Volume 9,
Number 2

ISSN 0730-9295

Information Technology and Libraries

June 1990

CONTENTS

ITLBDG 9(2) 117–212 (1990); Inf Technol Libr

If your online catalog contains misspellings, typographical errors, and old forms of headings that confuse and frustrate catalog users, contact Blackwell North America, the leader in automated authority control for over 15 years. Blackwell's authority control service, based on Library of Congress name and subject authority files, standardizes headings for improved online access. Write or call today for more information on Blackwell's Authority Control Service.

Technical Services Division
BLACKWELL
NORTH AMERICA, INC.

Technical Services Division, Blackwell North America, Inc., 6024 S.W. Jean Road, Building G, Lake Oswego, Oregon 97035
Phone Toll Free: 1-800-547-6426 or 503-684-1140 (in Oregon) FAX: 1-503-639-2481 Canadian Toll Free: 1-800-626-1807

ISSN 0730-9295

Information Technology and Libraries

Volume 9, Number 2: June 1990

CONTENTS

ITLBDC 9(2) 117–212 (1990); Inf Technol Libr

Information Technology and Libraries

Information Technology and Libraries is the official publication of the Library and Information Technology Association, a division of the American Library Association, 50 E. Huron St., Chicago, IL 60611; *Executive Director*: Linda J. Knutson. The journal is issued quarterly in March, June, September, and December.

Information Technology and Libraries publishes material related to all aspects of library and information technology. Some specific topics of interest are: Automated Bibliographic Control, AV Techniques, Communications Technology, Cable Systems, Computerized Information Processing, Data Management, Facsimile Applications, File Organization, Legal and Regulatory Matters, Library Networks, Storage and Retrieval Systems, Systems Analysis, and Video Technologies. *ITAL* welcomes unsolicited manuscripts. Submissions should follow the guidelines stated under "Instructions to Authors" on page 116 of the March 1990 issue. Manuscripts of articles, communications, and news items should be addressed to the editor: Thomas W. Leonhardt, *Information Technology and Libraries*, University of the Pacific, Stockton, CA 95211. Copies of books for review should be addressed to: Susan B. Harrison, *ITAL Book Reviews*, The New York Public Library, 455 Fifth Ave., New York, NY 10016. Copies of software for review should be addressed to: George S. Machovec, *ITAL Software Reviews*, Arizona State University, Tempe, AZ 85287. Advertising arrangements should be made with Kurt Murphy, Hayden Library, Arizona State University, Tempe, AZ 85287.

Information Technology and Libraries is a perquisite of membership in the Library and Information Technology Association. Subscription price, $20, is included in membership dues. Nonmembers may subscribe for $40 per year in the U.S., Canada, Mexico, Spain, and other PUAS countries; $45 in other foreign countries. Single copies, $11. Second-class postage paid at Chicago, Illinois, and at additional mailing offices. *Postmaster*: Send address changes to *Information Technology and Libraries*, 50 E. Huron St., Chicago, IL 60611.

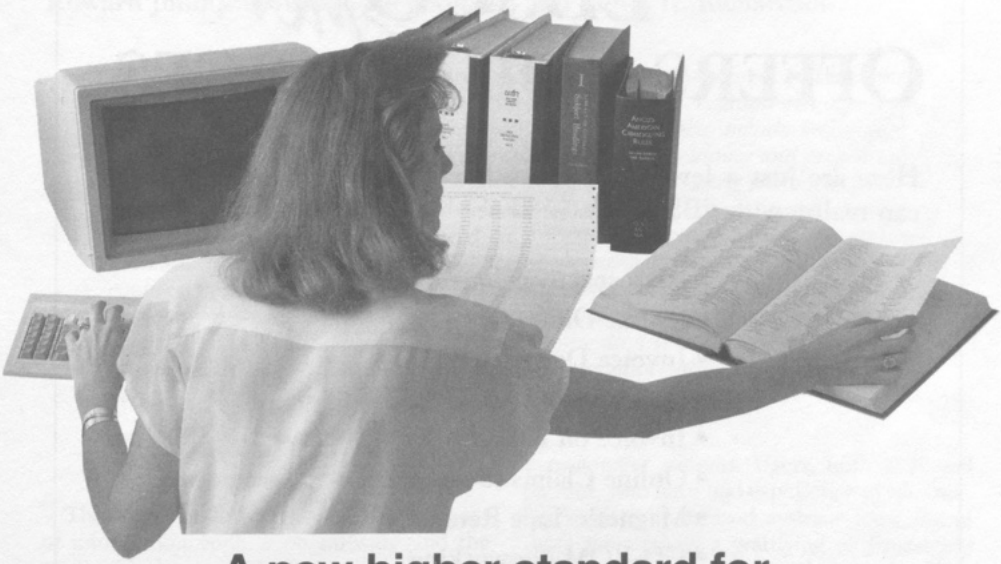
Circulation and Production: ALA Publishing Services (Eileen Mahoney, Chere Elliott, Bruce Frausto, Debra M. Hall, Colleen King, and Dan Lewis), American Library Association, 50 E. Huron St., Chicago, IL 60611.

Publication of material in *Information Technology and Libraries* does not constitute official endorsement by the Library and Information Technology Association or the American Library Association.

Abstracted in *Computer & Information Systems*, *Computing Reviews*, *Information Science Abstracts*, *Library & Information Science Abstracts*, *Referativnyi Zhurnal*, *Nauchnaya i Tekhnicheskaya Informatsiya*, *Otdyelnyi Vypusk*, and *Science Abstracts Publications*. Indexed in *CompuMath Citation Index*, *Computer Contents*, *Computer Literature Index*, *Current Contents/Health Services Administration*, *Current Contents/Social Behavioral Sciences*, *Current Index to Journals in Education*, *Education*, *Library Literature*, *Magazine Index*, *New Search*, *and* Social Sciences Citation Index. Microfilm copies available to subscribers from University Microfilms, Ann Arbor, Michigan.

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences–Permanence of Paper for Printed Library Materials, ANSI 239.48-1984. ♾

Here's where we split hairs



A new higher standard for Conversion & Standardization of Records

If yours is like most good libraries, your catalog reflects a history of changing cataloging rules, staff changes, different card vendors and perhaps even an effort at automation. It works. But, it isn't quite what you'd have if you could start over.

Our record conversion service treats your records (whether they be catalog cards or records from a local system) as though they were our own. Instead of simply converting them, we go through each individual entry with our advanced proprietary computer program and refer every apparent conflict to the experts in our separate bibliographic and authorities departments. There, our experts get out the books and make each entry as correct as you'd make them yourself, if you could afford the time. We split hairs to give you the very best catalog possible.

At WLN, we have always expected higher standards than were accepted nationally. From a modest beginning 13 years ago, we now serve 550 libraries. And, as a result of demanding the utmost in accuracy and pushing the very limits of computer and programming technology we now offer the most sophisticated record conversion and standardization service in the world.

Our service is timely, flexible and affordable. Your catalog is returned in whichever form you select...tapes, CD-ROM, microforms, etc..

For background information providing the details you'll need to prepare the most advantageous RFP (for you and your patrons) call or write: Bonnie Allen, WLN, Mail Stop AJ-11W, Olympia, WA 98504-0111, (206) 459-6518.

wln

Meticulous librarians

A Review and Exploratory Investigation of Instructional Design Strategies Relevant to Library and Information Management Software

Edward John Kazlauskas, Rich Pinder, and Judith H. Richardson

A review is presented of selected strategies employed in educational and training psychology that might be incorporated into library and information management software to make such software more effective. Areas of review include: techniques of preparing the learner; methods for providing learning guidance and presenting the content; techniques for eliciting performance and providing feedback; methods for assessing performance; and vehicles for enhancing retention and learning transfer. Also discussed is the need to present consistency and to recognize individual differences. Based on this review, a number of specific features that could be incorporated into the software are described. Then an exploratory study of a sampling of library and information management software is conducted based on these features. The overall aim of the investigation is to provide information that might assist the individual who is designing an information application or the manager who is evaluating alternative system choices.

AIM

This paper attempts to assist the designer of information application software and the manager who is evaluating alternative systems. It examines the literature of educational and training psychology, and to some extent the literature of human factors engineering, in order to describe possible strategies that might be employed in library and information management software. Although certain of these strategies are being used in some software today, frequently the rationale for such use is not known. The paper then reviews representative library and information management software using the strategies and techniques outlined in the first part of the study.

BACKGROUND

The past years have witnessed the proliferation of computerized library and information management systems. Users, both staff and patrons, who have had experience in interacting with computerized systems have found these interactions a gratifying or frustrating experience and have met with success or failure depending upon a number of variables, such as the user's own background, training ,and experience and the characteristics of the software/system used.

Concerns have been discussed in the literature on a wide array of topics relating to such human-machine interactions. Some of this literature has been system related, in which the characteristics of the software are examined according to a standard set of criteria, such as the database query language, output options, and data security methods. Specifically, these include software/system checklists, such as those decribed by Highsmith, Kazlauskas, and O'Rourke.[1-3] Other approaches have been used to review interactive systems such as online monitoring, whereby the system is

Edward John Kazlauskas is Associate Professor, Department of Educational Psychology and Technology, and Rich Pinder is Project Manager, School of Medicine, University of Southern California, Los Angeles. Judith H. Richardson is Librarian, Gloucester High School, Gloucester, Virginia.

evaluated in terms of such factors as response time and error rate.[4] Other studies have had more of a user focus. These include, for example, analyses of information-seeking and use behaviors, such as that by Mick et al.[5]; studies relating to individual differences, such as those by Fenichel, Bellardo, Borgman, and Logan and Woelfl[6-9]; investigations of computer anxiety, such as that done by Sievert et al.[10]; studies of attitude, such as that of Miwa and Nakayama[11]; and a study by Fidel and Soergel that integrates the results of previous studies of factors affecting online bibliographic retrieval, including the setting, the user, the request, the database, the search system, the searcher, the search process, and the search outcome.[12]

Another approach to investigating human-machine interactions in the library and information management context might be to examine software in terms of its psychologically based components—that is, to consider the software in terms of what positive psychological/learning strategies are employed. The overriding purpose of incorporating such strategies into software is to make the interactions more positive in terms of user friendliness, ease of learning, learning retention, and, of course, results. As more library and retrieval software producers are providing demonstration diskettes of their software, it behooves these producers to incorporate positive learning strategies into their demonstration diskettes.

ASSUMPTION

An assumption is made that the strategies and techniques described in the literature might be relevant to the design of library and information management interactions. Additionally, library and information management software is assumed akin to computer-assisted instruction (CAI) software to the extent that it is used by a variety of users, many of whom have little knowledge or understanding of the system and content with which they will interface. Thus, some built-in instructional approaches are necessary. Likewise, as users of library and information management software and systems interact with a multiplicity of systems, it is important that these systems provide not only the functionality but also instruction to the casual user.

In the literature there is no one theory or set of strategies, but rather various theories that describe elements, some of which might be appropriate for our needs. The various learning theories relevant to our concern fall into the areas of contemporary behaviorism and cognitive psychology. Behaviorists state that learning is a link between stimulus and response—individuals respond to specific stimuli, such as a request to select from a menu option, and are reinforced when a correct response is made. Cognitive psychologists are concerned with understanding how the individual learner processes and structures information, with an emphasis on the strategies a learner can use to learn. Both schools of thought are integrated into the following discussion.

STRATEGIES FROM EDUCATIONAL AND LEARNING PSYCHOLOGY

Preparing the Learner

One of the areas in the literature that is useful to our discussion is the "events of instruction" as outlined in the comprehensive instructional theory of Gagne and Briggs. The events of instruction are ways of assuring that the internal act of learning occurs.[15] Some of these events can be categorized as methods of preparing the learner to learn.

One method of preparing the learner is to gain the learner's attention. Gaining attention can be accomplished by the use of cuing techniques, including color, logos, underlining, and novelty and sound, which draw the attention of the user. Another attention-getter is the use of fast stimulus changes on screen, such as a rapid succession of screens that provide information on the name of the software/system, the producer, and the copyright statement.

An additional strategy to prepare the learner is to inform the learner of the objectives. This strategy prepares the learner and places the learner in a state of readiness to learn. Additionally, information about the content and the structure of the content is an aid to learning the material more effectively and provides information to the learner that reveals what he/she has accomplished and what is expected. In library and information management software, preparing the learner can be accomplished by the use of initial text screens that describe how the system will be used. This is often achieved by a menu op-

tions list that provides not only a list of the content but also the conceptual structure of the content. For example, a menu that lists the following options—create records, import records, search the database, print search results, optional output, help functions—provides the user with an overview of the content, its structure, and what online interactive behaviors will need to be performed. This menu should be kept short, however, so that these purposes are not defeated.

Another method of preparing the learner is to stimulate recall of prior learning by relating new learning to old. For example, this could be accomplished in online public access catalogs by relating the use of the online catalog to the use of the card catalog. Presenting the stimulus material with distinctive features, such as highlighting the difference between the results of manual versus online searching, is also used to prepare the learner and is accomplished using the same techniques as with gaining attention, such as underlining text. The purpose here, however, is to present the content so that the user will be able to distinguish it from other content. In an online public access catalog this could be accomplished by calling attention, either by highlighting or through the use of color, to such features as Boolean connections, which are unique to an online catalog as opposed to a card catalog.

Providing Learning Guidance

Another specific aid to learning is to provide guidance to learning the content. A logical structure of the software components, detailed instructions for the novice user, help statements, and errors messages that connect one part of the content to another are all methods for guiding the user through the software. The net result of such guidance is instilling the user with a sense of organization. Organization that is apparent to the learner aids in learning. "A user's sense of control rests on a robust understanding of how a given system functions, of why the procedures for operation are as they are, and of how the informational support system for the given system is organized." [16] This means that good software should have the following qualities: (1) its topic or use is clearly stated, (2) the subject matter is clearly and logically developed, (3) documentation is logically ordered, and (4) text is arranged in small, easy-to-read blocks.[17]

Advanced organizers, or introductory information presented in advance of the learning itself and typically at a higher level of abstraction, are a means of providing learning guidance. They have the ability to direct learner attention, provide cues to the learning, and are used to increase retention. Knirk and Gustafson state that there are some common characteristics of advanced organizers, including: they are short statements written at a more general level than the instruction that is to follow; they are designed to influence the learner's encoding process; they are stated at the learner language level; they contain no specific content from the information that is to be learned; and they assist in providing the relationship among the content. In library and information management software, advanced organizers would be menus and lists of commands.

Presenting the Content

Typically, learning is not the attainment of one isolated behavior but rather a composite of behaviors. Likewise, learning typically involves a mix of objectives to be attained, such as recalling facts, following procedures, and solving problems. Thus, it is important, first, that the prerequisite learning for each behavior has been achieved, and second, that the content be presented in its logical sequence, progress from the lower level to higher levels of learning, and contain the complete mix of behaviors to be attained.

The display of the content is important. In teaching a procedure, for example, a listing approach of the procedural steps may be more helpful to the learner than a narrative paragraph. One method found more frequently in presenting content is the increasing use of icons to illustrate certain functions of the system, such as with the Macintosh and the Microsoft Windows environment for IBM personal computers. As Oborne states, "Pictorial displays may be preferable to printed text, particularly when the information contains some form of structure."[19] Along the same lines, Picher notes that in some newer programs, there is an emphasis on the use of meaningful graphics, such as the use of Gantt and Pert charts.[20] For example, in "The Best Course of Action," a computer-assisted-

instruction (CAI) authoring language, charts are used to link icons of basic functions, such as display and question. Using this approach, a Pert-like chart illustrates the complex logic associated with an instructional sequence. For library and information management software, such an approach might be useful for constructing complex searches—each subset of the search could be illustrated by an icon, and the icons could be linked on a chart in possible Boolean fashion.

Eliciting Performance

Simply stated, eliciting performance means having the learner demonstrate the behavior. The user of library and information management software has to be able to perform various behaviors, such as formulating a search strategy or printing results. The software can elicit these behaviors by prompts and cues. A gradual fading of these aids is possible after practice or after repetition of the behavior.

Practice is a means by which the behaviors can be performed with greater precision. In fact, practice is a recurring theme throughout various theories. It should be noted that practice takes on a specific dimension to the behaviorist. A learner practices the performance and then receives reinforcement for that behavior. For example, the learner receives confirmation that performance is correct in practicing a search, selecting from a menu, or inputting a record, and the behavior is thus reinforced, either positively by a "hit" or negatively by an error message. Similarly, the behaviorist is concerned with cues, such as a list of actions required to input a record. Such cues can assist in eliciting the behavior.

Learning is complex and requires a composite of different behaviors. It is essential to practice elements of these behaviors, which are positively reinforced, and then to combine these elements into the total performance, which in turn is reinforced. A fading of cues to the performance occurs over practice of the total performance.

Providing Feedback

Learners need to know that an action taken has had an effect, or in our context, the system needs to provide feedback to the user.[21] This feedback should be immediate and obvious, should distinguish between success and failure, and should be displayed on the screen in a place where it is expected. It should be appropriate to the user, which means that although music and a graphic display may be pleasing to small children, a simple sign such as a "+" might be more appropriate for adults. Although many programs have used personification of the computer, e.g., "Be patient. I am working," studies have indicated that this is offensive to experienced users, who view computers as a tool.[22]

A corollary to the feedback principle is that studies show that humans are impatient with slow or variable response time, and that feedback responses taking longer than two to four seconds will produce frustration to the user.[23] Rubenstein points out that when programs need to delay responses, as in the case of transfer or sorting of large files, the system needs to provide feedback to the user by (1) announcing long delays and (2) having delays make sense to the user.[24]

Informing users of errors increases learning. This should occur as soon as practical.[25] Ledgard lists three hypotheses concerning errors and error correction that derive from this: (1) error messages should have a positive emotional tone (this means that messages with a negative connotation such as "illegal," "fatal," "invalid," "incorrect," and "syntax error" are intimidating to the user); (2) the user should be alerted to any potentially damaging action, or warning messages should occur if there is a chance that important information could be lost; and (3) error correction should be easy and immediate. This means error correction routines should be straightforward and available online, if possible.

Recognizing Individual Differences

The focus of learning is the individual, and designers of software must recognize that individuals differ in the skills and experience they bring to the computer. Kansky points out that this means that programs should be: (1) operable at different levels of skill, (2) operable at different rates of speed, and (3) flexible, especially in instructional programs, where they should present different kinds of problems at different skill levels. In individualized instruction, it is important to gather considerable information about the learner. This can be accomplished through an examination of existing student test data or by the administration of a separate psychological test. Data to

be gathered include the information processing style, such as whether the learners learn best with a high degree of redundancy, and the manner in which learners construct mental models. At this point, it is difficult to realize how such individualized learning profiles could be used to a great degree in library and information management software. However, it is practical to consider the use of several types of software interactions for the same system. This could include, for example, allowing the user to choose a text-oriented or an icon-oriented approach, and allowing the user to specify the amount of instruction to be received during the interaction.

Likewise, individuals differ in their anxiety level when they approach and then interact with a computer. High anxiety levels lower performance. Users should be able to retain their orientation within a program. This is another reason, in addition to different anxiety levels, for programs to provide online tutorials and help screens. In addition, acceptable forms of data entry should be clearly and simply written, nontechnically phrased documentation should be provided, with advanced features and complex operations moved to the end, and limitations of software should be stated at the beginning of the program so that the novice user understands the "rules of the game." One should be able to extricate oneself from the program by moving both forward and backward.

The interest on the individual also focuses on other relevant issues for library and information management software. Shneiderman points out that requiring users to keep newly learned information in short-term memory severely restricts the capacity for problem solving, in that human beings can only retain information in short-term memory for about thirty seconds.[30] This means, as Miyata and Norman point out, that the expression "out of sight, out of mind" makes a good slogan for software designers.[31] The computer's memory should be relied upon rather than the user's, and such tools as online documentation and windows that show the most commonly used commands should be incorporated in programs.

Individuals desire control of their environment, and this desire to control increases with the user's degree of experience.[32] It follows then, that the user should be able to control the program being used to the greatest degree possible. Rubenstein suggests that one way of accomplishing this goal is to let the user choose the order of the tasks to be performed.[33] Once again, the user should be able to move both forward and backward in the program. Several sources, including Oborne, point out that as the skills increase, the user should be able to suppress instructions and menus at will.[34] Indeed, Shneiderman proposes that experienced users prefer command languages over menu-driven programs in general.[35] Finally, display functions should be full and easy to use, so that information may be displayed in a form of the user's choosing.

Assessing Performance and Enhancing Retention

A major aspect of instruction and training is the step of assessing performance, specifically determining whether the individual has learned the content, skill, or attitude. While in a library or information management software interaction it is not suggested that a test of performance be administered, other techniques can be employed to assist the user in determining whether the behavior has been achieved. For example, opportunities for the user to try sample commands, with resulting assistance through helpful diagnostics, provide a method for users to assess their own learning.

It is important to assess the behaviors not only during a given interaction but also over time. Software should provide a vehicle for enhancing retention and learning transfer. This can be accomplished by reviewing the content at the end of the session and by providing a variety of practice opportunities, such as having the user conduct searches on each of the searchable fields in a database. Transfer of learning is facilitated when the learning situation resembles a testing or application situation, or as Rubenstein states, " The computer must accommodate the user, rather than vice versa. Don't force the user to think about data in an unnatural (or just different) way."[36]

This has several kinds of impact on user-friendly software development. Richer points out that one current trend is away from general purpose databases, word processors, and spreadsheets toward those that are geared toward a certain industry, such as scientific

word processors or city planning spreadsheets.[37] Another idea is that prompts for data input should resemble those that might be used in manual systems. Other techniques that help users by emulating their own situations are (1) to present text information in a manner that reflects the written word: from top to bottom and from left to right; (2) to present numerical information in tabular form, right-justified; (3) to allow information to "page down," not scroll; and (4) to base command language on legitimate English phrases composed of familiar, descriptive words.[38]

Maintaining Consistency

Underlying the above strategies is the principle that human beings function best in a situation that presents consistency.[39] This suggests that software should lack ambiguity and show simplicity in its organization; for instance, there should be no elaborate or meaningless use of graphics.[40] In addition, the same keys and commands should be used for the same purpose throughout the program. Indeed, many newer programs share the same keys and commands from program to program. Also, wherever long lists appear, they should be ordered in some way, whether it be logically, alphabetically, numerically, or chronologically.

SUGGESTED SOFTWARE FEATURES

Based on the review of these selected strategies, library and information management software could incorporate a number of features to make it more effective from the learning perspective. These features include: using attention getters, such as color, logos, and fast pacing of initial screens; providing information on the purpose, content, and structure of the software; using advanced organizers, such as menus and lists of commands; relating the system to what the learner already knows; logical organization and display of content; possible use of icons to represent content; user self-assessment measures, such as through the use of immediate, meaningful feedback; system consistency, such as through the use of the same commands, function keys, and icons; a variety of interaction methods to satisfy the needs of different individuals; and techniques, such as cues and practice, to facilitate learning retention.

From these elements, a checklist of features can be outlined, including those related to preparing the user, providing learning guidance, presenting the content, eliciting performance, providing feedback, incorporating assessment and retention events, maintaining consistency, and considering the characteristics of the individual. This checklist can form the basis for reviewing a representative sample of library and information management software to determine whether the programs incorporate these instructional design strategies.

STUDY OF SELECTED LIBRARY AND INFORMATION MANAGEMENT SOFTWARE

Methodology

Instructional design factors isolated in the first part of this paper were organized into four major categories. These include: (1) the initial interaction, in which the user first interfaces with the software/system; (2) the interaction events, whereby the content is presented and the individual performs the interaction; (3) the individualization characteristics, which offer different levels and modes; and (4) help and online tutorial functions. A listing of the factors grouped by these categories is presented in appendix A.

Next, a representative sample of library and information software/systems was selected for review using this checklist. Only systems easily accessible to users were chosen, thus eliminating some systems not commonly available to library/information center patrons/users. Several examples of software/systems from three types of sources were selected: CD-ROM information systems; online public access catalogs (OPACs); and microcomputer database management software commonly used for text retrieval applications. Eight systems were reviewed at four different sites. Each of the systems was reviewed using the checklist of instructional design factors to ascertain whether or not the features on the checklist were included. As appropriate, comments were gathered on the use or nonuse of the features. For example, if feedback was provided, it was noted as to what type it was and whether it was positive or negative in nature. Any additional comments relevant to that system's use of feedback were also gathered.

Findings

Using the results of this review (see appendix B for a summary of the data), the following findings were noted regarding the incorporation of instructional design factors into library and information management software.

There was minimal use of any initial interaction factors to prepare the learner, with the exception of the use of menu options. Attention-getting devices were poor. The screens displayed to the user were primarily text only, in normal-sized fonts. Simply stated, there was little in the way to entice users, to gain their attention, or to provide initial motivation. In most cases, menu options provided the user with an overview of the functions of the system, and in some instances text descriptions provided additional information regarding the objectives or content.

The systems provided guidance through the use of logical structures, appropriate step sizes or amount of content presented in one display, and use of advanced organizers, such as text descriptions of what was to follow. In all these systems the content was adequately presented, although there was an emphasis on large amounts of text displayed on the screen. Performance was elicited by requesting selection from menus or requesting the user to input specific searches. Library and information management software appeared to be quite successful in the use of guidance and content presentation strategies.

Generally, the methods of providing feedback were poor. If feedback was provided at all, it was not always positive in nature. Links to help functions were not always easy, and the help statements were not always understandable since frequently they were stated in computer jargon.

Each library and information management software example was consistent in use of the same keys and commands, and in frame (display) protocols. The major problem was inconsistency among systems, since each of the eight systems reviewed used different keys, commands, and screen display areas. Transfer of learning from one system to another was impeded by this situation.

