of short records. Those records contain call number, "main entry" heading, title proper (up to 255 characters), edition statement, place of publication, date, volume and part information, and status information (holdings, locations, charges, etc.). Each participating library's database is maintained separately, though they are all held on the same mainframe computer (at the central administrative computer center of the University of Illinois). Each database can be searched from any of the more than six hundred terminals in the state, by codes and search keys. Those searches are author, author/title, title, and call number (either direct call number or shelf position). Once located, entries can be used to charge, discharge, renew, "save," and recall materials. All of these functions (with the exception of discharge) can be done directly by the library user. This includes charging items from remote locations.

It is evident from the preceding that LCS could not be seen as a replacement for the card catalogue, despite the fact that it has many virtues and capabilities that go well beyond those of manual files. The problem thus posed was simple to ask but difficult to answer. It was: how can the virtues of LCS be preserved while its capabilities were being expanded or supplemented? The very question ruled out certain answers. A separate catalogue system was not acceptable, nor was a simple expansion of LCS itself. It is interesting to note that Ohio State University library has carried out a successful and major expansion of its single campus LCS system. The extensive rewriting of the Illinois LCS software and its installation as a statewide network made the adoption of the OSU expanded LCS infeasible. That statewide dimension of LCS also made necessary a statewide (or potentially statewide) solution to the catalogue dilemma.

An early decision was that the supplementary system, which with LCS would form the Online Catalogue, should be sought among existing systems rather than be developed within the library and campus. This fundamental decision was made on economic grounds (such internal development is inordinately expensive), on grounds of human resources (few if any libraries possess a cadre of persons with the necessary expertise to develop an acceptable major automated system) and on philosophical grounds. The latter are based on the inherent uncooperativeness of locally produced systems and the potential for cooperative development and other forms of cooperation that are inherent in the purchase of existing systems. The last fundamental of the search for a solution to our bibliographic control problem was that the purchased system should not replace LCS, but should complement it by possessing attributes and capabilities that LCS does not. Given the decision that the new system should not stand alone, the complementarity necessarily implied a link between LCS and that new system. This link was to become the single most important and difficult technical problem of the Online Catalogue. (It is discussed further below and in the article by Catherine Salika in this section.)

Specific attributes of the sought system were:

1. It should be based on MARC (i.e. full bibliographic) records derived from use of OCLC, with all standard access points (especially subject).
2. It should allow full authority control including a syndetic subject structure.
3. It should be capable of being linked to the existing short record circulation system (LCS) to provide what, to the user, would appear to be a single comprehensive system.

4. It should have potential as the basis for a statewide union catalogue.

The quest for the second and more complex part of the Online Catalogue was undertaken by a number of staff from the university library and from UIUC's computer services agency. Various systems were studied thoroughly. That of the Washington Library Network (WLN) proved to be the nearest to that meeting all the requirements listed above. The important characteristics of the WLN system that led to this decision included the fact that WLN had been conceived and created within a network environment and that it is a fully functioning and fully developed system within that environment.

Once the choice was made, a package of grant and local funding was assembled. The grant money (LSCA funds approved by the Illinois State Library) was for the purchase of the WLN software and its associated database system (ADABAS). The university money and other local resources were for the mounting of the software on UI computers, the addition of the database, the construction of the link between the existing system (LCS) and WLN, and the purchase of additional hardware and telecommunications links. The essential condition of the LSCA grant was that the money be used to do research into, and to demonstrate the feasibility of, a statewide union catalogue. To this end, the UIUC Library sought and won the collaboration of the River Bend [Illinois] Library System. Not only did this association provide an opportunity to demonstrate the practicality of cooperative bibliographic control between libraries of different kinds that are distant in location, but also the River Bend staff were invaluable to the project in providing assistance with design specifications that were suited to the special needs of public libraries, and to evaluate the project in that light.

When the WLN software and ADABASE were acquired in late 1980, two questions arose immediately. These were the technical problems of mounting the new and separate software on the same central mainframe computer that held LCS, and the question of the database. ADABAS was installed early in 1981 and was closely followed by the installation of the WLN source code (version 2.00). The most commonly expressed complaint during this period was that the WLN documentation was inadequate. This lack was no doubt the result of the modern phenomenon that, almost invariably, those who achieve have little or no time to document, while those who have time to document do not achieve. A small test database of some eleven thousand bibliographic records (OCLC/MARC) was then loaded into the system. While work was proceeding on other matters, five terminals were online to the test database and the software for demonstration and testing.

The first step in creating the initial database for the Online Catalogue was the extraction of the UIUC and River Bend records from the ILLINET Bibliographic Data Base (a service of the Illinois State Library and consisting of OCLC archival tapes). The reading and extraction process took approximately three months and yielded some 750,000 UIUC and River Bend records. These records were copied onto disks and, subsequently, to an output tape. This database covered all cataloguing (with minor exceptions) of both agencies since late 1974. It presented two important problems. These were that most records created before 1979 were not in conformity with AACR2, and that a significant number of duplicates were to be found in the database. To resolve, at least partially, both of these, it was decided to use the service then being offered by the AMIGOS network and to contract with them to convert (or "flip" in the then prevalent jargon) all headings to AACR2 forms and to amalgamate and eliminate, as far as possible, all duplicate records. These AMIGOS did to the great satisfaction of all parties. In addition to the bibliographic records thus added, the WLN software and the fundamental ideas of modern cataloguing required the creation of subject and name authority files. We decided to add the Library of Congress authority files and to supplement them with headings from our records that were additional to those already created by the Library of Congress. This raised an important point. Should the authority files contain names and topics that

were not represented in the bibliographic file? It seemed to us that it should. An indication that a heading is correct or that it represents a reality is important, even though the particular file may not contain associated bibliographic records. In other words, the authority files should be as comprehensive as can be, since they map the universe of names and subjects, whereas a bibliographic file is, necessarily, limited to a collection or group of collections of physical objects. The usefulness of the authority files' map of the universe is, of course, partially vitiated by the lack of currency in the issuing of some LC files. (For a detailed discussion of the authority question in the Online Catalogue, see the article by Nancy Romero and Arnold Wajenberg in this section).

With the software installed and the database created, the next formidable obstacle was that of the link between the bibliographic (MARC) records and the status (LCS) records. This link was both philosophically and technically necessary. From the philosophical point of view, the idea that a catalogue search would yield not only bibliographic information but also an indication of the availability of the sought item and the means to gain access to it was the important distinction between the online catalogue and all of its predecessors. Technically, the idea was that both systems would be accessible from the same terminal and, while maintaining their separate software identity, would appear to the user to be different aspects of a unified system. This is not the place to delve into the technical intricacies of the link (even if it were, I am not the person). Suffice it to say that the obstacles were great and the process laborious, but that a successful outcome finally was achieved. It is now possible, by issuing a very simple command, to summon up the LCS (status) record associated with a bibliographic record that has taken one's fancy. Moreover, this link has been achieved without any degradation of the efficiency of the LCS component per se.

Some minor amendments were made to the WLN software in the course of its installation, but none involved deep rewriting of the programs. This policy allows the participants in the online catalogue to take advantage of all future modifications to, and enhancements of, the WLN software. The essential components were now (early 1984) in place.

One pervasive question that I have not addressed is that of human involvement in the planning and implementation process. From the beginning, the project was planned systematically to be one which reflected all views of all components of the UIUC Library and of our partners, the River Bend library system. To this end, a large committee representative of all "public" and "technical" units of the library was established. This Policy and Implementation Committee met monthly with (by means of a conference telephone) our colleagues at River Bend. Further, the comprehensive committee was divided into a number of subcommittees to deal with such topics as terminals, priorities, content of databases, and screen displays. A complementary committee on technical matters composed of library faculty and computer center staff was also established. The whole process was monitored and fed by the deliberations of a Steering Committee consisting of senior library staff (including the university librarian) and senior computing center staff. When the project became an actuality, considerable work and progress were contributed by a user education committee that devised training sessions for staff, carried out those sessions, and wrote and disseminated printed materials on the online catalogue ranging from fliers to a detailed one-hundred-plus-page manual written by the chair of the committee, Gary Golden. The point that is central to our approach is that our efforts—some successful, some not—were made to involve all types of opinion, and that such efforts involve, necessarily, a complex, incredibly time-consuming, and at times, frustrating participatory structure. Democracy has its drawbacks. They are not as numerous as those of alternative management techniques.

With the programs and files installed, the one remaining important question was that of presentation to the user of the catalogue. LCS has its own commands and presentation, as has WLN. They are unlike and equally opaque to the uninitiated. For

instance, if one were searching for Anthony Trollope on LCS the command would be:

AUT/TROLLOANT

on WLN such a search might be:

f a trollope, an#

Such hermeticisms are unacceptable enough in one manifestation, in two they are surely intolerable. The choices were obvious:

1. Leave the two systems alone.
2. Write an interface program to convert one set of commands to the other.
3. Install a user-friendly system that would translate "natural language" questions and answers to the artificial languages of the two systems.

The choice of rewriting one or both sets of programs to yield a new set of commands was ruled out by the policy decision that no changes in the deep structure of the WLN programs would be undertaken. The eventual resolution was to adopt the third possibility. C. C. Cheng, a professor of linguistics at UIUC (the author of a detailed discussion later in this section), was commissioned to write a user interface that uses natural language to provide a menu-driven system that presents the user with a range of options that are, in fact, a subset of the total number of options available on LCS and WLN. That subset consists, naturally, of the most commonly used access commands. The interface program is held on IBM Personal Computers purchased without disk drives. These are the preferred public terminals for the Online Catalogue. At present, the majority of public terminals are "user-friendly" PCs; in a short time all public terminals on the campus will be of this type. The beauty of such a method is that much of the processing takes place within the individual PC. While the commands are being constructed, there is no communication with the central computer, no use of expensive telecommunications, and no interference with the use of the systems at other terminals. When the command has been formulated, be it an LCS or a WLN command, it is sent to the central computer; data is retrieved, and upon return, manipulated and presented to the user. Note that the PC terminal is incapable of formulating an illegal command. Another central point about the "user-friendly" interface is that it routes all enquiries that it can to the LCS component. The reason for this is that LCS can satisfy the majority of demands (i.e., known-item searches) and is also less expensive and swifter than the WLN component. To the user of the system operating at a "user-friendly" terminal, not only does the Online Catalogue appear to be a seamless whole, he or she is not obliged to know how to do anything other than to read and type (neither at a high level of proficiency).

Before the Online Catalogue could be declared operational, a number of "stress tests" were deemed necessary. Both the software and hardware passed these tests with great success. Accordingly, the Online Catalogue became operational at the library of UIUC and at River Bend headquarters on the August 27, 1984. It was then the subject of a performance review, which yielded no insoluble problems, and was officially dedicated, with all the usual pomp, on April 12, 1985. The card catalogue and its subsidiary files have been closed down for some time. The WLN (FBR) component now contains more than 850,000 MARC records. (In addition, the LCS component has more than 2¼ million UIUC records, and more than 4 million LCS records statewide.) There are approximately two hundred terminals online to the catalogue, of which fifty or so are public "user-friendly" PCs. The old order faded and gave way to the new.

The challenges and opportunities for the future are legion. The Online Catalogue in its present configuration will undoubtedly grow. Will the hardware, telecommunications links, etc., be able to cope with that expansion? Almost certainly, though it may involve some extra expenditure. There are those who cry doom ("The system is falling! The system is falling!") but they are usually those who have not understood the history of technological advancement. The Online Catalogue which was designed ab initio to be a statewide bibliographic control system will be under pressure to become so. The problems that that expansion raises are financial, strategic, and political. They are neither technical nor bibliographic. How those problems will be addressed and solved is more a matter, at this time, of

prophecy than of certainty. It seems to me that the establishment of a statewide union catalogue is a historic imperative and, given the availability of a proven tool and the manifest desire of the overwhelming majority of library agencies for such a system, a historic inevitability. The other great challenge of the future is the provision of access, via the same system, to other, possibly nonbibliographic files (such as those of indexing and abstracting services). The "user-friendly" PC interface of our Online Catalogue has demonstrated the possibility of linking different files and programs in a way that makes them appear to be one system to the user. If one can do that for two systems, why not three? or four? or more?

The Online Catalogue in our library was long in the achieving, took the time and dedication of many people, and, though neither perfect nor, as yet, complete, has been a success in terms of the criteria set down at the beginning of the project. We hope that it will be not only of benefit to the scholars, students, and other citizens of Illinois, but also to all those who seek to use new technology in the quest for universal bibliographic control.

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Linking LCS and FBR: The Library's Perspective

William Gray Potter

INTRODUCTION

When investigation of an online catalogue for the University of Illinois at Urbana-Champaign (UIUC) began in 1978, there were several constraints.

First, many of the functions required of an online catalogue were already present in LCS, the brief record circulation system that had been imported from Ohio State University (OSU). LCS was just becoming operational for UIUC and the other two campuses of the University of Illinois and would soon be extended to other academic libraries in Illinois. While LCS with its brief record and limited searching capability could not meet the primary requirement of the online catalogue (i.e., replacement for the card catalog), it did provide many of the features needed—most importantly, known-item searching, complete holdings information, and call-number access. Therefore, a system was required that would complement the catalogue features of LCS by providing access to and maintenance of a database of MARC records. The system specified to provide this database with at least the access and level of bibliographic detail provided by the card catalogue was termed the Full Bibliographic Record or FBR. The Online Catalogue was perceived as a marriage of LCS and FBR.

Second, funding was limited. The university administration had promised some computing resources for the full bibliographic record component of the Online Catalogue, but this was mainly in the form of continuing support; not funding for acquisition or development of a system.

Third, just as LCS was being extended to other libraries in Illinois, it was expected that at some point the FBR would be networked as well. Thus, one requirement of the FBR was that it support a network of libraries.

LCS, as it existed then and as it exists today, is a very powerful system. It contains a brief record for every title owned by a participating library and a holdings line for virtually every volume in that library. Currently it supports a network of twenty-seven academic libraries with over six hundred terminals, 7 million titles, and 13 million volumes and still retains a response time of under four seconds. Further, LCS allows staff and patrons at one library to query the database at another library and to request materials directly through the same terminal at which they are searching.

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OPTIONS FOR AN FBR

The task in 1978, then, was to recommend a system to provide a full bibliographic record system (FBR) that could coexist with and complement LCS. There were three main options.

First, OSU Libraries had added a full bibliographic record to its version of LCS since Illinois had acquired the system in 1977. Unfortunately, the Illinois version was by now very different from the original version. Programmers had rewritten much of LCS to make it support a network of libraries. These changes made the inner workings so different from the new OSU version that implementing it would have been as difficult as implementing any other system.

Second, to undertake local development of a new system: this was never seriously considered because of the cost and the uncertainty of every having a workable system.

Third, and presenting the best combination of cost and performance, to look at operational systems then in place and find the one that met the requirements best: a complete investigation based upon a list of requirements resulted in selection of the Washington Library Network (WLN) software. WLN was selected because it had superior searching capabilities, offered the best authority control system, operated on IBM equipment, supported standard ASCII terminals, and could be made to work with LCS.

LINKING VERSUS INTEGRATING

Throughout the investigation into available systems, a philosophy of system design was emerging. That philosophy was that it was better to link systems to attain full functionality in a library system than to attempt to design a single integrated system. This approach was born out of necessity because of the constraint imposed by the existence of LCS. However, as the investigation progressed and as questions were asked about functions beyond circulation and the catalogue, linking systems began to make more and more sense.

An integrated system for library automation might be defined as a system that supports two or more library functions (circulation, online catalogue, acquisitions, serial check-in, etc.) by sharing common files and programs.

The linking of systems involves establishing linkages or avenues between and among individual systems for individual functions so that information from these systems can be viewed at the same terminal.

At first, those involved in the investigation wanted a fully integrated system. However, the LCS factor caused thinking to expand to consideration of just what was meant by an integrated system. The primary and most desirable feature that an integrated system offers is that all the information pertaining to a bibliographic item can be viewed at the same terminal. A secondary but important feature of integration is that all the records involving a bibliographic item can be edited and updated simultaneously. For example, if a field is changed in the catalogue record, that change should also show up in relevant circulation or acquisition records.

While these are certainly two fine objectives for any automated library system, they can be achieved by linking systems as effectively as they can be by integrating systems. Further, there are some definite disadvantages to integrated systems.

The first disadvantage is that a library is tied to a single source for all functions. In the case of a turnkey vendor, this means waiting for the vendor to provide or upgrade functions according to the priorities that the vendor has set. We are all familiar with libraries that have signed contracts for integrated systems when only one or two functions were available and received a promise or a contract from the vendor that the other functions would be added soon. In many cases, that promise has never been fully realized.

The second disadvantage is that one function may not be as good as another in an integrated system. The online catalogue may be superior, but the acquisition system may not be adequate. With an integrated system, a library cannot shop for a better acquisition module apart from the system it already has.

A third disadvantage is that the func-

tional subsystems of an integrated library system are so interrelated that the operation of one may degrade the operation of another. For example, the circulation system may consume so much machine resource that response time in the online catalogue or the acquisitions subsystem will rise, thus frustrating users and delaying the processing of materials.

Linking systems, on the other hand, can avoid these problems. By linking different systems for different functions, a library is not tied to one vendor. Instead, it can shop for the best circulation system, the best acquisition system, the best serial check-in system. Because each module is separate and works with its own files and programs, and possibly runs on its own machine, the interaction among systems is kept to a minimum and the poor or greedy performance of one does not degrade the performance of another. Indeed, if one module of a linked system crashes, the others will often continue.

TWO LEVELS OF LINKING

During the investigation into systems available for the FBR in 1978 and during the development of the Online Catalogue over subsequent years, the evolving design philosophy at UIUC favored linking of systems as opposed to developing a single integrated system. This approach was further refined to include two levels of linking that can be termed immediate and batched. Immediate linking involves having two systems operating more or less independently and available at the same terminal with a direct link between associated records. As described in a following article by Catherine Salika, the linkage of LCS and FBR is an example of an immediate link. In this case, LCS and FBR operate almost independently on the same terminal network. Access to one or the other system is based upon the command given. A filter examines each command and sends it to the appropriate system, LCS commands to LCS, FBR commands to FBR. There is a link file that contains the record identification number of each full bibliographic record matched with the record number of each associated LCS record. Upon viewing a full bibliographic record, issuing a simple link command will retrieve from LCS the associated circulation record, which reveals holdings and status information. The link is an immediate link because both systems are fully present at the same terminal. The only problem is having to know both sets of commands, but this problem is solved by use of an intelligent user interface, described in a following article by C. C. Cheng.

An immediate link was deemed necessary for LCS and FBR because the information contained in LCS concerning circulation status is constantly changing and because the patron needs the latest status information to assist in locating materials. The trade-off in achieving an immediate linking of LCS and FBR is the possibility that one system may degrade the performance of another, since they both run on the same central computer. This was a critical point, since other libraries in Illinois depend upon LCS for circulation and resource sharing. However, extensive and rigorous testing showed that, in the present environment, the two systems coexist very well and that the operation of one does not interfere with the operation of the other. Indeed, the use of LCS for known-item searching actually relieves the load that would otherwise be placed upon the FBR. This is important because LCS is a simpler, more efficient system. Routing as many searches as possible to LCS reduces the overall demands of the combined LCS/FBR system.

For other functions, an immediate link by means of which the most current records for each function are linked online may not be necessary or justified. For technical services functions, it is not essential that patrons or public service staff have the most complete and current information available from their terminals. It is usually sufficient to provide information that is current within a day or two or even a week. The trade-off in providing an immediate link to technical services functions is that system performance may well suffer. This would result in patron frustration and in less efficiency when processing materials in technical services. Finally, in a network of libraries, immediate linking limits the choices available to those libraries. No net-

work could be expected to provide immediate and direct links among more than one each of a circulation system, full bibliographic record system, acquisitions system, and serial check-in system.

The option is to provide batch linkages. This allows separate systems to operate for certain functions with a means for creating a status record in the Online Catalogue. For example, an acquisitions system can be run on a separate computer and periodically create an order record to be entered into the Online Catalogue. At UIUC, a separate acquisitions/accounting system operates on a minicomputer in the library. This minicomputer-based system creates a file of order records that is periodically entered into the LCS module of the Online Catalogue as circulation records that contain brief bibliographic information and most order information. Thus, a patron, reference librarian, or book selector searching the Online Catalogue by author and/or title will learn about books that have been ordered as well as books that are already catalogued. When books are received in acquisitions, this order record is changed to show that it has been received and sent to be catalogued. When the book is catalogued, the OCLC catalogue record overlays and replaces the order record. A real advantage of this approach is that if the decision were made to replace the current minicomputer-based acquisition/accounting system, no change would be required in the Online Catalogue. Only the programs and file formats used to create the order record for input into the Online Catalogue would have to be changed.

Another example of linking two systems in a batch mode is serial check-in. UIUC currently uses a combination of LCS and microcomputers for check-in: the microcomputers fool LCS into behaving as if it were a check-in system. One possibility under consideration is for using an independent check-in system, possibly based on microcomputers, and periodically loading information on the most recent issue received into the LCS portion of the Online Catalogue. This information would update a status line for a serial in the LCS record that would inform the user which current issues have been received. By placing this information on unbound issues in the LCS record, it would appear just above the information on bound volumes.

These two examples reflect the evolving approach to automation at UIUC during the development of the Online Catalogue. Linking systems by transferring information on a batch basis would not interfere with the performance of the Online Catalogue and yet would still provide information on the status of materials in technical processing. It also allows greater freedom in selecting systems to support technical processing operations.

THE LCS NETWORK

This approach to linking may also be adopted by the other libraries that use LCS in Illinois. During 1985, a committee of librarians selected from among the twenty-seven academic libraries in Illinois using LCS was charged with looking at alternatives for providing circulation and resource sharing among those libraries. This committee recommended that the use of LCS be continued because there was no cheaper or better system that could support the level of activity currently maintained by LCS. It also recommended that the possibility of expanding the FBR portion of the UIUC Online Catalogue to the other LCS libraries for operational use be explored. A third recommendation was that the automation of acquisitions and serial check-in should be left to local systems but that a common format for transferring status information from these systems into LCS should be devised.

ADVANTAGES OF LINKING

The advantages of linking systems, then, are that (1) a library is not tied to one vendor or source, (2) a library can shop for the best available system for each function, and (3) the interaction among functions is kept to a minimum and the performance of one does not affect the performance of another.

A larger advantage of linked as opposed to integrated systems is more a matter of perception than of actual accomplishment. At UIUC, the Online Catalogue has become a gateway into information not found in the card catalogue, the manual system that it was developed to replace. Through a

variety of links, the Online Catalogue is a gateway to both more specific information about the UIUC Library (where books are located, whether they are checked out, what books are on order) and to more general information about what is available from other libraries. By making the Online Catalogue a means to information beyond the old card catalogue and beyond the library itself, the expectations of staff and users alike are raised. Specifically, they expect that when they approach the Online Catalogue, whether in the library or in their homes, offices, or dorm rooms, they will be able to learn more than the card catalogue ever could tell them. At the moment, they can find out about the holdings of other libraries. In the future, we can build upon increased expectation to provide access to outside databases and eventually to full-text systems. It is here that the true power of the Online Catalogue will be realized—a lens for exploring a larger and wider bibliographic universe than any single library could ever hope to provide. ■■

Linking LCS and FBR: Technical Perspective

Catherine Salika

As has already been discussed in Michael Gorman's article, the Full Bibliographic Record (FBR) system based on WLN software and the Library Circulation System (LCS) are accessible at the same terminals. FBR provides a flexible searching language as well as full bibliographic displays. LCS provides call numbers and detailed circulation information. When planning for FBR began in 1980, it was apparent that users of the twin systems would need a simple way to get from a full bibliographic display to circulation data. The link between FBR and LCS was designed for this purpose.

The link has two major elements. The link file is used to associate FBR records with LCS records. It is built and maintained by several batch programs. The LINK command in FBR makes use of this file to construct a message to LCS asking that the corresponding LCS record be displayed. This command is implemented in several online programs. The link file and the LINK command will be described separately in this article.

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THE LINK FILE

Fundamentally, the link file is a list of LCS records that correspond to each FBR record. We had to choose a unique, identifying number to store in this file for both LCS and FBR records.

There were two obvious candidates for the unique number in LCS: the call number and the title number. The title number is assigned sequentially to an LCS record as it is loaded into an LCS database. Each LCS library has its own database with its own series of title numbers. A combination of a library identifier and a title number identifies a record uniquely. Similarly, each LCS library has its own set of call numbers. Call numbers are unique to the LCS records belonging to each library, so a combination of a library identifier and a call number identifies an LCS record uniquely. The University of Illinois occasionally reclassifies some items. This makes the call number slightly more subject to change than the title number. For this reason, we chose to use the library identifier and title number for the link file.

There were also two candidates for the unique number in FBR: the record identifier (RID) and the internal sequence number (ISN). In the FBR database, the RID is the OCLC number of the record. Our procedures assure that this number remains unique. (Some other WLN installation sites use RIDs that are not unique.) The ISN is sequentially assigned by ADABAS, our database management software. The FBR database is a union catalog, so there is no need to combine either of these numbers with a library identifier. We chose to use the RID as the unique identifier because we were confident that it would almost never be changed.

It is possible for one FBR record to be associated with several LCS records. There are several ways that this might occur.

While most of the University of Illinois' collection is classified in Dewey, a few of the departmental libraries use LC classification. If copies of an item were classified in Dewey at one department and LC in another, two LCS records would be created for this item. In FBR, however, there would be only one record because both copies were probably cataloged using the same OCLC record.

Monographic sets pose another interesting problem. In LCS, they are given as a series with multiple volumes. The series title and volume number are stored, but the titles of the individual volumes are not. In FBR, each volume is stored as a distinct bibliographic item, but the series title and volume number are part of each record. Each volume of a monographic set is linked to the same LCS record. Unless a user remembered the volume number given in the FBR display of a record, she or he would not know which volume of the LCS record referred to the item wanted. To avoid this situation, we decided to store the volume number of items in a monographic set in the link file.

Each record in the link file contains one RID and one set of linking data for each of the corresponding LCS records. The linking data are the library identifier, the title number, and (for monographic sets) the volume number. How are these data generated? As was mentioned above, we have chosen to make the OCLC number of the bibliographic record into the RID. The library identifier and volume number are also part of the OCLC records. The title number, however, is assigned by LCS as each record is loaded into the LCS database. The first step in building the links is to extract the OCLC number, library identifier, volume number, and call number from the OCLC record. A batch program looks up the call number in the LCS database and records the title number that has been assigned to the record. Some editing must be done on call numbers to imitate editing done by LCS. For example, we use Su-Doc numbers for call numbers on many documents. The slashes in these numbers are a problem in LCS because the slash is a delimiter in the LCS command language. LCS converts all slashes to plus signs before it loads these call numbers. The linking programs must do the same. Once the data are gathered, it is a simple matter to load them into the link file.

This procedure works well for current OCLC records. When we loaded our older records, however, we encountered problems. Over the years, some parts of our collection have been reclassified. These have been done through OCLC, so we have OCLC records with the current call number. However, we also have OCLC records with obsolete call numbers. Links cannot be made for records with these call numbers because they no longer appear in the LCS database. Changes to our OCLC profile have also caused problems. At one time, we specified that the oversize stamps *Q* and *F* be assigned automatically to call numbers by OCLC. These stamps were printed on cards, but did not appear on our OCLC tapes. Later, we began to put the stamps in the call numbers manually. Still later, we changed the stamps to *Q.* and *F.* so that call numbers for oversize volumes would not be confused with LC call numbers. At that time, we changed all of the *Q* and *F* stamps in the LCS database to *Q.* and *F.* manually. As a result, a call number in the LCS database that has an oversize stamp may appear on the OCLC tapes in one of three forms: without a stamp, with a stamp, or with a stamp followed by a period. We have similar situations with several other groups of call numbers. If the linking program is unable to find a call number in the LCS database, it will try several variations on the call number based on the age of the record, the collection for which it was catalogued, and the size of the item.

Despite this editing, some older call numbers cannot be linked. Some may belong to items that have been removed from the collection. Others may have been reclassified. These unlinkable data are written to a file for manual processing by the library staff.

THE LINK COMMAND

LCS and FBR are accessed from the same terminals. Communications for these terminals are managed by IBM's Telecommunication Access Method (TCAM). TCAM routes messages between terminals and on-

line systems and performs some error detection. Messages may be commands typed by a user of a terminal or a response to a user coming from an online system. TCAM has queues for online systems and terminals. Messages that are ready to be sent to one of these places are left by TCAM in a queue until the destination is ready to receive the message. Typically, one terminal is used with one online system. In this case, TCAM decides where to send the message based on the terminal ID. Things are more complicated for the LCS/FBR terminals because messages may need to be sent to either of these online systems. A locally written Message Switcher (MS) in TCAM looks at the first two characters of messages from these terminals to decide whether to send them to the LCS queue or the FBR queue. Figure 1 shows the path that an LCS command takes; figure 2 shows the path for an FBR command.

TCAM is flexible enough to allow for a variety of configurations of terminals, online systems, and queues. The FBR LINK command takes advantage of this. The LINK command must be seen in the context of a search to be understood fully. The user does a search to be understood fully. The user does a search in FBR and retrieves one or more bibliographic records. The user may give several commands to display the records and determine which records relate to the items that are wanted. The user then types the LINK command followed by the item numbers of the relevant items. In response, the LCS records corresponding to the FBR record are displayed on the user's terminal. Figure 3 shows the sequence of communication between FBR and LCS. The details are given below:

> First, TCAM looked at the LINK command. The Message Switcher identified it as an FBR command and sent it to the FBR input queue.

> FBR took the LINK command from the queue and checked to see that it was syntactically and semantically correct. There was no error, so FBR went to the link file to look up the linking data.

> FBR formatted these data into an LCS "search by title number" command. This command included the title number, library identifier, and volume number, if there was one. The format made the command look as if it came from a terminal, not FBR.

> There are two output queues from FBR. One routes messages back to the terminal; the other routes them to LCS. FBR wrote the LCS command to the queue that routes to LCS.

> TCAM took the LCS command from that queue and sent it to the LCS input queue.

> LCS read the command from the input queue.

> LCS searched its database to find the desired information, formatted it for display, and wrote it to LCS' output queue.

> All LCS output goes back to terminals. TCAM took the results from that queue and sent it to the proper terminal.

It is possible for a user to give a LINK command for more than one record at a

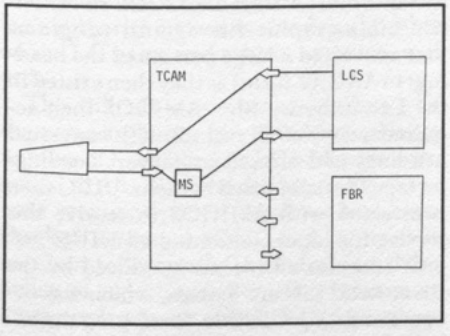

Fig. 1. Routing of any LCS Command.

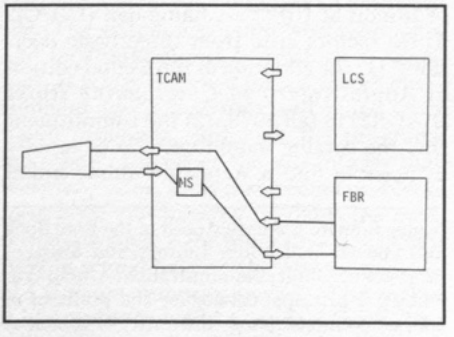

Fig. 2. Routing of any FBR Command.

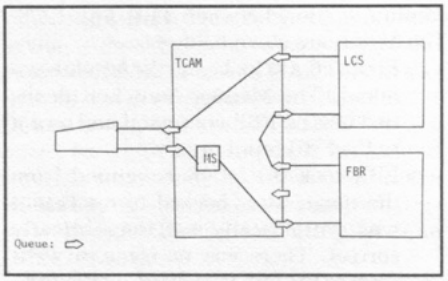

Fig. 3. Routing of an FBR LINK Command.

time. It is also possible for one FBR record to be linked to several LCS records. In either case, FBR builds a more complicated LCS command that causes all of the LCS records to be displayed.

At present, it is not possible for a patron to cross the link in the other direction; one cannot go from an LCS record to an FBR record. This feature is not high on our priority list. However, the link file was designed so that this enhancement could be made in the future. ■■

Authority Records and Authority Work in the Online Catalogue

Nancy Romero and Arnold Wajenberg

Several factors have determined the form and content of authority records, and therefore the nature of authority work, in the new online catalogue at the University of Illinois at Urbana-Champaign (UIUC). These factors arise from three basic decisions: (1) the adoption of the second edition of *Anglo-American Cataloguing Rules (AACR2)* in fall 1979, (2) the commitment that the catalog should develop as rapidly as possible into a statewide online union catalog, and (3) the selection of the Washington Library Network (WLN) programs for maintenance and use of the catalogue. Each of these basic decisions acted on the others, and shaped the solutions to the various problems created by each decision.

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ADOPTION OF AACR2

UIUC began to apply AACR2 to all descriptive cataloging, including the formulation of name and uniform title headings, in fall 1979. At that time, the library had been an OCLC participant for almost five years. ILLINET, the state network providing OCLC services, was maintaining a tape archive of bibliographic records (the ILLINET bibliographic database) used by all OCLC participants in Illinois, including about 500,000 UIUC records.

Initially, the intention was to limit the online catalog to records created after the adoption of AACR2, in order to provide a high degree of uniformity among headings. However, it was felt that the value of the catalog would be much greater if it included all of the cataloguing created since UIUC began using OCLC. This meant, of course, that the catalogue would contain a mix of headings that would represent the same person, body, series, etc. in sometimes radically different forms. "Clemens, Samuel Langhorne" versus "Twain, Mark" and "Illinois. University" versus "University of Illinois" are obvious examples. This problem was regarded as very serious, and those planning the online catalogue sought to mitigate it as much as possible.

A partial solution was made possible by OCLC and AMIGOS. Shortly after loading the Library of Congress (LC) name authority tapes into its database, OCLC ran its entire bibliographic file against programs that converted a large portion of the headings to AACR2 forms as they then existed in the LC authority file.[1] AMIGOS then acquired a copy of all records with converted headings and offered to convert headings on tape files submitted to them. UIUC then contracted with AMIGOS to receive this service for tapes containing all UIUC records and also all records produced by the River Bend Library System, which was cooperating with UIUC in developing the online catalogue. For a small additional fee,

AMIGOS also agreed to purge duplicate records from the file.

By the time UIUC was ready to send the file to AMIGOS, in January 1983, it contained approximately 600,000 records on fifty-nine reels of tape. After converting headings and merging duplicate records, AMIGOS returned 583,000 records to UIUC.

UNION CATALOG COMMITMENT

From the beginning it was intended that the UIUC online catalogue should be developed in such a way that it could easily be expanded into a union catalogue to be used by other libraries in Illinois. This was a major factor in the decision to use the WLN programs. For the same reason, the River Bend Library System was invited to participate in the project, and records for the libraries served by that system were included in the database.

The commitment to a union catalogue also led naturally to the decision that forms of headings should reflect national standards whenever possible. For that reason, the Library LC name and subject authority tapes were purchased and loaded into the online catalogue before any bibliographic records were loaded. A so-called mapping program was then written so that, when a heading from a bibliographic record matched exactly the headings of a *see* reference, the bibliographic record would be linked to the authorized heading to which the *see* reference led, thus, in effect, converting the heading to the authorized form. This was done to supplement and expand on the conversion by AMIGOS. The result of these actions was to base the online catalog's authority system as closely as possible on the LC name and subject authority records.

This still left a number of problems. In the name authority file, there were a large number of headings that LC had never converted to AACR2 form (although all of the most frequently used headings had been checked against AACR2, and changed if necessary). Because LC had abandoned the policy of superimposition, if a cataloguer there needed to use one of the old headings for a work currently being catalogued, the heading would be evaluated for conformity to AACR2 and changed if necessary. Since UIUC is committed to following national standards, its cataloguers must follow the same practice when they need to use an old heading for a work currently being cataloged. Every effort is made to follow the LC interpretation of AACR2, to maximize the possibility of establishing the same form that LC catalogers will use when they encounter the name. Of course, such efforts cannot be 100 percent successful, and some headings must be changed at a later date to conform to LC's practice.

The LC subject authority tapes that were loaded into the online catalogue contained the cumulated subject headings that had been established as of summer 1981. They, therefore, contained the subjects in the ninth edition of *Library of Congress Subject Headings (LCSH)*, together with the changes and additions contained in the 1979 and 1980 supplements to *LCSH*, and some of the changes in the 1981 supplement. Just as important was the fact that they provided the *see* and *see also* references contained in LCSH and its first two supplements. Unfortunately, however, LC did not provide identification numbers for the subject headings that would remain constant on various tapes as the headings underwent various revisions. It is therefore not possible to use update tapes from LC to correct subject headings in UIUC's online catalogue. All such corrections must be entered manually.

WLN PROGRAMS

A major factor in selecting the WLN programs for the UIUC online catalogue was the provision they included for an authority file. The system accommodates references and facilitates global corrections of headings. It is also designed for a network environment and is therefore well suited for a union catalogue. Although the programs have provided all of the advantages that were hoped for, some unexpected problems have been encountered. Perhaps the most serious problem is the program's lack of any field in which to store the control number of LC name authority records. This makes it impossible to load LC update tapes. The omission was an inevitable result of the fact

that WLN developed its authority file before the MARC format for authority records was developed, and it will be corrected in version 3.0 of the WLN programs. It is nevertheless a serious inconvenience that must be endured until the UIUC programs can be upgraded to the level of WLN's version 3.0.

Another rather unexpected problem is the limitation on global change. It is true that, when catalogue records are fed into the system from OCLC tapes, all headings are stripped off and compared with the headings already in the authority file. If an exact match is found, the heading is added to the authority file (linked to the bibliographic record) and is copied into a review file for the online catalogue maintenance staff to evaluate. Henceforth, changes can be made to the heading in the authority file no matter how many bibliographic records are linked to it. However, for an incoming heading to merge with a heading already in the file, the match must be exact, in coding as well as content and punctuation. If the MARC coding for a heading varies, more than one record is added to the authority file. For example, the subject heading "Illinois and Michigan Canal" was sometimes coded 650 (topical subject), sometimes 610 (corporate subject), and sometimes, correctly, 651 (geographic subject). The result was three apparently identical headings in the authority file, each with different bibliographic records linked to it.

Another, greater, problem stems from a limitation on the extent to which global change is possible. The correction of a single heading in the authority file does indeed correct an indefinite number of bibliographic records, as many as are linked to the heading. However, a heading alone is a separate authority record from a heading with subdivisions. The scope of this problem is best shown by another example. In fall 1983, in *Cataloging Service Bulletin* number 22, LC announced that the heading "Underdeveloped areas" was being changed to "Developing countries." A check of the UIUC authority file, after months of work on this apparently straightforward change, reveals that as of August 29, 1985, there are 885 headings in which "Underdeveloped areas" is the first element, and 440 in which the phrase is a subdivision, for a total of 1,325 headings still to be corrected.

CONTINUING AUTHORITY WORK

The librarian who is cataloguing currently received materials for the online catalogue is presented with a rather confusing state of affairs. Headings must be verified against an authority file that has as its basis the LC name and subject authority tapes. Some of the name headings on those tapes have been checked against AACR2 and corrected, if necessary, and some have not. This basic file has been supplemented by an equal number of headings taken from bibliographic records on archival tapes supplied by OCLC. Some of the name headings were converted to AACR2 or constructed after the adoption of AACR2, but some were pre-AACR2 headings. Some of the subject headings were assigned after the publication of the ninth edition of *LCSH*, and some predate that edition.

VERIFICATION OF HEADINGS

There are numerous methods to verify headings constructed in the cataloging process. These methods are outlined as follows: (1) if there is an OCLC printout of an LC authority record for the heading, and the rules code shows the heading is AACR2, the form in the 1xx field of the authority record is used — if a reference is needed in the online catalogue that is not already present on the authority record, it is traced on the OCLC printout; (2) if there is no LC authority record, or if the LC authority record coding for rules is neither AACR2 nor AACR2-compatible but there is a record in the online authority file giving an AACR2 form, that form is used; (3) if no AACR2 form is given on either a local or LC authority record, the heading is established according to the instructions in AACR2 and in LC's *Cataloguing Service Bulletin* (CSB).

In addition to applying AACR2 as inter-

preted by LC to the form found in the item, consulting the online catalog is necessary in order to avoid creating variant forms of heading for the same person, corporate body, or series title. The following categories of heading often present problems and are always verified in the online catalogue: forenames, compound names, names in which the first forename is represented by an initial, personal names with title, pretwentieth-century personal names, corporate bodies, series, and uniform titles.

Four kinds of information usually searched in the online catalogue for purposes of formulating headings are needed (a) to determine whether the heading for another person, corporate body, series, or uniform title is identical to the form in the item being catalogued; (b) to determine whether the person, corporate body, or title in the item being cataloged is already present in the online catalogue in a variant form or forms; (c) to determine the predominant form of a personal or corporate name from statements of responsibility in bibliographic records; and (d) to discover whether an AACR2 form has been established, even though the LC authority record is not yet available. For verification of headings, the authority file is checked first, then, if necessary, the bibliographic file. Valuable information can be obtained by looking at the complete display of a bibliographic or authority record, which gives the complete MARC coding in alphabetic characters. The complete display can usually be called up by adding the symbols *$,c* to any command that retrieves a single record.

All searches in the authority file begin with the command *t* (for "term"). Other combinations of letters are added to *t* to designate specific types of searches: *t a* for an author search, *t kac* for a keyword corporate author search, *t set* for a series title search, *t a* or *t atu* for a uniform title search, and *t s* for a subject search.

In searching for corporate headings, use of the keyword search is very helpful. It allows certain words to be omitted from the search without worrying about whether they are stop words. The only problem that may be encountered with keyword searches is that of retrieving an unmanageable number of matching headings. In that case, the keyword search can be replaced by the "term author-corporate" search, to which is added the truncation command *#*.

Each record in the authority file is assigned in a sequential number called the "record identification number" (RID). The RID can be used to determine whether a heading came from LC authority tapes or was generated from a bibliographic record. Because the LC authority tapes were loaded into the online catalogue before the bibliographic records, the authority records that come from the LC tapes have lower RIDs than those generated from bibliographic records.

There is a peculiarity about the way in which RIDs are constructed. The program not only supplies the prefix *voc* (for "vocabulary," the WLN designation for the authority file) but also formats the number to resemble an LC card number. As a result, the number always consists of two digits followed by a hyphen and the rest of the number. If the number is six digits or fewer, the hyphen is preceded by two zeros. If the number is seven digits, the first digit precedes the hyphen, and the rest of the number follows the hyphen. Any zeros immediately following the hyphen are dropped. Thus, the RID 2,005,623 would appear as: voc02-5623.

Each record in the authority file is also supplied with a three-letter code that designates whether the heading was established by LC under AACR2. At the beginning of the first line of each record, the second *a* in the term *vaa* shows that the heading was established by LC under AACR2. If the heading is established from a bibliographic record, then the second *a* in the term is replaced by a blank.

The programs used to load records from the LC authority tapes into the online authority file were not able to cope with certain situations, with the result that some records that were *see* or *see also* references in the LC file appear to be established headings in the online authority file. Fortunately, there are clues to watch for. For example, the search for the author J. A. Smith, *t a smith j a*, retrieves

1. ndnb Smith, A. J.
2. nd Smith, A. J.
3. Smith, A. J. (Albert James), 1924-
4. ndnc Smith, J.

a 3. Smith, J. A.

Notice that, apart from the strange letters preceding *Smith*, the content of lines 1 and 2 are identical. The odd letters preceding *Smith* come from the revised subfield *w*, as used in the latest edition of the authorities format, and occur only with references. We would therefore expect lines 1 and 2 to contain the first lines of reference records. However, if we select a complete display of each line, we see

va voc00-24424 db 09/15/83 —/—/— 08/17/84
NAPSO !wa !ndnb!Smith, A. J.
va voc00-250574 db 09/15/83 —/—/— 08/17/84
NAPSO !wa !nd!Smith, A. J.

with no instructions to see another heading. Because the RIDs in the authority file are identical to the internal sequence numbers (ISNs), it is easy to search for authority records adjacent to the suspicious records. The searches "t isn 24423 $,c" and "t isn 250573 $,c" retrieve

va voc00-24423 db 09/15/83 —/—/— 08/17/84
NAPSO !a !Smith, Albert James.
va voc00-25073 db 09/15/83 —/—/— 08/17/84
NAPSO !a !Smith, Anthony James.

These look suspiciously like the headings to which the two references might refer, and this is confirmed by authority records retrieved from OCLC, for *Smith, Albert James* and *Smith, Anthony James*. Each traces a *400* or *see* reference from *Smith, A. J.* Unfortunately, the present online catalogue programs cannot cope with two different reference records with identical headings. Therefore, name headings retrieved with subfield *w* coding that are not references are questionable and are always checked further.

Additional information helpful in identifying an AACR2 heading can sometimes be found by checking the complete display of a bibliographic record, when the LC authority record is not available. In the complete display of a bibliographic record, the "source of cataloguing" field can be used to determine whether LC catalogued the title by looking for the symbol "DLC," meaning the Library of Congress. In addition, looking in the fixed field CAT FORM, or DESC of the MARC format, shows which rules governed the description. The code *a* would show that LC followed AACR2 when cataloguing the title. It would therefore be a certainty that every heading in the catalogue record is an AACR2 form established by LC, and that the same form can be used without further investigation. In addition, bibliographic records can also provide the kind of verification that has traditionally been done in cataloguing; that is, they can disclose an acceptable heading already established for a person or corporate body that needs to be traced. A search of the authority file can provide a record for a heading similar to the one being established, but not proof that they are variant forms of the same name. A search of the bibliographic record in which the heading appears can provide the cataloguer with the background information needed to make a decision. For example, if an author writes on the same subject but uses variant forms of name on title pages, the bibliographic record can be used to relate the two forms of an author's name by showing subject matter. Records in the bibliographic file can also serve as a valuable resource for determining the predominant form of personal or corporate names, as often required by AACR2. Since AACR2 requires the accurate transcription of statements of responsibility found on title pages and other prominent sources of information, comparison of statements of responsibility in catalogue records — for works by a person or emanating from a corporate body — can reveal the predominant usage of that person or body.

As with name authority records, subject headings from LC subject authority tapes were loaded into the online catalogue before any bibliographic records were loaded. Also as with name authority records, subject headings taken from LC subject authority tapes can be identified with the RID. Just as with name authority records, the RID has a prefix *voc* followed by two digits, a hyphen, and the rest of the number. The authority tape contains the headings listed in the ninth edition of *Library of Congress Subject Headings*

(LCSH) as modified and expanded through (approximately) the 1981 supplement. Of course, further supplements have been issued, and the changes in those supplements have not been systematically added to the online authority files. Therefore, some of the authority records from the LC tapes are obsolete. As a general rule, however, headings from the tape are regarded as legitimate for use in establishing subject headings. Also as with name authority records, when the subject authority records were loaded, some reference records lost the line that shows them to be references, so that they look like legitimate headings. Furthermore, subjects taken from bibliographic records may easily be obsolete or incorrect, unless the bibliographic record resulted from LC cataloguing produced since the adoption of AACR2. Subjects not taken from the LC authority tapes or from recent LC cataloguing are always verified in *LCSH* and its supplements, LC's *Guide to Subdivision Practice* or the LC *Subject Cataloging Manual.*

Subject authority records are searched in much the same way as name authorities. The command *t s* (for "term subject") is used and can be refined depending on the type of subject search wanted:

t st (for "term subject-topical")
t sg (for "term subject-geographic")
t sa (for "term subject-subfield a" limiting the search to the subject as first element of the heading)
t sn (for "term subject-not subfield a" limiting the search to the subject used as subdivision)

These refinements are sometimes insufficient to permit direct searching for certain subjects. This will happen when so many different subdivisions have been used with a subject that the authority file has too many authority records beginning with that subject for the system to list and display. "Indians of North America" is such a subject heading. The search "t st indians of north america" cannot at present retrieve any records. However, it is possible to circumvent this problem for subject authority records by substituting the "browse" command. It takes the form *b st* or *b sq*, and permits one to enter the subject authority file structured as if it were an alphabetically ordered list. Thus the command "b st indians of north america" retrieves the listing "Indians of North America," followed by the first nineteen subdivisions used with that subject. One can browse through the rest of the listing for that subject by using the command b 20 (for "browse beginning with line 20").

Many of the bibliographic records loaded into FBR had subjects from sources other than *LCSH*, because the OCLC record contained them at the time of cataloguing. The source of a subject heading is encoded in the second indicator after the tag for the subject heading and can be seen in the complete display of the bibliographic record. The tag for the topical subject is *SUT* and for a geographic subject, *SUG*. A tag with an indicator appears as *SUT L*. The most frequently occuring indicators are

L Library of Congress subject
C Library of Congress children's subject
M National Library of Medicine subject
A National Agricultural Library subject

Subjects in all of these categories can be searched in the online catalogue.

CONCLUSION

The procedures described above suggest some of the complexities with which a librarian must cope when cataloguing for the online catalogue. They may easily appear overwhelming. However, the establishment of headings for any old and large card catalogue was also a very complex operation; the process was simply more familiar. Some of the complexities, in fact, stem from the great retrieval capabilities of an online system. Some of the problems can be expected to be eliminated by improvements in the programming on which the online catalogue depends. In any case, the advantages of the online catalogue outweigh the disadvantages, for the cataloguer as well as for the library patron.

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Maintenance of an Online Catalogue

Sharon E. Clark and Winnie Chan

DATABASE PLANNING AND MAINTENANCE

In the planning and implementation of the Online Catalogue at the University of Illinois at Urbana-Champaign (UIUC), maintenance of the database was extremely important. Of great concern was how to ensure a quality database that would reflect the most current cataloguing records and at the same time provide for successful links to Library Computer System (LCS), thereby enhancing user access to the Online Catalogue. Problems addressed during the planning process that had a positive impact on the maintenance of the Online Catalogue included: processing of the OCLC archival tapes, specifying the order in which the Authority Files and the Full Bibliographic Record (FBR) File would be loaded initially, and defining the order in which the tapes would be loaded into the Bibliographic File of the Online Catalogue to achieve maximum linking capability. Initially, the FBR database was to include cataloguing records created through OCLC since November 1979, the date when the library adopted AACR2 as its official cataloguing code. At that time the old main card catalogue was closed and a "New Books" AACR2 catalogue was initiated. However, the library owned OCLC archival tapes from 1974 to 1979 that, if edited to AACR2 form, could be loaded into the Bibliographic File of the Online Catalogue database. Therefore, the UIUC library contracted with the AMIGOS Bibliographic Council, Inc. to accomplish the AACR2 conversion of bibliographic records created through OCLC for materials catalogued since 1974. The AACR2 conversion process performed by AMIGOS allowed for an increase in the initial size of the database as well as a significant reduction in the amount of subsequent manual maintenance that otherwise would have been required.

Another aspect of the AMIGOS conversion project was the elimination of duplicate records, which was a necessary requirement prior to the local development of software that could be used to establish links between the FBR records and their counterparts in LCS. Each week when OCLC records are loaded into the Online Catalogue databases (LCS and FBR), the automatic links for each item are created by matching the call number in LCS with the 09X field in the MARC record. The 09X field is then removed from the FBR record. It is this effective linking capability that supported the library's decision to continue to store the copy-unique information such as call number and holdings information in LCS only, thereby eliminating the need to perform maintenance on this local information in both the LCS and FBR files.