For the most part, the interactions were fixed and there was little opportunity for the user to change the interaction methods, such as having different display formats or different screen display areas. However, some systems did incorporate the ability for users to identify the amount of instruction they wanted to appear on the screen, such as more instruction for the novice user. The microcomputer database systems did provide the opportunity for different modes of interactions, such as command or menu-driven. Most systems also provided methods to reduce users' anxiety levels by providing menus, help screens, and easy methods to return to a main menu or to exit the system. None appeared to incorporate concluding events, that is, such features as performance assessment or review of content. All of the systems provided help options and/or online tutorials. These functions exhibited many of the same characteristics of the software in general, such as good consistency and presentation of content but poor feedback techniques.

Implications

Based on this exploratory review of library and information management software, there are a number of instructional design strategies that could be employed to achieve more positive interactions.

The systems reviewed appear to assume that the user will be highly motivated to use the system and will come with an understanding of how the system works, and that the system will be sufficiently user friendly to enable satisfactory interaction. This is not always the case. Adequate methods of preparing the user should be employed in library and information management software to gain the user's attention.

An increase in user motivation can be achieved if the overall objective of the software is initially presented. User manuals and information sheets generally explain these objectives, but having this explanation on the system as part of the preparatory introduction would be advantageous.

Screen design theory encourages minimizing the amount of text displayed at one time. Library and information management software should be designed so as to present textual material in an uncluttered manner, making sure to leave large areas of blank space surrounding units of text.

Feedback after a response should be specific and to the point. If the response is incorrect, the feedback should indicate why the

response was incorrect and provide appropriate linkage to help or tutorial information.

Learning transfer can be increased by the thoughtful standardization of key/function correspondence. This type of standardization is hampered by the fact that different systemsuse different keyboard layouts. Library and information management software developed on similar system platforms should, however, use standard conventions as they are accepted. Examples in the current MS-DOS platform would be to use the Escape key to return to the previous level or the F1 key for access to the "Help" command.

CONCLUSION

Given the demonstrated success of employing instructional design principles in the fields of education and training, it follows that implementing strategies as outlined in this paper to assist in the development of library and information management should be of benefit. However, additional research is needed in the area.

Software development teams should consider adding an instructional design review to their development process. The utilization and knowledge of the rationale for the use of the strategies and practices of educational and training psychology may well hold relevance for the design of more effective library and information management software. However, this requires careful planning and a realization that there is more to software design than content expertise. The important point is that certain principles of good interactive software design are emerging, which, if followed, have the potential of improving the effectiveness of library and information management systems.

REFERENCES

1. Anne L. Highsmith, "Library Processing Systems and the Man/Machine Interface," *Information Technology and Libraries* 5, no.4:267–84 (Dec. 1986).
2. Edward John Kazlauskas, "Information Management Software: Guidelines for Decision-Making," *Database* 10, no.6:17–25 (Dec. 1987).
3. Victoria O'Rourke, "Selection of an Online Public Access Catalog: A Checklist Approach," *Information Technology and Libraries* 6, no.4:278–87 (Dec. 1987).
4. Ronald E. Rice and Christine L. Borgman, "Use of Computer-Monitored Data in Information Science and Communications Research," *Journal of the American Society for Information Science* 34, no.4:247–56 (July 1983).
5. Colin K. Mick, "Toward Usable User Studies," *Journal of the American Society of Information Science* 31, no.5:347–56 (Sept. 1980).
6. Carol M. Fenichel, "Online Seaching: Measures that Discriminate among Users with Different Types of Experience," *Journal of the American Society of Information Science* 32, no.1:23–32 (Jan. 1981).
7. Trudi Bellardo, "An Investigation of Online Searcher Traits and Their Relationship to Search Outcome," *Journal of the American Society of Information Science* 36, no.4:241–50 (July 1985).
8. Christine L. Borgman, "Individual Differences in the Use of Technology: Work in Progress," *Proceedings of the American Society of Information Science* 22:243–49 (1985).
9. E. L. Logan and Nancy N. Woelfl, "Individual Differences in Online Searching Behavior of Novice Searchers," *Proceedings of the American Society of Information Science* 23:163–65 (1986).
10. Mary Ellen Sievert and others, "Investigating Computer Anxiety in an Academic Library," *Information Technology and Libraries* 7, no.3:243–52 (Sept. 1988).
11. Makiko Mixa and Kazuhiko Nakayama, "User's Attitude Change during On-Line Search Training: A Case of Inexperienced Librarians," in *Proceedings of the National Online Meeting*, comp. Martha E. Williams and Thomas H. Hogan (Medford, N.J.: Learned Information, 1984), p.227–34.
12. Raya Fidel and Dagobert Soergel, "Factors Affecting Online Bibliographic Retrieval: A Conceptual Framework for Research," *Journal of the American Society for Information Science* 34, no.3:163–80 (May 1983).
13. Robert M. Gagne, *The Conditions of Learning and Theory of Instruction*, 4th ed. (New York: Holt, 1984).
14. Robert M. Gagne and L. J. Briggs, *Principles of Instructional Design*, 2d ed. (New York: Holt, 1979).
15. Charles M. Reigeluth, ed., *Instructional Theories in Action: Lessons Illustrating Selected Theories and Models* (Hillsdale, N.J.: Lawrence Erlbaum Associates, 1987).
16. John Selly Brown, "From Cognitive to Social Ergonomics and Beyond," in *User Centered*

Systems Design: New Perspectives on Human-Computer Interaction, ed. Donald A. Norman and Stephen W. Draper (Hillsdale, N.J.: Lawrence Erlbaum Associates, 1986), p.457–86.
17. Bob Kansky, William Heck, and Jerry Johnson, "Getting Hard-Nosed about Software: Guidelines for Evaluating Computerized Instructional Materials," in John H. Tasher, *Improving Instruction with Microcomputers: Readings and Resources for Elementary and Secondary Schools* (Phoenix, Ariz: Oryx, 1984), p.118.
18. Frederick G. Knirk and Kent L. Gustafson, *Instructional Technology: A Systematic Approach to Education* (New York: Holt, 1986), p.127.
19. David J. Oborne, *Computers at Work: A Behavioral Approach* (New York: Wiley, 1985), p.264.
20. Oliver L. Richer, Cynthia R. Lubrano, and Rochelle Theophano, "The Promise of Application Software," *Byte Bonus Edition*, Summer 1987, p.37–42 .
21. Henry Simpson, "A Human-Factors Style Guide for Program Design," in Decker F. Walker and Robert D. Hess, *Instructional Software: Principles and Perspectives for Design and Use* (Belmont, Calif.: Wadsworth Publishing Co., 1983), p.133.
22. Richard Rubenstein and Harry Hersh, *The Human Factor: Designing Computer Systems for People* (Burlington, Mass: Digital Press, 1984), p.140.
23. Ben Shneiderman, *Software Psychology: Human Factors in Computer and Information Systems* (Boston: Little, 1980),p.228.
24. Rubenstein and Hersh, p.148.
25. Janis Morariu, "Human Factors for Design and Evaluation of Software," *ASIS Bulletin* 12, no.1:18–19 (Oct./Nov. 1985).
26. Henry Ledgard, Andrew Singer, and John Whiteside, *Directions in Human Factors for Interactive Systems* (New York: Springer-Verlag, 1981), p.155–58.
27. Simpson, p.134.
28. Kansky, Heck, and Johnson, p.118.
29. Shneiderman, p.225.
30. Ibid., p.224.
31. Yoshiru Miyata and Donald A. Norman, "Psychological Issues in Support of Multiple Activities," in Donald A. Norman and Stephen W. Draper, *User Centered System Design: New Perspectives in Human-Computer Interaction* (Hillsdale, N.J.: Lawrence Erlbaum Associates, 1986), p.279.
32. Shneiderman, p.226.
33. Rubenstein and Hersh, p.125.
34. Oborne, p.264.
35. Shneiderman, "The Future of Interactive Systems and the Emergence of Direct Manipulation," in *Human Factors and Interactive Computer Systems*, ed. Y. Vassiliou (Norwood, N.J.: Ablex, 1984), p.4.
36. Rubenstein and Hersh, p.220.
37. Richer, Lubrano, and Theophano, p.38.
38. Rubenstein and Hersh, p.68.
39. Simpson,p.132.
40. Ledgard, Singer, and Whiteside, p.149. ■■

APPENDIX A. INSTRUCTIONAL DESIGN FACTORS

Initial Interaction Preparing the User

- gaining attention thru use of:
  - color
  - logos
  - underlining
  - text characters
  - graphics
  - animation
  - sound
  - novelty
  - fast stimulus change
  - flashing
  - other (specify)
- inform re objectives/content by:
  - purpose specified
  - objectives stated
  - text description
  - menu of all options
  - specify types of results
  - other (specify)
- stimulate recall of old learning:
  - relate to old learning
  - identify new learning
  - use of examples
  - distinctive features in new learning
  - other (specify)
- other

Providing Guidance

- logical structure of the content
- content in small blocks, appropriate step size
- detailed instructions for novice user
- help statements connect to other content
- error messages connect to other content
- content blocks/options connects easily
- documentation logically ordered
- use of advanced organizers such as:
  - general statements
  - assist in encoding process at language level of user
  - provide content relationships
  - other (specify)
- other

Interaction Events

Presenting the Content
- presented in logical sequence
- prerequisite learning achieved
- progresses from lower levels to higher levels
- adequacy of type of displays including:
  - text
  - listings of steps/procedures
  - graphics
  - icons
- adequacy of screen use:
  - amount of content presented on screen
  - scrolling capability
  - paging capability
  - content structure capability
- other

Eliciting Performance

- use of prompts and cues
- use of confirmation
- use of reinforcement
- other

Providing Feedback

- use of feedback mechanisms such as:
  - text
  - sound
  - graphics
  - personification
  - other (specify)
- characteristics of feedback:
  - positive in nature
  - if error, level of method of error correction outlined
  - other (specify)
- appropriate to the user
- appropriate feedback response time
- other

Maintaining Consistency

- content level similar
- lack of ambiguity
- use of same keys
- use of same commands
- no unmeaningful use of graphics, etc.
- consistent frame protocols in:
  - input area
  - menu area
  - help area
  - information area
- other

Recognizing Individual Differences

- operates at different levels
- operates at different rates of speed
- use of individual styles such as:
  - high degree of redundancy
  - different display formats
  - different modes of interaction, such as:
    - command driven
    - menu driven
    - device driven
  - other (specify)
- fosters low anxiety levels thru use of:
  - menus
  - windows
  - online tutorials
  - help screens
  - online documentation
  - simple, nontechnical text
  - straightforward methods of data entry
  - limits of system stated
  - easy to move thru system
  - easy to extricate from system
  - other (specify)
- other

Help/Tutorial Functions

Presenting the Content

- presented in logical sequence
- prerequisite learning achieved
- progresses from lower levels to higher levels
- contains complete mix of behaviors
- adequacy of type of displays including:
  - text
  - listings of steps/procedures
  - graphics
  - icons
- adequacy of screen use:
  - amount of content presented on screen
  - scrolling capability
  - paging capability
  - content structure capability
- other

Eliciting Performance

- variety of methods of demonstrating behavior
- use of prompts and cues
- use of practice
- use of confirmation
- use of reinforcement
- other

Providing Feedback

- use of feedback mechanisms such as:
  - text
  - sound
  - graphics
  - personification
  - other (specify)
- characteristics of feedback:
  - positive in nature
  - if error, level of method of error correction outlined
  - other (specify)
- appropriate to the user
- appropriate feedback response time
- other

Maintaining Consistency

- content level similar
- lack of ambiguity
- use of same keys
- use of same commands
- no unmeaningful use of graphics, etc.
- consistent frame protocols in:
  - input area
  - menu area
  - help area
  - information area
- other

Concluding Events

- performance assessed
- review of content at end of session
- variety of practice opportunities
- similarity to real situations
- other

APPENDIX B. LIBRARY AND INFORMATION MANAGEMENT SOFTWARE REVIEW

(X indicates that the software exhibits the factor)

	SOFTWARE EXAMPLES*							
	1	2	3	4	5	6	7	8
Initial Interaction								
PREPARING THE USER								
gaining attention thru								
color								
logos		X						
underlining							X	X
text characters	X	X	X	X	X	X	X	X
graphics								
animation								
sound								
novelty								
fast stimulus change								
flashing								
other (specify)								
inform re: objectives/content								
purpose specified				X	X			X
objectives stated								
text description								
menu of all options	X	X	X	X	X	X	X	X
specify types of results								
other (specify)								
stimulate recall of old learning								
relate to old learning								
identify new learning								
use of examples								
distinctive features in new								
other (specify)								
other								
PROVIDING GUIDANCE								
logical structure of the content	X	X	X		X	X	X	X
content and appropriate step size	X	X	X		X	X	X	X
detailed instructions for novice							X	
help statements connect								
error messages connect								
content blocks/options connects								
documentation logically ordered				X			X	

*1 = OPAC; 2 = OPAC; 3 = OPAC; 4 = CD-ROM; 5 = CD-ROM; 6-ROM with front-end software; 7 = library dbms; and 8 = library dbms.

	SOFTWARE EXAMPLES*							
	1	2	3	4	5	6	7	8
use of advanced organizers such as								
general statements	X			X	X			X
assist in encoding process								
at language level of user	X		X	X	X	X	X	X
provide content relationships	X	X	X		X	X	X	X
other (specify)								
other								
Interaction Events								
PRESENTING THE CONTEST								
presented in logical sequence	X	X	X	X	X	X	X	X
prerequisite learning achieved	X		X	X	X	X	X	X
progresses from lower to higher								
adequacy of displays including								
text	X	X	X	X	X	X	X	X
listings of steps/procedures								
graphics		X			X			
icons								
adequacy of screen use								
amount of screen content	X	X	X	X	X	X	X	
scrolling capability								
paging capability	X	X	X	X	X	X	X	X
content structure capability								
other								
ELICITING PERFORMANCE								
use of prompts and cues	X	X	X	X	X	X	X	X
use of confirmation	X	X	X	X	X	X	X	X
use of reinforcement	X	X	X	X	X	X	X	X
other								
PROVIDING FEEDBACK								
use of mechanisms such as								
text	X	X	X	X	X	X	X	X
sound								
graphics								
personification								
other (specify)								
characteristics of feedback								
positive in nature							X	X
if error, level of				X			X	X
method of correction outlined								X
other (specify)								
appropriate to the user	X		X	X	X	X	X	X
appropriate response time	X	X	X	X	X	X	X	X
other								
MAINTAINING CONSISTENCY								
content level similar	X	X	X	X	X	X	X	X
lack of ambiguity	X			X	X	X	X	X
use of same keys	X	X	X	X	X	X	X	X
use of same commands	X	X	X	X	X	X	X	X
no unmeaningful use of displays	X	X	X	X	X	X	X	X

*1 = OPAC; 2 = OPAC; 3 = OPAC; 4 = CD-ROM; 5 = CD-ROM; 6-ROM with front-end software; 7 = library dbms; and 8 = library dbms.

	SOFTWARE EXAMPLES*							
	1	2	3	4	5	6	7	8
consistent frame protocols in								
input area	X	X	X	X		X	X	
menu area	X	X	X	X	X	X	X	
help area								
information area	X	X	X	X	X	X	X	
other								
RECOGNIZING INDIVIDUAL DIFFERENCES								
operates at different levels							X	X
operates at different rates								
use of individual styles such as								
high degree of redundancy	X						X	
different display formats		X					X	
different modes of interaction								
command driven								X
menu driven	X	X	X	X	X	X	X	X
device driven								
other (specify)								
fosters low anxiety levels thru								
menus	X	X	X	X	X	X	X	X
windows								
online tutorials								
help screens	X	X	X	X			X	X
online documentation								
simple, non-technical text	X				X	X	X	
straightforward data entry	X	X	X	X	X	X	X	X
limits of system stated								
easy to move thru system	X	X	X		X	X	X	
easy to extricate from system	X	X	X		X	X	X	
other (specify)								
other								
Help/Tutorial Functions								
PRESENTING THE CONTENT								
presented in logical sequence	X	X	X	X	X	X	X	X
prerequisite learning achieved								
progresses from lower to higher								
contains complete mix of behaviors								
adequacy of displays including								
text	X	X	X	X	X	X	X	X
listings of steps/procedures								X
graphics				X				
icons								
adequacy of screen use								
amount of content on screen	X	X	X	X	X	X	X	X
scrolling capability								
paging capability	X	X	X	X	X	X	X	X
content structure capability								
other								
ELICITING PERFORMANCE								
variety of behavior methods								
use of prompts and cues								

*1 = OPAC; 2 = OPAC; 3 = OPAC; 4 = CD-ROM; 5 = CD-ROM; 6-ROM with front-end software; 7 = library dbms; and 8 = library dbms.

	SOFTWARE EXAMPLES*							
	1	2	3	4	5	6	7	8
use of practice								
use of confirmation	X	X	X	X	X	X	X	X
use of reinforcement	X	X	X	X	X	X	X	X
other								
PROVIDING FEEDBACK								
use of mechanisms such as								
text	X	X	X	X	X	X	X	X
sound								
graphics					X			
personification								
other (specify)								
characteristics of feedback								
positive in nature								
if error, level of								
method of correction outlined								
other (specify)								
appropriate to the user	X	X	X	X	X	X	X	X
appropriate response time	X	X	X	X	X	X	X	X
other								
MAINTAINING CONSISTENCY								
content level similar	X	X	X	X	X	X	X	X
lack of ambiguity	X	X	X	X	X	X	X	X
use of same keys	X	X	X	X	X	X	X	X
use of same commands	X	X	X	X	X	X	X	X
no unmeaningful use of displays	X	X	X	X	X	X	X	X
consistent frame protocols in								
input area	X	X	X	X	X	X	X	
menu area	X	X	X	X	X	X	X	
help area								
information area	X	X	X	X	X	X	X	
other								
CONCLUDING EVENTS								
performance assessed								
review of content							X	
variety of practice								
similarity to real situations							X	X
other								

*1 = OPAC; 2 = OPAC; 3 = OPAC; 4 = CD-ROM; 5 = CD-ROM; 6-ROM with front-end software; 7 = library dbms; and 8 = library dbms.

A Database Management System for Interlibrary Loan

Amy Chang

In facing the growth of interlibrary loan requests; dealing with different libraries and policies; verifying obscure requests; meeting the individual's demand; and managing massive paper files, invoices, statistics, etc., the linterlibrary loan librarian's job is neither simple nor easy to accomplish. However, the database management system of Texas Tech University Libraries has offered a high-speed, easy-to-use computer system in controlling files, maintaining records, generating reports, and streamlining the work flow that enables the staff to be more productive.

As information becomes easier to access through information technology systems such as online databases and compact disc technology, the demand for acquiring information in libraries has grown dramatically. However, libraries cannot purchase, process, or store all materials. Therefore, interlibrary loan has become a pivotal point in meeting the demands of the library users.

In responding to the library user's expectation for faster service in ILL, locations for a book title or serial title can be searched on OCLC and large numbers of requests can be processed electronically throughout the nation using the OCLC Interlibrary Loan Subsystem. With the ILL subsystem, a work form appropriate to the searched bibliographic record can be pulled up on an OCLC terminal. When the work form displays on the screen, the OCLC number and author/title of the book or serial are also read from OCLC. The user needs only to enter the locations, citation of an article, name of the patron, and copyright information on the screen. The user can also enter any special message to the lender (such as rush, fax an article, etc.). As soon as the user completes the work form on the terminal, the request is ready to be sent to the assigned locations electronically.

The recipient has four working days to process a request. A maximum of five locations can be assigned for one request. If the assigned library cannot supply the material and answers "no" on the ILL system, the request automatically moves to the next location. If the recipient does not give an answer on the system within four days, the request will be transferred to the next location or returned to the sender with an "unfilled" answer. Such items as renewal requests, overdue notices, and shipping notices, can also be sent through the system.

Although the ILL system has shortened the hours or days in finding locations and processing requests, tasks for managing records to meet the demands for information in the ILL unit are still very labor-intensive. In many libraries, records and files are managed manually by cards and papers. For example, according to the Copyright Law, if the requested issue of a serial title has been published within five years of the date of the request (e.g., a serial issue published 1985 and request date of 1988), records must be maintained on the title of that serial with the request date, the issue of the serial, and number of times requested. Many hours can be spent in creating cards and maintaining files for the Copyright File before a request can be processed. Since the paper file can only be

Amy Chang is Coordinator of Interlibrary Loan, Texas Tech University Libraries, Lubbock, Texas.

indexed in a limited way (by author or by title), when the staff needs to retrieve records by name of the patron, ILL number, or an inadequate title entry from the paper file, the retrieving task can be very time-consuming and difficult. Generating reports, such as collection development wish lists from paper files, may not be possible. As files grow larger, staff spends hours in dealing with misfiled cards and duplicate cards. As a result, interlibrary loan has been faced with a massive records management dilemma.

In today's information world, the speed and efficiency of acquiring information are emphasized. The manual method of managing records can no longer satisfy users' demands for timely information. With automation applications having increased dramatically in the library, utilizing the microcomputer and software in managing records can keep all phases of service running at the same level of efficiency.

The system for computerizing ILL records at Texas Tech University Library was proposed by the staff in the spring of 1987. dBase III Plus was chosen for the project. After two years, the system has been enlarged several times. The massive paper files were converted onto a database management system that maintains data, generates reports, and retrieves records. The system has been useful not only in determining storage capacity and organizing and sorting data but also in generating useful reports and managing the daily paper flow (see "An Analysis of the System Performances").

DATABASE MANAGEMENT SYSTEM

The database itself can be regarded as a kind of electronic filing cabinet that collects computerized data files. Actually, a database management system is a computerized record-keeping system. It allows the user to maintain information and make information available. Included among the many tasks it performs are the following:

- adding new files to the database;
- inserting new data into the files;
- retrieving data from the files;
- updating data in the files; and
- generating reports.

There are several essential advantages in using such a system:

- It provides faster access for retrieving and updating records than tracking down the records from the paper files. Mechanical tasks for managing large files, such as updating files and organizing records, are always handled better by computer.
- Information becomes sharable when the system generates different reports from the database for different uses. This feature offers a different view of the database by user. For example, with the ILL Database the subject specialist can identify reports for collection development, the administrator receives statistics, and ILL staff use the database for retrieving records and managing files.
- The capacity for generating statistics allows users to form different statistical reports. For example, how many requests were received during a certain period of time? How many library users come from specific departments or what is their status? How many materials are borrowed or loaned from specific subject areas? The statistics provide administrators with information for determining how the service has been used.
- There is a large storage capacity for data. The size of storage depends upon the size of the hard disk.
- Structure of the database is flexible. That is, the user can create numbers of fields for the database—title, author, OCLC number, ILL number, patron's name, etc. With such database structure flexibilities, users are able

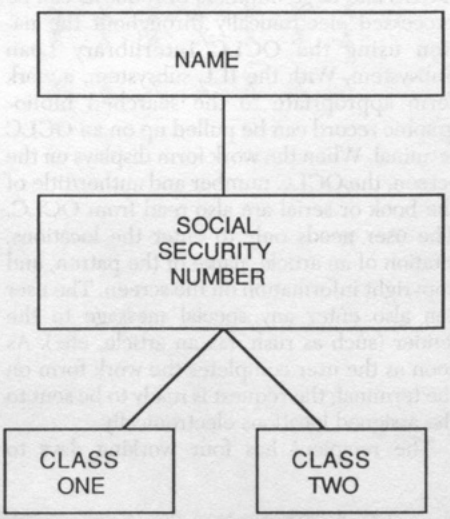


Figure 1. Hierarchical Data Model.

to index the data by any of the field names and organize the file based on the users' needs. There are three types of structures for database systems: the Hierarchical Model, the Network Model, and the Relational Model.

A Hierarchical Model is structured in an ordered set of trees. It consists of a single "root" together with an ordered set of subtrees and actually is a root/parent/child structure (see figure 1). With the parent/child relationship, the data structure diagram must form a tree. The direction of the functional arcs is always toward the tree and away from the root so that the system will automatically delete the entire tree as the parent of the database is deleted. That is the constraint of the hierarchical database structure. The Hierarchical Model is designed for complex data models.

The Network Data Model is an extended form of the hierarchical data structure. In network structure, a child record can have any number of parents. It is structured by the record type and the link. A record type in a data structure represents an entity type in the diagram. Links represent the relationship types and specify the connections between record types (see figure 2).

The Hierarchical and Network Models are structured for databases requiring large amounts of storage space and very fast computing speed. The Relational Data Model is based on relations and is represented as tables. It is laid out in rows and columns. The heading of each column describes the type of information in the column, and each row contains the information itself. The columns form fields and the rows make up records in the database. Such a database structure works well on a microcomputer. As an example, in figure 3, NAME is a field, and so are SOCIAL SECURITY, CLASS ONE, and CLASS TWO. Each row makes up one record, so that all the data for Smith forms one record. dBase is a relational database system.

To structure a database is to name fields, decide the size of each field, and specify whether the fields will be represented by numbers, dates, or characters. Once the structure is defined, fields are stored in the data directory. Then data can be input according to the field structure and stored in a file.

Normally, fields are determined by the kinds of reports needed by the users from the database and the options for retrieving a re-

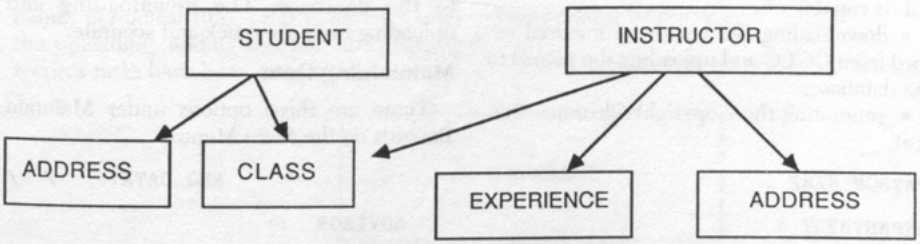


Figure 2. Network Data Model.

NAME	SOCIAL SECURITY NUMBER	CLASS ONE	CLASS TWO
SMITH	002-12-3456	ENGLISH	MATHEMATICS

Figure 3. Relational Data Model.

```
Structure for database: C:arrival.dbf
Number of data records:     715
Date of last update    : 02/06/90
Field  Field Name  Type       Width    Dec
    1  PATRON      Character     30
    2  DEPT        Character     25
    3  ADVISOR     Character     20
    4  ADRS1       Character     30
    5  ADRS2       Character     25
    6  BK_TITLE    Character    110
    7  P_TITLE     Character    110
    8  ART_TITLE   Character    110
    9  CITATION    Character     65
   10  ARR_DATE    Date           8
   11  DUE_DATE    Date           8
   12  SUPPLIER    Character     30
   13  OCLC        Character     12
   14  REQ_NUM     Character     12
   15  USTAT       Character     10
   16  CHARGE      Character     25
   17  VSOUR       Character     20
   18  CC          Character     10
   19  VERIF       Character      6
   20  REQ_DATE    Date           8
   21  REC_DATE    Date           8
   22  RET_DATE    Date           8
   23  CALL        Character      5
** Total **                     696
```

Figure 4. Structure for Database.

cord. All of these will be based on the data being collected. The structure for the ILL database system has 22 fields (see figure 4). dBase III Plus has a built-in feature called the screen painter, with which the user can create customized format screens for display. Fields can be placed anywhere on the screen (see figure 5).

THE FUNCTIONS OF THE SYSTEM

This Database Management System for ILL is capable of:

- downloading the borrowed material record from OCLC and uploading the record to the database;
- generating the Copyright Clearance Report;
- producing the notification letters to patrons; and
- generating Research Reports for patrons. As the user interacts with dBase III Plus, the system is capable of:
- producing the borrowing report for collection development;
- retrieving a record by ILL number, OCLC number, title, request date, or keyword of the title;
- compiling monthly and yearly statistical reports; and
- generating overdue reports.

With the application program interface capacity of dBase, several functions of the ILL database system were programmed to be "menu driven." The user needs only to press the function key and the computer will start to perform the specified task (see figure 6). Figure 7 shows the functioning of the system.

AN ANALYSIS OF SYSTEM PERFORMANCE

Unloading Data

When the materials are received, the staff can call up the records from the ILL subsystem to a floppy disk. Using the importing data and the downloading capacity of dBase, the staff can upload the data from the floppy disk to the database. The downloading and uploading tasks are quick and accurate.

Maintaining Data

There are three options under Maintain Records on the Main Menu:

```
PATRON NAME :                                    REQ_DATA:    /  /

DEPARTMENT :                              ADVISOR  :

NO. & STREE          :                           REC_DATE:    /  /

CITY, STATE & ZIP    :                           RETURNED:    /  /

BOOK AUTHOR/TITLE    :

PERIODICAL TITLE     :

ARTICLE AUTHOR/TITLE :

CITATION :
OCLC:                                CALL#:          ILL_NUM:
SUPPLIER:                                            VER SOURCE:

DUE DATE :    /  /    CHARGES  :                                  VERIF:

COPYRIGHT (REQ:ISSUE) :      :      ARRIVAL DATE :    /  /   STATUS :
```

Figure 5. Arrival Record Appending.

```
Copyright, 1987          Texas Tech Library                    MAIN MENU
                         Interlibrary Loan

        IHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH;
        :INTERLIBRARY LOAN DATABASE MANAGEMENT SYSTEM        :
        HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH<


                0 >  EXIT TO DOS

                1 >  UPLOAD RECORD

                2 >  MAINTAIN RECORDS

                3 >  NOTIFICATION LETTER

                4 >  GENERATE REPORTS/RESTORE

                5 >  BACKUP/RESTORE


                        Please Enter a Number
```

Figure 6. Main Menu.

1. Add New Records: allows the user to enter the record that was not processed through OCLC, such as material requested by mail and requests by telefax machine.
2. Modify Records: enables the user to call up the uploaded record by patron's name or the ILL number to make any necessary change to the record.
3. Reindex Records: allows the user to index the records in the database by patron's name, periodical title, or ILL number after the uploading, adding records, or modifying records tasks have been completed.

Notification Letters

As soon as the uploading, modification, or inputting task is completed, the system will be ready to generate the letters that notify patrons of the arrival of their materials. The name of the patron, department or home address, title of the material, and charges can be pulled up from the database once the record is uploaded (see figure 8).

Generating Reports

Three reports can be generated from the

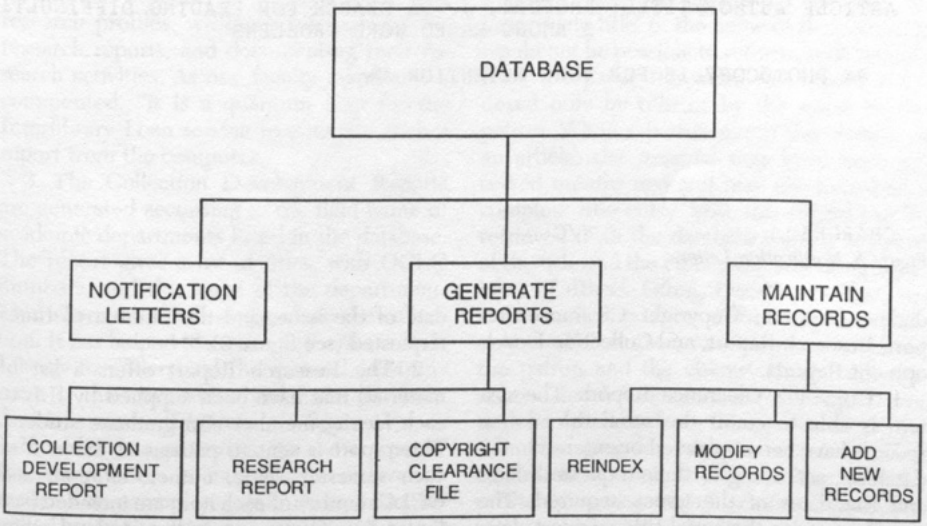


Figure 7. Functioning of the System.

```
INTERLIBRARY LOAN
TEXAS TECH UNIVERSITY LIBRARY
TEXAS TECH UNIVERSITY
LUBBOCK, TEXAS 79409-0002


          BAKER,
          SPECIAL EDU.
          ON CAMPUS


DATE:02/02/90

The Interlibrary Loan material which you ordered has arrived,
and is ready for you to pick up at **CIRCULATION DESK. Please
come to the library at your earliest convenience. THANK YOU.


PERIODICAL TITLE     : (P) JOURNAL FOR RESEARCH IN MATHEMATICS EDUCA
                       TION.

ARTICLE AUTHOR/TITLE: KNOFORG, J. "A SEARCH FOR READING DIFFICULTIE
                       S AMONG ERRED WORD PROBLEMS""

  ** PHOTOCOPY IS FOR YOUR RETENTION **


CHARGES              : N/C
```

Figure 8. Notification Letter.

database system; Copyright Clearance Report, Research Report, and Collection Development Reports.

1. Copyright Clearance Report: The system is able to count the serial titles when records have been uploaded or entered in the database, according to their requested dates and the dates of the issues acquired. The report provides the serial title, request date, date of the issue, and the number of times requested (see figure 9).

2. The Research Report offers a list of materials that have been supplied by ILL to each faculty member and graduate student. This report is sent to patrons at the end of each semester. Title, author, citation, and OCLC number of each item are included (see figure 10). These reports have helped many

PERIODICAL TITLE	COPYRIGHT	COUNT
(P) ACA BULLETIN.	1988:1985	4
(P) ACA BULLETIN.	1988:1984	1
(P) ACA BULLETIN.	1988:1985	3
(P) ACADEMIC THERAPY	1988:1985	1
(P) ACM SIGSMALL SYMPOSIUM ON SMALL SYSTEMS [PROCEEDINGS]	1988:1985	1
(P) ADVANCES : JOURNAL OF THE INSTITUTE FOR ADVANCEMENT	1988:1986	1
(P) ALCOHOLISM: CLINICAL AND EXPERIMENTAL RESEARCH	1988:1986	1
(P) AMERICAN INDIAN ART MAGAZINE	1988:1985	2
(P) AMERICAN SOCIETY OF ANIMAL SCIENCE, WESTERN SECTION MEETING	1988:1986	1
(P)ANNALS OF THE AMERICAN ACADEMY OF POLITICAL AND SOCIAL	1988:1984	1
(P) ANTIBIOTICS AND CHEMOTHERAPY	1988:1984	1
(P) APPETITE.	1988:1986	1
(P) ARCHAELOGY	1988:1987	4
(P) ARCHIV FUR GESCHICHTE DER PHILOSOPHIE	1988:1986	1
(P) ARCHIVES OF GENERAL PSYCHIATRY.	1988:1985	1
(P) BALLET REVIEW.	1988:1984	1
(P) BEHAVIORAL ASSESSMENT	1988:1988	1
(P) BEHAVIORAL ASSESSMENT	1988:1988	4
(P) BEHAVIORAL ASSESSMENT	1988:1987	1
(P) BRIMLEYANA	1988:1985	1
(P) BRITISH JOURNAL OF ADDICTION	1988:1986	1
(P) BRITISH JOURNAL OF SPORTS MEDICINE	1988:1987	1
(P) BULLETIN (NEW MEXICO STATE UNIVERSITY. AGRICULTURAL EX)	1988:1984	
(P) BULLETIN OF THE PSYCHONOMIC SOCIETY.	1988:1987	1
(P) CA MAGAZINE.	1988:1987	2
(P) CANADIAN JOURNAL OF PSYCHIATRY, REVUE CANADIENNE DE PSYC	1988:1986	1
(P) CANADIAN JOURNAL ON AGING = LA REVUE CANADIENNE DU VIEIL	1988:1985	1
(P) CANADIAN MINING JOURNAL.	1988:1986	1
(P) CANADIAN SYMPOSIUM ON CATALYSIS (9TH : 1984 : QUEBEC)	1988:1984	1
(P) CANCER LETTERS	1988:1984	1

Figure 9. Copyright Clearance Report.

faculty and students in building their own research profiles, writing a bibliography for research reports, and documenting their research activities. As one faculty member has commented, "it is a quantum leap for the Interlibrary Loan service to generate such a report from the computer."

3. The Collection Development Reports are generated according to the field name of academic departments listed in the database. The report gives a list of titles, with OCLC numbers, and the name of the department. This information reflects needs in the collection. It has helped librarians at the Texas Tech Library to understand the research environment of their institution and make purchase decisions more effectively (see figure 11).

In addition to generating the above reports, the system offers an easy way to retrieve records. For example, a full record can be pulled out of the database with the only information supplied being the ILL number, an incomplete title, or the name of the patron. It would not be possible to retrieve such records from the paper file when the record is indexed only by title or by the name of the patron. When a patron needs the citation of an article, the material may have been received months ago and may not have had a complete title entry. Still, this record can be retrieved from the database using a keyword of the title and the embedded searching capability of dBase. Often, Interlibrary Loan receives an invoice from a library that supplies only the ILL request number or the name of the patron and the charge. Using only this abbreviated information, the full record can then be called up from the database.

In managing records, this system offers a systematic method for controlling records, providing an easy way of locating information and organizing records. It has saved time in

```
                    TEXAS TECH UNIVERSITY LIBRARIES

                      INTERLIBRARY LOAN REPORT
                     ==========================

NAME : BHALERAO, M.
-------------------------------------------------------------------------------

PERIODICAL TITLE : (P) PROCEEDINGS /

ARTICLE TITLE    : THOMPSON, R. "SUPPRESSION OF MICROSTRUCTURAL INFLUENCES
                    ON THE ACOUSTIC MEASUREM
CITATION: VOL:        NO:              DATE: 1983          PAGES: 988-990
-------------------------------------------------------------------------------

PERIODICAL TITLE : (P) THE JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA.

ARTICLE TITLE    : PAO, Y. "ACUSTOELASTIC WAVES IN ORTHOTROPIC MEDIUM"

CITATION: VOL:        NO:              DATE: 1985          PAGES: 806-812
-------------------------------------------------------------------------------

PERIODICAL TITLE : (P) NONDESTRUCTIVE EVALUATION : APPLICATION TO MATERIAL
                   S PROCESSING : PROCEEDINGS OF A SYMPOSIUM
ARTICLE TITLE    : THOMPSON, R. "EFFECTS OF MICROSTRUCTURE ON MEASUREMENT
                   OF STRESS""
CITATION: VOL:        NO:              DATE: 1984          PAGES: 137-146
-------------------------------------------------------------------------------

PERIODICAL TITLE : (P) NONDESTRUCTIVE EVALUATION : APPLICATION TO MATERIAL
                   S PROCESSING : PROCEEDINGS OF A SYMPOSIUM
ARTICLE TITLE    :      "THOMPSON, R. "EFFECTS OF MICROSTRUCTURE ON MEASUR
                   EMENT OF STRESS""
CITATION: VOL:        NO:              DATE: 1984          PAGES: 137-146
-------------------------------------------------------------------------------

PERIODICAL TITLE : (P) NONDESTRUCTIVE EVALUATION : APPLICATION TO MATERIAL
                   S PROCESSING : PROCEEDINGS OF A SYMPOSIUM
ARTICLE TITLE    :      "THOMPSON, R. "EFFECTS OF MICROSTRUCTURE ON MEASUR
                   EMENT OF STRESS""
CITATION: VOL:        NO:              DATE: 1984          PAGES: 137-146
```

Figure 10. The Research Report.

```
Page No. 1
01/05/88
        SEMESTER REPORT TO LIAISON FROM INTERLIBRARY LOAN

OCLC #      TITLE                                          DEPT

8968609     (P) PROCEEDINGS 6TH INTERNATIONAL              COMPUTER
            CONFERENCE ON PATTERN RECOGNITION,             SCI
            OCTOBER 19-22, 1982, MUNICH, GERMANY

13861566    (B) NEW COMMUNICATION SERVICES:                COMPUTER
            A CHALLEGE TO COMPUTER TECHNOLOGY              SCI

1445487     (P) IBM SYSTEMS JOURNAL                        COMPUTER
                                                           SCI

1764613     (P) PROCEEDINGS OF THE ROYAL SOCIETY           COMPUTER
            OF LONDON                                      SCI

12625477    (P) ACM SIGSMALL SYMPOSIUM ON SMALL            COMPUTER
            SYSTEMS: (PROCEEDINGS)                         SCI

12418596    (B) THE LOCUS DISTRIBUTED SYSTEM               COMPUTER
             ARCHITECTURE                                  SCI

1519568     (P) PROCEEDINGS OF THE HUMAN FACTORS           COMPUTER
            SOCIETY ANNUAL MEETING.                        SCI

4353174     (P) STALLINGS,W. "COMPUTER                     COMPUTER
            ORGANIZATION AND ARCHITECTURE"                 SCI
```

Figure 11. The Collection Development Report.

indexing and maintaining records, saving space in storing records, and generating reports quickly and thoroughly.

CONCLUSION

Developing a database system requires some knowledge of microcomputers, data-

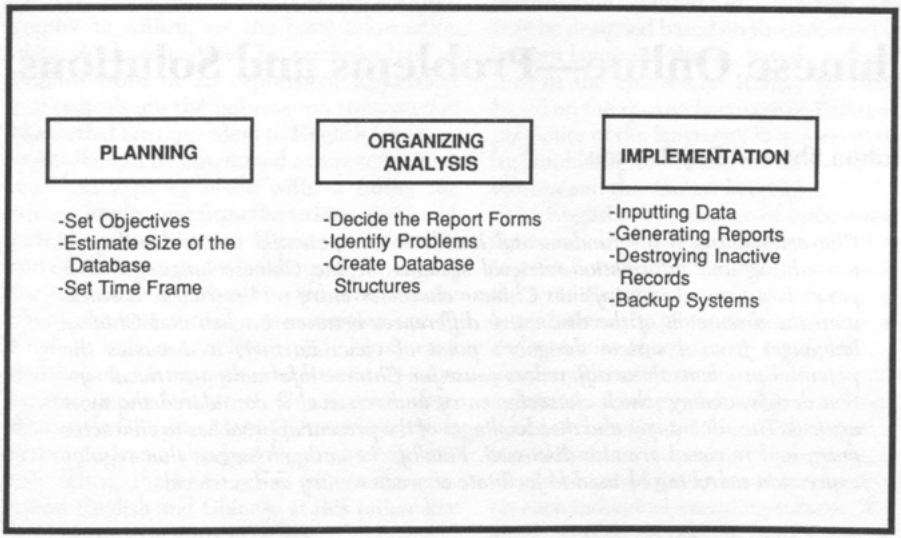


Figure 12. Routine Management of Records.

base structure, and the logic of a program. Since there are many database system packages on the market, one may not need to be involved in the tasks of programming or system design. The knowledge basic to understanding high technology is needed, however, when one is dealing with the problems in developing a database management system and in selecting an appropriate system for the operations. The skill in working with computers will assist the user in analyzing the advantages and disadvantages of a product, utilizing the product to its fullest potential capacities, and understanding the limitations of the system.

In general, a quality software product for a database management system should provide flexibilities that allow users to maintain data, generate reports, retrieve records under various conditions, and offer speed and accuracy in record keeping.

Computerizing a system requires planning, organization, analysis, and implementation. In the planning stage, one needs to set objectives, define the major activities of the system, estimate the size of the database, design a time frame for the project, and choose software. In the organizational and analysis stage, one needs to identify the task that originally slowed down the operation and determine the potential for expanding the use of the system in the future and in creating a data structure. It is also important to recognize and identify the users to be served and to decide what kind of information and reports need to be generated from the database. In the implementation stage, emphasis will be on the routine management of records, which includes collecting data, retrieving records, generating reports, and destroying inactive records (see figure 12).

In facing the growth of interlibrary loan requests, dealing with different libraries and policies, verifying obscure requests, meeting user demands, and managing the massive paper files, invoices, and statistics, the interlibrary loan librarian's job is neither simple nor easy to accomplish. However, the database management system developed at Texas Tech University Libraries offers a high-speed, easy-to-use computer system that controls files, maintains records, generates reports, and streamlines the work flow and thus enables the staff to be more productive. ■■

Chinese Online—Problems and Solutions

Yunhua Shi and Ray Larson

Character entry is the fundamental hurdle to the potential use and utility of text-editing and information-retrieval systems for the Chinese language. This paper is a general inquiry into Chinese character entry and retrieval. It starts with the discussion of the distinctive differences between English and Chinese languages from a system designer's point of view. Further, it discusses the potential problems these differences cause for Chinese information-retrieval system design, among which character entry and retrieval is considered the most critical. The advantages and disadvantages of the present approaches to character entry and retrieval are also discussed. Finally, the authors suggest that regular expression searching be used to facilitate character entry and retrieval.

In an industrialized information age, the availability of powerful computers enables us to operate upon and utilize the exponentially growing amount of public and private information in ways that were not previously possible. The major task of information system design is to utilize the capabilities of the computer to provide effective access to stored information as well as effective techniques to retrieve relevant information. Today many flexible techniques are available to access information stored in English and other Western languages. For these systems the critical issue lies in providing effective techniques to retrieve relevant or pertinent information to meet users' information needs.

In Chinese information retrieval, character entry and encoding is still the fundamental hurdle to computer processing of information. Character entry includes entering characters into the computer to create source files as well as entering characters as search keys to retrieve stored information. It is a critical problem not only because it governs the creation of a source file and the subsequent retrieval of information from the file but also because it is a fundamental component of the potential use and utility of a computer system. Whether a user is willing to use the system depends, to a large extent, on whether the system provides flexible character entry and access to the stored information.

This paper is a general inquiry into Chinese information retrieval systems design. It first discusses from the system designer's point of view three differences between Chinese and English languages: differences in the number, the order, and the size of the basic information symbols used when constructing the two languages. Because of these differences, two potential problems exist in Chinese information retrieval system design: problems in character storage and in character entry and retrieval. Character entry and retrieval was and still is the most critical problem worth our further investigation. This paper also discusses the advantages and disadvantages of the present approaches in character entry and retrieval. Finally it suggests the use of regular expression searching to facilitate character entry and retrieval.

DISTINCTIVE DIFFERENCES IN ENGLISH AND CHINESE INFORMATION RETRIEVAL

In English, words are the basic information units. Alphabetic letters are the information construction symbols. By arranging the alphabetic letters in different ways we obtain words, then sentences, text, etc. In Chinese,

Yunhua Shi is a doctoral student and Ray Larson is Assistant Professor, School of Library and Information Studies, University of California, Berkeley.

the square-shaped characters, which are ideographic in nature, are the basic information units. A character may be equivalent to an English word or an expression. Keystrokes and radicals are the information construction blocks that are equivalent to English letters. A keystroke can be envisioned as a pen stroke: a mark on a paper made without lifting the writing implement from the writing surface. A radical is a combination of pen strokes that in and of itself can imply meaning. By arranging the keystrokes or radicals in different ways we obtain characters, then sentences, text, etc. In English, only a few letters can be a word themselves; for example, the letter *a* or *I* can be an independent word. This is more often the case in Chinese. Many Chinese keystrokes and radicals can also be independent characters. Thus, there are some similarities between English and Chinese at this rather low level of construction.

However, in English information processing, as long as a word has been input according to a standard spelling, the user will have little difficulty retrieving the word and gaining access to information indexed under the word. But when processing information in Chinese, even if a user knows how to write and to pronounce a character, he or she may still have significant difficulties entering the character into a computer to build a source file or to create a search key to retrieve the information indexed under that character. In comparing English and Chinese information retrieval system design, we find three distinctive differences between the two languages of which a pure English or a pure Chinese speaker may not be aware. These differences pose potential problems for Chinese information retrieval system design, especially for character entry and retrieval.

First, in English, the total number of the basic information construction symbols we use to build the set of words is known. It is the twenty-six alphabetic letters. In Chinese, on the other hand, the total number of basic information symbols used to construct the character set is not known. It varies from several to hundreds depending on how one defines a character encoding scheme. A character encoding scheme is a methodology used to code the entire character set. It usually contains a set of basic construction symbols and a set of rules governing the use of the construction symbols. An encoding scheme may be designed based on the structure of the written language, that is, based on the structure of the characters. It may be designed based on the spoken language or based on the phonetics of the language. It may be designed by combining the characteristics of both the written and the spoken languages.

In English, the number of basic construction symbols we use to build individual words is predefined in the dictionary. For example, the word *English* is composed of seven alphabetic letters. In Chinese, though the shape and structure of a character is predefined, the number of construction symbols used to build a character is not predefined in the dictionary. When we design a Chinese information retrieval system, the number of symbols that should be used to encode a character depends on each individual encoding scheme. For example, certain encoding schemes may specify that the basic construction symbol set contains eight symbols. These eight symbols will be used to code the entire character set (somewhat like the twenty-six alphabetic symbols being used to encode the word set in English dictionary). However, certain encoding schemes may specify that the basic construction symbol set contains 150 symbols, and these 150 symbols will be used to code the entire character set. It is obvious that there is a proportional relationship between the number of basic construction symbols used to code the entire character set and the number of construction symbols used to code individual characters: the larger the number of basic construction symbols used to code the entire character set, the smaller the number of construction symbols needed to code individual characters. Consider, as illustration, if English letters were decomposed into a set of shapes, such as left-facing curves, right-facing curves, straight lines, and so on. The more shapes that are available in this basic construction set, the fewer of them will be needed to express one character—up to twenty-six shapes that can express each character individually. It is also obvious that if the number of basic construction symbols used to construct the entire character set is too large, the standard keyboard would not be big enough to hold these symbols.

A second difference in the two languages is in the order for writing the characters. In

English, the order of the letters used to build words, sentences, text, etc., is predefined. A word is constructed by putting together alphabetic letters from left to right according to the predefined symbol sequence in the dictionary. For example, to write the word *English*, we know that e should be followed by n, n should be followed by g, etc. By convention, a person writing the word *English* will write the characters in order from left to right. However, this is not the case with Chinese characters. The characters themselves evolved from pictographs and are roughly square in shape. There is no unique, predefined order for writing the characters. To write a character, one can start from left to right, then from top to bottom; or one can start with the outside structure and progress to the inside structure, or vice versa. No matter which way you proceed, you will still get the same character shape. Though characters are theoretically constructed from left to right, from top to bottom, and from outside to inside, under most situations ambiguity exists, especially when certain character components are embedded in others. In such circumstances, personal preference becomes a factor in deciding the writing order.

The third distinctive difference is that in English, for a given point size, the size of the twenty-six alphabetic letters is independent of the length of the words. For example, if we choose a font size of 12, then the letter *a* will be the same size whether it appears in *can* or in *character*. The size of an alphabetic letter will not be influenced by the length of the word that contains the letter or by the position of the letter in the word, with the obvious exception of the use of capital letters to signal proper names and the beginning of sentences. Because English words are written from left to right in linear fashion, they can extend in length without altering the size of the alphabets.

In Chinese, the situation is quite different. For a given font type, the size of the characters is fixed. As a result, the basic construction symbols that make up the characters have to alter their size in order to fit into specific characters. To understand this, one can imagine the situation that the words *a*, *can*, *and character* are the same size. When the alphabetic character "a" is used as an independent word *a*, then its size would be the same as the size of the entire words *can* or *character*. When "a" is in word *can*, then it would be one-third of the size of word *a*, and in the word *character* it would be one-ninth of the size of the word *a*. This has the greatest impact on the requirements for displaying the characters. They cannot be simply composed by combining the basic symbols (as English words are composed by stringing together the individual alphabetic characters), but instead each character must be stored in its full graphic form. Because of the uncertainty and ambiguity of the number, the order, and the size of the basic symbols used to construct individual characters, character storage, entry, and retrieval present special difficulties in Chinese information retrieval system design.