Although the WLN programs created a file of authority headings as a result of loading full bibliographic records, cross-references among headings were not created. Since the process of keying cross-references manually is labor-intensive, costly, and prone to keying errors, the decision to buy the Library of Congress name and subject authority tapes for authority control and a cross-reference structure proved advantageous from the perspective of maintenance. Loading of the LC authority tapes was completed in September 1983. Because headings for names and subjects are usually stored only once, maintenance was significantly reduced. References are automatically generated by loading the LC tapes. Headings that do not match those already in the database are accepted as new and added permanently to the database. References for these headings must then be added manually.

The library adopted the strategy of loading the authority file first and the full bibliographic file second further to reduce the amount of maintenance required. Had the reverse happened, it would not have been possible to take advantage of the system's

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mapping capability via *see* references, with which unauthorized headings prior to entering the database could be flipped to the preferred AACR2 form, thus alleviating the need for manual verification of any unauthorized headings inadvertently used in cataloguing records.

Once the Authority Files were in place, loading of the OCLC archival tapes, often referred to as the ILLINET tapes, began without delay. To ensure the use of the most recent input call numbers, and thus to minimize link maintenance, the ILLINET tapes for the previous years were run in reverse chronological order from October 17, 1983 to August 10, 1982. Tapes from this time included the materials recently reclassified under a Title IIC grant for the mathematics library. Next were the AMIGOS tapes covering cataloguing records from September 9, 1974 to August 9, 1982. The initial loading of the Full Bibliographic Record File was completed in April 1984 (Murphy 38–39).

The FBR program was then enhanced to implement a few necessary adjustments as well as recommendations from the library's Online Catalogue Technical Committee. Tape loading started again in July 1984 and became a continuing process with current LCS maintenance since August of that year. Once each tape is loaded, the link between FBR records and their LCS counterparts is created by the university programmers. Subsequent catalogue maintenance of LCS, FBR, and the link is handled in the Automated Records Maintenance Section (ARM) of the Automated Systems Department at the UIUC Library.

SYSTEMS MAINTENANCE

The Automated Records Maintenance Section was created in 1978 to maintain the library's newly acquired online circulation system, which was to become the LCS component of the future Online Catalogue. When the FBR component of the Online Catalogue became fully operational in September 1984, ARM's responsibilities were expanded to include maintenance of the FBR database and the LCS/FBR link file.

To ensure a smooth transition from the card-oriented operation to a total online environment, workflow within Automated Systems was only minimally modified as indicated by asterisks in figures 1 and 2. A current version of ARM's workflow is detailed in figure 3. New procedures and guidelines for systems maintenance, however, were being instituted. Coding of the 910 field for OCLC input was redefined in order to expedite the weekly review process in ARM. Routing of authority cards requested by cataloguers were sent directly to ARM for online updating, rather than to the OCLC inputters who had previously typed cards for the manual authority file. Microcomputers were used to replace the laborious manual procedures of gathering documentation for reporting link error updates by the OCLC support staff. Finally, written procedures were developed to ensure consistency in making data corrections involving more than one database.

Changes to LCS may be made online using the workfile to modify the location and the circulation period. The majority of changes to LCS, however, are batched using SUPERWYLBUR, a modified text editor, and its datasets, UPDATES and HOLDING. UPDATES corresponds to the LCS master file record and is used for changes involving bibliographic and copy information. The HOLDING file is used for changes to monographic series and serial holdings and corresponds to the Serial Holdings Record in LCS. LCS maintenance is run weekly.

One limitation of SUPERWYLBUR, however, is that the inputter is unable to view the LCS record when keying in the corrections to a record. Ambiguous corrections, therefore, must be verified on LCS prior to inputting. Another drawback is the time spent in training and in learning the command structure of SUPERWYLBUR. Programs written for the microcomputer can be made user-friendly, eliminating inputter decisions on format, commands, and spacing, as well as extra keystrokes. In order to facilitate a large volume in conditions of staff turnover, ARM developed IBM PC programs geared toward specific LCS and Link maintenance operations. One such program called COMBINE has recently been implemented to handle corrections in both UPDATES and HOLDING. The program, which requires an LCS

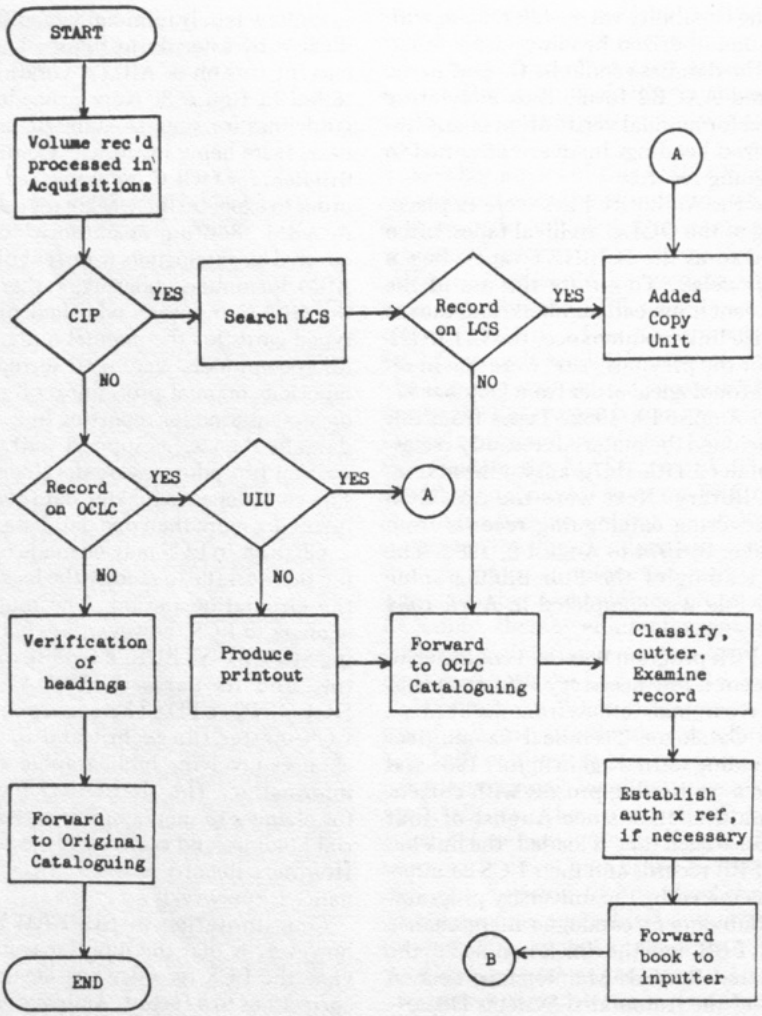


Fig. 1. Automated Systems Workflow: Searching and Cataloguing.

communication linkup, has increased the accuracy and speed of data entry, since verification of record status for change is provided at the time of updating (see figure 4).

Other programs have been developed to prepare LCS updates for SUPERWYBUR that do not require communication with the LCS system, and thus are not affected by LCS downtime. So far, these programs have been used to handle special projects such as the changes in locations necessitated by the transfer of materials from thirty-five departmental libraries to the newly opened sixth stack addition and by "added copies" changes. The large numbers of transactions can be formulated from simplified keystroke patterns, thereby resulting in increased speed to each data entry. During the first three weeks the program was in use, 48.2 transactions per hour were recorded as compared with 25.3 transactions per hour without the program using the traditional SUPERWYLBUR data entry methods.

Programs have been designed for use with microcomputers to streamline the link

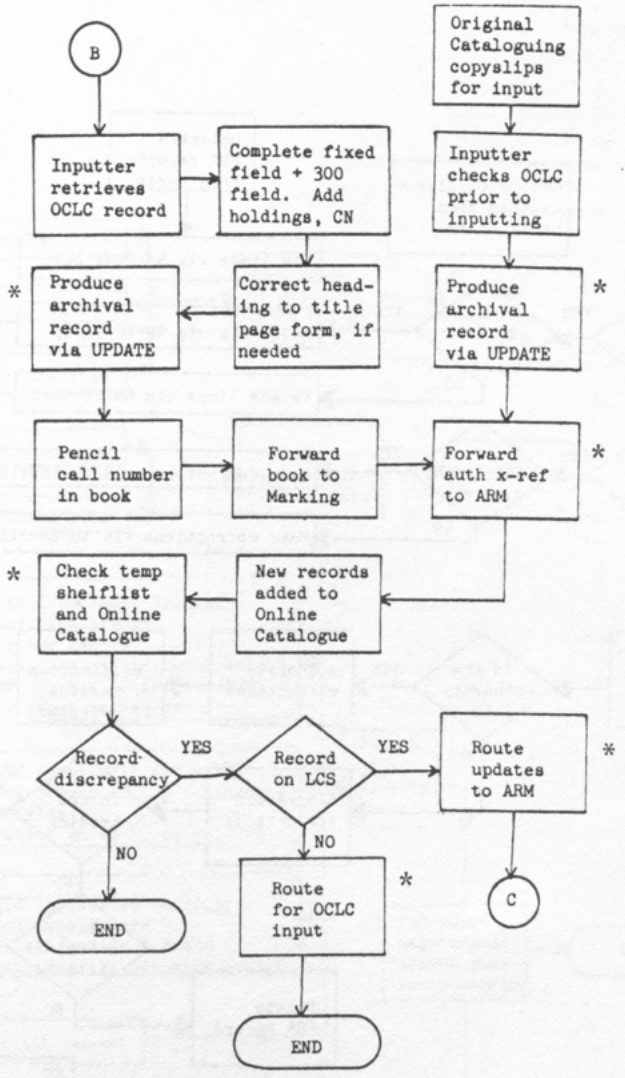


Fig. 2. Automated Systems Workflow: Inputting and Processing.

maintenance process, increase output, and decrease manual verification. For example, link maintenance has been greatly facilitated through programs (LINKER) designed to download unlinked raw data from SUPERWYLBUR on to diskettes and automatically to search the Full Bibliographic Record and the LCS database for possible links. Links thus identified are then stored on diskettes to be uploaded to SUPERWYLBUR for batch maintenance. While the majority of unlinked records are handled successfully this way, printouts containing information on nonmatches are generated for staff to search and verify, usually only on LCS, which allows for greater speed and efficiency of maintenance.

The LINKER program first searches an unlinked full bibliographic record in LCS by title using the LCS command TLS/. If more than ten LCS records are retrieved,

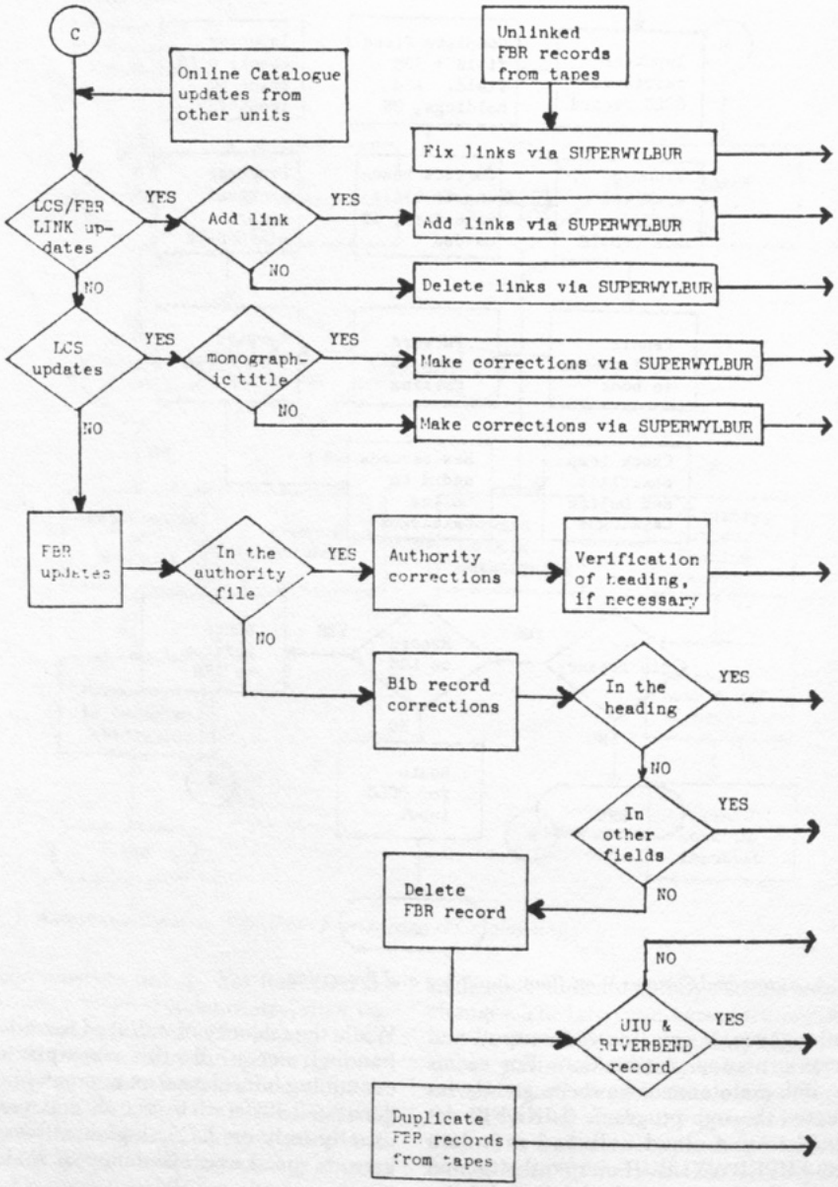


Fig. 3. Automated Systems Workflow: Maintenance.

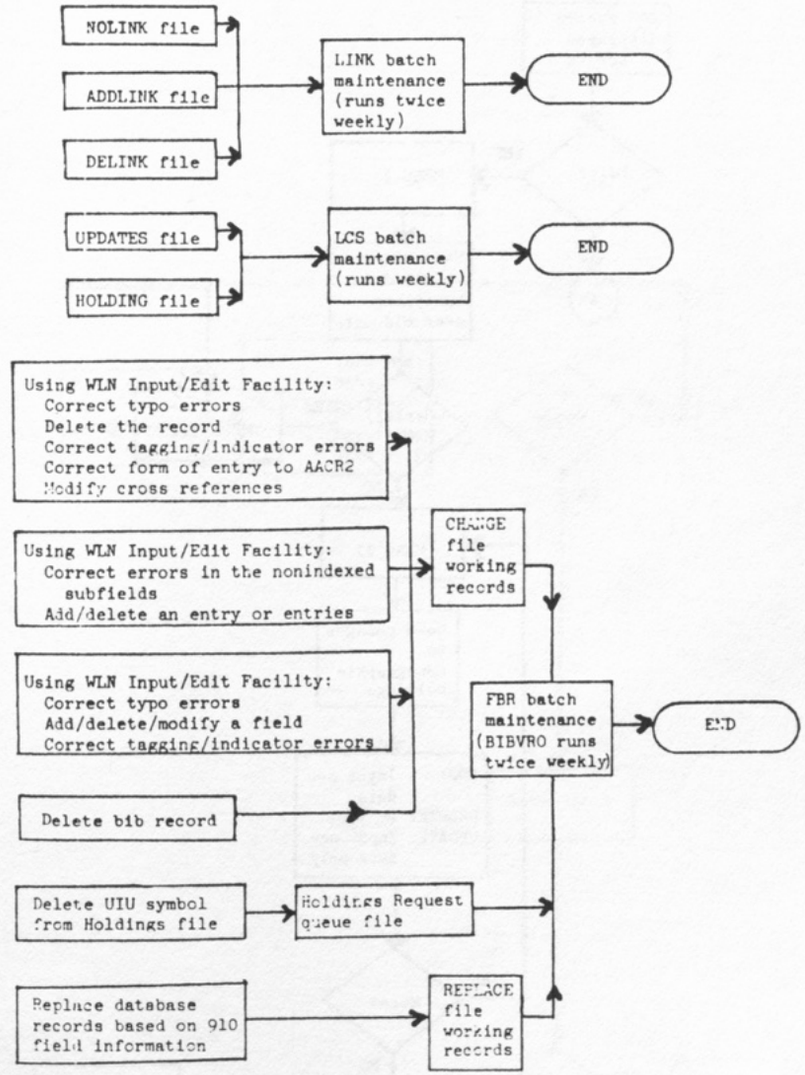
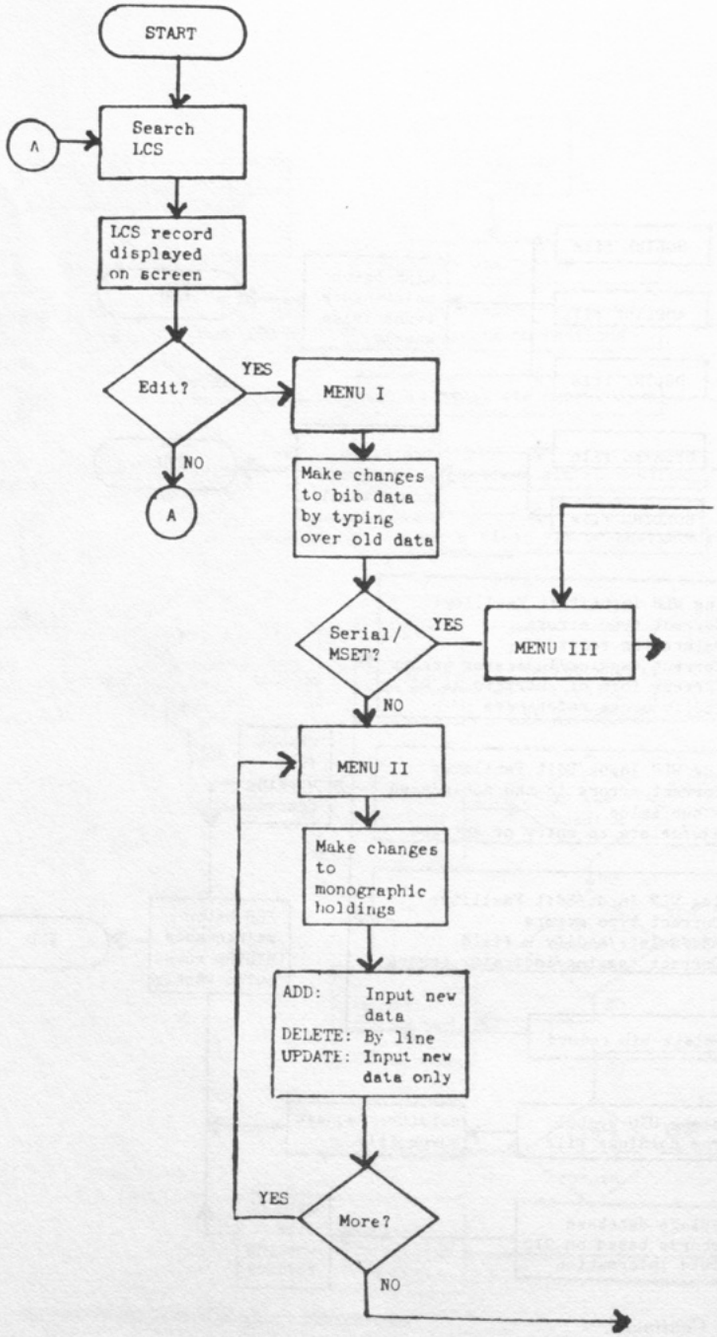


Fig. 3. Continued.



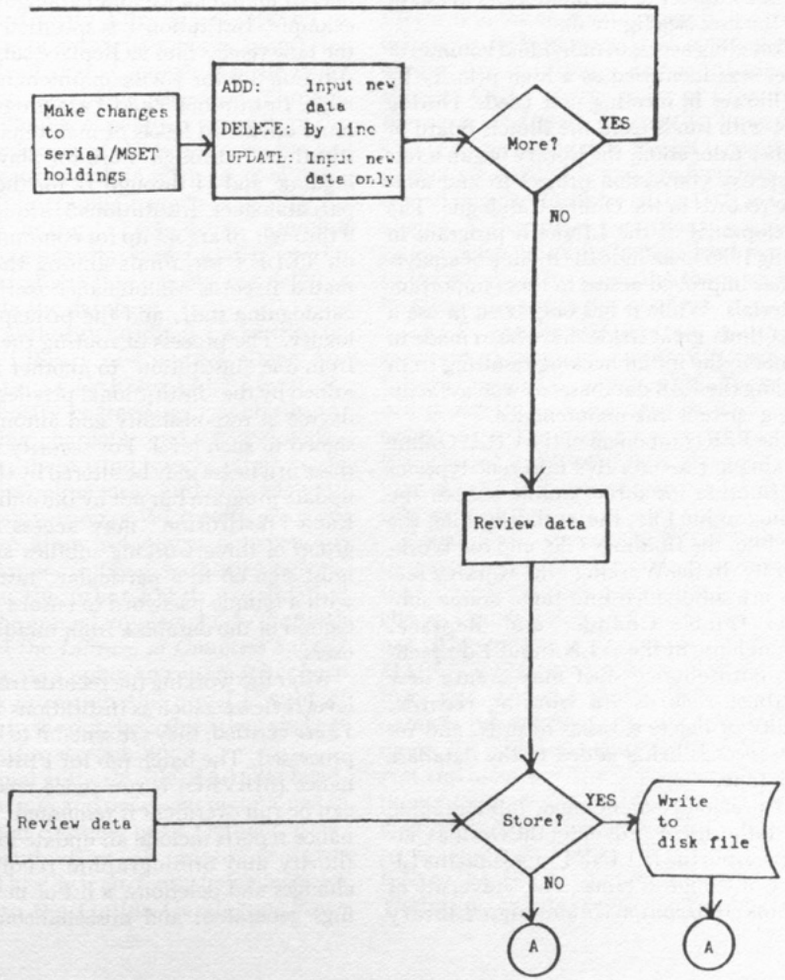


Fig. 4. COMBINE Program Flowchart.

the program searches the LCS database by author and title (ATS/) (see figure 5). Typically, the title or author/title search will yield from two to ten LCS records. If this approach yields more than ten LCS records, the program ends the searching process and all of the records retrieved up to this point are printed out and routed to staff for review. However, when one LCS record that matches the title and year of the unlinked FBR record is retrieved, the LINKER program accepts this match as a successful link and the linking data are stored on diskettes for uploading. In most cases, the program locates the appropriate record and then checks to determine if this record relates to an analytic entry. The program will then identify the call number and volume number of the main series to establish the link (see figure 6).

Providing access to individual volumes of series was identified as a high priority by the library in meeting user needs. During 1984 with funds from the Illinois Board of Higher Education, the library began a retrospective conversion project to add analytic records to the Online Catalogue. The development of the LINKER program in spring 1985 to include the linking of analytics has improved access to these important materials. While it has only been in use a short time, great strides have been made in reducing the initial backlog resulting from loading the FBR database, as well as facilitating current link maintenance.

The FBR component of the UIUC Online Catalogue provides five different types of information for direct online access: the Bibliographic File, the Authority File, the Key File, the Holdings File, and the Working File. In the Working File, working records are subdivided into three online subfiles: Input, Change, and Replace. Through use of the WLN Input/Edit facility, maintenance staff may create new database records via working records, modify or delete existing records, and review records being added to the database from tape.

As previously mentioned, bibliographic and authority records enter the Online Catalogue from the ILLINET tapes and the Library of Congress tapes. The University of Illinois at Urbana-Champaign Library does not input cataloguing records locally from keyboard into the database via the Input subfile. On the other hand, the majority of routine FBR maintenance is done in the Change subfile, which contains copies of existing database records (bibliographic and authority) undergoing change or deletion. Finally, the sources of the working records in the Replace subfile are external, consisting solely of bibliographic records rejected from the High Volume Update program that loads the ILLINET OCLC/MARC format records into the database. The Input/Edit facility also supports a multi-level review process to help to ensure the quality of work in the Working File.

The UIUC Library has twelve categories called "institutions" for use by staff members in maintenance and cataloguing. For example, Institution 1 is specified to store the tape rejects into its Replace subfile; Institution 2 is for novice maintenance staff, while Institutions 3 and 4 are progressively more advanced levels of maintenance. Institutions 7 through 8 are for Slavic cataloguing; and 11 through 12 for the principal cataloguer. Institutions 5 through 6 and 9 through 10 are set up for communication on TELEX terminals among the Automated Records Maintenance staff, Slavic cataloguing staff, and the principal cataloguer. The process of routing the records from one "institution" to another is determined by the "institutional privileges"; the degree of responsibility and autonomy assigned to each level. For security reasons, these privileges may be altered by the batch update program but not by the online user. Each "institution" may access its own group of three working subfiles and each must sign on to a particular "institution" with a unique password to ensure the protection of the database from unauthorized users.

After the working file records from high-level reviewers such as Institutions 4, 8, and 12 are verified, they are sent out to be batch processed. The batch job for FBR maintenance (BIBVRO) is run twice weekly but can be run overnight if requested. Maintenance reports include an update log of authority and bibliographic records, i.e. changes and deletions; a list of new headings generated; and miscellaneous statis-

tics. Routine backup of workfile is provided six nights per week and backup of the entire database is provided weekly subsequent to loading the OCLC archival tapes and modifying the bibliographic, vocabulary (authority), keyword, and holdings files.

The Holdings File displays minimal bibliographic data as well as a symbol of ownership for a catalogued item. Individual holdings associated with bibliographic records may be added or deleted. Any holdings attached to a bibliographic record must be removed, however, before deleting the record. Since copy-unique information such as call number or serial holdings is not retained with the holdings record, Holdings File maintenance is dramatically lessened except for updating the library-unique data, such as campus codes.

The Authority Files are composed of three types of authority records: names, series, and subjects. Changes may be made online and then batch-processed. Through a global change capability, changes in the authorized form of the heading on the authority record result in retrieval of all associated bibliographic records under the revised heading. Procedures involve eliminating unauthorized authority entries by merging them into one form or deleting them from the database.

Name authority headings are verified on OCLC's Library of Congress Name Authority File (LCNAF) for AACR2 form. Series authority corrections essentially involve filing character and subfield codes. However, there is no intense effort yet to update the online series authority file until the current version of WLN software is enhanced to allow references between authority types. Subject authority corrections, on the other hand, are verified against the annual supplements to the ninth edition of the *Library of Congress Subject Headings*. As a policy, no attempt has been made to maintain the non-LC subject headings in the database since they are kept primarily for accessibility.