POTENTIAL PROBLEMS IN CHINESE INFORMATION RETRIEVAL SYSTEM DESIGN

Because of the problems discussed above, developing techniques for character storage, entry, and retrieval is clearly not a simple process in Chinese information retrieval system design. In this section, we will discuss how the characters are stored in the computer, how they are retrieved, and what the potential problems are.

Character Storage

First, because the total number of construction symbols used to construct the character set, the number of symbols used to construct each character, and the size of the symbols are not certain, it is difficult to determine how many and what size of the symbols should be stored in the computer. It is estimated that in Chinese there are about 4,000 frequently used characters and 3,000 commonly used characters, which cover over 99 percent of the daily oral and written communication needs.[1,2] As a result, besides some basic symbols, thousands of characters are stored in the computer with each character having a unique internal code and a graphic presentation. In most Chinese information systems, about 16,000 characters are stored. The system also must be expandable to accommodate characters encountered that are not yet stored in the computer (another problem not faced by English-language systems). It is estimated that there are about 60,000 characters in the Chinese vocabulary.

The binary internal code table for Chinese characters is analogous to the ASCII value table. In the ASCII code set, there are 128 alphabetic letters, digits, and special symbols. The code set is coded with seven bits (2^7 = 128). There is also an extended eight-bit binary code set, with 256 (2^8 = 256) alphabetic letters, digits, and special symbols, which includes most common diacritical marks used in European languages.

However, Chinese far exceeds the capacity of a single byte. ISO standards 646 and 2022 provide specifications for encoding each Chinese character in two bytes. The bit group from 0100001 to 1111110 make a total of 94 codes. With two seven-bit bytes, 94 × 94 codes can be generated, which can accommodate about 8,000 unique character codes. In common practice, if a system uses 8,000–32,000 characters, eight-bit coding will be used for its internal processing. This is done by adding one more bit at the left-most side of each of the two seven-bit bytes. When the number of characters in the code set exceeds 32,000, a three-byte code may be used for information processing.

The characters are stored in the computer as a character dictionary. Each dictionary entry is a record that contains many fields, for example, for internal code number, for input symbol sequences, and for character variations. Usually, besides the character dictionary, character graphics are also prestored in bit-matrix forms of various sizes (16 × 24, 24 × 24, 24 × 32, 32 × 32, 32 × 48, etc.). Thus, a large amount of storage may be required just to hold the character dictionary and graphics. For example, a character of size 24 × 24 would take 72 bytes of storage. To store 16,000 character graphics of one font type and of size 24 × 24 would require 1.2MB of storage. If a Chinese information-retrieval system needs to provide character fonts of different styles and sizes, the storage required can be enormous. Considerable research has been carried out to reduce font storage by image compression, by butting the basic character construction symbols (radicals and keystrokes) together to form a character, or by enlarging and smoothing from prestored smaller-sized characters.[3] A potential method for handling various sizes of character graphics would be to adopt the sort of specialized character shape encoding used in Adobe PostScript fonts, or in Knuth's METAFONT,[4] where each character definition is essentially a program that describes how to draw the character, adjusting automatically for different sizes.

Character Input

Due to the fact that tens of thousand of characters are stored in the computer, and because the number, the order, and the size of character construction symbols are uncertain, it is difficult to establish a direct link between the information construction symbols located on the keyboard and the characters stored in the computer. Methodologies are needed for entering characters into and retrieving characters from the computer. Technologies such as optical character recognition and voice recognition are not yet ready for application in Chinese information-retrieval system design.

Character entry and retrieval is mainly fulfilled through input codes, which serve as a connection between the information symbols on the keyboard and the internal code of a character. For each character, we have two types of codes: internal machine code and input code. Each character has one and only one internal code, which uniquely identifies that character. However, a character will usually have more than one input code. Input codes are designed based on character-encoding schemes. As we have discussed before, a character-encoding scheme is a methodology designed by individuals to code a character set. It usually specifies a set of basic construction symbols and a set of rules governing the use of the basic symbols. It is created after a careful study of the characteristics of written language—the characters—and of the spoken language—phonetic scripts. At present, more than 500 encoding schemes have been designed, each with its advantages and disadvantages. Based on an given encoding scheme, a set of input codes will be created with each character having one or more input codes to identify a unique character code.

Input codes are stored for the convenience of character entry. The more input code sets a system provides, the more access points the user will have to a particular character. In this sense, Chinese input code sets to a character dictionary are similar to author, title, and key-

word indexes to a bibliographic record. An input code will be stored as a field in the corresponding character dictionary record. In Chinese information-retrieval systems, usually several or dozens of popular input code sets are stored. The more input code sets a system provides, the more access points the user will have to records stored in the system.

A typical scenario for Chinese character input involves four steps. First, the user presses a function key (or key combinations depending on system specification) to inform the computer system what kind of input encoding scheme he is going to follow. The computer system then knows which input code set to search. Second, he types in a sequence of symbols in the form of radicals, keystrokes, phonetic symbols, or digits, depending on the encoding rules specified in the corresponding input encoding scheme. Third, the computer compares the input symbol sequence with the corresponding input code set stored in the character dictionary. If it finds a match, it traces the internal code to the graphics and displays the graphics on the screen or sends the graphics to the printer. Fourth, if more than one match is found, the computer displays one screenful of the matched characters after another according to the usage frequency of the characters. This means that the most frequently used characters will be displayed first. If no match is found, then the computer sends a message to the screen to inform the user of the failure of the search.

Problems with Input Codes

Inputting characters via input codes is not an easy task because there is neither a universally accepted or recognized input code for each character nor a set of universally accepted or recognized rules for generating input code for the characters. System designers have their own conceptual models about how the characters should be stored and coded. Users, meanwhile, have their own mental models about how the characters might be stored and coded, and these will often differ from one individual to the next. Since the characters are stored according to the system designer's conceptual model of character encoding, if the user's mental model does not match the system designer's conceptual model, then the characters will not be easily accessible to the user. To match his mental model with the system designer's conceptual model, the user has either to memorize the character input code set defined by the system designer or be familiar with the encoding rules stipulated by the system designer. Even for a frequent user of the system, this is not likely to be an easy task.

If character encoding is based on written Chinese, that is, based on the composition and decomposition of the characters, then uncertainty is involved in composing and decomposing characters. Based on character shape, various codes can be created. If we consider encoding the whole character set, permitting any component combinations, then the number of possible combinations is astronomical. As a result, a set of rules has been worked out for each encoding method. The rules are, in fact, an attempt to limit all these encoding possibilities to only one possibility. However, because the rules are imposed by the system designer, the user has to memorize either the code set or the set of encoding rules to make character entry successful. In order to avoid the difficulties of character decomposition, some researchers resort to Chinese spoken language as the basis for character encoding.

Chinese spoken language also presents a number of problems for character entry and retrieval. Linguists consider that there are eight distinct dialect groups. Within each dialect group, there are dozens of subdialects, most of which are mutually unintelligible to their speakers.[5] In order to facilitate oral and written communication among Chinese people speaking different dialects, and with the outside world, three notable phonetic scripts were created for written Chinese: Wade-Giles, Zhuyinfuhao, and Pinyin.

Phonetic spelling was first introduced in China by two groups of Westerners: missionaries and diplomats. Following the Opium War in the mid-nineteenth century, missionaries arrived in China in great numbers. To facilitate communication with the Chinese and to promote Bible reading, they romanized the major dialects and published Bibles in romanized translations. Western diplomats communicated with Chinese through a different approach. The most notable effort was made by Thomas F. Wade, Secretary of the British Consulate in Peking (Beijing). The

transliteration worked out for his Mandarin Language Reader, published in 1867, was later modified by H. A. Giles for his Chinese-English Dictionary published in 1912.[6] The Wade-Giles phonetic system is still in use in Taiwan and Hong Kong and among Chinese in Western countries.

The two other phonetic scripts, Zhuyinfuhao and Pinyin, were devised by Chinese for Chinese. Zhuyinfuhao phonetic script was devised in 1918 by the government of the Republic of China after the overthrow of the Qing Dynasty. The Pinyin phonetic script was created following the establishment of the People's Republic of China in 1949. It was designed to phoneticize the northern dialect in order to provide a standard dialect (Putonghua) throughout the country.

The primary difficulty when entering Chinese characters by phonetic scripts is the existence of homonyms, or characters that are pronounced alike but are different in meaning and structure. In Chinese phonetic scripts, whether in Wade-Giles, Pinyin, or Zhuyinfuhao, there are only a limited number of possible and meaningful vowel or consonant-vowel combinations. For example, in Pinyin, there are only 415 vowel or consonant-vowel combinations which can be used independently representing character pronunciations. Four tones are specified in order to distinguish characters that have the same consonant-vowel combination but different meaning and structure. They are level tone, rising tone, falling-rising tone, and falling tone. Adding four tones, we still have only 1,660 (415 × 4) distinguishable vowel and consonant-vowel combinations. These 1,660 phonetic strings are used to represent tens of thousands of characters. As a result, almost all the characters have homonyms; some have dozens, a few have more than a hundred. In a pure phonetic input system, the user has to choose the character he wants from some set of retrieved homonymous characters. This becomes a slow and tedious process if it has to be done for each character input. Homonyms are not the only problem with phonetic encoding. As we mentioned before, it is estimated that there are about 60,000 characters in the Chinese vocabulary, but only 4,000–7,000 are frequently used. People may not even know how to pronounce the infrequently used characters, so there is no way for them to access these characters by phonetic scripts. Naturally, people who do not know standard phonetic scripts may not even be able to enter the frequently used characters.

APPROACHES TO CHARACTER ENCODING

For decades computer scientists, electronic engineers, linguists, information scientists, and others have been working to provide solutions to the problems of Chinese character entry in order to facilitate Chinese text editing and information retrieval. Many approaches have been proposed. These approaches can be classified into three categories.

Technological Approach

The technological approach includes two aspects—optical character recognition and voice recognition. Optical character recognition converts typewritten materials, handprinted characters, and typeset materials into a form for computer processing by measuring the differences in reflectivity between ink and paper and then using this information to identify a character through one of the two methods: matrix matching and feature analysis. In optical character recognition, the input pattern is separated into single characters in the preprocessing process. Each character pattern is then converted and digitized into a two-dimensional image. This two-dimensional dot-matrix information is then compared to a set of prestored features of Chinese characters. Statistical and syntactic methods are used to decide the best matched character. In online printed character recognition, the input character images are in standard format; it is not difficult to compare the input characters to the prestored features of characters of the same format. Therefore, the recognition error rate is low. In online handwritten character recognition, the keystroke position, direction, and length are captured while a keystroke is drawn. As a result, the recognition task becomes easier. The printed-character recognition and online handwritten-character recognition technologies are already available in the market. However, offline handwritten-character recognition is still a difficult task, because each user can write the same character in a different format, while in the computer, usually only one dot-matrix format is stored. Thus, it is very diffi-

cult for the computer to find a correct character image and the recognition error is high. Technology for off-line character recognition is not yet in practical use.[7-10]

Voice recognition technology compares the acoustical signals of a human speaking with signals stored in the computer. In voice recognition, the trouble is how to distinguish homonymous characters, that is, how to distinguish characters with similar sound and characters that are pronounced with accents. While the technology of character isolation is helpful in the recognition task, it is not sufficient. Syntactic and semantic analysis also need to be applied. Moreover, Chinese syntax and semantics are quite complex even when considering a limited application area. In general, there is still a long way to go before we can apply optical character recognition and voice recognition techniques to text editing and to information retrieval.[11-13]

Linguistic Approach

The linguistic approach involves the study of the syntactic structure of the Chinese language and the meaning of the characters. This approach tries to facilitate character entry and retrieval by diagnosing the syntactic and semantic structure of an input string and comparing it to the syntactic and semantic information stored in the computer. Jiang has discussed a system for parsing Chinese.[14] Some Chinese text-editing and information-retrieval systems use character pairing technique to facilitate character entry. Characters stored in the computer are paired into expressions or phrases. An input string is reorganized (by the user or by the computer) into pairs before searching. According to King, "in speech and writing these pairings eliminate about 95% of the ambiguities created by ambiguously identified syllables." [15] Paired character entry is mainly used to eliminate homonymous characters in phonetic scripts input.[16] The trade-off is that the paired character phrases or expressions must be prestored in the computer.

Character Structure and Pronunciation Analysis

Character structure and pronunciation analysis is the third approach to character entry and is the most common approach among the three. The research has examined a wide range of topics such as the character structure, character formation, character composition and decomposition, character entropy inferences (the amount of information each character contains), pictophonetics, dialects, character sounds, and phonetic scripts.[17-20] More than 500 Chinese character input and encoding schemes have been proposed based on character structure and pronunciation analysis.[21] These input and encoding schemes can be classified into five categories: (1) large keyboard input, (2) keystroke and radical input, (3) phonetic script input, (4) character shape and pronunciation input, and (5) digital input.

In a large keyboard input system, thousands of characters are placed on the keyboard. Depressing a key or selecting with a light pen would input the character indicated on the key or shown on the screen. This method is very intuitive. The user can see the character image on the keyboard. It requires no mental effort to decompose a character. The user does not have to learn or memorize the character encoding and decomposing rules required for medium-sized or small (standard) keyboard systems. It does not require knowledge of phonetics. People who do not speak a standard vernacular can use this encoding scheme. Input error rates are low since the user only needs to press one key to enter a character. However, the input speed is slow, the equipment is clumsy, and the cost is high. Even though the keyboard is large, the number of characters that can be placed on the keyboard is still limited. For this reason, the number of characters is expandable by inputting character codes to the computer when the character image is not located on the keyboard. To facilitate finding the characters, they are arranged on the keyboard by radical and keystroke count or by usage frequency. Still, only well-trained operators who are familiar with the input encoding method and positional strategies can use the system. It is not easy for casual users to operate. Large keyboard systems were once very popular in Japan in the late 1970s and in the early 1980s in office automation. At the Tokyo Data Show in 1978, nearly all office computers used large keyboards. But by the 1984 Tokyo Show, there had been a rapid shift to small keyboard systems.[22] In keystroke and radical input, all the characters are decomposed into radicals,

or keystrokes. Input can be performed using a medium-sized or a standard keyboard. The user is required to decompose the character by following a set of encoding rules. Input speed depends primarily on the user's familiarity with the encoding rules. If the input is done by decomposing characters into keystrokes, then the codes may be long for characters with complex shapes. Many of the most common encoding schemes belong to this category.

In phonetic script input, no character decomposition is necessary. The user does not have to memorize any character encoding rules, but as previously mentioned, phonetic script input also has two obvious problems. First, in each of the Chinese phonetic schemes, whether Pinyin, Wade-Giles, or Zhuyinfuhao, there are limited distinctive phonetic combinations. Each phonetic combination thus will correspond to several or dozens or even hundreds of characters. A way is needed to control the homonyms. Second, people who do not know the phonetic scheme cannot use it. Those who do not know the phonetic scheme very well may find it inconvenient. In addition, there are a large number of characters that people may not even know how to pronounce (a university student, for instance, can only pronounce correctly about 4,000–7,000 characters), so people are unable to input these characters by phonetic script. Nevertheless, Pinyin is the most popular among phonetic script input schemes.

In character shape and pronunciation input, a standard keyboard is usually used. An encoding scheme of this kind combines the advantages of the keystroke and radical input with the advantages of phonetic script input, yet it also retains their disadvantages. In other words, it requires knowledge of phonetic scripts, but not as much as in a pure phonetic script input; it requires mental effort to decompose the character, but to a lesser extent.

The obvious advantage of digital input (i.e., using a numeric code to represent each character) is that the keyboard is small and portable. The equipment is relatively cheap. However, the codes are difficult to remember; the numbers used to encode characters have nothing to do with the meaning, shape, or pronunciation of the character; and there are no mnemonic schemes for memorizing them.

In general, among the three approaches to character entry, the technical approach and the linguistic approach are either at an experimental stage or have limited application. The third approach—character structure and pronunciation analysis—has therefore become the popular approach for character entry and retrieval. Each of the five types of input encoding schemes has its advantages and disadvantages, and no single input encoding scheme can satisfactorily solve all Chinese character entry problem. Therefore, other methodologies are clearly necessary in order to improve the process. One such technique with potential utility is regular expression searching.

FACILITATING CHINESE CHARACTER ENTRY AND RETRIEVAL THROUGH REGULAR EXPRESSION SEARCHING

In this section we propose to use regular expression searching to facilitate Chinese character entry and retrieval. Regular expressions are first used for describing tokens in compiler writing because they can be converted conveniently into finite automata.[23] Several languages use regular expressions to describe patterns. For example, in LEX, patterns are specified by regular expressions, and a compiler for LEX can generate an efficient finite automation recognizer for the regular expressions. The pattern-scanning language AWK uses regular expressions to process input line, and the UNIX system shell also allows a user to write regular expressions.[24,25] Because of its convenience for pattern matching, regular expressions are widely used in Western-language text editing and information retrieval.[26-28] A regular expression in text editing and information retrieval is defined as a pattern to be used when searching a source file. It is composed of a mixture of symbols and metasymbols. The symbols match exactly the same symbols in the source file; metasymbols, on the other hand, have special meanings, which are specified by the system designers and which can represent a range of symbols. An example is the use of regular expressions in command languages created by database vendors for flexible searching of the files they make available. Typically, there is a metasymbol specified to represent truncation, so that a search query containing a word ending in the truncation symbol will retrieve

all words that match the root. Another typical use is a metasymbol (sometimes called a "wild card") that can be mapped to any alphabetic character or set of characters. This can enable a searcher to input a word such as *color* and replace the second "o" with a metasymbol in order to retrieve variant spellings of the word *color* as well as *colour*.

In English information retrieval and text editing, regular expression searching and metasymbols are frequently used to save typing and memorization effort or to broaden a search. In Chinese text editing and information retrieval, regular expression searching has the advantages of saving searchers' time and mental effort and reducing mental model mismatch errors. The user can use metasymbols to represent those characters or components of characters that are difficult to define and difficult to decompose, and type in the characters or the part of the characters that are easy to define and easy to decompose. By applying metasymbols in the regular expression, the user can avoid some errors caused by typing in a wrong symbol sequence. This is a benefit especially attributed to Chinese text editing and information retrieval. Suppose a user wants to search for a character by following the rules of an encoding scheme that is based on character component decomposition. He can decide the first component and the last component of the character. If he is unsure as to the component(s) for the middle part of the character, a metasymbol representing the middle part of the character can be used. If a user wants to input an expression that contains four characters and is not sure how to decompose the second and the fourth character, he can simply represent the second and the fourth characters by two metasymbols.

Regular expressions vary from one user to another depending on individual information-seeking behavior. A user's information-seeking behavior may be influenced by his goal in searching, knowledge about the character input schemes, experience with computers, familiarity with command language, and the time he is willing to spend searching or editing. On the other hand, regular expressions allowed by the system will also vary from one system to another depending on the system hardware and software facilities. In addition, the metasymbols used and the meaning of the metasymbols vary from one system to another depending on the system's functional specifications. To facilitate Chinese character entry and retrieval, at least four types of metasymbols can be employed:

1. a metasymbol representing one character symbol;
2. a metasymbol representing one or more character symbols;
3. a metasymbol representing one character; and
4. a metasymbol representing one or more characters.

If we call the four types of metasymbols as metasymbols of types A, B, C, and D respectively, then it is obvious that metasymbols of types A and B are used to retrieve individual characters; metasymbols of types C and D and the combinational use of metasymbols of types A, B, C, and D are for retrieving character strings. A character string is a pattern containing more than one character. A regular expression submitted by a user may contain no metasymbols or it may contain one or more metasymbols of one or more types. The metasymbols can be applied in any position in the regular expression.

Regular expression searching has the potential of becoming a useful tool in Chinese text editing and information retrieval. However, the side effect of regular expression searching is the retrieval of noisy information. Noisy information is defined as the information (characters or character strings) retrieved that matches the regular expression but is not relevant or appropriate to the user's information need. In English information retrieval, users frequently use metasymbols in the regular expression to broaden a search. In this case, the user wants to obtain certain amount of noisy information. This is because in English information retrieval, metasymbols are employed after the word stem to retrieve words that are of the same word stem. Words with the same word stem usually have some internal relationships. But this is not true for Chinese. Noisy information (especially noisy characters) retrieved by metasymbols is usually not useful or desired by the user. Though some characters use the same radical as their major component, these characters still do not have meaningful internal relationships.

In Chinese information retrieval and text editing, noisy information in the form of noisy

characters will be retrieved if the regular expression containing metasymbols is mapped to source files of characters, such as a Chinese character dictionary. Noisy information in the form of noisy character strings will be retrieved if the regular expression is mapped to source files of character strings, such as a title index, a thesaurus, an author index, etc. Therefore, in regular expression, we need to design methodologies to control noisy information and find the regular expressions that provide the best performance. However, noisy information control is not the topic of this paper.

ACKNOWLEDGEMENTS

Special thanks should be given to Professor Michael Cooper, who has constantly provided us with insightful advice and support. We should also thank Dr. Wellington Yu, chairman of the Chinese Language Computer Society, for providing us with the most recent information concerning computer processing of Chinese and oriental languages.

REFERENCES AND NOTES

1. Yaoxing Chen, "The China National Standard Chinese Character Code for Information Interchange and a Code for International Use," *International Cooperation in Chinese Bibliographical Automation, Canberra, Australia, Aug. 29–Sept. 1, 1982.*
2. Yongquan Liu, "Aspects of Chinese Information Processing," International Cooperation in Chinese Bibliographical Automation, Canberra, Australia, Aug. 29–Sept. 1, 1982.
3. Willington C. P. Yu, "A Historical Advancement of the Chinese Language Computing," in *Proceedings of 1988 International Conference on Computer Processing of Chinese and Oriental Languages, Toronto, Canada, Aug. 29–Sept. 1, 1988.*
4. Donald E. Knuth, *Computer Modern Typefaces* (Reading, Mass.: Addison-Wesley, 1986).
5. Peter J. Seybolt and Gregory Kuei-ke Chiang, eds., *Language Reform in China: Documents and Commentary.* Dauson: Sharpe, 1979.
6. Ibid.
7. Guo-wei Cei and others, "A Microcomputer-based Printed Chinese Character Recognition System," in *Proceedings of 1988 International Conference on Computer Processing of Chinese and Oriental Languages,* Toronto, Canada, Aug. 29–Sept. 1, 1988.
8. Shunji Mori, "Research on Machine Recognition of Handprinted Characters," *Computer Processing of Chinese & Oriental Languages* 1, no.1:24–39 (1983).
9. Tie-Cheng Yu, "Voice Input to Computers," *Computer Processing of Chinese & Oriental Languages* 1, no.2:104–115 (1983).
10. Huada Electronic Company Ltd., *Chinese Character Input Methods* (unpublished).
11. Ibid.
12. Yu, "A Historical Advancement of the Chinese Language Computing."
13. Yu, "Voice Input to Computers."
14. Yiping Jiang, "Chinese Parsing: An Initial Exploration at LRC," *Computer Processing of Chinese & Oriental Languages* 2, no.2:127–38 (1985).
15. P. L. King, "Human Factors and Linguistics: Key to High-Speed Chinese Data Entry," *Computer Processing of Chinese & Oriental Languages* 1, no.2:116–23 (1983).
16. Keh-Jian Chen and Chuan-Shu Cha,"The Design of a Conceptual Structure and Its Relation to the Parsing of Chinese Sentences," *Proceedings of 1988 International Conference on Computer Processing of Chinese and Oriental Languages,* Toronto, Canada, Aug. 29–Sept. 1, 1988.
17. Jiang, "Chinese Parsing."
18. C. K. Chen and R. W. Gong, "Evaluation of Chinese Input Methods," *Computer Processing of Chinese & Oriental Languages* 1, no.2:236–47 (1983).
19. Wei Cui, "Evaluation of Chinese Character Keyboards," *Computer* [IEEE Computer Society] 18, no.1:54–59 (1985).
20. Willington C. P. Yu and R. J. Evey, "An Easily Learned Input System for Chinese Characters," in *Proceedings of 1986 International Conference on Chinese Computing, Singapore, Aug. 20–22, 1986.* Singapore: National University of Singapore, 1986.
21. Yongquan Liu, "Some New Advances in Computers and Natural Language Processing," in *Proceedings of 1986 International Conference on Chinese Computing, Singapore, Aug. 20–22, 1986.* Singapore: National University of Singapore, 1986.
22. Joseph D. Becker, "Typing Chinese, Japanese, and Korean," *Computer* [IEEE Computer Society] 18, no.1:19–26 (1985).
23. Alfred V. Aho and others, *Compilers: Principles, Techniques, and Tools* (Reading, Mass.: Addison-Wesley, 1986).
24. Alfred V. Aho and Jeffrey D. Ullman, *Principles of Compiler Design* (Reading, Mass.: Ad-

dison-Wesley, 1979).
25. Brian W. Kernighan and Rob Pike, *The UNIX Programming Environment* (Englewood Cliffs, N.J.: Prentice-Hall, 1984).
26. Alfred V. Aho and J. M. Corasick, "Efficient String Matching: An Aid to Bibliographic Search," in *Communication of the ACM* 18, no.6:333–40 (1975).
27. D. Julian and M. Davies, "String Searching in Text Editors," in *Software—Practice and Experience* 12:709–717 (1982).
28. Williams S. Page, "The Design of an SDI Module for the MINISIS Database System," in *The Application of Mini-and Micro-Computers in Information, Documentation and Libraries*, C. Keren and L. Perlmutter, eds. (Tel Aviv, Israel: 1983). ■■

Special Section: Format Integration

Editor's note: These papers are based on presentations made at a MARBI program on format integration presented at the 1989 ALA Annual Conference in Dallas, Texas.