A manual authority file of AACR2 headings for names and series was maintained in Automated Systems until October 1984, when production of catalogue cards ceased. This file is currently being incorporated into the Online Catalogue. Since then, authority records prepared by copy and original cataloguers are routed to Automated Records Maintenance for input. Headings for which cross-references are requested are checked and the cross-references are keyed in manually after the tapes run each week. Discrepancies may involve checking bibliographic and authority files for a match with that heading and then making the appropriate correction.

In order to ensure a quality authority file and to reduce the amount of manual review necessary, a microcomputer program has recently been implemented to detect discrepancies. The PC-Authority program, written in BASIC, was developed to streamline this process through automatic retrieval of local data. In essence, this program is to the online catalogue what the filer was to the card catalogue. In the past, catalogue maintenance staff could detect errors on catalogue cards produced through OCLC at the point of filing into the card catalogue. Currently, however, some categories of error are not recognized as conflicts in OCLC and are therefore accepted into the database of the Online Catalogue. At this stage, the primary goal is to clean up new headings being added weekly to the database by screening them against headings already in the database.

The PC-Authority program is run by specifying a range of authority records by Internal Sequence number (ISN). Each record is retrieved automatically and processed. After the program searches by ISN, it performs a Term Search according to type of entry (i.e. name, corporate, series, subject) (see figure 7).

Based on the assumption that a heading that exists in only one form in the database is the authoritative form, the program checks that heading but will not print it out. The program can easily check for MARC format errors (i.e. tagging, indicators, and subfield codes). If a personal name is incorrectly tagged as a corporate name, the program will detect both the correct and incorrect headings. This occurs on the second pass (loop 2) in the program. It does not matter whether the error is in the record being checked by the program (by ISN) or in a record already in the database. Therefore, this coincides with the filing

```
F R ocm02506500 $,c

                                                    BIBLIOGRAPHIC DISPLAY

   COLLECTION ID.ALL
     as   ocm02-506500  db   10/31/83  11/07/83  --/--/--  CAMPUS,   CAMPUS,
        MECP     $ab     $Goa, Daman and Diu (India).$Bureau of Economics,
                         Statistics & Evaluation.
        TILAO    $a      $State income of Goa, Daman and Diu, for the year ...
        IMPN     $ab     $Panaji :$Govt. of Goa, Daman and Diu, Bureau of
                         Economics, Statistics and Evaluation.
        COL      $ac     $v. ;$28-21 x 34 cm.
        NOG      $a      $"Revised estimates."
        SUT-L    $az     $Gross national product$Goa, Daman and Diu.
        GAC      $a      $a-ii---
        CAL N    $ab     $HC437.G6$G625b
        DDC      $a      $339.354/799
        CAS      $acdd   $DLC$DLC$m.c.$UIU
        LDN      $a      $ocm02506500 830418
        AUT      $a      $lc
        FFD  PUB STAT=c     BEG DT=19uu  END D=9999  CNTRY=ii      FREQ=a
               REGLTY=r       ISDS=   TYPE SER=    PHY MED=      REPRO=
             TYPE MAT=   CONTENTS=s    GOV PB=f      CONF=       TI PG=u
                INDEX=u   CUM IND=u  ORG ALPH=a  SL ENTRY=    MOD REC=m
                CAT S=   CAT FORM=a       LAN=eng


                                                    HOLDINGS DISPLAY

   COLLECTION ID.NET
   1. Goa, Daman and Diu (India). Bureau of Economics, Statistics &
           Evaluation. State income of Goa, Daman and Diu, for the
           year ...   ocm02-506500


TLS/STATINCOM/SER
 PAGE 1              62 MATCHES          0 SKIPPED        (NOT ALL DISPLAYED)
01 UNITED STATES. INTERNAL REVENUE  STATISTICS OF INCOME: INDIVIDUAL INCOM
02 U.S.--INTERNAL REVENUE SERVICE.  STATISTICS OF INCOME: FIDUCIARY INCOME
03 U.S.--INTERNAL REVENUE SERVICE.  STATISTICS OF INCOME: CORPORATION INCO
04 U.S.--INTERNAL REVENUE SERVICE.  STATISTICS OF INCOME: ESTATE AND GIFT
05 UNITED STATES. INTERNAL REVENUE  STATISTICS OF INCOME. SUPPLEMENTAL REF
06 GOA, DAMAN AND DIU (INDIA). BURE STATE INCOME OF GOA, DAMAN AND DIU, FO
07 OKLAHOMA--TAX COMMISSION         STATE INCOME TAX
08 U.S.--INTERNAL REVENUE SERVICE.  STATISTICS OF INCOME: ESTATE TAX RETUR
09 UNITED STATES. INTERNAL REVENUE  STATISTICS OF INCOME$ WASHINGTON, D.C. 1981
10 U.S.--INTERNAL REVENUE SERVICE.  STATISTICS OF INCOME.

Too many hits on TLS, will try ATS
ATS/GOA STATE/SER
 PAGE 1              3 MATCHES           0 SKIPPED        (ALL DISPLAYED IN 1)
01 GOA, DAMAN AND DIU (INDIA). BURE STATE INCOME OF GOA, DAMAN AND DIU, FO
02 GOA, DAMAN AND DIU (INDIA). BURE STATEMENT OF THE ESTIMATED RECEIPTS AN
03 GOA, DAMAN AND DIU (INDIA). BURE STATE INCOME OF GOA, DAMAN AND DIU, OU

DSL/1
339.354799G534S
GOA, DAMAN AND DIU (INDIA). BUREAU OF ECONOMICS, STATISTICS & EVALUATION
STATE INCOME OF GOA, DAMAN AND DIU, FOR THE YEAR$ PANAJI    76-913222
     2617060              1   ADDED: 830502   SER
01 ACD 001 NDCIR             MARKED BY YR./YR)
02 STX 001 16-4W             1977/1978
03 STX 001 16-4W             1976/1977
04 STX 001 16-4W             1975/1976
PAGE 1 END

CN=339.354799G534S
ME=GOA, DAMAN AND DIU (INDIA). BUREAU OF ECONOMICS, STATISTICS & EVALUATION
TI=STATE INCOME OF GOA, DAMAN AND DIU, FOR THE YEAR
ED=
PL=PA
LC= 76913222
TN= 2617060
FD= 0

possible link ocm02506500      2617060
```

Fig. 5. LINKER Program Sample Run.

```
STARTING THE URBANA.505FILE.......
                Links= 0    Inconclusive= 0                    Total=    0
F R ocl72213369 $,c

                                                  BIBLIOGRAPHIC DISPLAY
   COLLECTION ID.ALL
     am   ocl72-213369  db   12/03/84  12/01/83  12/03/84  CAMPUS,   CAMPUS,
          MEPS     $ad    $Langdon, Merle K        ,$1905-
          TILA2    $ac    $A sanctuary of Zeus on Mount Hymettos /$by Merle K.
                          Langdon.
          IMP      $abc   $Princeton, N.J. :$American School of Classical
                          Studies at Athens,$1976.
          CDL      $abc   $xi, 117 p., ;14: leaves of plates :$ill. ;$28 cm.
          SET 0    $av    $Hesperia. Supplement.;$v. 16
          NOB      $a     $Includes bibliographical references and index.
          SUT L    $a     $Zeus (Greek deity)
          SUT L    $azz   $Excavations (Archaeology)$Greece$Hymettus Mountain.
          SUT L    $azz   $Inscriptions, Greek$Greece$Hymettus Mountain.
          SUG-L    $ax    $Hymettus Mountain (Greece)$Antiquities.
          GAC      $a     $e-gr---
          SBN      $a     $0876615167
          CAL      $ab    $DF221.H94$L36
          DDC      $a     $938/.5
          CAS      $acd   $DLC$DLC$UIU
          LON      $a     $ocl72213369
          FFD       CONF=       FEST=      INDEX=x    ME IN B=x
               INTEL LV=         FIC=       BIOG=        LAN=eng  DAT KY=s
                  DATE1=1976  DATE2=        CNTY=nju    ILLUS=af     REPRO=
               CONTENTS=b     MODRC=       CAT S=     GOV PUB=    CAT FORM=s


                                                  HOLDINGS DISPLAY
   COLLECTION ID.NET
   1. Langdon, Merle K        , A sanctuary of Zeus on Mount Hymettos /
            ocl72-213369
      URBANA  CAMPUS, U. OF I.


TLS/SANCZEUS
913.05HESUP.V.16   LANGDON, MERLE K., 1905-
A SANCTUARY OF ZEUS ON MOUNT HYMETTOS$ PRINCETON, N.J.    76-16777
     2887594   1976       1    ADDED: 841202   MSET
01 SER 001 UNAS               IF YOU WANT THIS ITEM, ENTER DSC/913.05HE.SUP.,B=1
                              6
PAGE 1 END

DSC/913.05HESUP.,B=16
913.05HESUP.       HESPERIA$PRINCETON
NOLC      1537451               1   ADDED:  781113   SER
01 CLX 001 16-4W              16-17 1976-78
PAGE 1 END

CN=913.05HESUP.
ME=
TI=HESPERIA
ED=
PL=PR
LC= 0
TN= 1537451
PD= 0

possible link ocl72213369      1537451,B=16
                Links= 1    Inconclusive= 0                    Total=    1

Urbana.505 run statistics:

                Links= 1    Inconclusive= 0                    Total=    1
```

Fig. 6. LINKER Program Sample Run.

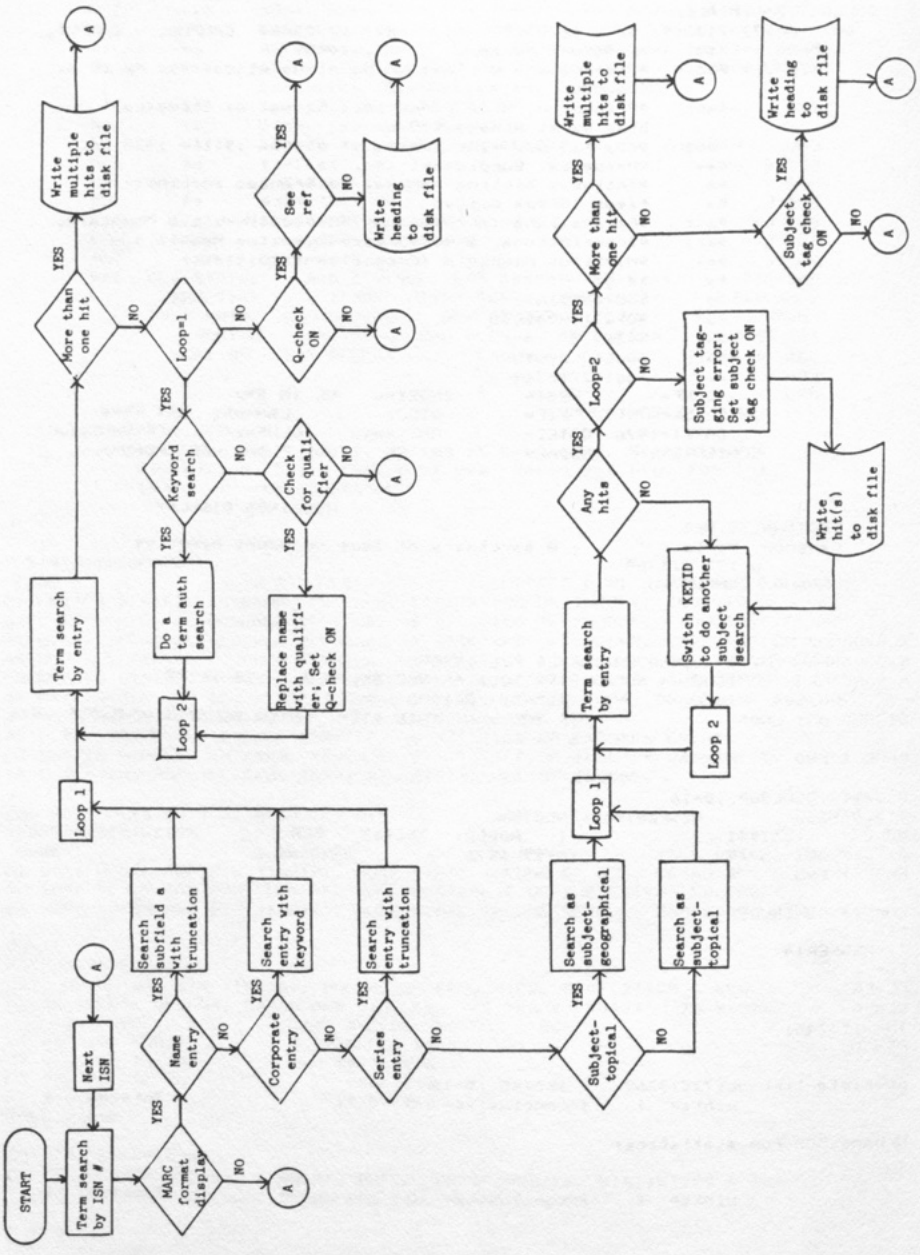


Fig. 7. PC-Authority Program Flowchart.

practices established when the Library adopted AACR2. Conflicts in headings are not anticipated but are dealt with as they occur after cataloguing (Clark). By the same token, a tagging error in an existing subject heading will be detected by the PC-Authority program on the first pass (loop 1) if the incoming heading is correctly tagged. If the incoming heading is incorrectly tagged, the error will be detected in the second pass (loop 2) after comparison with the existing heading. Errors in filing characters also generate multiple headings that need to be merged. The program usually locates these in a series search.

The program checks for a qualifier in AACR2 entries that are in the authority file as variant forms of a heading rather than as cross-references to headings. If the qualifier is embedded in the AACR2 form of heading, the program will check that heading with the qualifier as well as variant forms of that heading. If the variant form is not established as a see reference, the program will print both headings for verification.

The presence or absence of dates in headings is also checked by this program. If a heading is established without dates but the authorized AACR2 entry includes dates, or vice versa, the program will retrieve both headings for verification and conflict resolution.

Discrepancies in diacritics are also checked. If a heading appears in more than one form as a result of errors involving diacritics, the program will retrieve the headings for correction. Although diacritics currently do not display on public terminals, errors in diacritics will generate separate headings that would normally have been merged into the authoritative form.

The PC-Authority program prints out all headings for manual review each time multiple hits occur, indicating the variant forms of heading. Staff then check the OCLC LCNAF to determine the authoritative form of headings. If headings are not found on the OCLC LCNAF, FBR is checked to determine the originator of the cataloguing record. ARM staff consult with cataloguing staff as necessary to resolve conflicts and then make corrections in the Online Catalogue.

The PC-Authority Program was initiated and tested in July 1985. During the two-month test period, 1,296 headings were checked. Of those checked, 14 percent required corrections.

Quality control of online cataloguing records has actually improved over the previous card catalogue maintenance. When cards were a factor, ARM had to wait for the cards to arrive, then pull the shelflist card and match it with the temporary shelflist card and LCS. Turnaround time was approximately two weeks. Since October 1984, when card production stopped, staff who formerly maintained the card catalogue check the temporary shelflist records weekly against FBR and LCS and, in the process, can locate unlinked records.

A temporary shelflist file is maintained in Automated Systems for manual quality control. All updated records are filed weekly by call number. After the OCLC tapes are loaded into the Online Catalogue each week, the records are checked against LCS and FBR for accuracy and to ensure that the link has been made. Printouts are made for any records containing errors and are routed for correction. Reports are generated weekly denoting statistics on number of records successfully added as well as those rejected.

SUMMARY

Maintenance of an online catalogue need not pose insurmountable problems. Knowledge of past and current cataloguing practices, workflow, and user expectations is critical, since decisions made during the planning stages will most certainly affect maintenance later on. Planning for the Online Catalogue at the University of Illinois at Urbana-Champaign provided the opportunity to address issues confronting libraries in transition from a manual to an online environment. For example, changes were sometimes made on catalogue cards that were not reflected on the library's OCLC archival tapes, therefore involving manual maintenance after initial loading of the database (Clark).

By the 1970s, filing and changes in the card catalogue at the UIUC Library had

proven to be extremely labor-intensive, requiring more staff, time, and funds than were available or economical. Simply put, maintenance of the card catalogue had become less than satisfactory. Due to the volume of cataloguing produced at the UIUC (on average, eleven thousand titles per month for the past fiscal year), it was impossible for the staff to check every record and then keep the card catalogue up-to-date. In contrast, the maintenance of the Online Catalogue, which has not been dependent upon the arrival of cards to check and file, has allowed for a more current database that can be maintained in a more timely manner. The development of detailed workflow procedures, coupled with local microcomputer programs, has allowed for efficient maintenance procedures and quality control of the database. More important, however, effective maintenance has contributed to improved user access to library resources.

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The Effect of the Online Catalogue on Reference: Uses, Services, and Personnel

Beth S. Woodard and Gary A. Golden

As more libraries implement online catalogues, it is important to consider how they will affect reference service. This paper discusses the significant changes the reference department will see in its use of the library's catalogue, the services expected of the department, and the knowledge required of the staff. The greater number and variety of access points available in an online catalogue increase the efficiency and speed of retrieval significantly and influence the approach of the reference librarian to known item, subject, and reference requests. In addition to influencing approaches to questions, the online catalogue requires the reference librarian to improve his or her knowledge of cataloguing and classification, since the cues found in the card catalogue are not present in an online environment. As patrons were also dependent on the alphabetical arrangement to find what they wanted in the catalogue, the advent of the online catalogue has an impact on reference services by requiring more one-to-one instruction in the use of the system.

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INTRODUCTION

The University of Illinois at Urbana-Champaign (UIUC) Library is a decentralized system of thirty-eight departmental libraries with central processing services for acquisitions and OCLC cataloguing. While specialized reference service and original cataloguing are provided by departmental libraries, a Central Reference Service coordinates a general Reference Library that provides reference service primarily in the humanities and social sciences and to the government documents collection. The Reference Library collection is particularly strong in bibliographies, biographical directories, and statistical sources. Since the Reference Library serves no one particular department or school in the university, it has a diverse clientele, including many in interdisciplinary fields. As such, the Reference Library tends to be a court of last resort for many of the departmental libraries for questions that are peripheral to their fields and for researchers and students experiencing difficulty in locating materials throughout the library system.

By virtue of its close proximity to the main card catalogue, the Reference Library was until 1979 the only place within the library system where access to records for all of the university's library's cata-

logued materials, holdings, and locations was available. At that time, the library implemented the Library Computer System (LCS) as an automated circulation system that gives access to all catalogued materials by author, title, author and title, and call number, giving holdings and circulation status through terminals located throughout the library system. It was not until October 1984 that subject and keyword access was provided through the Full Bibliographic Record (FBR) the second component of the library's Online Catalog. The FBR component is a completely separate system based on the Western Library Network (WLN) software and has replaced the card catalogue for materials catalogued since 1975. The production of catalogue cards ceased when FBR was introduced. FBR does not contain call numbers or circulation information, which are in LCS, but each FBR record is linked to its corresponding LCS record. Automated systems at UIUC, besides LCS and FBR, also include a serial check-in system and an online order system that includes direct orders and approval plan materials.

The LCS component of the Online Catalogue is searched for known items using abbreviated searching algorithms such as four letters of the first word of the title and five letters of the second word. FBR allows all the traditional access points found in a card catalogue (i.e., author, title, subject, series, author-title) and also allows searches by keyword in titles, keyword corporate authors, ISBN, ISSN, and uses boolean logic including 'and,' 'or,' and 'not.' There is also a searchable authority file containing the Library of Congress name and subject files and authority records from all items catalogued at UIUC.

The effect of the Online Catalogue on both the staff and patrons has been significant. This paper will stress the benefits, problems, and solutions inherent in using online catalogs in a reference situation. We are primarily concerned with the reference librarian's responses and uses of our Online Catalogue, but since patron problems influence the questions asked of the librarian, they will be dealt with peripherally.

WHY USE A CATALOGUE?

The fundamental reason why a patron or reference librarian uses a catalogue, online or card, is to determine if the library owns certain materials and the location of either known items or items on a particular subject. The catalogue answers the questions: "Does the library have the book *Sports In America* by Michener?" and "Do you have any books about Texas politics?" In addition, a reference librarian consults a catalogue to find something to answer a patron's specific question. For example: "How is Christmas celebrated in different countries?"

How successful patrons are with their searches in an online catalogue is hard to determine, just as it was difficult to estimate the efficiency of card catalogue users. It is apparent, however, that patrons usually approach a reference librarian only when they fail to find what they want or for instruction in the use of the online catalogue. The reference librarian, as Jesse H. Shera told a 1966 conference audience, ". . .historically came into being because there was this gap between the library resources [i.e., the catalogue] and the resources themselves."[1] This gap may be due to one of the following: we do not own what they want, we never catalogued it, we catalogued it differently from the information in the citation they brought to the catalogue, a card is misfiled in the card catalogue, or a commonly used term, such as "star wars defense" is not yet used in the catalogue. Whatever the reason, patrons have enough insecurity in their catalogue use ability or too much confidence in the collection to believe that the library does not possess what they want, and thus, ask for help. The question is: how does an online catalogue help or hinder retrieval?

RETRIEVAL USING AN ONLINE CATALOGUE

Correct and Complete Citations

A correct, complete citation provides, of course, the easiest and most successful search in any catalogue. The reference librarian at UIUC examines the citation, determines its completeness, and usually begins by searching LCS, the circulation portion of our Online Catalogue, because it has short records for everything ever catalogued. Also, if found in LCS, location and circulation information is immediately

available. Since LCS has only limited access points (e.g., only the main name entry is available), some searches fail and a search of FBR, the MARC portion of our Online Catalogue, is undertaken.

The advantage of searching any online catalogue for a known item is that the reference librarian has the ability to try multiple approaches (e.g., author, authority file, or keyword corporate searches) without having to go from file drawer to file drawer as in a card catalogue. Also, the form of a citation does not necessarily have to match the form of an entry in the catalogue. Footnotes and bibliographies follow the rules of style manuals; entries in catalogues often conform to quite different sets of rules. The ability to search by keyword means that patrons do not need to know the "correct" cataloguing forms or to understand complex hierarchical structures. Having to follow *The Chicago Manual of Style* when citing an item and *AACR2* when looking for an item is no longer necessary. This greatly improves both the speed and ease of retrieval in known-item searches.

Incomplete and Incorrect Citations

The most common bibliographic problem faced by the reference librarian is the incomplete citation. These citations may have incomplete titles, subtitles alone, or partial names of corporate or personal authors. A large percentage of these incomplete citations have had to be verified in various reference sources before one could attempt to locate them in a card catalogue. Our Online Catalogue offers a solution to this problem.

The use of keyword searches for titles and corporate authors allows retrievability with very limited information. In employing a keyword title search, a search of both the title proper and subtitle is done. For example, a reference librarian using a keyword title search in our Online Catalogue could find the book about Lyndon Johnson called *The Path To Power* even though the correct title is *The Years of Lyndon Johnson: The Path to Power*. The concept of corporate authors with hierarchical structures is very difficult for most patrons and many librarians to understand. Cataloguing rules dictate that, in some instances, a subordinate unit is entered under its highest body. In an online environment, a corporate keyword search allows retrieval without having to know or understand this hierarchy. A search having as little information as "Radiation Technology Division" would find all higher bodies having a subordinate agency with that name. At UIUC, we now have the ability to find the catalogued proceedings of a conference with as little information as the date or the place of the meeting.

Patrons do not always have the correct author, title, or subject of the work in which they have an interest. The name may have been misspelled in the bibliography or footnote or it may have been given verbally so that the patron does not know the actual spelling. In any online catalogue the computer axiom "garbage in–garbage out" dictates that you must enter words exactly as they appear in the record. A misspelled word retrieves only other misspelled words. Patrons approaching the card catalogue with such incorrect information also encounter problems with the filing arrangement of the catalogue, however, ". . . in flipping over cards, enough alphabetical cues [are] presented so that the user [can], with enough time, stumble on the correct title,"[2] which we call the "fumble factor." There is no "fumble factor" in our Online Catalogue, because entries are not retrieved in alphabetical order as they are in the card catalogue, and only items matching the search input are retrieved. Therefore, it is up to the reference librarian to catch a misspelling.

Another set of incorrect citations result when words are out of order or extraneous words are added. A patron looking for the *Proceedings of the International Symposium on Isotope and Radiation Techniques in Soil Physics and Irrigation Studies* would fail in the card catalogue since "proceedings" is part of the subtitle and not the first word! In the case of extraneous words, keyword searching is advantageous since you can enter the title as known, then eliminate words in a step-by-step process.

Subject Searches

One type of subject search attempts to retrieve everything the library owns on a par-

ticular subject. A patron beginning research on a dissertation or a faculty member writing a book might require this type of exhaustive research. Several approaches are used by our reference librarians to establish all subject headings pertaining to a subject.

The most common approach is to use the online authority file to identify the relevant headings correctly. A separate online authority file is searched to obtain the authorized Library of Congress subject heading or a local option heading. That heading is then used to find bibliographic records on the subject.

One important benefit that must be pointed out in the online subject authority file is that it brings together all instances of a subject heading, whether it is in the first subfield or in a subsequent subfield, so that one can be more precise in heading selection. A search of the authority file for the subject "writing" would retrieve headings such as "Japanese Language—Writing" as well as "Writing—Identification." Browsing alphabetically is also a possibility.

In addition to using the authority file to obtain subject headings, a search by keyword in title is usually beneficial. Most titles of nonfiction books are indicative of the subject matter of that book. Therefore, another approach to finding appropriate subject headings is to use keyword in title searching to identify one book, then look at the tracings to identify subject headings. A keyword title search "screen writing" would reveal that the "correct" subject heading is "Moving-picture Authorship."