Format Integration: Handling the Additions and Subtractions

Sally H. McCallum

When discussion of integration of the seven USMARC bibliographic formats began in the early 1980s, the following statement of the goal for that process was adopted by the ALA Machine-Readable Bibliographic Information Committee (MARBI)[1]: "The USMARC bibliographic formats are considered a single integrated format. Content designation defined therein is valid in any record in which it is appropriate." This statement served as the target for the additions and subtractions that constitute format integration.

Prior to 1980, the USMARC bibliographic format specifications were defined and published as separate format documents for books, serials, etc., and updates were distributed for each separate format when required. In 1980 the bibliographic formats were combined into one looseleaf document titled *MARC Format for Bibliographic Data (MFBD)* with looseleaf updates. The separate formats thus became "specifications" for each basic form of material. The current names for the seven component specifications are: Books (BK), Serials (SE), Archival and Manuscripts Control (AM), Computer Files (CF), Maps (MP), Music (MU), and Visual Materials (VM). The specifications were still distinct in the document, however, as a "validity designation" for each element and value was given (see figure 1). In 1987 a new edition of the combined looseleaf document was issued under the slightly adjusted title *USMARC Format for Bibliographic Data*.

Even with the integration of the documentation, the practice remained of considering each addition to the format against each form of material separately. So ingrained was this way of considering changes that at the same MARBI meeting in which the above definition of format integration was finalized, the USMARC advisory group also discussed whether some coded values that were being defined for the Music specification should be valid only for the sound recordings part of that specification. This, of course, resulted from the fact that while sound recordings and printed music have always been integrated in USMARC, some implementations have separated them in their local systems.

Thus the several-year process of integrating the formats has helped to reorient all USMARC users toward viewing USMARC bibliographic content designation as global and not linked to specific form-of-material specifications.[2]

FORMAT INTEGRATION GUIDELINES

When the format integration process began, it was immediately realized that this was not simply a matter of filling in all the blanks on the format validity charts for all elements. Doing so would have meant, in some instances:

- several elements defined for the same information,
- useless elements defined for all forms of material that had once been defined (uselessly) for only one, or
- content designation with two definitions.

Therefore, in addition to the basic goal to make all content designation valid for all forms of material throughout the format, two supporting goals were adopted:

- weed out useless elements rather than propagate them to additional forms of material, and

Sally H. McCallum is Chief, Network Development, MARC Standards Office, Library of Congress.

Content Designators		Form-of-Material Validity
521	TARGET AUDIENCE NOTE	SE AM CF VM
	Indicator 1 - Display constant controller	SE AM CF VM
	♭ - No information provided	SE AM CF VM
	8 - No display constant generated	SE AM CF VM
	Indicator 2 - Undefined	SE AM CF VM
	ǂa Target audience note	SE AM CF VM
	ǂ3 Materials specified	AM VM
	ǂ6 Linkage	SE AM CF VM

Figure 1. Field before Integration.

- settle any resulting conflicts.

Because of this, format integration did not just result in extending the validity of elements, but it also deleted, made obsolete, and added elements. The following sections describe each of these types of changes and give descriptions, statistics, and examples of the changes in each category.

TYPES OF CHANGES

Extensions

The majority of the changes are the extensions. Extension means taking every content designator in USMARC—field, indicator, subfield, value—and making it valid for all of the seven basic forms of material covered in the bibliographic format. As an example, figure 2 shows the 521 field from figure 1 *after* format integration. Before integration, the field as a whole was only defined for serial, archival/manuscript, computer file, and visual material items. One of the subfields was even more restricted. Subfield 3 was defined only for archival/manuscript and visual material. The format integration changes make the field and all indicators, indicator values, and subfields valid for all material: books, serials, archives/manuscripts, computer files, maps, music, and visual material.

Obsoletes

A number of elements that were not considered useful were made "obsolete" during the integration process. When a USMARC element is documented as obsolete, it should no longer be used in new records or in information added to update older records after a date specified in USMARC. Many obsolete content designators will continue to exist in older records; thus an understanding of their meaning will always be necessary. Detailed guidelines were thus worked out for how obsolete elements should be handled:

- Elements will continue to appear in USMARC documents but will be marked obsolete.
- Elements can remain in records created earlier; thus database conversion is not necessary. They can continue to be exchanged on tapes when older records are exchanged.
- USMARC documentation will note where the appropriate place for the data would be in the future.
- Tags, subfield identifiers, and coded val-

Content Designators		Form-of-Material Validity
521	TARGET AUDIENCE NOTE	BK SE AM CF MP MU VM
	Indicator 1 - Display constant controller	BK SE AM CF MP MU VM
	♭ - No information provided	BK SE AM CF MP MU VM
	8 - No display constant generated	BK SE AM CF MP MU VM
	Indicator 2 - Undefined	BK SE AM CF MP MU VM
	ǂa Target audience note	BK SE AM CF MP MU VM
	ǂ3 Materials specified	BK SE AM CF MP MU VM
	ǂ6 Linkage	BK SE AM CF MP MU VM

Figure 2. Field after Integration.

ues that are made obsolete are *not* reassignable.

Deletes

In a limited number of cases it appeared that elements could actually be deleted from the format. An element that is deleted will completely disappear from USMARC documentation, and thus the tag, subfield identifier, or value *could* be reassigned. Since assigning new meanings to content designators that have been previously defined would be a serious problem in the USMARC environment, very stringent criteria were used for allowing a content designator to be deleted. A tag, subfield identifier, or coded value can be deleted only if:

- it has been reserved but not defined, or
- there is near certainty that the content designator has not been used.

Adds

The process of adding fields, subfields, and values is the definition of completely new content designation in USMARC.

STATISTICS AND EXAMPLES

The above are the four basic categories of changes emerging from format integration. The following sections indicate the number and type of changes in each category, starting with the simplest, the deletes, and ending with the most numerous, the extensions.[3]

Deletes

There were six fields and two subfields deleted from USMARC bibliographic specifications:

002 Subrecord Map of Directory
003 Subrecord Relationship
004 Related Record Directory
320 Current Frequency Control Information
330 Publication Pattern
331 Former Publication Pattern
~~4~~n National Library of Canada call number
in 490 Series Statement
500 General Note

The first three, 002, 003, and 004, had been reserved tags in MARC documentation since its beginning. They had also been reserved tags in the 1971 version of the NISO standard ANSI Z39.2, which defines the USMARC format structure. By 1985, however, only 002 remained a reserved tag in the NISO standard. These tags will no longer appear in the USMARC bibliographic documentation, and they can be defined for other uses by the usual review procedures. Only 002 is constrained, since the NISO standard states that it must be used for some sort of subrecord technique.

The 320, 330, and 331 deletes were three tags that had been reserved long ago for information that is now essentially a part of the *USMARC Format for Holdings Data*. The tags were reserved before the concept of the holdings format was formulated. No indicators or subfields had ever been specified for these fields.

The last two deletes, the n subfield in the 490 and 500 fields in the above list, were subfields that had been reserved for use by the National Library of Canada but had never been used and were not needed for the future.

Obsoletes

A number of USMARC bibliographic content designators were made obsolete in the format integration process. Several situations motivated this, including past requirements, lack of use, and overlaps with other elements. The number of elements made obsolete, by type, are as follows:

23 subfields
16 whole fields
10 indicator values
9 indicator definitions
4 character position definitions
2 code values

Several obsoletes were elements that were established for specific purposes in the early days of MARC. Changes in cataloging rules and routines and in system development over the years caused some users to begin supplying defaults and most systems to ignore these content designators. Thus the original purposes for which they were created could not be fulfilled and they became "anachronisms" to current format users. They continued, however, to appear in the documentation, since they were still defined. LC's Network Development and MARC Standards Office staff, OCLC's and RLIN's user support staff,

and countless others have had to try to explain these items to conscientious creators of records. Some examples of such anachronisms that were made obsolete are:

008/32	Main entry in body of entry
1XX, Indicator 2	Main entry/subject relationship
260, Indicator 1	Presence of publisher in imprint

Other obsoletes involve elements that had essentially never been used, such as:

503 Bibliographic History Note
302 Page Count

Three serial 008 elements were made obsolete because they were so poorly maintained they had ceased to be used. These fixed-field elements were sometimes coded when a record was first created but were not maintained as the serial changed its "habits." Thus the following field 008 values for serials were made obsolete:

008/30 Title page availability
008/31 Index availability
008/32 Cumulative index availability

A number of the obsolete subfields came from two changes that affected many fields. These changes were the decisions to make obsolete subfield z (Source) in all note fields where it was defined and subfield q (Parallel title) in all the linking entry fields. There were nine z subfields and twelve q subfields in the format. Since note fields that had been format specific were being defined across all forms of material and the linking fields were being similarly extended, rather than make these useless subfields valid for all material, the decision was to eliminate them. They constitute twenty-one of the twenty-three subfields made obsolete.

A number of elements were made obsolete because of the need to eliminate overlaps after the formats were merged. There were several instances of different content designators that had been defined for the same data content in different form-of-material specifications over the years. One example was a key serial element: frequency. Before integration the following fields were used for the indicated forms of materials:

Before integration:

310 Current Frequency (SE)
315 Frequency (current and former) (CF, MP)
320 Former Frequency (SE)

All three fields (310, 315, and 320) would have become valid for all forms of material with integration, and the format user would not know which to use. Field 315 was thus made obsolete and fields 310 and 320 will be used for all forms of material.

Another case of overlap was the second indicator in the 700-740 added entry fields. In the process of reconciling the values used for visual materials and those used for all the other forms of material, four values were dropped, making a more streamlined, easier-to-code, and more useful second indicator in this important set of fields.

700-740 Added Entry fields
Indicator 2, Type of added entry

Before integration:

0 Alternative entry (all except VM)
1 Secondary entry (all except VM)
2 Analytical entry (all except VM)
1 Printed on card (VM)
3 Not printed on card (VM)

After integration:

b No information provided (all)
2 Analytical entry (all)

Careful consideration was also given to the acquisition information in USMARC with the following result. Field 037, Source of Acquisition, was retained and defined for all forms of material, while fields 265 (Source for Acquisition/Subscription Address) and 350 (Price) were made obsolete. Field 037 contains subfields that accommodate source, price, stock number, and form of issue.

Several other fields were made obsolete because they fell into one or more of the above situations:

211 Acronym Title
212 Variant Access Title
214 Augmented Title
305 Physical Description for

Sound Recordings
308 Physical Description for Archival Films
512 Earlier/Later Volumes Separately Cataloged Note
523 Time Period of Content
527 Censorship Note (Archival)
537 Source of Data Note
570 Editor Note
582 Related Computer Files Note

Additions

The format integration process added very few elements to the format:

10 *b* defined in fixed field or indicator position
9 subfield *5* (Institution to which field applies) added
4 other new values defined
1 new field (006)
1 other subfield added

When a subfield identifier or tag is made obsolete, it just does not occur in future records, but fixed positions such as those in field 008 and indicator positions continue to be required in a record even if they are no longer defined for data. Thus the large number of blank values added were needed to fill the fixed field and indicator positions that were undefined in the integration process.

The anomaly on the list of additions is the subfield 5 item. In the final stages of the format integration review, the titles of the note fields were discussed to see whether any needed to be changed to clarify the scope of the note. For example, after integration a note formerly defined only for maps and visual materials, field 507, Scale Note, was now defined for all kinds of material, including music. Since the note does not refer to musical scale, it was renamed "Scale Note for Graphic Material" to avoid confusion. During this review of the note fields several people pointed out that the 5 subfield that identifies the institution for institution-specific notes needed to be added to several note fields. Thus the addition of 5 was not really a requirement for format integration but was convenient to take care of during the proceedings.

Four new values were defined to assist in settling overlaps. Two of these were indicator values in field 246 to help solve the dilemma described below. The others occurred in the type of date/publication status position (008/06). Values c (actual and copyright date) and d (detailed date) in that position for most forms of material conflicted with c (currently published) and d (dead status) defined for printed serials and computer file serials. The decision was made to change the two nonserial values, defining two new values.

After integration:

c Serial item currently published (all)
d Serial item ceased publication (all)
e Publication and copyright date (all)
t Detailed date (all)

A critical overlap situation was the 246 field, used for "varying form of title for the item being cataloged" in the serials specification, and the 740 field, which held "varying form of title for the item being cataloged and other titles related to the work" for all other forms of material. This was a complicated overlap situation for several reasons. The serial field 246 differentiated by indicator the different types of varying titles so that both an added entry and a note could be generated from the field content. The field 740 did not specify the type of title; instead, it was expected that a 500 note would be included in a record to give the title information in a note when needed. The 740 field had been used extensively in records following the six specifications for which it was defined, as had the 246 field for serial records. In addition, three specialized title fields that had not proven useful were to be made obsolete (fields 211, 212, and 214 listed earlier), and these "varying titles for the item being cataloged" needed another location.

The decision was made to keep the varying forms of the title of the item being cataloged in the 2XX block of tags and narrow the 740 field to only the titles of related works that it presently contains. This required the addition of two indicator values and a subfield to the 246 field. The resulting fields, both defined for all forms of material, will have the following content.

After integration:

246 Varying Form of Title (all)
Other titles for item being cataloged
Absorbs:
211 Acronym title

212 Variant Access Title
214 Augmented Title
most of 740 Added Entry
Variant Title
740 Added Entry—Uncontrolled
Related or Analytical Title (all)
Titles of other works related to the item being cataloged

Extensions

Finally, the most pervasive and most obvious changes are the extensions. Every field and element in the format was extended to be valid for all forms of material except Leader/6 Type of Record *values* and character positions 18-34 of the 008 field.

The impact of this extension on the core access fields—the 1XX (main entries), 4XX (series added entries), 600-650 (subject added entries), 700-730 (added entries), and 800-830 (series added entries)—is minimal. These fields have been essentially integrated throughout the development of MARC.

There was moderate impact in the 0XX area, where the various specialized numbers are in 010-048 and classification numbers are in the 050-088 fields. Classification numbers were generally already defined across the formats, but many of the specialized number and code fields are specific to forms of material: Publisher Number for Music for music; Postal Registration Number for serials; Original Study Number, for computer files. All of these number fields are now, however, defined across the format, even though they are highly unlikely to be needed with some forms of material. A basic tenet of format integration was that an element's being unlikely to occur for a form of material did not mean it would not be defined. If it does not occur, it simply will not be used.

In the 2XX and 3XX areas the main impact is in the area of special imprint fields for films and sound recordings and specialized ISBD data fields for music, maps, computer files, and archival films. Material-specific data fields are similar to the material-specific number fields. They are defined but will not be used for most material.

Extensions—Note Fields

However, the extensions in the 5XX note fields also involve material-specific fields now defined for all material. Here a special problem was faced. The development of specialized notes has always been somewhat uneven in the format. The books specifications, for example, contained relatively few special notes, the computer files had many special notes, and the archival/manuscript specifications used notes for control and management of archival collections.

A review was undertaken of a number of special notes to see whether they really needed separate tagging or could be eliminated in favor of use of the general 500 note tag. In order to evaluate the notes, a set of criteria that assist in deciding when separately tagged note fields are appropriate was developed. This was a valuable by-product of the format integration process, and these criteria will be added to "The USMARC Formats: Background and Principles."[4] Under the new criteria, a special note field may be established when one of the following is true:

- the note is used for special indexing or retrieval purposes,
- special manipulation of the note content is a routine requirement, or
- specialized structuring of the note content using subfields is needed.

Consideration was given to stating that even though a specialized note existed, the 500 General Note could always be used as a default for the data, but it was decided that such an allowance would be counter to the production of records that could be used by many institutions without change. Instead the criteria state that a specific note field should be preferred if it is defined.

In the end, seven note fields were eliminated and the remainder were defined for all forms of material.

Extensions—Linking Entry Fields

A major area of extension in the format is in the 76X-78X linking entry fields. These fields were largely valid only for printed serials although some had been validated for books, and one, 773 Host Item Entry, was valid for all forms of material. These fields will be needed for nontextual serials in the future but their use with monographic material is not clear. The 76X-78X fields contain citations to related items both for the generation of notes and linking to records for the related items. It will probably be the case that the "note generator" facility will not be needed for mono-

graphic material since the 5XX fields are adequate. Not until there is greater interest in linking together records for related items will the linking entry fields become useful for monographic material. Several of the relationships expressed by the linking tags are primarily applicable to serials, however, so that the use of these fields outside serial material may be self-limiting.

Extensions—Archival Specifications

One more area for special note is the group of special subfields and data fields designed for archival control. This includes subfields such as g (Bulk dates) in the 245 title field, and f (Type of unit) in the 300 collation field, and notes like the 584, Accumulation and Frequency of Use Note. The validation of these elements for books, music, maps, etc., may be initially alarming; however, one of the goals of format integration was to ensure that all forms of material could be controlled both serially and archivally. Thus all special archival control content designators will be necessary for all forms of material so that archivists dealing with collections of nonprint material can record all the special data needed for processing the archive.

CONCLUSION

This survey of changes to USMARC resulting from format integration has not treated two very important items, the extension of the 007, Physical Description Fixed Field, and the addition of the 006, Fixed-Length Data Elements—Additional Material Characteristics, to accommodate better mixed-media items and nontextual serials. Stephen Davis reviews that area in detail in the following article.

The real goal of format integration is to make the USMARC bibliographic format more flexible and easier to implement and use in the future. Increasingly, nonconventional material will be entering libraries, and the format should accommodate the same standard of bibliographic description and access that is now possible for conventional material. The disruption of implementations in the short term will provide for more streamlined implementations in the longer term.

NOTES

1. MARBI is a joint committee of the ALCTS, LITA, and RASD divisions of the American Library Association. It forms a major component of the USMARC advisory group, which includes other associations such as the Special Libraries Association, Association of Law Libraries, Society of American Archivists, etc. Changes to the USMARC formats are discussed in MARBI meetings forums twice a year.
2. "Content designation" in USMARC refers to the tags, indicators, subfield identifiers, and values defined in the USMARC documentation. Content designation identifies the data that USMARC communicates.
3. A complete listing of all changes to USMARC approved under format integration is contained in the following publication, which may be obtained from LC's Cataloging Distribution Service: *Format Integration and Its Effect on the USMARC Bibliographic Format* (Network Development and MARC Standards Office, 1988).
4. This brief document is maintained by MARBI in conjunction with the Network Development and MARC Standards Office at the Library of Congress. It is available without charge from that office. ■■

Format Integration: Handling Serials and Mixed Media

Stephen P. Davis

In most network and local system input and display software, fixed field elements are grouped together into semimnemonic tags at the top of the screen. In the underlying USMARC format, however, these data elements are grouped in three distinct fields, namely:

- the Leader, which is 24 bytes in length,
- the 008 field, which is 40 bytes, and
- the 007, which is variable length, though predictable for a given type of material.

REVIEW OF USMARC FIXED-FIELD ELEMENTS

Leader Positions 6 (Type of Record) and 7 (Bibliographic Level)

In the Leader, character positions 6 and 7 are the most important for the following discussion. Leader position 6 is the Type of Material (see figure 1 for a list of values defined). With two exceptions it can be used to tell the "format" of the item, e.g., music or maps. The exceptions are books and serials, where Leader/6 simply indicates "language material" and Leader/7 is required to determine whether the item is a monograph or a serial.

Leader position 7 indicates the "bibliographic level" of an item. Possible values are: m (monograph/item), s (serial), a (monographic component part), b (serial component part), c (collection), and d (subunit).

008 Field (Fixed-Length Data Elements)

The 008 field gives coded data about the "intellectual content" or publication aspects of the item, and some miscellaneous control information, such as date entered on file, date of publication, language of publication, nature of contents, and cataloging source. The 008 field is not repeatable in a record. This is because the character positions in the 008 field are defined relative to the values in Leader/6 and /7.

007 Field (Physical Description Fixed Field)

The 007 field is a coded physical description fixed field. At present there are 007s for the following types of materials only: maps, globes, projected graphics, microforms, nonprojected graphics, motion pictures, sound recordings, and videorecordings. There are no 007s for books, computer files, three-dimensional artifacts, etc. The 007 field is self-defining, since the initial character position in the field tells the nature of the data that follows.

THE PROBLEMS

With this background on the USMARC fixed fields, the following describes the basic issues that prompted changes in the format, namely the long-standing problems in the USMARC formats in recording fixed-field information for nontextual serials and mixed media items.[1]

Nontextual Serials

The first problem is how to identify in the format whether the nontextual item is a serial. Until now, it has been possible to do this only for music, maps, and computer files. It has *not* been possible to designate a visual material item (like a videorecording) or a manuscript as a serial, because Leader/7 (Bibliographic level) value "s" has never been validated for visual materials or archival and manuscripts control. The more troubling problem is that even when a nontextual serial can be identified as such in Leader/7 (as is the case with serial maps, music, and computer files), the serial-related 008-type fixed-field information, such as frequency, regularity, successive/latest entry, etc., cannot be coded. This is because use of the 008 field is locked into the following formula:

- If the item is a textual serial (i.e., Leader/6 = a and Leader/7 = b or s), the serial-type 008 field must be used.
- In all other cases, the 008 field must be coded according to the format or medium of the item as reflected in Leader/6.

Since the 008 field is not repeatable, there is no way to code serial 008-type fixed-field information for nontextual serials.

Stephen P. Davis is Assistant Director for Library Systems, Columbia University, New York City, and also the current Chair of the ALCTS/LITA/RASD Machine Readable Bibliographic Information Committee.

Mixed-Media Items

A parallel situation arises with mixed-media items such as the following:

- a kit, where items are in different media (e.g., a filmstrip, a sound cassette, and twenty-five workbooks)
- an item with a basic bibliographic unit in one format and accompanying material in a different format (e.g., a book with accompanying microfiche)
- An item that intrinsically reflects different materials types (e.g., a videotape of a musical performance, or a computer file that creates a cartographic image)

With these kinds of mixed-media materials, the problem is that once the primary material type is chosen (in Leader/6) the record is locked into having only the 008 type for that primary form of material. It is not possible to code characteristics of accompanying material or secondary aspects of the item. For example, if an item is a computer file with musical characteristics, the cataloger must decide which is the more important aspect of the item. If it is the computer file aspect, the Leader and 008 are coded accordingly and the other aspect of the item, the musical aspect, cannot be coded at all. (When using bibliographic utilities, choosing the primary material type usually also means choosing what logical file a record will be housed in, e.g., the visual materials file, the archival and manuscripts control file, or the computer files file.)

Thus the basic problems with the current 008 are that it is (1) not repeatable and (2) not

FIXED FIELD RELATIONSHIPS BEFORE FORMAT INTEGRATION

Leader/6	Leader/7	007-Types	008-Type
a = Language material	a,c,m	Microform	BK
	b,s	Microform	SE
b = Archival/manuscript	a,b,c,d,m	Microform	AM
c = Printed music	a,b,c,m,s	Microform	MU
d = Manuscript music	a,b,c,m,s	Microform	MU
e = Printed map	a,b,c,m,s	Map, Globe, Microform	MP
f = Manuscript map	a,b,c,m,s	Map, Globe, Microform	MP
g = Projected medium	a,b,c,d,m	Projected graphic, motion picture, videorecording	VM
i = Non-musical sound recording	a,b,c,m,s	Sound recording	MU
j = Musical sound recording	a,b,c,m,s	Sound recording	MU
k = 2-dimensional non-projected	a,b,c,d,m	Non-projected graphic	VM
m = Computer file	a,b,c,m,s	[None]	CF
o = Kit	a,b,c,d,m	[Any]	VM
r = 3-dimensional artifact	a,b,c,d,m	[Any]	VM

FIXED FIELD RELATIONSHIPS AFTER FORMAT INTEGRATION (1993)

Leader/6	Leader/7	007-Types	008-Type	006-Types
a = Language material	a,c,m,d	[Any]	BK	[Any]
	b,s	[Any]	SE	[Any]
b = Archival/manuscript	[Any]	[Any]	AM	[Any]
c = Printed music	[Any]	[Any]	MU	[Any]
d = Manuscript music	[Any]	[Any]	MU	[Any]
e = Printed map	[Any]	[Any]	MP	[Any]
f = Manuscript map	[Any]	[Any]	MP	[Any]
g = Projected medium	[Any]	[Any]	VM	[Any]
i = Non-musical sound recording	[Any]	[Any]	MU	[Any]
j = Musical sound recording	[Any]	[Any]	MU	[Any]
k = 2-dimensional non-projected	[Any]	[Any]	VM	[Any]
m = Computer file	[Any]	[Any]	CF	[Any]
o = Kit	[Any]	[Any]	VM	[Any]
r = 3-dimensional artifact	[Any]	[Any]	VM	[Any]

Leader/7: m (monograph/item), s (serial), a (monographic component part), b (serial component part), c (collection), d (subunit)

008-Types: BK (Books), SE (Serials), AM (Archival and Manuscripts Control), CF (Computer Files), MP (Maps), MU (Music), VM (Visual Materials)

Figure 1. Fixed-Field Relationships.

006 BOOKS

00	Type of 006 code
	a Books
01-04	Illustrations
05	Target audience
06	Form of item
07-10	Nature of contents
11	Government publication
12	Conference publication
13	Festschrift
14	Index
15	Undefined
16	Fiction
17	Biography

006 COMPUTER FILES

00	Type of 006 code
	m Computer file
01	Frequency
02	Regularity
03-04	Undefined
05	Target audience
06-08	Undefined
09	Type of computer file
10	Type of machine
11	Government publication
12-17	Undefined

006 MAPS

00	Undefined
	e Printed map
	f Manuscript map
00-04	Relief
05-06	Projection
07	Prime meridian
08	Cartographic material type
09-10	Undefined
11	Government publication
12-13	Undefined
14	Index
15	Undefined
16-17	Special format characteristics

006 SERIALS

00	Type of 006 code
	s Serial control
01	Frequency
02	Regularity
03	ISDS Center
04	Type of serial
05	Form of original item
06	Form of item
07	Nature of entire work
08-10	Nature of contents
11	Government publication
12	Conference publication
13-15	Undefined
16	Original alphabet or script of title
17	Successive/latest entry

006 ARCHIVAL AND MANUSCRIPTS CONTROL

00	Type of 006 code
	b Archival and manuscript control
01-05	Undefined
06	Form of item
07-17	Undefined

006 MUSIC

00	Type of 006 code
	c Printed music
	d Manuscript music
	i Nonmusical sound recording
	j Musical sound recording
01-02	Form of composition
03	Format of music
04	Undefined
05	Target audience
06	Form of item
07-12	Accompanying matter
13-14	Literary text for sound recording
15-17	Undefined

006 VISUAL MATERIALS

00	Type of 006 code
	g Projected medium
	k Two-dimensional nonprojectable graphic
	o Kit
	r Three-dimensional artifact or naturally occuring object
01-03	Running time for motion pictures and videorecordings
04	Undefined
05	Target audience
06-10	Accompanying matter
11	Government publication
12-15	Undefined
16	Type of material
17	Technique

Figure 2. 006 Fixed-Length Data Elements—Additional Material Characteristics.

self-defining. Not self-defining means that a 008, if repeated, would be impossible to interpret, since it is defined by reference to Leader positions 6 and 7. The top part of figure 1 illustrates the fixed-field relationships before format integration.

THE SOLUTIONS

One way to address this problem would have been for LC and MARBI to have proposed a complete revision to the 008 field, making it repeatable and adding an additional character position to make it self-defining. This might have worked, but it would have involved a great deal of redundancy, since the 008 contains both format-specific information as well as general information, such as date entered on file, dates of publication, language code, cataloging source, etc., that would have to be repeated in each iteration of the field. Also, the designers of format integration would not have acted responsibly, given the millions of MARC records now in circulation and the cost of tracking them down and changing them all. This would not have been a popular decision.

Instead, a less elegant but more pragmatic solution was developed that will require minimal change to existing records. This solution is the new 006 field, named Fixed-Length Data Elements—Additional Material Characteristics. The new 006 contains what might be called the "essence" of the 008. There are seven types of 006, paralleling the seven types of 008 fields, for Books, Serials, Visual Materials, Archival and Manuscripts Control, Maps, Music, and Computer Files. Each 006 field is eighteen characters long, although not all positions are defined. Each type of 006 contains the 008 data elements that are unique for that type of material. The data elements that are the same for all 008 types, such as dates, language codes, cataloging source, etc., have been omitted. Figure 2 shows the structure of the 006 fields.

The 006 also has the advantage of being self-defining. This was done by making the first character of the field the same as the Type of Material data element in the Leader/6. As a result, all subsequent 006 character positions are always defined by reference to the first position.

With the new 006 field, catalogers will be able to code all fixed-field aspects of nontextual serials and mixed-media items. The way this will work can be described by a fairly simple model.

- If an item is basically textual, the seriality aspects will always be carried in the 008 field as is done presently; there will be no change in practice. In addition, nontextual media aspects of the item, including characteristics of accompanying material, can be recorded in one or more 006 fields.
- For basically nontextual items, Leader/6 will continue to control the choice of 008 field (again no change). However, any serial aspects or secondary media aspects may be coded in one or more 006 fields.

Consequently, all textual serials will continue to have a serial-type 008; but nontextual serials will have a serial-type 006. Except for textual serials, primary media aspects will be coded in 008; secondary media aspects will be coded in 006s.

The lower part of figure 1, Fixed-Field Relationships after Format Integration, illustrates that for textual serials, the 008 type is "serials"; but for other media types, seriality will be reflected in a 006 field (along with any secondary media aspects). It may also be possible for an item that is basically nonserial (or cataloged as such) to have a books-type 008 field and *also* a serial-type 006 field. An example of something that might be treated this way is a loose-leaf publication, which is conventionally cataloged as a monograph but which may have serially issued updates.

007 FIELDS

Looking at the top of figure 1, it can be seen that the use of 007 is currently heavily restricted. Except for kits (type "o" materials), normally only one type of 007 appears in a given record. If one has a book item, with several kinds of important accompanying material in different media, it is now not allowed to include additional 007s for accompanying material. The reason for this is more historical than functional. Unlike the 008, the 007 is already repeatable and self-defining, since the first character position of the field tells the format of material and defines the character positions following.

Under format integration, there will no longer be any restriction on the use of 007. Those who wish to will be able to use it as often as they like to make sure that no aspect

of an item goes unrecorded. Some have raised the concern that multiple 007s in a record will be confusing, because they cannot be "linked" appropriately to other data in the record. In response to this, it should be remembered that coded data in USMARC are meant primarily for the purpose of automated computer manipulation and, sometimes, online or batch retrieval. In most cases there are corresponding eye-legible data in the record that will serve the purpose of clarifying the items to which they relate. Added to this is the simple fact that the USMARC format contains no generalized technique for linking fields within a record.

EXAMPLES

Following are a few schematic examples of nontextual serials and mixed-media items under format integration.

Example 1. A book, accompanied by an audiocassette:

Leader/6 = a (Language material)
Leader/7 = m (Monograph)
008-Type = Book
006-Type = j (Music) [optional]
007-Type = s (Sound recording) [optional]

Example 2. A loose-leaf publication, with a serial updating service:

Leader/6 = a (Language)
Leader/7 = m (Monograph)
008-Type = Book
006/Type = s (Serial) [optional]

Example 3. A kit consisting of a filmstrip, an audiocassette, and twenty-five maps:

Leader/6 = o (Kit)
Leader/7 = m (Monograph)
008-Type = Visual materials
006-Type = i (Nonmusical sound recording) [optional]
006-Type = e (Printed map) [optional]
007-Type = h (Microfilm) [optional]
007-Type = s (Sound recording) [optional]
007-Type = a (Map) [optional]

Example 4. A serially issued musical publication:

Leader/6 = e (Printed music)
Leader/7 = s (Serial)
008-Type = Music
006-Type = s (Serial) [optional]

Example 5. A software program that plays a musical composition:

Option A
Leader/6 = m (Computer file)
Leader/7 = m (Monograph)
008-Type = Computer file
006-Type = j (Music) [optional]

Option B
Leader/6 = j (Music)
Leader/7 = m (Monograph)
008-Type = Music
006-Type = m (Computer file) [optional]

Example 6. A publication consisting of a serially issued videodisc reproducing a map set, plus software to manipulate and display. The cataloging institution has decided to make the videorecording aspect primary; either the map or the computer file aspect might also have been made primary.

Leader/6 = g (Projected medium)
Leader/7 = s (Serial)
008-Type = Visual Materials
006-Type = s (Serial) [optional]
006-Type = e (Printed map) [optional]
006-Type = m (Computer file) [optional]
007-Type = v (Videorecording) [optional]
007-Type = a (Map) [optional]

CONCLUSION

In conclusion, the fixed field changes resulting from format integration do not really seem too forbidding or complicated. Rather, they remedy some long-standing omissions in functionality in USMARC and allow for equal treatment of nontextual serials and mixed-media items.

The next step for those planning for the implementation of format integration at the institutional level will be to look carefully at the *need* for such coded data and to establish some guidelines about when they are appropriate and cost-effective. It is unlikely that the Library of Congress, ALA, or the networks will impose any restrictions on the number and type of 006s and 007s that may be added to a record. It will probably devolve back to the local institution or cataloger to decide the level of coding appropriate to the collection or application. There are a few questions, how-

ever, that might bear answering on the national or network level. For example: should 006 coding of serial aspects of nontextual serials be required in national-level records? Should additional guidelines be promulgated for deciding what the primary versus secondary media aspects of an item are, so that different institutions do not routinely make different decisions? These are perhaps questions for LC, MARBI, CC:DA, and the networks. This upcoming proliferation of fixed-field coding possibilities will also make it desirable for networks and local systems to develop sensible and user-friendly input assistance for catalogers. Finally, steps need to be taken to make better use of all this coded data by developing appropriate retrieval and reporting software that will eventually justify the cost of all this coding.

NOTES

1. Nontextual serials are nonprint items issued in successive parts and intended to continue indefinitely. Examples are serially issued music, serially issued maps, and serially issued videocassette publications. ■■

Format Integration: Coordinating the Implementation

Kathleen Bales

WHY COORDINATE?

At first glance, it may not be clear why coordinating the implementation of the Format Integration change is important. Aside from vague notions of common good, the reasons for coordination become evident by tracing the path of the large number of records that circulate among systems.

Although figure 1 covers bibliographic records only and does not include movement from local systems to utilities, it illustrates current extensive record movement. The Library of Congress uses Research Libraries Information Network (RLIN) terminals to catalog nonroman materials: Chinese, Japanese, Korean, and Hebrew. These records are copied to magnetic tape and sent to LC's Cataloging Distribution Service (CDS) to be loaded into MUMS, the LC online cataloging system.

LC uses Online Computer Library Center (OCLC) terminals to catalog serials as part of CONSER; the serials records are also sent on tape from OCLC to CDS for loading into MUMS. Staff at the Research Libraries Group (RLG) sends RLIN user records to LC for reporting to the National Union Catalog (NUC). OCLC and RLG load records from each other into their databases; these records represent both microfilm projects and recon exchanges from various users. LC, of course, sends records to everybody.

What happens when an unexpected field appears on one of these tapes? All of these systems can convert fields not used in the receiving system if the field is expected, since values can be mapped to a field the system recognizes. However, new fields are different; various methods are used when this happens. For instance, OCLC tests each file the first time it is received and decides whether to load it or not, based on quality and completeness. RLG loads an unexpected field as an error field; the record is available for copy cataloging when the error can be corrected in the record of the institution copying it. WLN loads the records and staff corrects the problem, working from printed reports. In summary, there is some overhead involved in coping with unexpected fields, and some records may not get loaded.

PLANNING FOR COORDINATION

As the Machine-Readable Bibliographic Information Committee (MARBI) began to come to the end of the format integration work, LC, various members of the committee, and the USMARC Advisory Group began to think about how the implementation could be coordinated. They agreed that LC and the utilities needed to look at their own work schedules to try to discover how the Format Integration work related to the other projects already scheduled.

The first implementation meeting was in January 1989, at the ALA Midwinter Meeting; staff members from LC, OCLC, RLG, WLN, and UTLAS were present. Topics cen-

Kathleen Bales is Manager, Library Applications, Research Libraries Group.

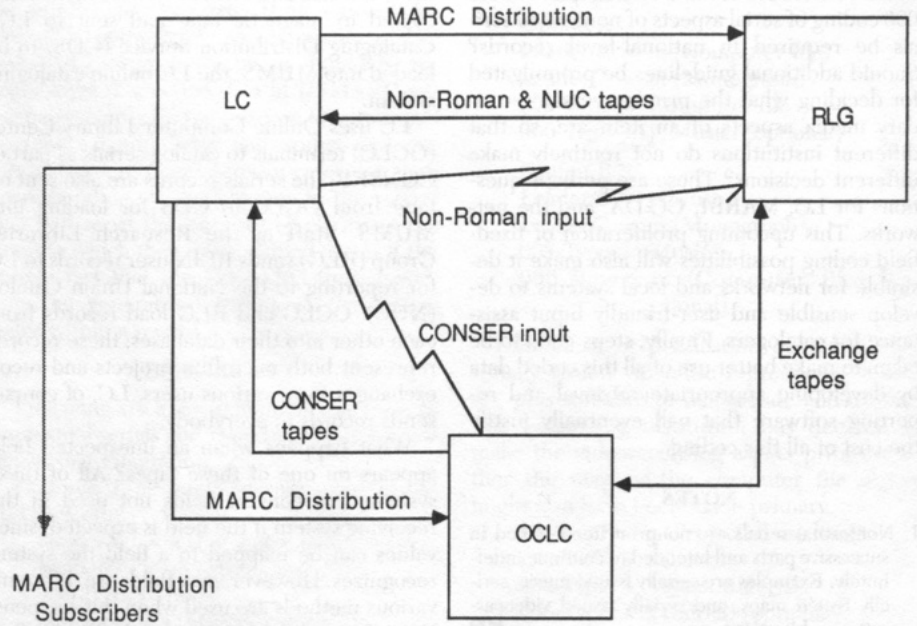


Figure 1. Bibliographic Record Movement.

tered around the four types of fields: deletes, obsoletes, adds, and extensions. The following conclusions from that meeting were announced during Midwinter. LC will not be ready to implement complete Format Integration before 1993, and the other organizations agreed to wait until then. These organizations are in favor of implementing most of the work in one release, although some categories of changes (deletes and obsoletes) are being implemented earlier.

At this meeting, LC and the utilities also agreed to meet informally at every ALA Conference until implementation in order to discuss questions or problems and to keep up to date on the planning process.

The group discussed the problem of documentation. If all of the results of Format Integration were published in USMFB, it would be confusing for users to see that a field was valid for all formats in that document when they could not use it in their system. Instead, LC will publish the changes that will be done in the future in a separate section for each field. This makes the process more orderly; when changes are implemented earlier, the information will be moved from the futures section into the regular field description.

The above organizations will continue to issue reports from the regular meetings held at Midwinter and Annual Conference. In addition, OCLC and LC will report any relevant information at the meetings they hold at ALA. Written reports will go into the various newsletters published by these organizations: the *OCLC Newsletter*, the *RLG Operations Update*, the *WLN Participant* and the *Library of Congress Information Bulletin*. OCLC also distributes information updates on project progress to the networks, which notify the appropriate constituencies. In addition, OCLC has a regular information mailing to vendors about technical developments.

IMPLEMENTATION DECISIONS ON SPECIFIC CHANGES

For the most part, groups or categories of changes will be handled in similar ways. As mentioned above, adds cannot be imple-

mented ahead of the target date, since early implementation will cause problems in other systems. Deletes have disappeared from USMBF and are not a problem, since they were never implemented.

Obsolete Fields

Those fields being made obsolete require a variety of approaches. Some fields will simply cease being coded. Some examples are: using blanks in some indicator positions and using blanks for 008 bytes 30, 31, and 32 for serials (Title Page Availability, Index Availability, and Cumulative Index Availability).

The method of moving data from one place to another depends on how many occurrences there are of the old field. If there is a small number of occurrences it may be best to change the data manually; for example, field 302 (Page Count) would be moved to field 300 subfield a (Extent), and 512 (Earlier/Later Volumes Separately Cataloged) would go to 500 (General Note).

If there are a large number of occurrences, there are various ways of handling the fields. For one-to-one mapping, there could be a batch conversion for the whole database or conversion of incoming and outgoing records. Another method is to convert the records in the online application as records are used; some systems may use a combination of these. Converting field 212 (Variant Access Title) to field 246 (Varying Form of Title) is an example of one-to-one mapping.

Where mapping is not one-to-one or is very complicated, a partial conversion could be done, with the user completing it in online interaction. An example of this is field 350 (Price), which can be mapped to field 037 (Stock number), subfield a (Terms of availability); the record would need to be examined for the presence of qualifying information in the field and any necessary adjustments made.

Seriality, Mixed Formats and Access Issues

The methods for handling these materials in the implementation will be system specific because of the relationship of the formats to system architecture.

LC

LC's approach to format integration is just a part of the work being done to analyze both LC information needs and their existing systems, in order to decide what needs to change. LC staff is taking a corporate view of LC information and using logical modeling tools for both data and processes. The result of some of that work is a reorganization of staff to provide better service for LC constituencies.

At the time this article was written, it was unclear what changes will be made in the LC systems for serials, since all record formats are being considered in this analysis. For instance, a specification for a serials management system is complete but has been set aside until its logical relationship to the other system modules has been examined. The resulting changes, referred to at LC as "Resystemization," will be installed no earlier than 1993. More detailed dates will be announced as they are known.

The format integration changes will be part of this installation, but the installation will be phased. A prototype will probably be created for staff evaluation, and after each phase is installed, an integration period with CDS is needed. Only after this last process will the first format integration changes be distributed on regular tapes.

OCLC

Because of OCLC's work on the new system, the timing of the implementation will affect the amount of work to be done. If all functions, including editing and searching, are not yet in the cataloging modules by 1993, the changes will have to be put into the current system as well.

Records are already in one physical file. OCLC will retain qualification by material type, but staff is not sure whether the technique for doing this will remain the same. Now the indexes for the different formats arestored separately. The staff will need to examine this structure and make decisions about the changes needed. The initial new systems implementation will use the current database structure. When a new database structure is put into place, it will have to accommodate qualification. Implementation of field 006 does not have to be in the first phase, since the number of records having mixed media format is small and the effect on retrieval minimal. Extra 007 fields can be

```
+-------------------------------------------------------------------------------+
|BKS/PROD  Books        INP/BIB                        CAT/Create       CRLG-SMR|
|<MESSAGE LINE>                                                                 |
|<COMMAND LINE>                                                                 |
|   MMD:       OR:     POL:      DM:      RR:        COL:      EML:    GEN:   BSE:|
|   COM:g  FMD:    OR:    CL:    BEM:    SEP:    MDS:    WD:    SSP:            |
|   COM:k  FMD:    OR:    CL:    PRS:    SSN:                                    |
|   COM:m  FMD:    OR:    CL:     PR:    SEP:    MDS:    WD:    KS:    ARV:     |
|   COM:v  FMD:    OR:    CL:     VF:    SEP:    MDS:    WD:    KS:             |
|   RMD:   OR:  SPD:    SND:    GRV:    DIM:    WID:  TC:  KD:  KM:  KC:  RC: CAP:|
|   COM:a    SMD:       OR:     CLR:    MPHY:        TREP:                PL:   |
|   COM:d    SMD:       OR:     CLR:    MPHY:        TREP:        PRD:          |
|                                                                               |
|                                  +-----------------------------------+        |
|                                  | OPTION A:                         |        |
|                                  | This screen contains only 007s. It|        |
|                                  | would be used in conjunction with |        |
|                                  | the next screen. This screen could|        |
|                                  | be presented first, at the end of |        |
|                                  | bib, or only by request.          |        |
|                                  +-----------------------------------+        |
|                                                                               |
|                                                                               |
|                                                                               |
+-------------------------------------------------------------------------------+
```

Figure 2.

```
+-------------------------------------------------------------------------------+
|BKS/PROD  Books        INP/BIB                        CAT/Create       CRLG-SMR|
|<MESSAGE LINE>                                                                 |
|<COMMAND LINE>                                                                 |
|   ID:                 RTYP:c   ST:p  FRN:     MS:        EL:?      AD:mm-dd-yy|
|   CC:        BLT:       DCF:?  CSC:?  MOD:?  SNR:       ATC:        UD:      |
|   CP:          L:       INT:?  GPC:?  BIO:?  FIC:?      CON:????              |
|   PC:        PD:    /          REP:?  CPI:?  FSI:?      ILC:????   MEI:?   II:?|
|   ILC:????  INT:?  REP:?  CON:????  GPC:?  CPI:?  FSI:?  II:?     FIC:?  BIO:?|
|   020 __                                                                      |
|   040 __                                                                      |
|   1XX __                                                                      |
|   240 __                                                                      |
|   245 __                                                                      |
|   250 __                                                                      |
|   260 __                                                                      |
|   300 __                                                                      |
|       __                                                                      |
|       __                                                                      |
|       __                                                                      |
|       __                                                                      |
|       __                                                                      |
|       __                                                                      |
|       __                                                                      |
+-------------------------------------------------------------------------------+
```

Figure 3.

added using the current technique.

Conversion of obsolete fields to current usage will be done when possible as a background batch project. Incoming data will also be mapped, but if new fields (those in the Adds category) are received before new system implementation, decisions will have to be made about how to handle the situation. OCLC must also analyze the effect of Format Integration on duplicate detection.

WLN

At WLN, the records are in one physical file; since in that system there is no qualifica-

```
+-------------------------------------------------------------------------------+
!BKS/PROD  Books       INP/BIB                          CAT/Create       CRLG-SMR!
!<MESSAGE LINE>                                                                 !
!<COMMAND LINE>                                                                 !
!   MMD:       OR:     POL:      DM:      RR:        COL:       EML:     GEN:   BSE: !
!   COM:g  FMD:    OR:    CL:    BEM:    SEP:    MDS:    WD:    SSP:             !
!   COM:k  FMD:    OR:    CL:    PRS:    SSN:                                    !
!   COM:m  FMD:    OR:    CL:     PR:    SEP:    MDS:    WD:    KS:    ARV:      !
!   COM:v  FMD:    OR:    CL:     VF:    SEP:    MDS:    WD:    KS:              !
!   RMD:    OR:  SPD:    SND:    GRV:    DIM:    WID:  TC:  KD:  KM:  KC:  RC: CAP: !
!   COM:a     SMD:       OR:     CLR:    MPHY:       TREP:                PL:.   !
!   COM:d     SMD:       OR:     CLR:    MPHY:       TREP:        PRD:           !
!   ILC:????  INT:?  REP:?  CON:????  GPC:?  CPI:?  FSI:?   II:?   FIC:?  BIO:?!
!                                +-----------------------------------+      !
!                                ! OPTION B:                         !      !
!                                ! This screen contains 007s and 006. !      !
!                                ! It would be used in conjunction with!     !
!                                ! the next screen. This screen could  !     !
!                                ! be presented first, at the end of   !     !
!                                ! bib, or only by request.            !     !
!                                +-----------------------------------+      !
!                                                                           !
!                                                                           !
!                                                                           !
+-------------------------------------------------------------------------------+
```

Figure 4.

```
+-------------------------------------------------------------------------------+
!BKS/PROD  Books       INP/BIB                          CAT/Create       CRLG-SMR!
!<MESSAGE LINE>                                                                 !
!<COMMAND LINE>                                                                 !
!   ID:                RTYP:c   ST:p  FRN:    MS:        EL:?        AD:mm-dd-yy!
!   CC:        BLT:      DCF:?  CSC:?  MOD:?  SNR:       ATC:        UD:       !
!   CP:          L:      INT:?  GPC:?  BIO:?  FIC:?      CON:????               !
!   PC:         PD:    /        REP:?  CPI:?  FSI:?      ILC:????   MEI:?   II:?!
!   ILC:????  INT:?  REP:?  CON:????  GPC:?  CPI:?  FSI:?  II:?    FIC:?  BIO:?!
!   MMD:       OR:     POL:     DM:     RR:        COL:     EML:      GEN:   BSE: !
!   COM:g  FMD:    OR:    CL:    BEM:    SEP:    MDS:    WD:    SSP:             !
!   COM:k  FMD:    OR:    CL:    PRS:    SSN:                                    !
!   COM:m  FMD:    OR:    CL:     PR:    SEP:    MDS:    WD:    KS:    ARV:      !
!   COM:v  FMD:    OR:    CL:     VF:    SEP:    MDS:    WD:    KS:              !
!   RMD:    OR:  SPD:    SND:    GRV:    DIM:    WID:  TC:  KD:  KM:  KC:  RC:  CAP: !
!   COM:a     SMD:       OR:     CLR:    MPHY:       TREP:                PL:    !
!   COM:d     SMD:       OR:     CLR:    MPHY:       TREP:        PRD:           !
!                                  +-----------------------------------+      !
!                                  ! OPTION C:                         !      !
!                                  ! This screen contains 008, 007s,   !      !
!                                  ! and 006. This would be presented  !      !
!                                  ! as the first screen of bib,       !      !
!                                  ! followed by the next screen       !      !
!                                  ! for entering variable fields.     !      !
+-------------------------------------------------------------------------------+
```

Figure 5.

tion by material type, there are no real indexing issues for the WLN staff. They are not converting their database. The staff has not yet done the planning for system changes but will need to make decisions about format-specific edits and if there will be required fields for each material type.

RLG

RLIN records are now stored in separate physical files according to format. There will be no large database conversion. Incoming data will be mapped where possible; a decision still must be made whether to convert data in outgoing records. Staff wants to do

```
+-------------------------------------------------------------------------+
|BKS/PROD  Books        INP/BIB                        CAT/Create    CRLG-SMR|
|<MESSAGE LINE>                                                           |
|<COMMAND LINE>                                                           |
|    ID:                RTYP:   ST:p   FRN:     MS:         EL:?    AD:mm-dd-yy|
|    CC:        BLT:     DCF:? CSC:?   MOD:?  SNR:        ATC:      UD:      |
|    CP:         L:      INT:? GPC:?   BIO:?  FIC:?       CON:????           |
|    PC:        PD:    /      REP:?   CPI:?  FSI:?       ILC:???? MEI:?  II:?|
|   006:                                                                  |
|   007:                                                                  |
|   020 __                                                                |
|   040 __                                                                |
|   XX  __                                                                |
|   240 __                                                                |
|   245 __                                                                |
|   250 __                                                                |
|   260 __                                                                |
|   300 __                                                                |
|       __                                                                |
|       __                                                                |
|       __                                                                |
|       __                                                                |
|       __                                                                |
|       __                                                                |
+-------------------------------------------------------------------------+
```

Figure 6.

```
+-------------------------------------------------------------------------+
|BKS/PROD  Books        INP/BIB                        CAT/Create    CRLG-SMR|
|<MESSAGE LINE>                                                           |
|<COMMAND LINE>                                                           |
|   ID:                 RTYP:    ST:p   FRN:     MS:         EL:      AD:mm-dd-yy|
|   CC:        BLT:      DCF:?                   SNR:        ATC:      UD:      |
|   008  06:    07:     11:        15:       18:       22:   23:   24:      28:  |
|        29:    30:     31:     32:     33:     34:     38:   39:               |
|   006  01:      05:   06:   07:       11:     12:     13:   14:   16:   17:    |
|   007  00:h   01:     02:   03:     04:     05:     06:     09:   10:   11:   12:  |
|   007  00:g   01:     02:   03:     04:     05:     06:     07:   08:          |
|   007  00:k   01:     02:   03:     04:     05:                                |
|   007  00:m   01:     02:   03:     04:     05:     06:     07:   08:   09:   10:   11: |
|        12:    13:     14:   15:     16:     17:                                |
|   007  00:v   01:     02:   03:     04:     05:     06:     07:   08:          |
|   007  00:s   01:     02:   03:     04:     05:     06:     07:   08:   09:   10:   11: |
|        12:                                                                    |
|   007  00:a   01:     02:   03:     04:     05:     06:     07:               |
|   007  00:d   01:     02:   03:     04:+-------------------------------------+
|                                        | OPTION E:                           |
|                                        | This screen shows 008, 006, and 007s|
|                                        | that would be input as byte numbers for |
|                                        | each field. Variable fields would be on |
|                                        | the next screen.                    |
+----------------------------------------+-------------------------------------+
```

Figure 7.

some online mapping for records copied by another user, as well as when records are maintained, but the effect of this overhead on system performance will need to be studied.