A different method of obtaining everything owned by the library on a given subject is to use boolean logic in a combination subject/title search. After subject headings are identified using the methods outlined above, keyword or words in the title are combined using 'or' logic. This has the capability of combining terms to cover all aspects of a subject. A search combining the subject headings "Dogs—Surgery" or titles "dog# surger#" (where # indicates truncation) would find materials by subject or title. Therefore, even books that have not been assigned that subject heading would be retrieved if the words *dog*, *dogs*, *surgery*, or *surgeries* are in their titles.

Another type of subject search is one in which just a few recent books on a subject are desired. An undergraduate writing a term paper and a person just wanting to read something current about microeconomics fall into this category. A quick search of the authority file to get a relevant heading or the use of keyword in titles more than satisfies this type of patron.

Our Online Catalogue is greatly superior to the card catalogue when it comes to subject searches. The ability to manipulate an authority file to find the relevant headings and to also search on all parts of a subject heading allows for much broader coverage. Being able to search by keyword in title allows for the retrieval of works with subtitles containing relevant terms and also for the identification of additional subject headings. Having this capability to search by keyword in titles also allows retrieval of materials on a given subject before that subject has an authorized subject heading. The "star wars defense," which has been much in the news lately, is a prime example of a subject heading whose time will come, probably sometime in the next decade. A search by subject retrieves nothing, but a keyword in title search retrieves two items and finds that the "correct" heading is "Ballistic Missile Defenses." Since the time lag between when a subject is written about and when the Library of Congress makes it a subject heading is long, this keyword in title search capability guarantees the success of a search in an online catalogue when looking for new subjects.

Accessibility of Recent Materials

Many patrons are looking for recently published material. They may have read about it in the newspaper, have seen a review, or heard about it from a colleague. Our Online Catalogue is much more current than any card catalogue could ever be. The Online Catalogue allows access to materials approximately ten to twelve days after they are catalogued on OCLC. In fact, some materials are catalogued and made accessible in the Online Catalogue before they have been processed, marked, and shelved.

Since the Online Catalogue also contains an order file, including approval plan

books, librarians and patrons now know titles that are being ordered or have been received and are being catalogued. This ability to know what has been ordered and how long ago it was ordered allows the reference librarian to give a patron an approximate timetable for that book's arrival in the library and an idea of whether interlibrary loan might be more appropriate.

ANSWERING SPECIFIC QUESTIONS

In a reference situation, a question is asked and the librarian proceeds to the card catalogue to find the call number for a specific item or searches by subject. Many times the librarian goes directly to the shelves to browse in a classification area. In the majority of cases, the reference librarian is primarily concerned with locating materials within the reference collection to give the patron an answer as quickly and correctly as possible. In the known-item search, the Online Catalogue easily locates materials in the reference collection. However, there are some problems in both the subject search, because there is no way to limit that search to just the reference collection, and in browsing the shelves because of classification inconsistencies.

Like most online catalogues, our Online Catalogue cannot be limited to search any specific library location. Many subject searches using either keyword in titles or the Library of Congress Subject Headings would yield many entries in a database of over 900,000 records. The process of searching each record retrieved to locate books in reference could be very time-consuming.

Our short-term solution to this problem has been to resort to browsing the shelves in the classification area, which is either obtained from one record of an online catalogue search or through previous experience of the librarian. There are inherent problems with this approach. The first problem is the inconsistency in the classification system that at UIUC has gone through every edition of Dewey. Some biographical materials are classed in the 92s while others are classed under subject areas. Many other types of materials like style manuals and quotation books (082 versus 808), copyright (346.730482 versus 655.673), research centers (001.4025 versus 378s), grants (007.9 versus 378.32), paintings and illustration indexes (016.75 versus 759.13), and bibliographies of literary criticism (016.8 versus 800s) wind up being split in different and quite far apart classification ranges. We have also had to become much more cognizant of the inconsistencies and changes in classification brought about by numerous editions of Dewey.

The problem for the reference librarian is not just remembering these classification inconsistencies. Reference librarians must also know what is in each book in order to answer that specific question and we need to remember not only older familiar titles, but also any new books and where they are shelved. In addition, reference librarians must feel comfortable in knowing when they have exhausted all the possible resources to answer that question in the reference room. Added to this are numerous items within the reference department that are shelved out of order because they are in special locations such as credenzas, encyclopedia shelves, atlas cases, index tables, current biography shelves, desk collection, and new book shelves. Sometimes, there is a clear problem of finding material to answer a specific question quickly and efficiently within our own collection. However, until a scientific study is done comparing retrievability in card versus online catalogues, the exact extent of this problem will not be known.

There have also been some benefits in using our Online Catalogue to answer specific reference questions. One major benefit is that many searches have led us to titles in other libraries that have been much better in answering the question than anything in our own collection. We have quickly developed a heightened awareness of other resources within the library system. Another benefit accrues from our using an IBM personal computer with an internal modem as our terminal at the reference desk. It is a very simple task to dial into other systems such as CLSI, LUIS, OCLC, RLIN, BRS, and Dialog for everyday ready reference or bibliographic verification. Our ability to verify rapidly difficult or incorrect citations by either using our Online Catalogue or some distant online source has taken a "quantum leap" into the computer age.

EFFECT OF AN ONLINE CATALOGUE ON THE REFERENCE STAFF

Timothy Richards suggested that "the introduction of the online catalog will have a substantial impact on public services staff."[3] The question of what kind of impact and of its extent has not been adequately addressed in the literature. The following is a brief description of our experience with an online catalogue.

Knowledge of Catalogue Rules

There is increasing pressure on the reference librarians to improve their knowledge of cataloguing rules. While most reference librarians are familiar with main-entry concepts, it has been suggested that main entry will not be as important in the online catalogue as it was in the card catalogue.[4] However, corporate versus personal entries, uniform titles, topical versus geographical subjects, lead subfields versus subsequent subfields are all terms and concepts with which the reference librarian not only has to be familiar, but also be able to use daily in order to improve searching efficiency in a large online catalogue. The era of the "holistic librarian" is here.

For example, in the card catalogue one did not have to know that Bible was actually a uniform title in order to find it. One could always employ the "fumble factor" and stumble upon entries in the card catalogue. In our Online Catalogue, one must know to do a search by author or subject in the bibliographic file or by either author–uniform title or subject–uniform title in the authority file. The Online Catalogue does, however, offer a mechanism of finding out how a word is used in the database. By using a "key" search, we can display all the different ways that the word Bible can be retrieved from the online catalogue. The reference librarian then must determine which one of these access points is appropriate for the user's needs.

Creativity In Answering Questions

More imagination will be needed to narrow topics, to combine access points, and to identify appropriate sources as the database gets larger and more unwieldly. It is quite common to get hundreds of matches from a subject or keyword title search. Although the card catalogue yielded a lot of matches too, the fact that the number of matches appears on the screen makes the results look tremendous. Since many matches are retrieved in many searches from our database containing 900,000, what will happen when there are 2 million records? Different approaches may be needed to produce more efficient results to traditional requests as well as to answer new ones. New ways of limiting a search need to be developed (e.g., year, type of material, language, etc.). Patrons usually try the easy approaches before they come to the reference librarian. Librarians will have to know the circuitous, complex approaches to be successful in limiting some search results.

Training of New Librarians

With the implementation of an online system comes a need to know more about that system and the collection. This will have a dramatic effect on the training of librarians new to the library. Since not everything will be in the Online Catalogue, new librarians will have to be taught the limitations of both the online and card catalogues. It might also be much more difficult for new librarians to become familiar with the collection without the aid of the card catalogue or shelflist to indicate special locations. They will have to master any special locations and the inconsistencies inherent in classification schemes without having the aid of the covenient crutch, the card catalogue.

More Individual Instruction

Probably the most noticeable and lasting impact of the Online Catalogue on the reference staff is instruction in its use. It has been suggested that a "significant reason for creating the post of a reference librarian [is] to help and train the users to harvest the benefits the library catalogue can yield,"[5] but according to Gorman, "bibliographic instruction will be changed by the necessity to teach the use of a different and more rewarding key to the library's resources."[6]

A discussion of the changes in the form, content, and type of bibliographic instruc-

tion programs affected by the online catalogue are beyond the scope of this paper.[7] However, in addition to changes in instruction programs, there is a marked increase in the demand for individualized instruction when the patron is ready to use the Online Catalogue. Pauline R. Hodges of Ohio State University found that patron assistance with their catalogue "falls into three general categories; instruction, troubleshooting, and interpretation."[8] Librarians instruct users in basic search techniques, correct errors and misunderstandings of the system's capabilities, and interpret the information on specific records. What is the most efficient mechanism for this instruction?

There are several ways to deal with the demand for information and request for one-on-one instruction at the reference desk. The first possibility is to set up a telephone center with the primary role of conducting circulation functions such as renewals, saves, and checkouts over the telephone, and that can also handle simple known-item searching. The second possibility is to set up an information desk, near the catalogue terminals, for one-to-one instruction with users. This desk would be staffed by paraprofessionals and/or preprofessionals such as library school students. Another possibility is to provide the patron with access to information so that they can read about the system as they are using it in the form of online tutorials, help screens, and printed instruction and aids. Yet another possibility is to provide a user-friendly interface so that patrons do not have to learn the commands of the system, but can use a menu-driven approach. Menu-driven approaches are great for patrons who seldom use the system, are not terribly familiar with it, and are not interested in learning its intricacies. Librarians and sophisticated users, however, quickly become frustrated with the slower pace, and prefer to use commands. We feel that the option of commands or a menu-driven user-friendly interface, such as provided by our Online Catalogue, serves the needs of both patrons and librarians admirably. Our approach to instruction involves all of the possibilities named above. We have been successful in providing a mechanism for one-to-one instruction, while at the same time not overburdening the reference librarians with this task.

CONCLUSION AND RECOMMENDATIONS

The impact of the Online Catalogue on the reference staff, the library, our patrons, and the university has been tremendous. We now have a main catalogue that is only two weeks out of date for all materials catalogued since 1975 and is available wherever there is a terminal on campus. It is also available to patrons having computers with dial up capabilities and in every faculty office having a LocalNet connection. The Online Catalogue has also allowed us to offer other new and exciting services such as a telephone center so that patrons do not have to come to the library to check out or renew materials. We even mail materials to campus offices. Through the statewide LCS program, our patrons have access to over 8.8 million titles and we are planning for a statewide Online Catalogue in the near future.

The efficiency of the reference staff has been improved because we are able to find materials for patrons who have only a limited amount of bibliographic information. No longer are we tied to the first word in a title or the main part of a corporate entry as the only means to retrieve materials. The number of access points has increased dramatically as compared with the card catalogue, and promises to become greater as we index more parts of the MARC record. The ability to use keywords in titles to find subjects means we are no longer tied only to the few Library of Congress subject headings assigned to each book. We can also use titles to find books using the terminology of both the author and patron. This is especially important since it takes the Library of Congress years to assign new subject terms. In most cases, we have also increased the speed at which we can find materials for patrons. Letting "your fingers do the walking" is a lot quicker than searching through many different drawers of a card catalogue. We have also found it to be much easier and quicker to do fast bibliographic verification searches of outside databases by use of the personal computer

terminal at the reference desk. However, two things about the Online Catalogue cause problems for reference staff and patrons and need to be addressed.

The patron and reference librarian can no longer use the "fumble factor" and stumble upon an entry. In the card catalogue, even if one misspelled a word, one might fumble upon it if persistent enough. One also did not have to know much about the rules of cataloging to formulate a search strategy in the card catalogue. How much of a problem this is, or will be, is not known, but should be studied. A shortcoming in our Online Catalogue in a reference situation is the inability to locate materials in the library in which you are located. If we want to find a book in the reference room to answer a question we now have to search a catalogue containing over 900,000 records from all libraries on campus. Although this makes us aware of different books within our collection, it does take longer to zero in on a reference book. This problem will continue to grow as the size of our database grows. If possible, for large decentralized library systems, we recommend that online catalogues have the ability to limit a search to a specific library.

We strongly recommend that online catalogues increase their ability to manipulate records by limiting the number of matches retrieved and by increasing the number of access points. Date, language, and type of material are all important limiters that could increase the speed and efficiency of a search. Increasing the number of access points by adding keyword subject searching or by indexing contents notes or even tables of contents would benefit all searchers, patrons and librarians alike. Another feature that would increase efficiency would be one in which "automatic switching" of headings would be implemented. In this way, patrons and librarians would not waste valuable time in retyping headings or in lengthy explanations of the system.

We also recommend that libraries installing an online catalogue develop methods to teach and explain the use of that system effectively without putting the burden on an already busy reference staff. Patrons using even the most friendly system need help from time to time. One good solution is the use of an information desk to provide this help.

At UIUC, we have progressed a long way toward providing fast, efficient information about what is in our collection and what will be added in the future. We have now started to seek out and study innovative methods of providing access to other online sources of information for our patrons. Automating the catalogue is only the first step in our goal of improving access to information for patrons and librarians.

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Microcomputer-Based User Interface

Chin-Chuan Cheng

HUMAN INTERFACE

The Online Catalogue at the University of Illinois at Urbana-Champaign (UIUC) Library has two components: the Library Circulation System (LCS) and the Full Bibliographic Record system (FBR). The LCS component maintains brief titles and authors of library records and gives holding locations and circulation information in detail. It holds all the records for about 7 million titles in more than two dozen libraries in the state of Illinois. The FBR component shows bibliographic items as fully as in the card catalog. It contains about nine hundred thousand records.

LCS is a modified version of Ohio State University's Library Control System. FBR is the bibliographic subsystem of the Western Library Network (WLN). Although access to both systems from the same terminal has been made possible by implementing them on an IBM 3081 mainframe, the systems maintain two distinct command languages. It is difficult for most patrons to master these two sets of commands. I have designed and programed a user interface aimed at capturing the natural processes of the user search and at providing a graceful interaction between the patron and the computer. The interface program resides on the IBM PC and queries the user in natural written English. Natural language communication does not require additional learning by the user. In this context, the only requirement is the ability to type responses to a system inquiry. System search commands are formulated internally by the interface. Thus, any library user can interact with the microcomputer to search for the desired material.

What are the natural processes of library search and how does one design a graceful human–machine interaction? These are, essentially, the questions that I will discuss in this paper.

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SCREEN LAYOUT

The interface is microcomputer based, and its loading of the program does not depend on the database mainframe. Each IBM PC is loaded individually from cassette or disk. At UIUC, the sixty PCs used as library terminals do not have disk drives, and loading is done with a cassette player. It takes about five minutes to load the program this way. Initially, the interface asks the operator to enter the code of the department library where the PC is located and to determine the setting as to whether patrons are allowed to charge departmental holdings from that PC. The time of day is entered at this point. Then the interface clears the screen and displays the time in hour, minute, and second at the upper right corner of the screen. The following ready prompt is displayed on line one and the five choices shown on line twenty-five, which is the bottom line of the screen.

INTERFACE READY (See the bottom line to search; press <?> for help.)

Press 1 for Author-Title 2: Title 3: Author 4: Call No. etc. 5: Subject

Access to the help sequence is gained by pressing the <?> key. There are two screens of explanations. The first one explains the difference between LCS and FBR. The second one shows the user where to locate the <ERASE>, <ENTER>, and <Esc> key on the keyboard. It warns of the difference between the letter <L> and the number <1>. It also mentions that when the user is asked to type, the <ENTER> key should be pressed to signal the end of input. At the end of this sequence, the user is taken back to the "interface ready" prompt.

To begin a search, the user presses one of the keys numbered one through five, as indicated by a bottom-line message. As a number key is pressed, the interface erases the ready prompt, writes "Beginning of Search" in its place, and clears the bottom line. As soon as the type of search is identified through the queries, the message "Author-Title Search," "Title Search," "Author Search," "Call Number Search," "ISBN Search," "ISSN Search," "Shelf Position Search," or "Subject Search" is dis-

played on the bottom line. The search string entered by the user is also displayed on the bottom line. This bottom-line display remains there, with necessary update as the search progresses, until the end of this round of search. The queries, answers, and mainframe response continue to fill the screen until line twenty-four; at that point, further display will cause the screen to scroll up. Thus, the user can always review the last portion of the interaction to form the next search.

The interface-initiated queries and the strings entered by the user are shown in high intensity and records obtained from the mainframe are displayed in low intensity on a monochrome monitor. With a color monitor, high intensity remains high-intensity white, except that user input is green, and low intensity is shown in yellow lettering against a blue background. The different types of information are color-coded to facilitate easy reading.

The queries and answers that are useful for review remain on the screen until they are scrolled off. Lines showing options for the user to make a selection are erased as soon as a choice is made. The user never sees a leftover question on the screen. Because of the use of scrolling, a casual onlooker of a search in progress may feel that the screen is cluttered. Indeed, such comments have been made, and a uniform screen layout suggested. However, on the basis of my own observations of users in action, I feel that the screen display of the interface is not at all confusing. If an interface of this sort is engaging, then the user can continue to interact with the computer. To be engaging, the interface has to capture the thought processes of the user. This ability, of course, depends largely on the functions the interface provides.

SEARCH FUNCTIONS

The functions an interface can provide depend to a large extent on the capabilities of the database system on the mainframe. Our interface combines LCS and WLN (FBR) and offers the following search capabilities. Under each type of search, the queries are listed to show the process of interaction. Some of the queries are disjunctive and are not necessarily presented in the same sequence. Notice also that related queries are presented one at a time so that users can respond.

1. Author and title search
   a. Type the last name of the author and press <ENTER>:
   b. Type the first important word of the title and <ENTER>:
2. Title search
   a. Is this title a periodical? (Press <Y> if "YES, <ENTER> otherwise.):
   b. Type the first important word of the title and press <ENTER>:
   c. Type the second important word of the title and <ENTER>:
   d. What year of this periodical? Press <ENTER> if unknown:
   e. What volume of this periodical? Press <ENTER> if unknown:
3. Author search
   a. Press <C> if the author is a corporate body (association, institution, government, conference, etc.) Press <ENTER> if the author is a person.
   b. Type the name of the corporate body and then press the <ENTER> key:
   c. Type the last name of the author then press <ENTER>:
   d. Type the first name of the author and <ENTER>:
4. Call number, ISBN, or ISSN search
   a. Press one of these keys:
   <C>: Call Number
   <I>: International Standard Book Number (ISBN)
   <S>: International Standard Serial Number (ISSN)
   b. Type the complete call number and then press <ENTER>:
   c. Type the ISBN:
   d. Type the ISSN:
5. Subject search
   a. Press <ENTER> to search subject or <C> to search call number in subject area:
   b. Type the call number (whole or part) and press <ENTER>:

In the listing above, the subject search queries are not exhaustive. Subject searches are much more complex and will be treated more fully later. Most of the types of the searches belonging to LCS have already been discussed in an earlier paper.[1] Here I shall discuss how the interface combines LCS and the full records under the WLN system.

Initially, the interface issues commands to the mainframe to search LCS for author, title, author-title combination, call number, and shelf position (subject area call

number). Apart from call numbers, LCS records are indexed with some combination of two words from the author and/or the title. This is why the interface asks for two words for each of these searches. If LCS finds more than ten records, the interface then asks the user to provide a third word for match with the records obtained. Searches on LCS may result in more than forty matches, in which case the interface offers an option to the user of searching full records. If no items are found on LCS, the user is also offered an option to search full records before searching the other libraries on LCS.

The LCS search strings often need to be elaborated for full record searches with WLN. If necessary, the interface queries the user for more information. For example, a search of the author-title combination for LCS requires only the last name of the author and the first word of the title. If the search reaches WLN and no matching records are found, the interface presents the user with this information:

> More information is needed to narrow the search
> Type the first name of the author and <ENTER>. Press <ENTER> if none:
> Type other words of the title. Press <ENTER> if none:

A search that starts out with LCS may return to LCS from WLN so that other libraries can be searched. The user is, of course, shown a message indicating whether the circulation records or full records are being searched.

The subject search is the most important function of WLN. It is discussed below. The interface also provides other functions. It reverts to standard terminal processes if the user does not press one of the designated numerical keys (one through five). In this way, the user can bypass the interface and issue LCS or WLN commands directly. The interface also allows the library staff to switch to a flashing message to indicate that the mainframe computer is not available. Moreover, when the interface has not been used for four minutes, it clears the screen and displays "Press <B> to Begin" at various locations to save the screen from being burned out.

SUBJECT SEARCH

The subject search component is the most complex part of the interface. As patrons may not know the exact wording of the subject in question, some tolerance and intelligence must be built into the program. We approach this problem by trying to help the user sort out the subject by asking for the general area of interest:

> To begin, type a term as general as possible to describe the subject:
> (You'll be asked to provide more specific information in a moment.)

Then we seek to narrow the search with the following sequential queries:

> Type a more specific word or phrase and <ENTER>. (Press <ENTER> if your aren't sure of the wording.)
> Press <ENTER> for all or press the corresponding key if the subject is about a topic—<T>, person—<P>, corporate—<C>, or geographical area—<G>.

Once these pieces of information are obtained, the interface displays the following message:

> Searching the Full Bibliographic Records of the holdings acquired since 1975.

The interface determines the type of search command to issue to the mainframe on the basis of the presence or absence of the "specific phrase" asked for in the second query. If that information is absent, a "browse" command is forwarded. If it is present, a search of the exact subject heading as a string consisting of the "general term" as the heading and the "specific phrase" as the subheading is sent to the mainframe. If an exact heading is not found, the following modifications in the search string are made and searches are attempted one at a time (in the order given).

1. The hyphen sign, if present in the user's input, is deleted. This is an idiosyncrasy of the mainframe-terminal communications. For example, "bird-song" in the authority file can only be matched by "birdsong."
2. A truncation sign is added at the end of the search string. This is an attempt to find similar headings.
3. A "browse" command is issued to find

alphabetically similar headings. The browse command will eventually find something. However, if the result of this search is not satisfactory to the user, the remaining alternatives are attempted one at a time.

4. The "general term" and the "specific phrase" are strung together as one heading string, and the search is made without the subheading string.

5. Each word in the input string is taken as a heading and the boolean "and" is inserted in between.

6. The search string is taken as a title and a title search is made. This is no longer a subject heading search. However, useful results are often found in this attempt. This type of search makes the interface intelligent to some extent. It will be further discussed later.

During the search of one of these possibilities, if some headings are found, then the user can search the related bibliographic records further. If all the possibilities have been exhausted, the interface indicates this and returns to the "interface ready" prompt for the user to begin another search.

Of all these possibilities, the boolean search (number 5 given above) is most time-consuming and usually exceeds the upper boundary of number of hits before a meaningful result is obtained. It is very likely that we will eliminate this type of variant search in the near future. Currently, the interface makes use of the boolean "and" operation for the author/title combination and for alternative five of the subject search. It does not use the boolean "or." In the past, several attempts were made to incorporate these boolean operations, but the upper boundary of hits was often reached prematurely. This limitation of the interface is therefore largely a reflection of the characteristics of the WLN programs and database system.

The title search to find relevant headings in alternative six is an attempt to implement the thought process and skill of a seasoned library user. If the user is interested in looking at the full record of an item with a title similar to the search string, the full record is searched and the first assigned subject heading appearing there is used as the search string to find the correct relevant headings. This is exactly what a helpful librarian or a skilled catalogue user does. For example, if the user enters "Chinese linguistics" as a subject to be searched, the interface will find and display "Chinese literature," "Chinese literature—Indexes," etc. as the closest headings. It offers the following options:

These are the closest subject headings. Do one of the following:
Type a number and <ENTER> to see the corresponding bibliographic records.
Press <B> to browse—to see more headings.
Press <E> to end this search.
If these headings are not satisfactory, press <ENTER> to try another search.

When the user presses the <ENTER> key alone to indicate interest in trying another subject search, the interface will try alternatives four and five. If no headings are found, then it displays the message "No items were found" and goes on with the title search. At this point the message is shown: "Trying to find CHINESE LINGUISTICS in titles . . ." In this case, a title, *Chinese Linguistics: A Selected and Classified Bibliography* is found and the full record is displayed. The full record shows "Chinese language—bibliography" as the first assigned subject heading. The user is asked to press <H> to make another attempt to find relevant headings or press <ENTER> to go on. When the <H> key is pressed, the interface extracts the assigned heading from the full record, eliminates the subheading, sends another authority search to the mainframe, and displays "A relevant heading is: Chinese language." The following search results are displayed:

+2. Chinese language
*1. —Alphabet
4. —Dialects
5. —Hainan
6. —Hakka
7. —Lung-tu
8. —China
9. —Nan-tung
+10. —Etymology
3. —To 600

The interface examines the headings to see if special symbols are present. In this case, the "+" and "*" signs are attached to

some headings. The interface indicates that the user can ask for an interpretation of the symbols. The " + " sign is explained as "There are 'see also' cross references attached to this heading" and "*" as "This heading is invalid. A correct heading is attached." If the user selects a number that has the " + " sign attached, the interface retrieves and displays the "see also" headings. The user is advised to search some of them for relevant items later. The search continues with the selected heading. On the other hand, invalid headings are discarded by the interface and attached correct headings are used to search bibliographic items.

The user may choose one of these headings to view the related bibliographic records. Naturally, the user can also select a heading to start browsing. In this case, the user started out with a term that is not a heading in the authority file and ends up with correct subject headings. Currently, automated discovery of the correct relevant subject headings takes place only when a full record is retrieved. If a title search retrieves more than one record, only short records are displayed, and if the user does not request to see a full record, there is no way to discover the relevant heading. Furthermore, only the first assigned heading is extracted as the relevant heading to the search in progress. It may turn out that the other assigned headings are more relevant. At least the user should be given a chance to make a decision as to which one is closest to the subject in question. This matter will be considered in the future modifications of the programs.

A successful search, no matter whether the starting point is a subject, a title or an author, will result in the display of bibliographic records. If only one item is found, the full record is displayed. If more than one item is found, a maximum of five records in a short form are shown one at a time. For example, if twenty-two records are found for a subject, the interface shows the first five short records and offers the following options:

> These are short records number 1–5. Do one of the following:
> Press <C> for circulation information.
> Type a number and <ENTER> to see the corresponding full record.
> Press <E> to end record display.
> Press <H> to return to heading display.
> Press <ENTER> without a number to see the remaining records.