Adding the 006 and additional 007 fields will most certainly mean redesigning all of the input screens for bibliographic records. RLG staff asked for user input on this redesign; the users received a diskette containing possibilities for screens and were asked to comment. Figures 2–7 are taken from the diskette. Since the fixed fields can occupy many lines on a screen, the design issues go beyond how the layout of elements is arranged.

As is shown by figures 2 through 7, approaches range from moving all fixed fields to one screen, with variable fields on another, to keeping a minimum set of fixed fields with the variable and moving the remaining fixed fields to a separate screen. The design goal is to maximize efficiency of input for the largest number of records, while retaining an intelligible display and logical arrangement of fields. The results from the users indicate that they would prefer to have "extra" fixed fields on a separate screen, called up as needed.

Another aspect of format integration that must be studied is that of adding archival control for all material types: currently this is only available in RLIN for Archival and Manuscript Control (AMC) and Visual Materials (VIM) formats. Staff must reexamine the rules for allowing Holdings and Archival Control segments in the same record and make sure that both staff and the AMC constituency understand the implications for online and batch processing. If the archival control records remain in a separate file, RLG staff may need to add some additional search qualifications to make it easier to gather like materials together, regardless of the way they are controlled. As planning takes place for each aspect of the implementation, users will be consulted when there are decisions that should be guided by their needs.

DOCUMENTATION

There are big decisions to make about documentation, which will be influenced both by approaches to standards and by the extent that USMBF will contain information about usage. Some of the issues to be addressed are: combining documents across material types rather than continuing to separate by format; using USMFB as the primary source of information about fields and only documenting system-specific practices; and producing training materials for implementation and ongoing system use.

CONCLUSION

LC and the utilities have agreed to coordinate the implementation of Format Integration. Each organization must develop its own set of system changes, planning carefully so it can coordinate with the others. Documentation and training approaches need to be explored and then integrated into the system's schedules. The organizations participating in this effort are interested in learning what questions users of the formats and systems have and how the organizations can best inform the users of planned changes. The implementation should benefit users. LC and the utilities are dedicated to making the process as smooth as possible. ■■

Applying Format Integration: An Operational Test

George Gibbs

Just before the 1989 ALA Midwinter Meeting, I received a telephone call on behalf of MARBI asking if the UCLA Library cataloging staff would test format integration by cataloging some items using both the current standard and the revised standard. My contact asked me to report on what we encountered in our application of format integration, to identify problems and questions that might need addressing at the local or national level before libraries at large are faced with implementing the new look of MARC, and, lastly, to make recommendations based on what we had found.

I need to start by identifying two basic premises of my work. First, I am an OCLC user, and my recommendations are influenced by my conventions. Second, my perspective is that of a member of a large university research library's staff. Although we stand ready to catalog in all the MARC formats, in reality, the overwhelming majority of what we catalog is either a book, a serial, a music score, or a sound recording. If I were working in a media center of a library specializing in what to me are lesser-used formats, such as maps or computer files, my conclusions might be different.

The first task was learning about the details of format integration. Fortunately, at the ALA Midwinter Meeting in Washington I purchased the newly available Library of Congress publication *Format Integration and Its*

George Gibbs is Assistant Dean for Technical Services and Collection Development, University of Kansas Libraries, Lawrence.

```
Screen 1 of 2
NO HOLDINGS IN CLU - FOR HOLDINGS ENTER dh DEPRESS DISPLAY RECD SEND
OCLC: 13537891     Rec stat: n Entrd: 860130        Used: 860507
Type: a Bib lvl: m Govt pub:   Lang:  jpn Source: d Illus:
Repr:   Enc lvl: L Conf pub: 0 Ctry:  ja  Dat tp: s ##/F/B: ¤0
Indx: 0 Mod rec:   Festschr: 0 Cont: c
Desc: a Int lvl:   Dates: 1985,
  1 010
  2 040     BRL $c BRL $d m/c
  3 041 0   jpneng
  4 043     e-uk-en
  5 050 0   N6797.T88 $b Y375 1985
  6 090      $b
  7 049     CLUM
  8 100 1   Yashiro, Shuji.
  9 245 10  T¯an a¯ten : $b Manchesut-shi Bijutsukan shoz¯o = Turner at
Manchester / $c [supervised and written by Shuji Yashiro].
 10 260     [Tokyo] : $b Yomiuri Shimbun, $c 1985.
 11 300     [162] p. : $b ill. (some col.) ; $c 26 cm.
 12 500     Catalog of an exhibition held at the Odakyu Grand Gallery, Tokyo,
Apr. 12-May 8, 1985, and the Daimaru Museum of Art, Osaka, May 22-June 10.
1985.
 13 546     English and Japanese.

Screen 2 of 2
 14 500     Worldwide Books no. 51392.
 15 600 10  Turner, J. M. W. $q (Joseph Mallord William), $d 1775-1851 $x
Exhibitions. $w cn
 16 600 10  Turner, J. M. W. $q (Joseph Mallord William), $d 1775-1851 $x
Adaptations $x Exhibitions. $w cn
 17 610 20  Manchester City Art Gallery $x Exhibitions. $w cn
 18 650  0  Art $z England $z Manchester $x Exhibitions.
 19 710 2   Odaky u Gurando Gyarar i. $w cn
 20 246 11  Turner at Manchester.
```

Figure 1. Screen 1 of 2.

Effect on USMARC Bibliographic Records. It is a publication that I recommend highly to others. In addition to listing briefly all of the MARC fields, it includes several helpful appendixes laying out the obsolete and changed fields. The General Model on pages 7–9 was of particular use in ascertaining how one should encode the information about the several formats involved in multiformat items. I restudied this chart a number of times during this project.

Next, I met with the catalogers in the cataloging department of the UCLA Research Library who provide original records of monographs and serials, explained the test and my understanding of format integration, and solicited specific kinds of examples. Lastly, I systematically reviewed a large number of items awaiting cataloging, looking for situations that would change under format integration.

After surveying a large number of cataloging records for currently received material, I can report that the vast majority of our current cataloging will not be affected beyond some relatively superficial changes, for example, no second indicator in the 1xx field and using the 240 field instead of the 740 field for added title entries.

Figure 1 shows some of the superficial changes that will be caused by format integration:

- The M/ of M/F/B in the fixed field becomes obsolete.
- The second indicator in the 100 field becomes obsolete.
- The first indicator in the 260 field becomes obsolete.
- The language note formerly coded as a 500 note can now be coded as 546.
- The second indicator in the 710 field becomes a blank.

• The 740 would now be coded 246 and the first indicator added to show that the title in question is a parallel title.

Because so few records to be input will need both a 008 and a 006, the networks should keep separate work forms for each format as at present, updated, of course, to reflect the current standard for each format and with all elements validated for all formats.

Figure 2 shows the ability to mix elements from what are now separate MARC formats in order to describe more fully those items that have characteristics of more than one format. Finding examples of map or music serials or maps that are also puzzles was not difficult, but in terms of our total cataloging output, they constitute an extremely small percentage. In a few cases, we had a mixed-format item but decided not to apply elements from the second format.

Note that currently the 008 in the above example is for serials, but following the General Model for nontextual items, serials would become the secondary format after format integration is implemented. Maps would become the primary format and the new 008 reflects this change. Note that in the 006, a number of elements disappear entirely or are no longer needed because they already appear in the 008. Also note that the record contains fields that pertain to both maps and serials; both a 255 field from the map format and a 362 field from the serial format are present. If a title change were involved, linking fields would be used as in other serials.

In deciding how to implement format integration in the fixed field, it is regrettable that MARBI did not take a more radical step than just establishing the 006 field to record information about the secondary format. I realize that one limitation to the whole process was that the present structure of MARC had to be retained because of the possible damaging effects on systems that a complete overhaul might cause. However, a harmonization of the fixed field in all the MARC formats so that there would be only one field to fill in and that field would contain *all* fixed field elements would have been preferable to me, as opposed to the creation of the 006 field. As of this writing, I do not know how the bibliographic utilities plan to implement format

```
OCLC: NEW          Rec stat: n Entrd: 890616        Used: 890616
Type: e Bib lvl: s Lang:  eng Source: d Form:     Relief:
RecG: c Enc lvl: I Ctry:  dcu Dat tp: m Govt pub: f Indx: 0          008
Desc: a Mod rec:   Base:      Dates: 1974,9999
OCLC: 8608790      Rec stat: n Entrd: 820717        Used: 880502
Type: a Bib lvl: s Govt pub: f ~~Lang: eng Source: d~~ S/L ent: 0
Repr:  ~~Enc lvl: I~~ Conf pub: 0 ~~Ctry: dcu~~ Ser tp: m Alphabt:      006
~~Indx: u Med rec:~~  Phys med:   Cont:       Frequn:   Pub st:  c
~~Desc: a Cum ind: u Titl pag: u~~ lSDS:      Requlr: x ~~Dates: 1974-9999~~
  1 010
  2 040      CLU $c CLU $d m/c
  3 043      n-us---
  4 052      3701
  5 090       $b
  6 049      CLUM
  7 130 0    Miscellaneous investigations series (Geological Survey (U.S.))
  8 245 00   Miscellaneous investigations series.
  9 260 00   Washington, D.C. : $d Dept. of the Interior, U.S. Geological
Survey, $c 1974-
 10 255      Scales vary.
 11 300      maps : $b col. ; $c 124 x 103 cm. or smaller, folded in envelopes 3
0 x 24 cm.
 12 362      sheet 1-
 13 650  0   Geology $z United States $x Maps.
 14 710 20   Geological Survey (U.S.)

Screen 2 of 2
 15 780 00   Geological Survey (U.S.). $t Miscellaneous geologic investigations
$w (OCoLC)6697048
```

Figure 2. A Map Serial.

integration, but I urge them to make the process of adding a 006 field as simple and straightforward as possible.

Should the 006 field be added to each work screen used for inputting new records? A 006 field will be needed in such a small number of cases that it would be better to add the field to a record as needed. If the networks would institute a cut-and-paste operation in which the operator could choose the proper format, the process would be relatively simple. Otherwise, how can the network know in advance whether one will need the serial 006 or the map 006? Also, it will be necessary to have the capability of adding a 006 in order to enhance records already in the database. If a cut-and-paste command is not feasible, another possibility would be for the networks to formulate new commands that would allow for the addition of a 006 and would tailor it to the specific format needed at the time of input.

Of equal interest to me is the ability to use appropriate MARC elements across all formats. I reviewed the MARC Format for Bibliographic Records to remind myself of what fields are available and gave considerable thought to the question of whether they might be applicable to other formats. The MARC formats developed last have gained from the experience learned from the application of the earlier formats. The Books Format, the first developed, is the least specific in the notes area. I was particularly concerned when there were some more specific fields from a later format, for example, serials or computer files, which could be applied to monographs or in general to other formats and, more importantly, might be thought appropriate for use in other situations besides those for which they were originally defined. I have compiled a list of such fields and tags.

In looking at the list below you might consider it unlikely that one or more of the fields would be interpreted in the manner I suggest. However, for those catalogers who are cataloging material in a format with which they are not familiar, such misinterpretation might be possible. The entries on the list fall into three categories: (1) fields that might be used in new ways beyond that for which they were originally created, but probably should not be used in that manner; (2) fields for which there would need to be a rule change or interpretation before using in the manner suggested; and (3) the smallest group, those fields that could be used with a clear conscience.

MARC Field	Original Use
245 Title Statement $f Inclusive dates $k form version $s version	Established for the AM format

An inexperienced cataloger might use the subfield code $f for dates included in the title of an item, for example, 245 10 $a History of India, $f 1880 1980. Subfield $k might be used in the cataloging of theses or other manuscript material, for example, the form identifier "typescript" could be added at the end of theses titles. It is possible that $s Version might be confused with the 250 Edition Statement of computer file, for example, Version 2.1.

300	Physical Description $f type of unit $g size of unit	Established for the AM format

These subfields could be used in rare book cataloging to give more detail about the physical manifestation of an item, for example, $a 1 print : $b lithograph, b&w : image 33 x 41 cm., on $f sheet $g 46 x 57 cm.

340	Medium	Established for the AM and VM formats

This field might be used when more detail is desired for the physical description, for example, rice paper.

362	Date of Publication and/or Volume Designation	Established for the SE and MP formats

While the bibliographic description for serials has always included the chronological or volume designations, this practice has not been used in other formats. The fact that the volumes of a four-volume set are designated parts 1–4 is excluded from the record. Instead, 4 v. is recorded in the 300 field. In order to change the current practice, Area 3 would need to be defined for additional formats.

511	Participant or Performer Note	Established for the MU and VM formats

Carried to an extreme, this field could be used to record the authors who presented papers at a conference or the participants in a conference. I would recommend that the field be limited as currently defined.

515	Numbering Peculiarities Note	Established for the SE format

This field could be used to describe the idiosyncratic issuance of some monographic sets.

518	Date and Place of Capture/ Finding	Established for the AM, MU, and VM formats

The field could be used for such situations as, "Photos from negative made by Edward Weston, ca. 1928."

521	Target Audience	Established for the AM, CF, VF,and SE formats

This field could be used to record such information as "For grades 9–12," which appears on items.

522	Geographic Coverage	Established for the CF format

This field was created for computer files, a format for which the geographic coverage, if any, is not readily ascertainable without an in-depth examination of the files themselves. Rather than import this field into other formats, I would recommend that we continue to use the 043 and 052 fields.

525	Supplement Note	Established for the SE format

The field could be used for the occasional situation when the supplement is described in a note rather than in the subfield $e of the 300 field or as a separate record.

530	Additional Physical Form Available	Established for the AM, CF, VM, and SE formats

It would be possible to use this field to record information about multiple versions on a single bibliographic record. The field would need to be redefined in order to use it in this manner.

540	Terms Governing Use and Reproduction Note	Established for the AM and VM formats

Carried to an extreme, this field could be used to carry a standard message giving a library's policy on photocopying or use of the item. Such use is not recommended.

541	Immediate Source of Acquisition	Established for the AM, MU, and VM formats

The information about the source of acquisition for most material is better handled in a local acquisitions system rather than being included on the bibliographic record.

545	Biographical or Historical Note	Established for the AM and VM formats

Although the presence of biographical or historical notes may be a useful addition to an occasional record, the general use of this field is not recommended beyond the AM and VM formats.

546	Language Note	Established for the AM and SE formats

This field could be used in all situations in which a specific language note is added to a record.

550	Issuing Body Note	Established for the AM and SE formats

Use this field in those occasional cases in which the sponsoring body information does not already appear in the record.

562	Copy and Version Identification Note	Established for the AM format

This field might be used for some occasional monographic situations in which it is deemed important to add such specific information.

780	Preceding Entry	Established for the BK and SE formats
785	Succeeding Entry	

While the use of these linking fields is well established for serials, it has not been standard cataloging practice for monographs.

Whatever linking is done is from the newer edition back to the previous edition. The standardized use of linking fields across all formats needs further investigation.

Numerous MARC fields were established with a specific purpose in mind. In the current consolidated MARC format, each field is prefaced by a table listing the format or formats for which it was established and for which, in the old scheme of things, it was validated. Under format integration all fields are valid for all formats, but even in this new world, it will not be appropriate to use some fields except in the limited way in which they were first envisioned. Therefore, I recommend that the consolidated format retain the same chart but that the explanation be changed so that the table indicates in which format or formats the field is generally used. Also, additional examples, taken from all the formats, should help clarify the use of a particular field. These measures should help reduce the odd tagging that might result from a neophyte dipping into the MARC format.

I would also recommend that an authoritative body, the Committee on Cataloging: Description and Access (CC:DA) and/or the Library of Congress review the cataloging rules in light of format integration and decide whether or not the use of some of the fields I have listed is appropriate or even to be encouraged at all. Whatever the decision, new guidelines should be issued or past practice confirmed.

Each library must decide how it will implement format integration. A number of questions to consider come to mind:

- In what situations will the use of the full possibilities of format integration be used?
- For new records being created, will 006s be added in all circumstances or will the application be limited to some specific situations?
- If copy is available but lacking a 006 and other fields, what level of staff is appropriate to review the record and also make any needed additions or changes?
- What policy will be promulgated by the bibliographic utilities on the fullness of records?

Looking ahead to the impact of format integration on cataloging operations, I believe that serials cataloging would be affected more than other areas. The majority of the samples that I gathered are usually for a serial plus another format. In those libraries in which there is format specialization among the catalogers, I can foresee that the cooperation of serials catalogers with nonbook catalogers will be essential. Depending upon implementation decisions for some of the MARC fields listed above, rare book cataloging may be affected more than other monographic cataloging.

The ability to mix formats is a new concept that will take time to absorb. Until catalogers become accustomed to the full range of MARC fields, I foresee some initial apprehension and slowness in the acceptance of format integration. It will take some time for the MARC tags to be applied with the same dexterity as they are currently. ■■

Communications

Contingency Planning Resources

R. Bruce Miller

In 1988 I wrote "Libraries and Computers: Disaster Prevention and Recovery" in order to share my experience in minimizing the threat of disaster to library databases. Since that time I have had the opportunity to learn a great deal more about disaster prevention and recovery, including the addition of the term "contingency planning" to my vocabulary. Much of that learning process has been directly attributable to two resources that I encountered after I wrote the article. They have proven to be quite valuable, and I would like to call your attention to them.

The first is *Disaster Recovery Journal*. This quarterly journal is about to begin its third year of publication. Beginning in January 1990, it is free to all subscribers in the continental United States. I point this out because I generally avoid free publications; I see plenty of advertising without having to go to the effort of completing a subscription card. *Disaster Recovery Journal* does consist of mostly advertisements, and although the scattered articles have been steadily improving, they are far from scholarly material and are often poorly written and edited. Also, much of what is found in this magazine is aimed at the development of business recovery plans for large corporations.

Now that I have convinced you that you could not possibly be interested in this extra item in your "in" basket, let me tell more. I subscribed last year and found it to be so worthwhile that I purchased the entire run of back issues. This publication is a treasure trove of access to vendors, products, and information about disaster prevention and recovery. The focus is on computer systems, but there are articles and services directly related to library books as well. Here are some titles of articles from a recent issue: "HIS Damages from Hurricane Unfolding," "Disaster Recovery Walkthrough: An Exercise in Reality," "Saving the Books," "When the Smoke Clears," and "Preparing for Earthquakes." Through reading both the articles and the advertisements, I have picked up many ideas and have developed many insights about effective planning that I could have gained only through years and years of difficult first-hand experience. Trust me. Ask for a free subscription. Send your name, job title, company/library, address, and phone number to: *Disaster Recovery Journal*, 2712 Meramar Drive, St. Louis, MO 63129; (314) 846-1001.

The second resource is a contingency planning group. I have joined the local chapter of the Association of Contingency Planners. Once a month we meet for a few hours to share experiences and to listen to a program. These programs have ranged from a vendor touting his software that facilitates the preparation of a formal contingency plan to someone showing slides of the fire that would have cost his company $9 million (and probably his career!) if the contingency plan had failed. Although my library's budget is such that I cannot even consider trying to do some of the things that these "big kids" consider integral to business, I often pick up clever ideas that can be fitted to my less complex environment. I encourage you to join your local group. With a little research you can probably locate a nearby independent group. For information about the nearest chapter of the Association of Contingency Planners, call David Bell at (214) 812-2387 or write to: Association of Contingency Planners, National Headquarters, P.O. Box 73-149, Long Beach, CA 90801-0073.

R. Bruce Miller is Assistant University Librarian, Technical Services, University of California, San Diego.

REFERENCES

1. R. Bruce Miller, "Libraries and Computers: Dis-

aster Prevention and Recovery," *Information Technology and Libraries* 7:4 (Dec. 1988). ■■

Reference Advisory Systems Board

Robert J. Carande

A system containing numerous reference advisory systems (RAS) is described. Using HyperPAD as a front end, patrons are able to access RAS in a number of different subject areas. The system also queries the user for natural-language input. Such input is saved for future analysis in the development of a robust natural-language interface.

Computer-based reference advisory systems (RAS) provide a cost-effective way of supplementing reference services during peak hours or during times of minimal staffing of service points. In an earlier article, one such RAS, "Materials Librarian," was described and some of the practical issues and advantages involved in developing a RAS addressed.[1] This paper describes the larger system environment in which Materials Librarian and other reference advisory systems perform their reference functions in the Science Division of the San Diego State University Library.

GENERAL DESCRIPTION

The San Diego State University RAS Board presently runs on an IBM AT available to patrons of the Science Division. Final implementation of the system awaits the arrival of a 386 PC and a stand-alone desk.

The system consists of a front end, a cluster of RAS modules, a natural-language interface (Dialog/NLI) and a number of databases related to the RAS or the interface (see figure 1). All RAS and the Dialog/NLI are programmed using Turbo-Prolog. The front end is programmed in HyperPAD's PADtalk, a relatively simple but powerful object-oriented programming language.

Access to any of the RAS or the Dialog/NLI option is always through the Main Menu Board written in HyperPAD. HyperPAD calls and executes the selected external program. Upon completing an advisory session the patron is automatically returned to the Main Menu Board.

HYPERPAD AS FRONT END

Recently a number of hypertext/hypermedia products have become available for the DOS-based PC computer. A Research, Scholarship, and Creative Activity Award funded by the California State University during the summer of 1989 allowed us to examine the potential of these programs as a standard front end for a variety of RAS and CAI modules being contemplated. HyperPAD was selected because of its superior graphics, its efficient object-oriented programming capacity, its facility in launching external programs, and its multilevel accessibility that permits patrons to run but not edit or change the system.

The Main Menu Board consists of a number of visually distinct buttons, each corresponding to an external program. When a button is pressed, HyperPAD executes the relevant external program and monitors for program completion. "Behind" every HyperPAD button lies a small "script" written in PadTALK. The straightforward simplicity of this language is illustrated by the representative script below:

```
C Handler Select;
Begin
RUN "D:/Expert/Compsci/Compsci";
End
```

This program tells HyperPAD to go to disk D and find the root directory Expert, then find the subdirectory Compsci and execute Compsci with the command "compsci", and then return to the Main Menu Board when finished.

As more RAS are developed, buttons can be added to the main board with relative ease. When room runs out on one screen a second blank one can be quickly reproduced or button sizes reduced. HyperPAD promises maximum growth with minimum investment in time needed for reprogramming.

Robert J. Carande is Senior Assistant Librarian, San Diego State University Library, San Diego, California.

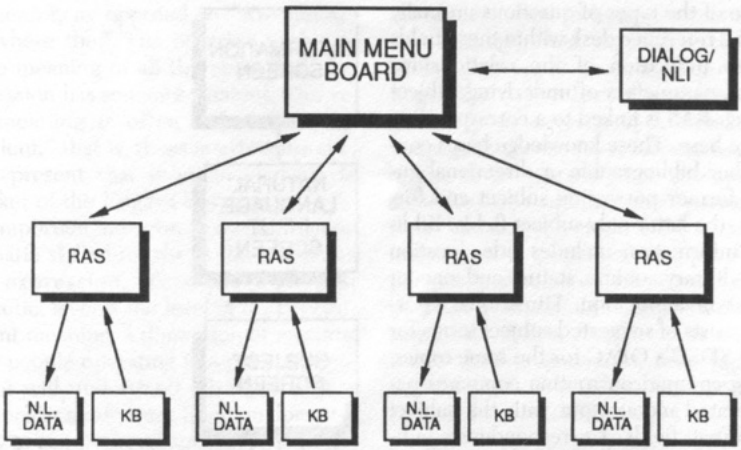


Figure 1. The System: Front End, cluster of RAS Modules, Dialog (NLI), and RAS related Databases.

DESCRIPTION OF CURRENTLY AVAILABLE RAS

The following menu-driven RAS have been programmed and are presently available.

- Materials Librarian: Provides reference advice for patrons seeking information in material science/engineering
- Public Health Librarian: Provides reference advice for graduate students seeking information in public health and related disciplines
- Nursing Librarian: Provides reference advice for graduate nursing students in the area of nursing
- Computer Science Librarian: Provides reference advice for patrons, undergraduate and graduate, on computer science, computer hardware and software, and artificial intelligence

These RAS represent four very popular subject fields at SDSU. A high percentage of our questions at the Science Division fall within the boundaries of one of these subjects. Plans call for many more discipline-related systems to be brought to the board during the coming months.