If <C> is pressed for circulation, the interface asks for a line number to identify the record. Then the circulation (LCS) record is retrieved. The user can charge, renew, or place a save request if the item has already been charged out by someone else. Similarly, if a full record is displayed, the interface asks the user:

> Wish to see circulation information? (Press <Y> if "YES," <ENTER> otherwise.)

At the end of the circulation record display or full record display, the interface reminds the user:

> Earlier we found 22 records.
> Wish to see these short records again? (Press <Y> if "YES," <ENTER> otherwise.)

When the user goes back to the short record display, the other records are displayed. As shown in the options given above, it is also possible to return to subject headings if a subject search is the starting point. At that moment, the user can review retrieved headings and search for other relevant bibliographic items. In summary, the process of search starts with provisional subject terms entered by the user. The user then can: (a) make appropriate selections of the headings; (b) find short or full records; (c) see circulation records for desired action; (d) return to short records display; and (e) return to the subject headings to find other relevant items. The user can terminate the search at any time.

PROGRAMMING

In terms of programming, the major part (about 55K bytes) of the interface was written in interpretive BASIC, and a small portion (slightly over 1K bytes) was written in the assembly language. The assembled machine code is loaded beyond the 64K byte of the BASIC work area. It takes care of: (a) asynchronous communications using interrupt; (b) display of clock with the second ticking; and (c) disabling the break keys so that the running of the interface cannot be terminated. The rest of the interface functions are performed by the BASIC program.

There were two major considerations in

deciding to use BASIC as the programming language. First, the majority of the IBM PCs at the UIUC Library for public use are equipped with a minimum hardware configuration. Currently, there are about sixty public PCs for public use. Each PC has a memory of 128K bytes and an interpretive cassette BASIC in the ROM. No other high-level languages or operating systems are available on these machines. Second, it is much easier to develop and test the interface with an interpretive BASIC with immediate feedback. I have used the IBM PC, XT, and AT at different times to program the interface.

The library PCs are dedicated to library searches only; no other use is allowed. Since the interface is reloaded only when a revision is made and after inadvertent interruptions such as power failures, the use of the slower loading cassette is not a problem. Moreover, the lack of disk drives discourages attempts by students to use these dedicated machines as word processors or calculators.

Is BASIC fast enough to perform all the required functions? Yes. The two speed-critical areas of communications and time display are handled by the assembled machine code. Time display is interrupt-driven. Communications are also interrupt-driven. However, the code is so short that these two functions do not compete seriously and, thus, cause deterioration of performance. The communications code collects incoming characters and stores them in a buffer for the BASIC routines to receive at their own slower pace. It is thus possible to set the speed of the communications line as high as 9,600 baud without affecting the performance of the interface. In the display and processing of written dialogs, the speed of the interpretive BASIC is more than adequate. The only perceptible delay is that of the mainframe search and not of interface processing.

The version of BASIC we use has a maximum of 64K bytes of program length. In fact, as certain areas of the program segment are used by the system, a 60K byte program is approaching the maximum. The interface is about to reach that upper limit, and future improvements such as those incorporating more intelligence are somewhat hard to implement due to memory limits. There are, naturally, other BASIC systems that can accommodate longer programs, but the cassette version in the ROM of the IBM PC has to be used. We are faced, therefore, with the difficulty of future expansion. However, this difficulty can be solved by transferring some BASIC routines to the machine code area to reduce program length.

CONCLUDING REMARKS

Library computer systems for patrons must be interactive and user-friendly. To achieve this goal we have created and installed this interface to carry on a person-machine dialog in natural written language. Natural language is an easy form of communication, and, therefore, the user does not need to be specially trained to interact with the computer. Natural language interactions between the mainframe and the user would add a great load to the network communications line and the central processing system. A microcomputer-based interface such as ours eliminates such load and frees the mainframe to perform database functions.

Moreover, the microcomputer-based interface can be developed and modified independently of mainframe operations. Such independence allows its author to improve and update any part at any time without any logistic constraints. Thus, it is possible to exercise a great deal of individual creativity and to incorporate suggestions from users.

Furthermore, as all the commands sent to the mainframe are always formed correctly by the interface, user errors in direct command mode are eliminated, which again reduces the load on the mainframe.

Naturally, reduction of the load on the mainframe is only a side effect. The most important function of a microcomputer-based interface is to make the machine more transparent to the user and more intelligent in its performance. We feel, with considerable experiential evidence, that our interface has taken a significant step in this direction.

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■■

Communications

Automated Periodical Reference Service

David Ellefsen

A patron in one of the smallest branches of the Salt Lake County library system can now sit down in front of a computer terminal, type out search instructions on a keyboard, review the references sources provided on the screen, select those of interest, and within minutes receive, by high-speed printer, a facsimile copy of the periodical pages on which the selected articles appear.

Salt Lake County has taken automated reference products, which have been in use for over a year, and combined them into a reference service that makes a major element of the fully automated library available now: online access to periodical indexes from anywhere in the fourteen-branch system with the full text of many of the articles available in an on-site search and retrieval system. In addition, using high-speed facsimile transmission, Salt Lake County is able to offer online periodical reference services and full text delivery to every branch within the system at nominal cost to the library and, in most cases, no cost to the patron.

The periodicals center at the main county library, which is the nucleus of the reference service, was not created all at once. It evolved out of distinct needs.

As a cost-saving measure in 1982, Salt Lake County subscribed to SEARCH HELPER, a software product that allows users who have no training with online database access to structure searches of seven Information Access Company databases that are available on Dialog Information Services, Inc. They are: MAGAZINE INDEX, covering more than four hundred popular periodicals from 1959 to the present; NATIONAL NEWSPAPER INDEX, covering the five major national newspapers with indexes back to 1979 for some publications; TRADE & INDUSTRY INDEX, covering almost 350 business publications with indexes back to 1981; LEGAL RESOURCE INDEX, covering more than 730 law periodicals from 1980; MANAGEMENT CONTENTS, indexes of articles from 1974 to the present from more than 600 publications covering business management; COMPUTER DATABASE, indexed coverage of more than six hundred publications covering the computer, electronics and telecommunications industries; and NEWSEARCH, providing daily updates of material destined for all of IAC index databases.

Salt Lake County subscribed to SEARCH HELPER for two reasons: the online usage of MAGAZINE INDEX, particularly, had become frequent enough, because of patrons' need for very timely information, to prompt the library to search out ways to reduce online costs, and the library was also looking for a method to turn online searching over to the patrons themselves.

Salt Lake County Library views its role as both an information and education center. Online information delivery is viewed as an ideal and beneficial method for introducing patrons to computers or extending their knowledge of what computers can do.

SEARCH HELPER enabled the library to meet both of those objectives. The library subscribed for a full SEARCH HELPER system: software, an Eagle II computer with a modem and printer; and seven hundred prepaid searches at $2.50 each. Because SEARCH HELPER's self-coaching features allow the patron to set up the search offline, then the software takes over to dial into and log onto Dialog Information Services, conduct the search and

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automatically sign off, Information Access Company is able to offer the $2.50 per search price. The greatest fear in putting online searching into the hands of a novice is that there will be lengthy indecision while the person settles on a search strategy that will get the desired results and the searcher will then stay online with the host computer long after the search should have been complete. Prior to SEARCH HELPER, only trained library personnel were allowed to use online reference services.

PATRONS ENCOURAGED TO CONDUCT ONLINE SEARCHES

Salt Lake County installed the SEARCH HELPER system with little or no patron training and it immediately paid off in several ways—lower online search costs, increased patron computer literacy, and fewer routine search demands for the professional staff. However, there was one major drawback. The SEARCH HELPER system was available only to users at the main library. Resentment developed among patrons at outlying branches who knew of the service but could not gain convenient access to it. Salt Lake residents are passionate about their library services. More than seventy percent of eligible members of the population hold current library cards and use them regularly. They are accustomed to receiving services beyond the traditional book and periodicals circulation and have grown to view their library as a community center with numerous special benefits, such as pianos for practice in the music room, computers for personal data processing in the computer center, and a complete darkroom facility in the photo laboratory. Egalitarianism is a goal within the system. If it is good for the main library, it is good for the branches.

ELITISM ELIMINATED

Salt Lake County resolved its SEARCH HELPER elitism by subscribing to a second SEARCH HELPER package of software and prepaid searches and mounting the software on an Apple computer as part of the CLSI system that is used for library technical services. As a result, thirteen of the system's fourteen branches have access to the benefits of SEARCH HELPER and patrons are encouraged to conduct their own online searches. (The seasonal branch at Alta doesn't have actual online access via CLSI.)

Information posters are used to publicize the existence of the SEARCH HELPER service and the patron goes to the reference desk to obtain a password. Librarians offer assistance where it is needed or requested; however, assistance requests have become rare as understanding of online searching—one of our prime objectives in installing SEARCH HELPER—has heightened. In addition to aiding in patron research and computer literacy, SEARCH HELPER has offered another important fringe benefit: it has allowed all library staff members to become familiar and comfortable with online searching. Formerly, online searching was restricted to those staff members who had been fully trained in search strategy and the entry protocol demanded of specific online information services. With SEARCH HELPER, even the newest staff member is not intimidated by online information gathering. The user can take all the time that is needed to set up the search, because it doesn't cost anything until he or she is happy with the strategy and instructs SEARCH HELPER to dial Dialog and begin.

MAGAZINE INDEX REMAINS FAVORITE ROUTINE REFERENCE SOURCE

MAGAZINE INDEX remains the database most heavily used by Salt Lake County patrons, so when Information Access Company introduced a full text companion product, MAGAZINE COLLECTION, the library saw this as an opportunity to provide a fully automated reference cycle which could be conducted by patrons themselves. The MAGAZINE COLLECTION offers the full contents of about three-quarters of the magazines covered in MAGAZINE INDEX. Once a patron or librarian at the main library has gathered a list of relevant citations either through SEARCH HELPER or in a simpler search from the microfilm MAGAZINE INDEX, a code number within the citation indicates

that the material is available in full text on MAGAZINE COLLECTION. To view or get a copy of the article, the person selects the indicated microfilm cartridge from the carousel in the system, snaps it into the automated reader/printer, advances the film to the indicated frame number, and either reads the article on the viewing screen or presses a button to obtain a printed copy of the material. Since the easy-to-operate system does not demand assistance from trained librarians, patrons quickly became proficient in conducting their own periodical searches. However, if assistance is requested, the services of a library aide are available in the periodicals center most of the day. MAGAZINE COLLECTION has greatly reduced the need to go into periodical stacks to search for specific issues of publications and has eliminated frustrations when the issue is out-of-file or has disappeared.

Yet with only one MAGAZINE COLLECTION at the main branch, the library system had again created a disparity of reference services between headquarters and the branches.

Over the past six months, the Salt Lake County Library has undergone a massive renovation and space expansion program. During this remodeling, we created a Periodicals Center that contains the SEARCH HELPER system on the Eagle computer, MAGAZINE COLLECTION, MAGAZINE INDEX, shelves for current issues of magazines and journals, and we added a Canon Fax 510 high-speed telecopier. This single piece of additional equipment allows us to extend MAGAZINE COLLECTION services to all of our thirteen year-round branches. The tiny Alta facility, which is open only during ski season when it is staffed by volunteers, is served by delivery from the main library.

A patron at one of the outlying branches who requests an article contained in MAGAZINE COLLECTION as the result of information gathered through SEARCH HELPER or the MAGAZINE INDEX, simply calls the main periodicals center with the accession code of the article. One of the two part-time staffers who work in the periodicals center retrieves a printed copy of the article from the COLLECTION, and sends it via the high-speed facsimile printer to receiving equipment at the appropriate branch. The typical response time between request and delivery of articles from the periodicals center is approximately seven minutes. (This includes taking the order, retrieving and printing the article in the MAGAZINE COLLECTION system, and sending it the branch. The actual teletransmission time is about seventeen seconds a page.) There is no charge for any of the reference services and though it is difficult, if not impossible, to collect hard figures, it is the belief that the cost of this automated magazine reference equipment is greatly offset by the savings in staff time.

A typical SEARCH HELPER/MAGAZINE COLLECTION cycle that may represent three to four dollars in actual library costs would demand up to five times that amount in staff time if the patron required search assistance and then the periodicals had to be retrieved from archives. It is library policy to provide patrons with up to fifty citations on a research topic at no cost. Further online reference services are charged at actual cost. Collecting fifty citations using SEARCH HELPER costs $7.50 and is accomplished in minutes. Gathering together fifty citations from print and microfilm sources could demand hours of a librarian's time to locate and list the citations, and then retrieve the publications themselves.

Looking at the economics of the new periodicals center to achieve the objective of fully servicing the branches, we would have to have duplicate subscriptions to all the periodicals contained in MAGAZINE COLLECTION at each of the branches in addition to providing storage space for retrospective issues. The automated search, retrieval, and high speed transmission system eliminates many of these duplicate costs.

All librarians have envisioned the day in the future when patrons could have free access to online information and could easily retrieve retrospective materials themselves. As the periodicals center came together, the Salt Lake County Library system has brought that vision to reality. ■■

Using a Text-Processing Language for Serial Record Conversion

James R. Lowrey and Paul V. Hardiman

In the 1960s and early 1970s, many institutions developed machine-readable serial listing systems. These were batch, usually punched-card systems, intended to produce a "Serials List" in print and/or microfiche format. These lists generally have provided some sort of supplementary information to the formal card catalog/shelflist, and many remain in use as a "quick stop" local reference tool for locating serial items.

Because most of these lists predate OCLC and other utilities, the formats vary widely, and most are now incompatible with MARC serial format and recent serial conversion projects. At the same time these lists continue to provide extremely concise and valuable local information, which may not be accounted for in a national or regional conversion project. Many are now "orphans" of sorts, as they await replacement by either online catalogs or by utility-based products.

The Golda Meir Library at the University of Wisconsin–Milwaukee began a serial list in the 1960s, including a check-in and claiming function. This system has been remarkably durable over the years and has been updated meticulously. The system now includes approximately twenty-five thousand entries for both open and ceased titles as well as cross-references. However, in recent years program maintenance has become impossible, the system represents a large drain on campus computing resources, and new options for more comprehensive material control and fund accounting are now available from a variety of vendors.

While the library maintains most of its serials on OCLC, a Local Data Record (LDR) project was only undertaken recently. The local system, however, includes many AACR2 revisions, accurate summary holdings statements, and a wide range of notes. It was apparent very early that the "old" local system would be extremely valuable for providing the core data for a new installation. Use of existing records thus became a requirement for a new system.

In June 1984, UW–Milwaukee purchased the PERLINE/BOOKLINE system from Blackwell Library Systems, Inc. Although many factors determined the purchase, one of the most important was the ability of the system to link or interface with other systems, present and future. The Blackwell system includes a MARC interface module called MICA, which appeared to allow the library the flexibility it required for future needs. The library investigated the possibility of reformating the existing serial records to the point where MICA could transfer them to selected PERLINE fields.

The old machine-readable library serials file consisted of fixed-length character fields imbedded in fixed-length records, which were punched-card images. Certain fields, such as title and notes, consisted of a variable number of fixed-length records. The type of each record was indicated by a card number at its beginning. The data needed for MICA consist of variable-length character fields concatenated in any order to form variable-length records. The type of each field is designated by a MARC tag at its beginning.

The problem posed by the library serials conversion project had five main aspects:

1. To reformat the old serials file data so that MICA could use them.
2. To transfer as much information as possible from the old system to the new one while minimizing the manual rekeying of data.
3. To replace the contents of certain old fields with data appropriate for the PERLINE system. For example, old language codes were translated to MARC-compatible codes.
4. To shorten the notes fields of the old file by performing consistent abbreviations

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on them. For example, in the old file month names and the numbers from one through ten were fully spelled out; these were translated to standard three-character abbreviations and digits, respectively. This shortening was necessary because PERLINE's maximum field length was sometimes too short to accommodate some of the old notes.

5. To split or combine certain fields of the old file. For example, in the old file OCLC and SUDOCS information was included in a notes field; this was split into separate fields for PERLINE. Conversely, the old multiple fixed-length notes records had to be combined into one variable-length field.

Given these basic requirements and characteristics, the library began to work with the campus data processing shop (University Information Systems). A solution for conversion was found by use of a powerful text-processing language, SPITBOL.

SPITBOL is a variant of SNOBOL4, a language developed in the 1960s. It belongs to a class of computer languages that were developed primarily for symbolic processing rather than for numeric processing. SPITBOL's basic data element is the character string. This line of text is a character string, as are the textual representations of computer programs, expressions in symbolic mathematics, and the data files that represent the UW–M library's serial collection. SPITBOL provides powerful facilities to detect patterns in character strings, to remove them or replace them with other character strings, to join and separate character strings, and to manipulate substrings. At the same time, the language has a simple, intuitive syntax, adequate facilities for structuring and modularizing programs, and the ability to handle arrays and tables.

The pattern-matching abilities built into SPITBOL are of little use when the data being manipulated does not contain predictable character patterns. Fortunately, the serials file had been maintained very consistently over the years. Thus it was possible to describe it in terms of simple SPITBOL patterns and program with little regard for exceptions. For example, every set of "missing notes" in the file ended with a digit followed by a period followed by a space. Such consistency made it an easy programming task to separate the "missing notes" from the other types of notes.

Because of its character-string manipulation facilities, SPITBOL proved to be the ideal tool to solve the conversion problem. Moreover, the conversion program was written with a fraction of the effort that would have been needed if more traditional languages such as Cobol or Assembler had been used.

One key feature of the MICA component is that it is very forgiving. The user builds tables to convert MARC fields (to the delimiter level, if desired) to specified PERLINE or BOOKLINE fields. MICA does not validate MARC tags or indicators, allowing the user to specify any tag/indicator combination desired. Therefore, items such as "OCLC Number" can be assigned any tag and MICA can accomodate it. The traditional MARC tags became unnecessary for "MARC-in," because the "MARC-out" table, if and when utilized, is completely independent. MICA accomodates both OCLC and RLIN formats and actually allows a user to convert a record from one format to the other. It is worth stressing that this project was not intended to reproduce the MARC format specifically, rather to provide a format that was "close enough" for MICA to accomodate. Had MICA been more stringent, the project would have involved considerably more work.

Mica also includes a powerful default capability, by which absence of a particular tag results in the insertion of specified data in a selected PERLINE/BOOKLINE field.

It was determined that the conversion project would be based on units of one thousand records, so that remaining unconverted records could be updated on the existing system throughout the project. Each group of one thousand records was loaded via tape into the PERLINE MARC file, then sent through MICA in batch to the Serial File. Each record then required an order and confirmation, in addition to a few fields of bibliographic data that did not exist on the old system. The data entry project, performed by students, required approximately two–three minutes of keying for each record. With average staff involve-

ment, each group of one thousand records required two–three weeks to convert.

In addition, a similar SPITBOL project reformatted the library's existing supplier file, which was loaded into PERLINE prior to the serial records. This allowed matching of serials and suppliers as a byproduct of tape loading. Once the active titles were completed, approximately fifteen thousand ceased titles were also reformatted and loaded.

Considering the age and purely local format of the serial records, the library has been able to provide an excellent source of data for the new system. It is anticipated that OCLC data may someday overlay selected fields, or online catalog developments may change the nature of PERLINE use entirely. Nevertheless, the accuracy and satisfaction obtained by reusing "obselete" records for a new generation of functionality has been most rewarding. ■■

OCLC UPDATE

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Reports and Working Papers

Networking Priorities for Standards Development

M. E. L. Jacob

NISO (National Information Standards Organization) Z39, formerly American National Standards Institute Committee Z39, sponsored a conference April 30, 1985, in Washington, D.C., in conjunction with its annual meeting, to identify where NISO should focus its standards development activities. The conference was attended by roughly eighty individuals from publishing, library, and information services organizations.

The day was spent in a series of brainstorming and prioritization sessions and will provide a context for NISO to develop its future standards. Many diverse themes were raised, but several common threads appeared. Major concerns included system and database compatibility and communication, archiving and preservation of electronic media, and improvements to and the impact of new technology and copyright on access to information. This particular overview will describe the various issues identified by those individuals and groups representing networking interests. Two such groups and ten individuals, who identified themselves as working in or with networks, were involved. Figure 1 lists the issues considered important by these groups.

In the morning, groups were formed to identify issues in major interest categories. In the afternoon, groups were mixed so each group had a variety of different interests represented. Consequently, the identification of critical issues by individuals in the afternoon session was influenced by their exposure to all the issues previously identified as well as those considered critical by other interest groups.

During the morning session one of the networking groups focused on specifics related to networking while the second group focused on the standards process itself. The top five issues for the first group are given in figure 2 and for the second group in figure 3. Two issues appeared on both lists: linking of computer systems and standards for full-text materials for electronic publishing.

Both of these issues also appeared in the individual priorities assigned in the afternoon and in the final overall priorities of all groups. The second group also listed speeding up/streamlining the standards process, which was also among the top five individual priorities. Two issues remained high among the individual priorities but had not appeared in either networking group's top five for the morning session. These were the acceptance and implementation of standards and the need to merge library, abstracting, and indexing files into one logical file for users. Apparently exposure to other groups' issues and interaction with individuals with other interests raised the priority of these for networking individuals but were not considered the most critical in the final summary.

The top five priorities for all participants were

1. Creating standards for networking and linking;
2. Improving the standard-making process;
3. Marketing standards and educating people about their existence and uses;
4. Creating standards for the structure and elements of full-text documents;
5. Creating standards for the storage media (e.g., CD-ROM, optical disks, etc.).

The conference did show the lack of knowledge of standards and the standards-

M. E. L. Jacob is vice-president, Library Planning, at OCLC and a member of the NISO board.

1. System interconnection standards building on CCCIT/OSI.
2. Standards for document formats (structure and elements).
3. Update of telecom standards—how usable, relevant?
4. Standards related to laser disks, data storage, data transfer, hardware.
5. More use of standards for citations.
6. Update/expand standards for identification of institutions/vendors, etc. for use in communication.
7. Evaluate/redefine standards for bibliographic information.
8. Financial support for NISO activities.
9. What is legal responsibility of NISO board?
10. Speed up the standards-making process.
11. How to harmonize U.S. with international standards activities?
12. How flexible, detailed, rigid should new standards be?
13. How can traditional institutions such as libraries adopt/adapt new technologies?
14. How to promote developing of intersystem networking standards?
15. Conflict resolution within NISO.
16. How to reconcile need for ease of use/user training with need to innovate?
17. What role should different groups play in standards development?
18. Who owns shared data?
19. Personal computer standards promote interchangeability, communication.
20. Should the librarian or the media be standardized?
21. Bibliographic standards for nontraditional media, e.g., electronic publishing.
22. How to measure the benefits of standardization?
23. Standards for a "short record" for public access.
24. Standard for measuring the quality of collection/resources/services.
25. Standard for demographic data on libraries.
26. Standard for common command/search languages.
27. Investigate the times and process of the standards-setting process.
28. Develop standard measurements of date-transferred system to system/accounting/economics necessity.
29. Achieve standards for how to choose what, how to preserve/protect.
30. How to make standards more accessible and better understood?

Fig. 1. Important Issues

1. System interconnection communication standards.
2. Standards for document (full text) structures and elements.
3. Update/evaluation of telecommunication standards.
4. Standards for archiving electronic data.
5. Standards for record/citation content.

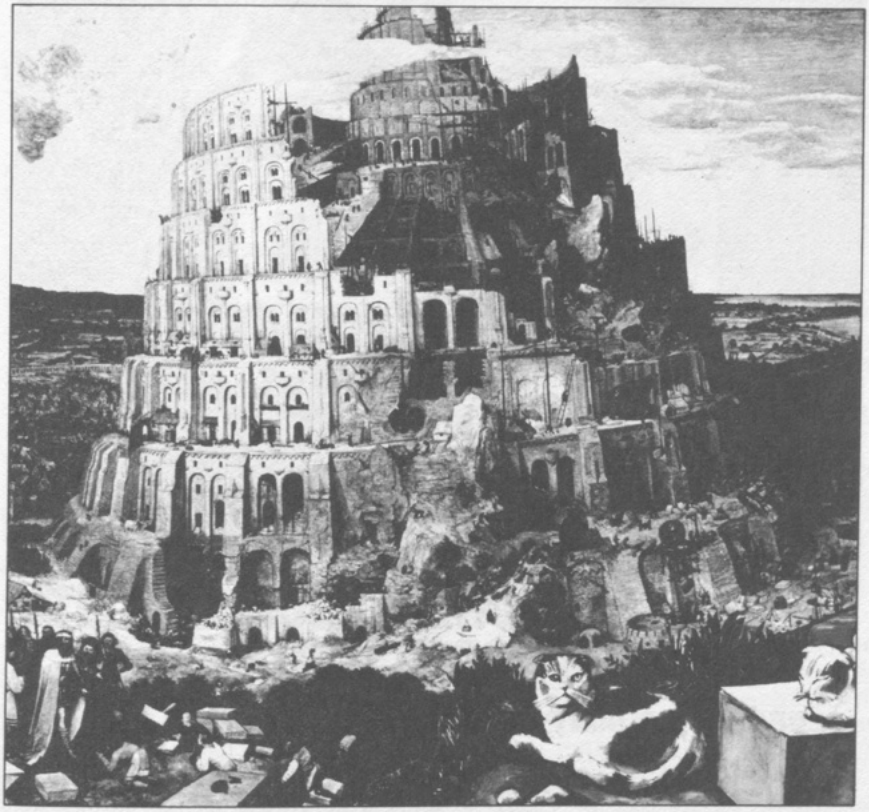
Fig. 2. First Group Top Five Issues

1. Improve and speed up the standards-making process.
2. Promote the development of intersystem networking standards.
3. How to measure the benefits of standardization? (3 and 4 rated equally.)
4. How flexible/rigid/detailed should standards be?
5. How to harmonize U.S. with international standards activities? (5 and 6 rated equally.)
6. Develop bibliographic standards for nontraditional media, e.g., electronic publishing.

Fig. 3. Second Group Top Five Issues.

making process on the part of many segments of the information community. The networking representatives appeared to be more aware of standards and their development than some other groups. Most of their recommendations related to new technology or improvements to the standards-making process itself.

All the issues remain on NISO's agenda. Those dealing with specific standards are being forwarded to NISO's Program Committee for review and action. Those related to communication, education and relationship are also being considered by appropriate NISO committees. NISO's board will review the report and recommendations of the Futures Committee on further action required by NISO. The conference accomplished its goal of identifying issues and standards needs for the near future. NISO's challenge now will be to bring about constructive change. ■■



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News and Announcements

British Library Establishes Transatlantic Link

The British Library is now linked directly with major library systems in the United States through a transatlantic telecommunications line. This link will enable a program of cooperative activities to be pursued, which will benefit librarianship and academic research on both sides of the Atlantic.

The line connects the British Library in London with the Research Libraries Information Network (RLIN) centered at Palo Alto, California, and with the National Library of Medicine (NLM) in Bethesda, Maryland. It has been installed as the first practical outcome of a recent agreement between the British Library and the Research Libraries Group, Inc. in North America.

The first activity where the link will have an immediate major impact is an international project, coordinated by the British Library, to create a computer database containing records of books, pamphlets, and ephemera printed in the United Kingdom and worldwide in the English language during the eighteenth century. From September 1985, the two editorial teams of the Eighteenth Century Short Title Catalogue (ESTC) project—a British Library team based in London and an ESTC/North America team based at Louisiana State University in Baton Rouge—will be able to work simultaneously on a single database held on the RLIN system in Palo Alto. At present the editors work on two separate files with exchange of computer tapes for updating. There will be considerable savings in time and effort and in quality control of the database. The ESTC file will continue to be available for online searching by users of BLAISE-LINE, the British Library's online information retrieval service.

The link will also improve communication with the NLM computer, whose databases of medical research can be accessed directly through the library's BLAISE-LINK service.

The British Library and the Research Libraries Group also plan to use the computer link for other cooperative activities: to aid preservation efforts by adding British Library microform records to an existing register of master copies of microforms held on RLIN, and to make possible the exchange of catalog records in machine-readable form.

Other national and major research libraries in the UK and Europe have expressed interest in an approval of this transatlantic computer link as a practical step to improved library cooperation. ■■

BLS, Inc. Introduces Perline/Bookline Software for IBM PC

Blackwell Library Systems, Inc., marketers of PERLINE/BOOKLINE software for the management and control of serials, monographs and acquisitions, has introduced an IBM PC version for IBM PC/XT and IBM PC/AT users.

The PC version is specifically designed to run under either MS-DOS or PC-DOS on the MSM-PC operating system. It offers exactly the same user-friendly menu method of operation as the standard version and performs functions as advanced as fund accounting and report writing.

The new PC software is recommended for information centers currently utilizing IBM PC equipment who are interested in expanding their information management capabilities.

In addition, a special introductory price puts the new PC version within reach of virtually all budgets. PERLINE and BOOKLINE software are available as a package for $15,000 or separately at $9,000 each.

For further information and free de-

scriptive literature, write or call Blackwell Library Systems, Inc., 202 E. Main St., Suite 105, Huntington, NY 11743. (516) 351–1611. ■■

Washington Library Network Goes Western

The Washington State Library (WSL) has announced that their computer division, the Washington Library Network (WLN), is officially renamed the Western Library Network.

WLN has been operating an online computerized library system since 1977 and now services over two hundred participants. The network began licensing library computer system software in 1979 and has several national and academic libraries participating as software licensees. ■■

File Transfer Pilot Project Operational

Participants in the File Transfer Pilot Project, coordinated by the National Library of Canada, have demonstrated the feasibility of a basic file transfer protocol (or intercommunication standard) to support the electronic interchange of bibliographic records. This project represents the world's first pilot operation of MARC record transfer using a subset of the Organization for International Standardization's file transfer functions.

The protocol, based on the Open Systems Interconnection reference model, enables Carleton University, Université du Québec, and the University of Waterloo to search and transfer records from DOBIS and the MARC Records Distribution Service (MRDS) by means of connection-oriented, computer-to-computer links. This can occur despite the fact that each institution operates different makes of computers, including DEC, Geac, Honeywell, and IBM.

The file transfer protocol considerably reduces both the amount of data entry required to create a local cataloging record and the turnaround time needed to obtain source records.

Carleton University has been transferring MARC records from DOBIS on a weekly basis since November 1984. The University of Waterloo and Université du Québec, users of the MRDS Selective Search Service, both made changes to their systems earlier this year in order to move from a tape environment to file transfer. ■■

CLSI Sunrise

CLSI has announced a new library automation system, Sunrise, for small libraries. Targeted for libraries with 30,000 to 150,000 titles and annual circulation of up to 750,000, Sunrise runs on a DEC (Digital Equipment Corporation) LSI 11/73 and supports a maximum of sixteen terminals. The system uses one Winchester disk drive with a choice of three sizes in disk storage capacity, depending on a library's database requirements.

Sunrise is offered at a price geared to the budgets of small public and academic libraries and corporate and medical libraries. It provides a full range of automation functions including PAC/II, CLSI's "next generation" online catalog, circulation control, acquisitions, cataloging subsystem, and network capabilities. CLSI's customer service organization is available to help with conversion needs, installation, and training. ■■

WLN Software Downloads Bibliographic Records to Microcomputers

The Western Library Network (WLN) announces a new software product for WLN and IBM PCs. Called Bridge-It, the new program opens the way for WLN participants to download tagged records for use with local microcomputer database software. Users can then create microbased data files, generate lists and bibliographies, or build small online microcomputer catalogs with downloaded WLN records.

Bridge-It works in both dedicated and dial-up telecommunications modes. Operating the program is simple, requiring only the tag names of the fields to extract, the amount of information desired, and the name of the file in which to store the data. The program uses menus and fill-in-the-blank forms on the screen. It can read an entire file of downloaded tagged screens.

As it does so, it extracts the user-defined information and builds a new file that many microcomputer database programs can use.

Database programs can access the processed data for local, offline uses such as searching, sorting, formatting, and printing. Libraries can also create comprehensive files that include WLN records and uncataloged items such as journal articles, unpublished manuscripts, and realia.

Bridge-It is compatible with a number of file management and database programs, including the popular Lotus 1–2–3, dBASE II and III, PC-File, Condor III, Knowledgeman, Framework, Symphony, Rbase 4000 and 5000, DataStar, and Nutshell.

The program is priced at $125. It comes on floppy diskette and includes a printed user manual. For more information, contact David Andersen, Microcomputer Consultant, Washington Library Network, Mail Stop AJ-11, Olympia, WA 98504–0111. (206) 459–6589. ■■

UC Plans Prototype Packet Radio Network

The California State Library has awarded $150,000 of Library Services Construction Act (LSCA) funds to the University of California Division of Library Automation (UC/DLA).

The award coves the first phase of establishing a prototype packet radio network to create a "wide-area network" consisting of a chain of six California public libraries extending from the San Francisco Bay area to Sacramento.

Participating libraries will be selected jointly by DLA and the state library, linked to each other, and connected to the UC library telecommunications network. This will make it possible for them to access the UC MELVYL online catalog (a combined listing of book and serial records from all UC libraries) and to experiment with services not currently available to them.

The project has two phases. In phase one, funded by the current award, suitable equipment was to be developed and tested. After September 1985, application was to be made for additional LSCA funds to complete the project by establishing the network linking the libraries.

In addition to offering further exploration of packet radio applications, this project represents an important cooperative effort between the California State Library and UC.

For additional information contact Carol Connolly, Development Coordinator, Division of Library Automation, 186 University Hall, University of California, Berkeley, CA 94720. (415) 642–9485. ■■

LIBS 100 to Speak Chinese, Japanese, and Korean

CLSI demonstrated the capability of processing codes generated by Chinese, Japanese and Korean (CJK) language data entry in its LIBS 100 System at the International Federation of Library Associations convention in Chicago on August 18–23, 1985. The terminal used was the RLG CJK Terminal, developed by Transtech International Corporation for the Research Libraries Group, Inc. Special permission was obtained from RLG for the demonstration.

CLSI and Transtech are developing the LIBS 100/CJK for libraries in Taiwan and in other East Asian markets. Transtech's new terminal, Sinoterm III, with the specific capabilities required of a local data entry and inquiry terminal, will be used in the library system. The final product will be introduced upon completion of negotiations with RLG concerning the use of REACC code (the RLG East Asian Character Code).

Transtech is a Massachusetts and Taiwan-based systems company that invented the Sinoterm input method for composing Chinese. This method was adapted and expanded under contract with RLG to add Japanese and Korean characters, along with the Roman alphabet, to one keyboard. The uniqueness of the approach lies in the definition of a set of 245 basic ideograms and a set of typing rules following the natural writing stroke sequence of Chinese characters. The 179-key keyboard can create 13,000 Chinese characters (classical and simplified), including Japanese Kanji and Chinese as used in Korea. Additionally, 150 Japanese Kana and 1,900 Korean

characters may be composed, and other characters can be added as required.

CLSI's LIBS 100 System includes integrated modules for acquisitions, circulation control, film booking, cataloging, and the public access catalog. Networking capabilities enable access to other libraries and to commercial databases. The system operates on Digital Equipment Corporation micro- and minicomputers. ■■

Baker & Taylor Approval Program Records Available to Innovacq Users

Baker & Taylor and Innovative Interfaces, Inc. have announced the creation of an electronic interface between the two companies. This interface permits title records and invoicing information for books received through Baker & Taylor's approval program to be transmitted to users of the Innovacq Library System.

The records transmitted are in MARC format and contain bibliographic data, net invoice amount, and fund accounting information. The capability to receive approval program records eliminates the library's need to key the data. This results in substantial time savings and reduction of potential keyboarding errors.

This program is the most comprehensive plan of its type, with the largest user base of academic libraries; each year over thirty-five thousand newly published titles are identified and made available through the program. ■■

Recent Publications

Book Reviews

Computer-Readable Databases: A Directory and Data Sourcebook. [V.1] *Science, Technology, Medicine.* [V.2] *Business, Law, Humanities, Social Sciences.* 1985 ed. Chicago: American Library Assn., 1985. 1658p. ISBN: 0-8389-0416-5 (V.1), 0-8389-0417-3 (V.2), 0-8389-0415-7 (2v. set), softcover, $157.50 (set) or $87.50 each. Issued previously by the American Society for Information Science (ASIS) and Knowledge Industry Publications. Martha E. Williams, editor in chief.

With the 1985 edition, *Computer-Readable Databases* assumes the dominant position among sources describing publicly available databases. Descriptions of online files containing bibliographic or nonbibliographic data in the sciences, technology, medicine, social sciences, humanities, business, and law number over twenty-five hundred, clearly surpassing Cuadra's *Directory of Online Databases* (with about seventeen hundred entries in the 1983/84 edition), Bowker's *Information Industry Marketplace* (with fewer than seven hundred in the 1983 edition), and Macmillan's *OMNI Online Database Directory* (with approximately eleven hundred database entries).

The depth of coverage, international scope, and logical organization of *CRD* are commendable. *CRD* has undergone several revisions and expansions, described in the introduction, attesting to its comprehensiveness. The 1982 edition contains fewer than one-third the number of databases currently included. Database annotations are alphabetically arranged by name and divided into two volumes, separating science, technology, and medicine from business, law, humanities, and social sciences. The entire set of indexes (by database name, subject, producer, and processor), in addition to some of the database annotations, is repeated in both volumes, simplifying use. Index entries refer to page numbers and include notes for online files that are no longer available (such as "Resources in Women's Education Equity") or for sites introduced too recently for inclusion (such as TELETEL and SCI-MATE). The Producer Index provides directory information for approximately 1,280 companies that create machine-readable databases.

Information supplied in the database descriptions includes names and acronyms, producer, frequency of update, number of records, vendors, subject coverage, and indexed fields. Included also are notes identifying the titles of printed equivalents to the online file and the availability of user aids, elements not often identified in other database directories. *CRD* consolidates database characteristics stemming from hundreds of pages of vendors' documentation; nevertheless, this does not preclude the searcher's need for this documentation for more specialized details such as specific field searching, years covered, or other indexed fields. The size and comprehensiveness of this latest edition of *CRD* mark it as a leader in the field, and because databases and online products are emerging routinely, periodic revision will continue to be required, as has been done here. Readers who seek critical commentary will need to consult other sources such as *Online*, *RQ*, *Database*, or *OMNI Online Database Directory* (Collier Macmillan Publishers, 1985), because material in *CRD* is nearly entirely vendor supplied.

The physical appearance of *CRD* could be improved. Perhaps owing to its production on a QMS laser printer, the darkness and legibility of the type are less than desirable, but fortunately this does not readily interfere with use.

CRD should prove to be a prominent resource for online searchers and end users doing searching. Given the hypothetical choice of purchasing a single tool for descriptions of publicly available databases, most libraries with computerized information retrieval services would choose wisely to purchase this work.—*Lori Bronars, Texas A&M University, College Station.* ■■

Online Database Search Services Directory: A Reference and Referral Guide to Libraries, Information Firms, and Other Sources Providing Computerized Information Retrieval and Associated Services Using Publicly-Available Online Databases. 1st ed. Detroit: Gale Research, 1984–85. 2v. 1186p. ISBN: 0-8103-1698-6, softcover, $110. Edited by John Schmittroth, Jr., and Doris Morris Maxfield.

A more concise and apt title for this work would be "Survey of Database Users and Producers," as it neither emphasizes nor describes the contents of databases themselves, but instead, identifies institutions that provide online retrieval services. The bulk of the text consists of entries on approximately 1,160 organizations and the basic characteristics of their search services. Details covered include systems used, subject areas frequently searched, fee policies, search personnel, search request procedures, and related services, along with directory information for the organizations. Given the individualistic emphasis, material in *ODSSD* will quickly become dated as service policies, personnel, and library services change. Information contained in *ODSSD* has been obtained from survey forms sent to U.S. and Canadian institutions. No statement regarding verification is made.

This work has been published in two parts, with each part being a separate volume. Each volume contains the following main sections: (1) online database search services, a profile of organizations and their services; (2) online systems index, a list of systems and their institutional subscribers; (3) index to organizations, arranged by databases searched; (4) index to organizations, arranged by subject areas searched; (5) search personnel index; and (6) geographic index of organizations, with a cumulation of these indexes in volume 2 but not in volume 1. The simultaneous publication of the two volumes would have simplified use of this source by combining the two separate main lists of organizations into one list and by eliminating the partial duplication of the indexes from volume 2 in volume 1. This arrangement is cumbersome because all entries from a particular institution will not necessarily follow each other. The entries for University of Illinois Library Reference Department and University of Illinois Library of the Health Sciences, both located in Urbana–Champaign, appear in different volumes.

In the library community, the primary users of *ODSSD* will likely be administrators of computer-assisted retrieval programs who are planning an online service. With the widespread availability of vendor-produced database documentation, customer-assistance telephone lines, and search aids and manuals, the usefulness of this source for online searchers is questionable. As an overview of the search services offered at about 1,160 U.S. or Canadian institutions, *ODSSD* could serve as a career-planning resource for online searchers. *ODSSD* will probably receive heavier use from companies in and serving the information industry, as a directory of potential customers.

Although *ODSSD*'s binding, paper quality, and legibility of type are of higher quality than *Computer-Readable Databases*, its usefulness to the library profession is of limited value. Librarians with stringent budgets for online aids would find it economical to purchase more comprehensive tools such as *Computer-Readable Databases.—Lori Bronars, Texas A&M University, College Station.* ■■

Saffady, William. ***Micrographics.*** 2d ed. Littleton, Colo.: Libraries Unlimited, 1985. 254p. (Library Science Text series) ISBN: 0-87287-453-2, hardcover, $28 in U.S. and $33.50 elsewhere.

William Saffady's *Micrographics* is a welcome second edition of his well-received 1978 work of the same title. A pro-

fessor of library science at Vanderbilt University, Saffady is a well-known advocate of micrographics education. He is editor of both *Micrographics Equipment Review* and *Computer Equipment Review* and has published on the subject of automation in libraries and on various topics in micrographics.

Intended for "practicing librarians and library school students who want a systematic presentation of the basic facets of micrographics as applied to library work," Saffady's text provides very broad coverage of most aspects of micrographics, beginning with an introductory chapter on "Microforms and Libraries" and ending with "Microforms and Libraries: The Future." In between are seven long chapters including such topics as types of microforms; micropublishing; reading and printing equipment; and bibliographic control. Saffady's interest in micrographics technology is obvious throughout the text: the lengthy chapter on COM (computer-output microfilm); the chapter entitled "Production of Source Document Microforms" detailing types of films, cameras, and processing techniques; and the lengthy discussion of equipment design and printing technology.

Although the second edition contains no radical changes from the first—neither in content nor in format—Saffady has successfully pinpointed areas requiring updated information (micropublishing examples); expanded sections that report on evolving technologies (computer-input and computer-output microfilm, CIM and COM); and has condensed or deleted sections containing outdated topics (certain storage methods). Also eliminated from the second edition—unfortunately—are the bibliography and a glossary. Considering the extent of the discussions of some very complicated technologies, coupled with the fact that the intended reader is for the most part relatively unsophisticated in micrographics technology, the six-page Glossary included in the first edition is a serious omission. Even more serious, however, is the exclusion of the nine-page "Selected Bibliography on Library Applications of Micrographics," included in the first edition. The copious and detailed Notes concluding each chapter are practically inaccessible in their present format (e.g., chapter 5 on "Micropublishing" has 42 notes citing 145 references). A reformatting of the references cited in the Notes would provide enough information to publish a separate monographic bibliography on micrographics. A select bibliography similar to the one included in the first edition would amplify the general usefulness of this text to a broader population of readers.

Libraries Unlimited has appropriately included this title in its Library Science Textbook series. *Micrographics* clearly reads as a textbook, not as a handbook. Saffady offers a bit of everything to every type of librarian, but not the whole to one. Many corporate and sci-tech special librarians will be interested in his discussions of a CAR system (computer assisted retrieval) and in random access files, yet how many academic libraries are ready for microfacsimile transmission or optical video disc? Despite this fact, these technologies exist, and both the library school student and the practicing microform librarian will benefit from Saffady's well-written review of recent developments in these areas. As Saffady himself points out, a serious problem is that too little emphasis is placed on micrographics education in library school curricula. There are too few courses in library schools that would find this text applicable. The fault, however, lies in the curricula, and not in the text. Likewise, all too often the practicing "microform" librarian is wearing several other hats and is looking for quick answers to practical questions in microform management. (Which is *really* the best reader/printer? or How should I label large microform sets?) Librarians who are new to microform management in a small- or medium-sized library and who are looking for answers to more basic questions may be better served with Ralph J. Folcarelli's *The Microform Connection: A Basic Guide for Libraries.* Likewise, practicing librarians in an academic setting may find more practical applications in *Microforms in Libraries: A Reader*, edited by Albert James Diaz. Anyone responsible for or learning about microforms in any type of library would benefit from a cover-to-cover reading of Saffady's well-written text. It is a welcome addition to the limited

library literature collection in this subject area. Every library with a microform collection should purchase it.—*Patricia Iannuzzi, Yale University Library, New Haven, Connecticut.* ■■

Nonprint Reviews

Professional Bibliographic System. Produced by Personal Bibliographic Software, P.O. Box 4250, Ann Arbor, Mich.

The package under review operates on the IBM PC or IBM XT or a compatible computer with at least 128K bytes of memory and DOS 2.x operating system.

The Professional Bibliographic System software package has been developed "to make it easy to manage a bibliographic database and to create and maintain properly formatted bibliographies or reading lists." It is designed to create citations in the ANSI standard for bibliographic references, although alternative styles can be created and supported within the system. It is designed to interact with companion Biblio-link software packages (e.g., Biblio-link OCLC) that are used to download citations from online systems, like OCLC, Dialog, etc. and process them into the desired bibliographic style.

It is evident from looking at the PBS manual and program that the authors designed their programs to deal with a wide variety of bibliographic citations. There are twenty standard document types to choose from, including art works, video recordings, and analytic monograph records. In addition, the user can tailor individual document types to suit the material to be included in the bibliography. The program provides twenty-eight optional fields of variable length that can be used to describe a document. The documentation also suggests ways in which material not readily classified can be described to fit comfortably in a bibliography. Together, all these features provide the user with a great deal of descriptive power in bibliographic citations. One need not struggle to fit long, complex, or difficult documents into fixed-length fields or inadequate document types. Other parts of the program allow one to select and order the bibliographic citations by index terms or other salient features. As a result of these features, Professional Bibliographic Software provides the user with the ability to describe, select, arrange, and format a bibliography or reference list with a great deal of flexibility and range.

In spite of the significant bibliographic features described above, Professional Bibliographic Software has substantial operational problems that limit this potential from being realized in practice. The primary deficiency in the PBS program is the inability to merge bibliographies or entries created in different files. To initiate PBS, one names a file, estimates the number of entries for the file, and PBS sets up a five-part segment on the disc to manipulate the data. PBS suggests that you overestimate the number of entries and identifies one thousand entries as the optimum for speed of access. The program will work, even if size of the file is underestimated, but speed of access will suffer. Data can be entered into this file by keying the entries or by transferring the contents of a datafile created on the same disc by a Biblio-link program into this file. Once created, the file can be added to only by transferring other Biblio-link datafiles that have been downloaded on the same disc or by keying in the entries. However, if the PBS file is set at the one thousand entry size, it will occupy over 200,000 bytes on the diskette. This severely limits the amount of data that can be gathered and used from a Biblio-link program. PBS has included several warnings about changing diskettes while in PBS. It states that changing data discs while in the program will permanently alter or destroy your data. At the same time, it is impossible to move the contents from one PBS file to another even on the same disc. This shortcoming limits the utility of the Professional Bibliographic Software to all but those exceedingly careful and farsighted individuals who can anticipate exactly the structure and content of each of their bibliographies. A researcher who writes articles with extensive references and later wishes to combine them in some way, perhaps as chapters in a book, will find that merging these references into a single list is not possible without rekeying all but one of the files.

There also are a variety of small operational problems that contribute to user frustration while working with the Professional Bibliographic System software. On the whole, the PBS program is very unforgiving of errors. If there is a typographical error when calling up a PBS file, the system responds by asking if you wish to create a file with that name. A negative response results in being returned to DOS, requiring the user to reboot PBS. This seems like an extreme reaction to a minor error. It is all the more frustrating because PBS has no command to show you the names of its files. One must use the DOS dir command to identify the PBS file names. When using the index search in the printing mode, errors will cause similar disproportionate reactions. A mistake in an index term will return the user to the main menu, not back to the index search part of the program, forcing the user to reselect from several menu pages. Some modifications in the default reactions to errors would improve the ease of use of the program.

The documentation for the Professional Bibliographic System presents the user with some interesting problems. Each aspect of the program is described quite clearly, with good examples, outlining the features of the program. Its shortcoming is in identifying the actions the user must take to accomplish the desired outcome. For example, the printer options section identifies twenty-four ways the output can be tailored. What is not identified is the mechanism for making the changes. The documentation also leaves unclear the permanence or impermanence of the changes, i.e., does the change last for the current session or until reset? Experimentation and calls to Personal Bibliographic Software were required to answer several operational questions. In fact, it is very simple to set the options and the choices remain in effect until reset by the user. A few small changes in the documentation would have made this and other similar aspects of the program much easier to use.

Overall, the Professional Bibliographic System software package offers the user a very powerful bibliographic tool that, at this time, operates in a constrained environment. A change in its ability to handle multiple files would make it a more valuable program for a variety of users and uses. In fact, the Professional Bibliographic System released for the Macintosh includes the merge feature. For IBM users, Personal Bibliographic Software, Inc., has a separate utility package that contains a merge program, among other file-handling utilities. There are also plans for an enhanced version of the Professional Bibliographic System for the PC that will include the merge feature. With the addition of either the utility package or the merge feature in the enhanced version, PBS becomes a broadly useful bibliographic tool.—*Kathleen Kluegel, University of Illinois at Urbana-Champaign.* ■■

Pro-Search. Produced by Menlo Corporation, 4633 Old Ironsides Drive, Suite 400, Santa Clara, Calif.

The package under review requires an IBM PC with two double-sided disk drives, an IBM XT or AT with one double-sided disk drive and one fixed-disk drive, or a compatible computer. The Texas Instruments Professional Computer is also supported. The computer must include a minimum of 256 RAM storage and must support DOS Version 2.0 or a later version. Other requirements: A Hayes Smartmodem 300, 1200, 1200B, or 2400, or any acoustic modem. Other modem types are also supported. An IBM compatible modem cable.

Pro-Search is a software package for computer communications and online searching. Designed and manufactured by Menlo Corporation, it is based on their first software product, In-Search, which provided a simplified end-user interface to Dialog. Pro-Search expands the In-Search Interface to include BRS support as well as the option to search any online service in native mode and to generate accounting reports summarizing online use of BRS and Dialog. Pro-Search designers claim these improvements were made in response to the expressed needs of online professionals that, although in some respects similar to the end user's, are for the most part quite different. As experienced online searchers who have used both dumb terminals and microcomputers to do our searches, we find

Pro-Search's claim and product are of great professional and practical interest. A searching and software package just for us? In this review we explore this claim and evaluate Pro-Search as it is intended—a software package meant for the professional.

Pro-Search is an interactive software program that supports basic telecommunications between a host computer and an IBM PC (PC, XT, or AT), IBM PC compatible, or Texas Instruments Professional Computer and allows two levels of interaction between vendor and user. The Native Mode supports a simple, straightforward interface between user and Dialog or BRS, allowing typing ahead of system prompts, cross-emulation of selected BRS and Dialog commands, uploading of search strategies, and downloading of search results to disk. The High Level Interface (HLI) supports the functions of the Native Mode as well as other features that allow searching of both BRS and Dialog with a common interface.

Regardless of the Pro-Search mode selected, certain conventions and features work throughout the program. Because the descriptions of Native Mode and High Level Interface rely heavily on these conventions and features, we will describe them briefly.

At the bottom of every Pro-Search screen is a status line that reports the condition of various program features. It shows whether the printer is on, if insert is on, the current status of the telecommunications connection, if information is being stored in a disk file and the percentage of space used up on the disk, and the amount of space used up in the temporary storage memory or buffer of the computer.

Pro-Search makes use of IBM function keys, assigning each a function that works both in Native Mode and the High Level Interface. The keys work as toggle switches allowing the function to be turned on or off at any point in the program. Pro-Search's extensive number of help screens may be accessed by toggling the help function key that will access the appropriate help screen for that point in the program. If online, a search in progress may be interrupted by pressing the break function key that sends a break message to the online service. The Mark key is used to select items from a list; for example, to mark portions of a buffer for printing or transferring to a disk. The phone function key connects or disconnects the computer from an online service. The data sheet key allows access to BRS-Aid pages or Dialog Bluesheets. The Disk function key initiates or stops storage of records or buffer contents in a disk file while the printer key activates or deactivates a printer. Finally and most important, the command function key can be pressed at any moment in the program to enter the command mode and to display a menu of available commands.

In Pro-Search, commands are used to activate the functions of the program. Whenever *F9* is toggled, a window just above the status line displays a menu of commands appropriate at a particular point in the program. Once in a command mode, the various command options can be selected by highlighting the desired command by moving the cursor and entering the command by pressing the return. Each command is also described by a one-line description that is displayed at the bottom of the window when the term is highlighted. The command window is always on the screen in the High Level Interface; in Native Mode it appears only when one presses the command function key.

As claimed, Pro-Search does provide a number of useful enhancements for native mode online searching. Not surprisingly, the enhancements featured for native mode searching are clearly designed to meet the needs of experienced online searchers who are primarily searching Dialog, Dialog2, or BRS. Among the features for native mode searching designed to be used only with these services are the accounting reports, which cover individual search sessions as well as the search activity in any given month in BRS and Dialog2; the cross-emulation feature, which allows one to use Pro-Search to translate online Dialog commands into their BRS equivalents or vice versa; an offline search strategy function, which allows one to enter up to fifty lines of text offline to be uploaded later into Dialog or BRS; and, finally, on-screen access, either online or offline, to Dialog Bluesheets of BRS-Aid pages. The other features Pro-

Search provides that are not exclusive to BRS and Dialog are briefly: automatic dial-up and log on to as many as twenty-three online services, the ability to type ahead of the host system in some online services so that one may enter lines of search strategy to be sent at successive system prompts, a retrieve buffer that temporarily saves everything that appears on the screen during the search session so that it can be edited and printed or stored in a disk file and viewed online or offline, full use of Pro-Search functions keys, and access to clearly presented and informative help screens while online or offline. Pro-Search clearly offers a very attractive set of enhancements for native mode searching, some of which deserve more detailed description.

As a communications program, Pro-Search can be used to automatically dial up and log onto as many as twenty-three different online services by using the phone function key. The communications parameters for Dialog, Dialog2, and BRS are already configured in the Pro-Search package, as are the parameters for BRS/After Dark, BRS/BRKTHRU, CAS Online, COLLEAGUE, CompuServe, Dow Jones News/Retrieval, Knowledge Index, MCI Mail, Newsnet, SDC Orbit, The Source, and VuText. All that is needed is for the Pro-Search user to complete the configuration of these services by providing telephone numbers and, where necessary, passwords. Additional services are easy to add, and any of the listed online services except Dialog, Dialog2, or BRS may be modified or deleted. The user's manual describes the necessary procedures for adding, modifying, or deleting a service and for setting up the automatic log on.

One of the more important Native Mode features—limited to Dialog, Dialog2, and BRS—is the ability to enter offline approximately fifty lines of search strategy of up to 240 characters each. These lines appear on the screen in high intensity as they are entered. Once online, they are sent successively one line at a time after each system prompt. Another very useful Pro-Search feature, Type-Ahead, is not limited to only Dialog, Dialog2, and BRS. It too allows the searcher to enter search lines on the screen, but in this case the search lines may be entered while online. This search strategy is also sent in succession, line by line, after system prompts, and appears in high intensity on the screen until sent. While online, these search lines may also be edited before they are sent. Type-Ahead thus allows the searcher to save time by entering the next steps of the search online while awaiting the next system prompt. It also allows the searcher to change and adapt the search strategy text already on the screen prior to being sent in light of what is being received from the host system.

The Type-Ahead function is preconfigured for BRS, Dialog, and Dialog2 and for any of the other services listed in the directory that can support this feature. A Type-Ahead column in the Online Services Directory screen shows which services offer the Type-Ahead feature. Type-Ahead may also be set up for any new online service that is added to the directory and consistently uses a system prompt. The user's manual gives clear directions for these procedures. The Type-Ahead feature is always on by default for Dialog, Dialog2, and BRS, but it must be turned on and off for any other online service. This can be done at any point while online after the first system prompt has been received. When on, "Type-Ahead" appears at the top of the screen.

Another feature Pro-Search offers for online native mode searching is cross-emulation. This allows the online translation of some Dialog or Dialog2 commands, operators, and truncation symbols into their BRS equivalents, or vice versa. For example, when cross-emulation is activated, searching of a BRS database can be done using Dialog commands, operators, and truncation symbols, and the opposite is also possible. Cross-emulation can be turned on and off at any point in an online search; when on, "Emulation" appears at the top of the screen. However, several cautions are noted in Pro-Search's manual for the use of cross-emulation: it is recommended that if used in a search it be used consistently throughout the search or not at all. It is also pointed out that not all Dialog or BRS commands and operators can be translated by Pro-Search. A list of BRS terms that can be translated into Dialog equiva-

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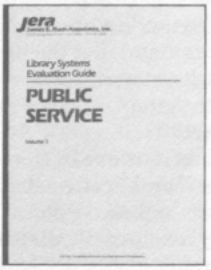

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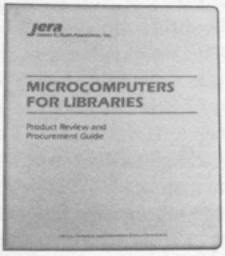

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lents and Dialog terms that can be translated into BRS equivalents is provided both in the user's manual and in a help screen. If a command that the program cannot translate is entered, it is sent untranslated to the host system and an error message is received.

The Retrieve Buffer is another important Pro-Search feature that deserves comment. Every online session is stored in a temporary memory, the Retrieve Buffer, until the searcher exits Pro-Search or uses the Clear command to erase the contents of the Retrieve Buffer. The contents of the buffer can be scrolled using the cursor movement keys. The complete contents of the buffer or only selected portions also can be either printed or stored in a disk file. The mark function key highlights those parts of the buffer that are to be selectively stored or printed. This allows the searcher to print or to save in a disk file only the important or useful parts of a search session, a procedure that is easy and straightforward. The Buffer Save command is used, the file name is entered by the searcher, and Pro-Search saves the file under that name, automatically assigning it the file name extension .REF. The content of the buffer can also be saved in an existing file by either appending it to the contents of the extant file or overwriting and destroying the contents of that file.

Searching BRS and Dialog2 with Pro-Search's High Level Interface differs considerably from searching in the native mode of these services or in Pro-Search's enhanced Native Mode. Designed to simplify the learning and searching of BRS and Dialog2, Pro-Search's High Level Interface (HLI) consolidates the command languages of these systems within an integrated set of on-screen command menus. A searcher unfamiliar with the commands of one system or inexperienced in either may search BRS or Dialog2 without a thorough knowledge of the particular command language. Moreover, Pro-Search's combined BRS/Dialog subject catalog can assist a searcher in selecting an appropriate database to search. The HLI also supports various uploading, downloading, and accounting functions.

A search in the HLI program always begins with the database selection screen. Three windows display database categories (e.g., arts and social sciences); subjects (e.g., art, book reviews); and a "card catalog" of BRS and Dialog databases. The database selection screen's command menu allows the searcher to either directly select a database to search or make use of the card catalog. A subject search involves choosing a category, scrolling through its subjects, and selecting a database from the card catalog. Each card describes the scope, coverage, and content of the database and its online and offline costs. These descriptions are brief—much like an entry from a typical database directory—and should be updated frequently.

Once a database has been selected, the database selection screen disappears and the search screen that identifies the database selected and that provides a worksheet for an offline search strategy reappears. This screen contains four columns for set number, keywords and phrases, selected index, and postings. Each search strategy entered offline can contain up to ninety-eight lines of up to fifty characters each, fourteen lines of which can be displayed on the screen at one time. Each line also allows for one field or paragraph delimitor. The keyword/phrase column allows one to enter words or phrases in natural language or with BRS or Dialog operators. If one enters terms without the operators, the program automatically assigns them in accordance with BRS or Dialog conventions. Since cross-emulation is also activated in the HLI, one may use Dialog or BRS operators regardless which system one is using. However, as only basic commands are supported in HLI, one must use them carefully and consistently.

Search sets may be qualified by field or paragraph delimiters, sorts, and limits. By entering the index command from the search-screen menu, a window will open that displays the available qualifiers for the selected database, the type of term it qualifies (word or phrase), and an example or proper use. A search line may be then qualified by scrolling through the list of qualifiers and selecting one qualifier. The entered qualifier will then appear in the index column for the search line. Similarly, ap-

propriate sets may be limited or sorted by selecting the limit or sort commands and following the prompts that appear in the limit and sort windows. If the database does not support limits or sorts, a window will open that advises one of this and will allow one to return to the search screen. Search lines may also be qualified using BRS or Dialog suffixes, e.g., communication competence/de (Dialog) or communication-competence.de. (BRS). However if one enters a Dialog prefixed field, one must surround the entire statement with quotation marks, e.g., "PY = 1984." Sets may also be combined using the familiar Boolean operators as they are defined and entered in a Dialog2 or BRS search. Search strategies may be edited by using cursor and editing keys.

Once an initial search strategy has been formulated, the search may be uploaded to the selected database vendor or saved on disk. To upload the search, one simply toggles the phone function key, which begins an automatic log-on sequence to the designated vendor. While the telecommunications protocol takes place, the search screen is replaced by the connect status screen, which traces the log-on sequence. Once connected, the broadcast messages of the vendor begin scrolling, after which the search screen reappears and hits are posted. To retrieve records, the retrieve command is selected from the search screen command menu. A retrieve-records window appears, which prompts one to select a set number, a range of records, and a format. Two types of format are available: Pro-Search's format, which allows title only (short format), title and indexing (medium format), full record (full format), or custom formats; and the standard BRS and Dialog options.

Once all prompts in the retrieve records window have been answered, the records scroll by with highlighted keywords and phrases. One may interrupt this display by using the space bar or scroll-lock key. One may also cancel the retrieval in progress by pressing the Break function key. If the Printer function key has been toggled, the retrieved records also will be printed. To download records, one must toggle the Disk function key prior to retrieval. A window will open that asks for a file name and whether to save the search strategy with the retrieved records. Once all prompts have been answered one may begin retrieving records.

As all retrieved records and search strategies are saved in the buffer, this information may be reviewed online or offline on the CRT, edited, and stored on disk or printed. Search strategies may also be edited, stored on disk, and executed again at a later time. A series of commands leads one through these processes.

A number of online commands also may be executed by using the search-screen command menu. Expand/root commands allow a searcher to perform expand/root searches in specific fields or paragraphs and to enter the sets formed by expand/root terms into the search strategy. Moreover, from the expanded information index screen, the thesaurus command allows access to Dialog's online thesaurus and its display of related term posting.

Dialindex and BRS' CROS may also be searched, beginning at the database selection screen. Two search options are available; one may either select a Pro-Search subject and then enter the Dialindex or CROS command, or one may simply enter the command and select the Dialindex or CROS categories or specific databases. Once databases have been selected, a single search phrase may be entered that will then be searched. As each database is searched, the database name appears on the screen and postings are listed. This display may be printed.

While the searcher is online, offline prints of sets, source documents, and SDI services can be ordered by selecting appropriate commands and answering prompts. News, cost, Dialog's explain command, and BRS' messages are also available.

Pro-Search contains an accounting feature that may be used in both Native Mode and High Level Interface to produce session and summary accounting reports for online use of BRS and Dialog2. Pro-Search will store accounting information for these two online services only. Either the accounting reports subprogram or the session command may be used to print accounting information. The session command is used while in Pro-Search to print current session

invoices listing the cost of the search session by database, further broken down by type of charge, and session cover sheets that list client and searcher names, databases searched, subjects searched, date, and ten lines of additional text. In contrast, the accounting reports subprogram is used after exiting Pro-Search. It too may be used to generate and print session reports, but in this case, for any search session for which information was entered. Perhaps more important, it can generate summary reports of search activity for the current month or for any previous month, summarized by client, charge code or job number, database, searcher, and online service.

Pro-Search produces these accounting reports for BRS and Dialog2 use by combining the information it automatically gathers with the information the searcher enters at the start of each search session by using the sessions commands and identify new session screens. When appropriate, the searcher may enter the subject of the search, job number, client name, charge code, and searcher name. Pro-Search then automatically stores in an accounting file for each month the time and cost information as well as database and online service name for each BRS or Dialog2 search session. Obviously, this would be a more useful feature if accounting reports could be generated for other online services. If, however, most search activity is done in BRS and Dialog2, then Pro-Search is offering a valuable management adjunct service to the online searcher. The accounting reports program is carefully thought out, as illustrated by the ease with which it handles a search in which the user is accidentally dropped from BRS or Dialog. In this case, the accounting reports include this session but earmark the search with an asterisk to indicate incomplete session charges.

Customer service and product support for Pro-Search are supplied by the Menlo Corporation. In addition to the information provided in the user's manual and the help screens, Menlo has a customer-service department that can be called for help. Unfortunately, they do not have an "800" number. Menlo also covers Pro-Search with a limited ninety-day warranty. If the system disk is damaged or defective during the year after the warranty expires, a replacement may be purchased for twenty-five dollars.

Because BRS and Dialog are continually adding or changing commands and databases, Menlo offers an update service that keeps Pro-Search database information up-to-date. Menlo charges a yearly fee of one hundred dollars for this service, and they provide a new set of category disks every two months as well as any other updates to the system disk, utility disk, or the user's manual that may be necessary to stay current. It is also possible to purchase just a single update, for twenty-five dollars, that covers the category disks plus other system or utility disk updates that have been issued. When the user registers his purchase of Pro-Search with Menlo they will also send a free copy of the latest version of Pro-Search to the purchaser if the version bought was not already up-to-date.

In the course of writing this review, we have had ample time to work with Pro-Search on an IBM PC-XT linked to a Toshiba P1351 printer and using a Hayes 1200 External modem. The following comments are based on this set-up and reflect our background as online searchers experienced in both versions of Dialog and BRS.

We found Pro-Search start-up procedures easy to follow. Online and offline documentation is clear, allowing full configuration of the hard drive within minutes. Although it took some time to write the programs that would allow logging on to several nonsupported services, this programming is not difficult for anyone with a basic familiarity with microcomputer programming and communications. Once configured, moving around in Pro-Search is easily learned by following the manual or by using the program's help screens.

Obviously, many of Pro-Search's Native Mode features can simplify search session procedures and make certain parts of an online search quicker and more cost effective. Typing ahead of the host system while online and offline search strategy preparation and uploading are two primary instances of features that make for more cost-effective searching. They are meant to

make searching easier for the novice as well as for the experienced searcher. None of these features, except cross-emulation, is meant to make online searching a less skilled activity. They do not replace the searcher's skills and experience; rather, they make doing a search more convenient. Automatic dial-up and log on, print, and disk options, data sheets, help screens, function keys—none of these make online searching simpler. Yet if designed well, they certainly make searching easier—and, we might add, more fun.

On this score, Pro-Search's Native Mode is a success. Easy to understand and use, it greatly increases the ease with which a searcher can perform an online search, especially in BRS and Dialog. Moreover, the Native Mode simplifies the use of the microcomputer's capacity to upload and download searches, perform basic accounting, and interface with other computers and command languages.

We believe that Pro-Search's Native Mode offers a well-integrated set of features for native-mode searching, features that are of real value for the online professional who is providing a search service. It offers what we would expect from professional online searching software, reflecting a thoughtful design and presented in an easy-to-use package.

We do have a few criticisms, however, that we believe are important, given Menlo's claim that Pro-Search's Native Mode is aimed at online professionals. In Native Mode one cannot upload except in BRS or Dialog2, nor can one save search strategies on disk—although this is possible in the HLI. To be useful on a daily basis for online professionals, the Native Mode should incorporate these features. The lack of accounting reports for other services is also unfortunate for those searchers whose pursuit of information is not limited to the two major vendors. To this list we might also add making available data sheets, cross-emulation and help screens for the other services. Even though BRS and Dialog are the two most widely used services, they are not the only services used by search intermediaries. We think it is realistic to expect Pro-Search's Native Mode to meet more of the needs of these online professionals by offering additional features for searching other services.

Like its predecessor, In-Search, the High Level Interface is obviously conceived of as an end-user program designed to simplify online searching through the use of menu-driven software. Although such assistance may be useful for the beginning professional, an experienced BRS or DIALOG searcher may find Pro-Search's HLI somewhat clumsy and perplexing, and the inexperienced searcher may find that the HLI does not explain enough.

The end-user approach to online searching assumes that the searcher cannot or will not learn the command language of a system and possesses only a rudimentary sense of the logic of online searching and databases. By definition this cannot be the case for the online professional no matter what level of practice. As intermediaries we are engaged in exploiting all the advantages of online searching, a goal that most of us would agree includes mastery of command languages, database structure, subject, and use of uploading and downloading. An

end-user package for professionals then would include features that would complement or extend what we know about online searching as well as features that exploit the microcomputer's technical prowess.

As such a professional end-user package, Pro-Search's High Level Interface clearly possesses some merit. The modus operandi of the High Level Interface obviously is the offline search strategy. For a searcher uncomfortable with one or both of the services supported, the High Level Interface thus provides one way of learning and using a less-known service. This is especially appealing for those of us who use one system almost exclusively yet from time to time need to search a database unavailable on our system of choice—the exclusive availability of ISI's Arts and Humanities Citation Index on BRS immediately comes to mind. Here the HLI would allow the Dialog searcher to forgo the onerous details of learning BRS telecommunications protocol and differences in command language. In the less pressured climate offline, he or she would be able to calmly follow indexes, sorts, and limits to construct a reasonably sound search strategy without too much recourse to BRS documentation.

Doing online searches may well be another story altogether. If a search strategy fails and one remains online, the High Level Interface will force one to work through a number of program steps that seem obtrusive, inefficient, and confusing at critical moments of the search. The HLI is inefficient in the sense that BRS and Dialog command languages are inherently parsimonious; one enters a command that is designed to be executed directly; there are no intervening steps. In some instances the High Level Interface does allow the use of direct commands, e.g., combining sets through the use of system-supported Boolean operators or the use of system-supported truncation symbols, but in most cases it does not. For example, the use of a prefixed field in Dialog requires entering the phrase in command form and set in quotation marks—at best a confusing convention, given the intent of the interface to make the use of commands simple. Another case in point is the HLI's cross-emulation feature. The proximity operators, truncation symbols, and print commands supported in cross-emulation in our opinion do not present problems of translation. More problematic are the additional indexes and their commands, which, in Dialog at least, are not consistent among the databases and are crucial to effective searches. The High Level Interface will allow one to use such indexes and their commands only by knowing the commands and the nature of these indexes in advance. Moreover, using the index command, one may only qualify a phrase once, although one may select a field or paragraph directly on the search screen by entering regular BRS paragraph labels of Dialog suffixes and prefixes. This latter option is necessary given the limitations of using the index command for more than one qualifier. However, at what point does one move from relying on the data sheets and the HLI's concept of one qualifier per search line to a more full and sophisticated knowledge and use of a database's structure? Would it not make more sense to learn a command language to such an extent that one would have little need to struggle with an interface that at crucial moments is adding more steps and commands?

We must admit that the High Level Interface becomes easier and more natural to use after repeated trials and that it may be a useful way for a well-trained but inexperienced searcher to gain some familiarity with Dialog2 or BRS. However, a rather important issue lingers. If Pro-Search's High Level Interface is intended as a professional version of an end-user or "transparent" interface to complex command languages, then would it not make more sense to offer an interface to the less well-known languages of important yet less-used services? In our experience neither Dialog2 nor BRS is so different in command language, protocol, or services to require the online professional to use menu-driven end-user systems instead of native mode. We would like to think that all professional online searchers, regardless of experience, have a sufficient grasp of BRS or Dialog command language and database structure to make most of the HLI search screen assistance superfluous, redundant, or overladen with confusing convention. In short,

what is the purpose of learning the interface when you already know or should know the command languages and database structures?

Interface support for less well-known systems, by contrast, would be useful. Confronted with the proliferation of databases and vendors, the online professional may need help in identifying, accessing, and searching these services, especially on an infrequent basis. End-user packages are already being developed or exist to assist the unsophisticated online searcher with these services. Would it not make sense to offer the professional intermediary an interface to these systems that would combine search savvy with certain professional end-user features?

We believe that Pro-Search offers most of the rudiments of this approach in its Native Mode. What would be most useful for online professionals would be an expansion of this thoughtfully designed and well-integrated software package to cover those services outside the BRS/Dialog orbit. In particular, Native Mode could offer data sheets, cross-emulation, and the excellent uploading and accounting features for online services other than BRS and Dialog. This does not imply that what Pro-Search currently provides for native-mode searching in any online service is not also very useful (e.g., type-ahead, automatic dial-up and log on, downloading to disk and the editing, viewing, and printing features of the buffer). Rather, this is to say that more would be even better.—*Dennis Brunning and Doug Stewart, Arizona State University, Tempe.* ■■

Other Recent Receipts

Listed here are books and other publications of potential interest to members of LITA, received for review. Some of these materials may be reviewed in later issues of *ITAL.*

Cochrane, Pauline Atherton. *Redesign of Catalogs and Indexes for Improved Online Subject Access: Selected Papers of Pauline A. Cochrane.* Phoenix, Ariz.: Oryx, 1985. 484p. ISBN: 0-89774-158-7, hardcover, $45.

Encyclopedia of Information Systems and Services. United States Volume. 6th ed. Detroit: Gale Research, 1985. 1230p. ISBN: 0-8103-1538-6, hardcover, $200. At head of title: 1985–86; edited by John Schmittroth.

Kinsella, Janet, ed. *Online Public Access to Library Files: Conference Proceedings.* Oxford: Elsevier International Bulletins, 1985. 202p. ISBN: 0-946395-18-7, softcover. "The Proceedings of a Conference Held at the University of Bath, 3–5 September 1984."

Merris, Russell. *Introduction to Computer Mathematics.* Computers and Math Series. Rockville, Md.: Computer Science Press, 1985. 284p. ISBN: 0-88175-083-2, hardcover, $27.95, for student's text; teacher's edition available separately.

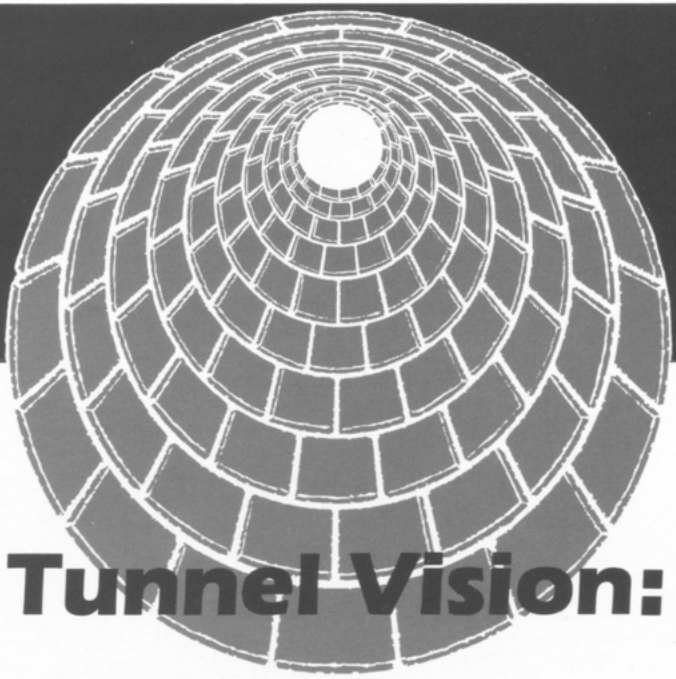
National Directory of Bulletin Board Systems. 1985 ed. Westport, Conn.: Meckler, 1985. 48p. ISBN: 0-88736-043-2, softcover, $9.95. Edited by Ric Manning.

Neway, Julie M. *Information Specialist as Team Player in the Research Process.* New Directions in Librarianship, no. 9. Westport, Conn.: Greenwood, 1985. 194p. ISBN: 0-313-24508-8, hardcover, $29.95.

Reynolds, Dennis. *Library Automation: Issues and Applications.* New York and London: Bowker, 1985. 615p. ISBN: 0-8352-1489-3, hardcover, $37.50.

Smith, John W. T., and Merali, Zinat. *Optical Character Recognition: The Technology and Its Application in Information Units and Libraries.* Library and Information Research Report, no. 33. 125p. London: The British Library, 1985. ISBN: 0-7123-3047-X, softcover. Distributed in U.S. by Longwood Publishing Group, Dover, New Hampshire.

Tseng, Sally C., comp. *LC Rule Interpretations of AACR2, 1978–1985.* 2d cumulated ed. Metuchen, N.J., and London: Scarecrow, 1985. 1171p. ISBN: 0-8108-1834-5, loose pages punched for a three-ring binder (not provided), $49.50. "Covers *Cataloging Service Bulletins* No. 1 (Summer 1978)—No. 27 (Winter 1985). Includes rule index to *CSB.*"



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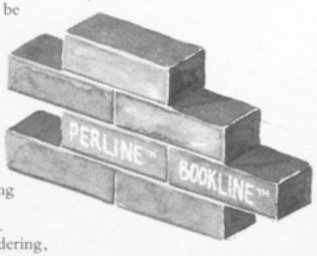

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