All of the RAS consist of the same parts: an input screen that prompts users for a natural-language description of their request; a menu tree; a dynamic database of menu choices selected in a given session; a knowledge base; a string manipulator that compares menu choices to knowledge-base entry fields representing subject domain and format type; and a database that stores the natural language request along with menu choices. The menu tree can be further broken down into two parts: a subject section consisting of one or more menus that determine subject matter and a format section consisting of a menu identifying format choices. The SDSU library puts a premium on brevity in developing menu trees, with branching kept to a minimum. It was felt that as far as possible, all subject options should be seen at once, followed by all format options. Research has shown that branching (depth) increases both user insecurity and the demands on short-term memory; efforts were made to restrict the menu tree to two screens whenever possible.[2]

Computer Science Librarian's structure is shown in figure 2. This is the most complex of the RAS, yet needs only two menus to determine subject interest.

For the overall principles governing the design of our interface, we adhered, with minor exceptions, to Dumas' *Designing User Interfaces for Software*.[3] Specific menu options were determined based on several factors. First, curricular divisions and emphasis within the relevant department(s) on the SDSU campus provided indications of how participants in the discipline(s) conceptually approached and categorized the subject matter. Second, menus were developed in close consultation with the relevant bibliographic specialists in the library.[4] Third, firsthand

knowledge of the types of questions normally asked at the reference desk within these fields gave some indication of the relationships among and parameters of underlying subject fields. Each RAS is linked to a corresponding knowledge base. These knowledge bases consist of either bibliographic or directional entries, the former possessing subject and format fields, the latter only subject fields. Bibliographic information includes title, location in SDSU library, online status, and one or more lines of annotation. Directional information consists of suggested subject terms for searching SDSU's OPAC for the same topics. The string comparison routine compares patron-generated menu input with the subject and/or format fields. Correspondence indicates a match between patron subject and format needs and the subject and format profiles of the bibliographic entry.

DEVELOPING PRIMARY DATA ON HUMAN-MACHINE INTERFACE IN THE LIBRARY SETTING

Currently, the second screen on all RAS requires a natural-language input from the user. The patron is prompted for input by the one of the following three statements:

"Type information request."
"Please type your question."
"How can I help you?"

Statement prompts are rotated once or twice a month. These three prompts run the range between the highly personal ("How can I help you?") to the impersonal ("Type information request"). The patron has three lines to express the request using natural English-language sentences. Once the natural-language input is entered, the program goes through the menu screens. It should be noted that the subsequent sequence of menu screens is not affected by the natural-language input. After the patron has selected the appropriate menu options, the natural-language input is linked with the option choices selected and saved in a separate file.

These data are important for several reasons. First, by linking the natural-language input with the menu selections, we can determine whether or not the patron would, in fact, have satisfied the information need by following the advice given. Second, we will spot subject gaps within individual RAS, helping determine whether the subject breadth of

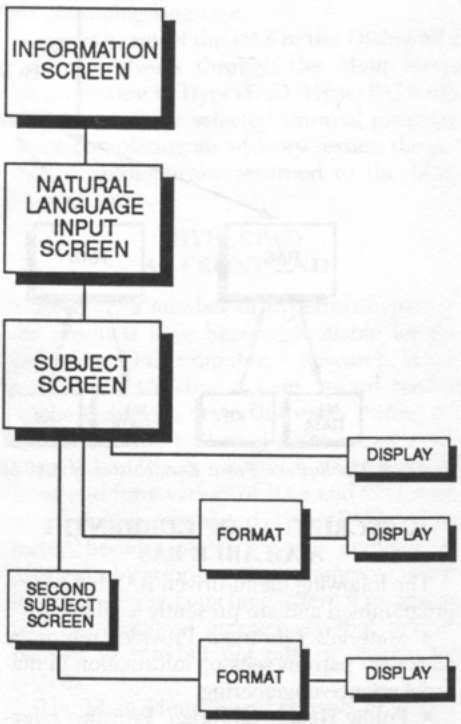


Figure 2. Computer Science Librarian's Structure.

menu options corresponds to patron needs. Third, we will see whether patron and author/programmer share the same understanding of the menu options. For instance, in Public Health Librarian's subject menu, the distinction is made between statistical data and epidemiological methodology; the RAS links all methodological information to the latter, while linking all the statistical, factual information to the former. Will the patron make the same distinction? We also distinguish between journal literature and literature reviews, but again, whether our patrons understand the difference is not known.

The fourth advantage in having this natural-language input concerns the future development of a natural-language interface. Theorists and practitioners working with natural-language interfaces identify three skills at work in the understanding of natural language: syntactic, semantic, and pragmatic.[5] Consider the question "Where are the journal indexes?" This question conforms to certain grammatical rules and therefore is syntacti-

cally coherent, as opposed to "Are indexes journal where the." The librarian is able to grasp the meaning of all the terms and thus the expression has semantic content. This semantic meaning is often called "context-independent," that is, there is a dimension of meaning present that is understandable to any speaker of the English language.

Most important, however, is the application of pragmatic skills brought to the evaluation of this expression. This pragmatic, or hermeneutic, level is the level of the context-dependent meaning, a dimension of meaning that only people operating in a particular environment will understand. To react fully to the sentence as a reference librarian does, it is necessary to comprehend not only the semantic level, but also the pragmatic rules governing interpretation. It is by drawing on his/her wealth of pragmatic knowledge that the reference librarian knows the question to be in need of elaboration. The librarian asks "Journals in what subject matter?" or "What kinds of journals?" and so on. An adequate reference NLI must be competent in grammar, context-independent meaning, and reference-negotiation-dependent meaning.

Standard algorithms written in Prolog have been developed to parse natural-language sentences according to grammatical rules.[6] The coding of semantic knowledge proceeds in a step-by-step manner using either synonym/acronym strings or hierarchical thesaurus structure nets to nest single terms within a context of meanings.[7] The coding of discipline-related pragmatic knowledge proceeds erratically, certain disciplines or "discussion contexts" being well advanced and other receiving little treatment.[8] Lenat has begun encoding the pragmatic links that frame a total world form together, but there is great distance between this world form and the detailed pragmatic knowledge a reference librarian brings to a reference interview.[9]

Practically all attempts at encoding and modeling pragmatic knowledge are based on human-human discourse data.[10] There is very little factual data reflecting the actual natural-language input people make when typing requests on a keyboard into a computer. Data on library patron input are very scarce.[11] This scarcity is unfortunate because natural-language interfaces for reference work depend on their being able to handle the actual expressions used in human-machine interaction. It is upon such expressions that the program must apply its pragmatic rules. It is hoped the data collected in these input files will help in developing a robust natural-language interface for reference negotiation.

The three types of input prompts are designed to test whether the "personal" quotient has any effect on kind of input. For instance, it is suspected that prompts using personal pronouns will elicit input containing personal pronouns and perhaps a more elaborate syntax. Impersonal prompts might cause more direct, matter-of-fact input. This information will be of importance when designing the future NLI algorithm.

DIALOG/NATURAL LANGUAGE INTERFACE

The Dialog/NLI interface assists the patron who is unable to identify a relevant RAS. The objective of the Dialog/NLI option is to suggest the RAS that has the highest chances of meeting the information needs of the patron. Presently this is done by conducting a dialogue reference negotiation modeled after the traditional method of branching, though efforts are made to conform to research findings regarding breadth versus depth whenever possible.

Once an end to branching is realized, a knowledge base is consulted in which the various RAS are weighted relative to these branching outcomes. With only four RAS currently available, each with its own clearly demarcated domain, this module is rarely used by the patrons. However, it is expected that as RAS increase, and domain areas begin to overlap, the Dialog/NLI option will come increasingly into play. In expectation of many focused RAS, the branching of the dialogue negotiation goes as far as possible within traditionally defined discipline and subdiscipline boundaries.[12]

Eventually this dialogue interface will be replaced by a more robust natural-language interface based on standard parsing algorithms and a lexical and pragmatic knowledge base informed by the data collected in our natural-language input files.

CONCLUSION

Librarianship is ideally situated to take advantage of and contribute to the growing in-

terface between computers, information, and information-seeking behavior. Indeed, much of the important linguistic data characterizing information-seeking behavior and facilitation can only be found within the practice of librarianship. In its academic, public, and special environments, librarianship clarifies and translates an individual's information need into the technical and broader categoreal order in which information is structured. The trend toward reposing this categoreal order and the information it structures in machine-readable files has long been with us. Remote online databases, CD-ROMs, and OPACs are familiar examples. Ahead lies development of interfaces, initially menu driven, eventually governed by natural language understanding, that conduct the clarification and translation process itself.

The system described in this article and the many potentials it creates for future interface applications were made possible by an intermediate familiarity with a programming language (Prolog) and a beginning knowledge of a hypertext product (HyperPAD). Because librarianship is the proving ground sine qua non of this science of interface creation, it is incumbent upon our profession to encourage programming literacy among its ranks. While the learning curve is not inconsiderable, neither are the paybacks that come with specialized software and the ability to contribute directly to an important dimension within librarianship.

REFERENCES AND NOTES

1. R. J. Carande, "Reference Advisory Systems (RAS): Some Practical Issues," *RSR* 17, no.3:87–90 (1989).
2. K. Snowberry, S. R. Parkinson, and N. Sisson, "Computer Display Terminals," *Ergonomics* 26, no.7:699–12 (1983). J. I. Kiger, "The Depth/Breadth Trade-Off in the Design of Menu Driven Interfaces," *International Journal of Man Machine Studies* 20:201–13 (1984).
3. J. S. Dumas, *Designing User Interfaces for Software* (Englewood Cliffs, N.J.: Prentice-Hall, 1988).
4. I would like to thank Lillian Chan for advice and evaluation of Nursing Librarian and Public Health Librarian, and Anne Turhollow for advice and evaluation of Computer Science Librarian.
5. J. Hirschberg, B. W. Ballard, and D. Hindle, "Natural Language Processing," *AT&T Technical Journal* 67, no.1:41–57 (Jan./Feb. 1988).
6. K. Weiskamp and T. Hengl, *Artificial Intelligence Programming with Turbo-Prolog* (New York: Wiley, 1988).
7. For a further discussion on semantic representation and information retrieval, see Alina Vickery and Brian Vickery, *Information Science in Theory and Practice* (Boston, London: Butterworths, 1987). Chapter 6, "Semantics and Retrieval," is especially pertinent.
8. Analyzing the results of searching INSPEC (1977 to the present) using "natural languages" coupled with discipline names finds that, in terms of relevant hits, the medical sublanguage is furthest advanced.
9. For a discussion of Lenat, see J. L. Casti, *Paradigms Lost: Images of Man in the Mirror of Science* (New York: Morrow, 1989), p.306–8. Also M. Waldrop, "Machinations of Thought," *Science* 85:44 (Mar. 1985).
10. See, for instance, the excellent discourse model developed in R. Reichman, *Getting Computers to Talk Like You and Me* (Cambridge, Mass.: MIT, 1985).
11. However, see B. A. Hockey and B. Nielsen, "Linguistic Analysis of Reference Transactions: If You Want an Answer, You've Got to Find a Question," in *SCIL 1988: The Third Annual Software/Computer Database/CD-ROM Conference and Exposition for Librarians and Information Managers (Chicago, March 7–9, 1988)*, p.38–39. Hockey and Nielsen have eighty hours of actual face-to-face discourse at a reference desk that they have submitted to analysis.
12. Divisions were primarily based on the Inspec Thesaurus. ■■

Connect 2400: Welcome to QuickCLIC!

Marcia Dunker

An electronic mail system was developed for the Cooperating Libraries in Consortium (CLIC), a consortium of seven private liberal arts college libraries and one private reference library in St. Paul, Minnesota, in the early months of 1989. During the previous year and a half, CLIC suggested that an electronic or "e-mail" system be developed to

Marcia Dunker works in Systems at Cooperating Libraries in Consortium, St. Paul, Minnesota.

speed along messages, meeting notifications, system developments, and requests for supplies. Consensus was reached on six goals for the e-mail system:

1. Reduce the number of CLIC meetings.
2. Faster communication.
3. Downsize demands on courier resources.
4. Decrease the time spent on telephone calls.
5. Reduce long-distance calls between our vendor, Carlyle, and CLIC, and the Carlyle Upper Midwest Interest Group and CLIC.
6. Provide greater information sharing between CLIC institutions, CUMIG, and Carlyle.

This article will elaborate on how QuickCLIC fulfilled these goals and describe the process, modifications, costs, and benefits for institutions considering the installation of similar electronic mail systems.

HISTORY

The libraries of Augsburg College, Bethel College, Concordia College, Hamline University (including the Law Library), Macalester College, The James J. Hill Reference Library, the College of St. Catherine, and the College of St. Thomas (all located in the Minneapolis-St. Paul area) incorporated as Cooperating Libraries in Consortium (CLIC) in 1969.

The consortium is governed by a board of directors composed of the library directors of member libraries. Office staff is employed at a central location to administer the cooperative activities of the consortium. Services and activities include resource sharing through reciprocal borrowing and interlibrary loan (ILL); CLICnet, an online catalog carrying the holdings of all member libraries; courier delivery service; cooperative collection development; and joint staff development. These operations are supported through annual membership fees; grant support is solicited for special projects.

SPECIFICATIONS

QuickCLIC, the name given to the electronic mail system, is resident on a WysePC+ with a 40MB hard drive. It utilizes the WWIV software, version 4.07, and accepts a 300/1200/2400 baud rate. Originally, it was connected to one of the office phone lines, although this was unsatisfactory due to the office's circle hunt feature. Rather than getting a busy signal stating that the system was currently accessed by another user, librarians trying to connect to the e-mail data line would be "bumped" to a voice line, only to hear a ghostly voice of one of the office staff emitting from the modem.

Because our automation vendor, Carlyle, based much of our system on telecommunications, we found that most of our equipment is adaptable and can be shared with our e-mail system. Users dialing into QuickCLIC need a modem, telecommunications software, a printer (to print off memos), and either a PC or dumb terminal. CLIC chose not to invest in new equipment but tried to utilize what was already available on the campuses. Our cataloging system used specific terminals installed with internal modems that were purchased for PC-to-PC communications, one of our vendor's products. Although the product did not materialize until much later, we did have the equipment at each remote site and only added Procomm, a software communications package, to access QuickCLIC.

FEATURES

QuickCLIC is composed of several subboards and a private e-mail section. The private mail section is divided into two parts: single or multiple. Mail can be sent to any member of any CLIC library registered on the system. Multiple mail is an option by which the sender can list up to twenty names or numbers and the same message will be sent to each person on that list. This is especially useful for reminding committee members of meetings, assignments, and agendas or for notifying libraries of impending downtime. The subboards are public. Any messages posted can be read by any user with the proper authorization. Because of the nature of CLIC, security levels vary with the users, but access to the boards is controlled through the use of toggling AR switches. Boards include "Of General Note," a general board that serves as a catchall for social events, messages, and notices of activities in the greater library community. This subboard is open to all QuickCLIC users and, along with "I'd Like to Call This Meeting to Order," serves as the backbone of our system.

"I'd Like to Call This Meeting to Order" is CLIC's calendar. This is updated daily with

the listing of meetings, agendas, reminders of special settings, and changes. Since the CLIC central office has one conference room that is utilized by each of the standing committees and interest groups, this subboard has saved the office staff much time in tracking, posting, and scheduling space.

Our online catalog is known as CLICnet. As with every computer system there is some scheduled and unscheduled downtime, changes, and maintenance to be done. In the past, this entailed the systems person contacting each library. This "round robin" calling was not a very efficient method, and the subboard "CLICnet Is Expected to Be Back..." was created. This subboard notifies of scheduled downtime, update completions, and delays experienced by operators. Follow-up reports are also posted on this subboard so library staffs can be well informed on the vagaries of CLICnet.

One of the administrative functions of the CLIC central office is to serve as a purchaser and distributor of bulk products utilized by all member libraries. "Your Order Please..." is a subboard for individual libraries to order ILL forms, overdue notices, printer paper, inkjet cartridges, and terminals and to notify staff concerning the status of courier bags and envelopes. Bookkeeping and inventory are simplified since requests no longer come in on scraps of paper via courier or telephone messages that do not reach their destination. The orders can be printed, dated when the materials are sent, and filed.

The remaining subboards are geared to special audiences and have restricted access. "Nuts and Bolts, Ports and Cables" is a technical board and restricted to the systems liaison at each institution. It also allows access to the library computer personnel from St. John's University (Collegeville, Minnesota), College of St. Benedict (St. Joseph, Minnesota), Carleton College (Northfield, Minnesota), and Iowa State University (Ames, Iowa). Carlyle, CLIC's vendor, has automated installations at each of these academic libraries, and this subboard is designed to provide a forum for questions, feedback, and solutions to problems encountered with Carlyle products.

Initially, Carlyle tried to use ALANET as an e-mail system to remain in contact with their customers in the Midwest and East. This was unsuccessful mainly because few Carlyle customers were also ALANET users. The Midwest Interest Group, composed of Carlyle customers in the Midwest, has access to QuickCLIC, and Carlyle has a subboard, "Carlyle's Corner," on which Carlyle posts information. This contains general knowledge: public relations, questions and answers, notifications of documentation changes, and new products. This subboard is open to all CLIC users, Carlyle staff, and Upper Midwest Interest Group members (MIG).

Two "policy" subboards exist on QuickCLIC. Restricted to CLIC board of directors and the library directors of each of the institutions in the Upper Midwest Interest Group, the "Upper Midwest Interest Group" subboard is still evolving as users decide what direction the subboard should take. The "Executive Washroom" is restricted to the CLIC board of directors and the CLIC consortium manager.

The only subboard open to the public is "In the Public at Large." This subboard is an area for dial-in users to post problems, solutions, and suggestions concerning our online catalog, CLICnet. The public only sees the one subboard.

USER BASE

Each user who signs on to the system for the first time needs to complete a short questionnaire (name, work phone, etc.) and choose a password. Each successive log-on requires only a name and password. Access levels will vary according to the user, board members and the CLIC manager having the highest levels (and a board to themselves), and Carlyle staff having access to two boards: "Nuts and Bolts, Ports and Cables" and the "Carlyle Corner." Access to the "Upper Midwest Interest Group" subboard is limited to Upper Midwest Interest Group members, the CLIC manager, and the CLIC board members.

MAINTENANCE

QuickCLIC continues to evolve as CLIC's needs change and staff finds more uses for the system. Future expansions include developing a section to include ILL requests. Our present paper system is good, but diminished turnaround time could be achieved in developing an electronic system.

EXPENSES

The addition of another phone line to the CLIC office costs $60 per month ($720 annually). The WWIV software was purchased from the author, Wayne Bell, with source code for $55. Hardware is owned and maintained by the CLIC central office and the final responsibility rests with the CLIC systems manager. At the May 10, 1988, Midwest Interest Group meeting held at St. Catherine's Library, it was suggested that MIG libraries might subsidize part of the cost; however, as of this date CLIC has supported the system.

ADVANTAGES

Utilizing an electronic mail system has many advantages for any consortium or library system with branches. CLIC listed seven goals for the e-mail system, and all have realized some success. The number of CLIC meetings has been cut back. Topics are posted and discussed and reports and updates given without requiring time for face-to-face meetings. Faster communication is possible as materials can be transmitted electronically from campus to campus more quickly than via the twice-a-day courier stops or through multiple phone calls.

Downsizing demands on courier resources is a crucial goal for CLIC as the advent of our online catalog stretches our courier resources to capacity. ILL requests increased 400 percent at some institutions, requiring CLIC to look to alternative methods for transmitting nonbook materials.

Remaining goals include decreasing the time spent on telephone calls, cutting back on long-distance calls between Carlyle and CLIC, and CUMIG and CLIC, and greater information sharing between CLIC institutions, CUMIG, and Carlyle. Memos and ideas are posted in mail and responded to rather than waiting for "call backs" or cryptic messages on answering machines. Materials and information are disbursed to a large audience without the usual dependent labor-intensive actions, thus leading to an increased effectiveness of the Carlyle Upper Midwest Interest Group. Forming a more cohesive group aids in formulating ideas, solutions, and modifications at both the national level and with Carlyle.

Although not all the advantages have been realized to the extent that CLIC projected, QuickCLIC will progress as the e-mail system matures and gains acceptance. ■■

Recent Publications

Book Reviews

Annual Review of Information Science and Technology, v.24. Ed. by Martha E. Williams. Amsterdam: Elsevier Science Publishers, 1989. 458p. $91 (ISBN 0-444-87418).

Book reviewing is good for you . . . or at least for me. When the rapid approach of the copy deadline finally made me read volume 24 of the *Annual Review of Information Science and Technology (ARIST)* published by Elsevier on behalf of the American Society for Information Science (ASIS), I was forced to reevaluate my prejudices about the relevance of ASIS to the practicing library professional. Previously, I had viewed ASIS and its works as the province of academics and researchers primarily interested in obscure mathematical formulas requiring several generations of translation before being applicable to front-line library and information retrieval situations. I was prepared to make an exception for the society's bimonthly *Bulletin*, which in recent years has capably addressed issues more closely related to operational situations, but that regard was offset by the association's seemingly interminable devotion to pondering the question "What is information science?" This preoccupation is not entirely absent from *ARIST 24*, but the volume contains much to recommend it as a source of competent and, at times, even gripping reviews of developments in selected areas of information science.

ARIST is intended to review "numerous topics within the broad field of information science and technology. No single topic is treated on an annual basis; it is the publication of the book that occurs annually. *ARIST* chapters are scholarly reviews of specific topics as substantiated by the published literature. . . . The time period covered varies from chapter to chapter, depending on whether the topic has been treated previously by *ARIST* and, if so, on the length of the interval from the last treatment to the current one. . . . The reviews aim to be critical in that they provide the author's expert opinion regarding developments and activities within the chapter's subject area."

The current volume contains reviews of international information issues by Eres; subject analysis by Lancaster, Elliker, and Connell; computer-readable dictionaries by Evens; bibliometrics by White and Mccain; chemical structure processing by Lipscomb, Lynch, and Willett; engineering information systems by Mailloux; social science information by Preschel and Woods; and the education and training of the information professional by Cooper and Lunin. The strongest chapters—those that do, in fact, incorporate an element of analytical comment as well as reportage—are those on subject analysis and bibliometrics. The chapters on international information issues, computer-readable dictionaries, chemical structure processing, and education and training present informative overviews of major issues in these fields. Although competent as reviews of recent publishing activity, I found that the chapters on engineering and social science information failed to ignite either an awareness of, or interest in, issues of significance in these fields.

However, for me, the real conundrum lies in the final chapter, a review essay on the foundations of information science by Heilprin, which crystallizes my concerns about the remoteness of the relevance of many of the issues dear to ASIS. As I understand it—and, after several attempts to wrestle with the chapter, I'm sure that I don't—the essay proposes a framework to accommodate the currently unknown future multidisciplinary contents of the foundations of information science, a framework that is "a general, conceptual model, almost empty of details, but those details [to be] as suggestive of possibilities and as invariant in time as we can make them today." On this subject, I await,

with interest (and some trepidation), elucidation from my colleagues.

To return to the reversal of prejudices, rather than their entrenchment. *ARIST 24* and, by extension, previous issues of this annual review publication have now been added to the arsenal of resources to which I turn when faced with the need to obtain an authoritative, in-depth overview of current thinking and published English-language literatures on the broad range of topics that can be categorized as falling within the domain of information science. The convenience of accessing the series could be improved by the addition of an appendix or index indicating the coverage of previous volumes. Newcomers to the field might also benefit from the inclusion of additional information on the backgrounds of individual contributors; only current institutional affiliations are now listed.—*Judy McQueen, Chicago, Illinois.* ■■

Authority Control in the Online Environment: Considerations and Practices. Ed. by Barbara B. Tillett. New York: Haworth, 1989. $22.95 (ISBN 0-86656-871-9).

In recent years there has been an outpouring of literature on authority control. While earlier writings debated the necessity for authority control in the online environment, more recent literature accepts authority control as basic to the function of the catalog and focuses instead on the most effective use of computer resources in achieving authority control. This collection marks an excellent addition to the field.

Authority Control in the Online Environment: Considerations and Practices consists of nine articles spanning a broad range, from theoretical to practical, from international developments through local case studies. The introduction by editor Barbara Tillett establishes a framework for the articles that follow. She outlines the distinction between authority work and authority control and posits a definition of automated authority control as "the computer's role In authority work, plus a more general control over the access points and search terms used in the computerized bibliographic file." Tillett proposes using the term *access point control* as less confusing and more accurate than authority control. This is an interesting approach in that it shifts attention to catalog usage rather than cataloging rules and to the computer as a mechanism for providing collocation and pathways through the catalog's resources.

The book begins on a broad perspective with an examination of authority control in an international context. Tom Delsey's article on authorities and authority control in relation to the concept of Universal Bibliographic Control traces the work done by IFLA in this area and discusses the technical requirements and administrative complexities of establishing an international authority system. An excellent overview of authority control literature of the past decade is presented in the article by Arlene Taylor. Taylor concentrates on theory and research and in doing so provides a comprehensive guide to the major issues in authority control today.

Two research articles in the collection are especially interesting. One is Elizabeth Fuller's research on the variation in personal names occurring in a bibliographic file. She investigates not only the extent of variation, but the patterns of variation, and examines what aspects of authority control can be accomplished through system programming. Richard Smiraglia's research focuses no authority control in relation to works rather than names. He has studied the extent to which multiple manifestations of a title occur in musical works and the role of uniform titles in identifying, collocating, and linking these various manifestations.

Other articles in the collection include an examination of the use of the Library of Congress Names Authority File (LCNAF) on RLIN, descriptions of authority control in the GEAC and the NOTIS systems, and studies of authority control implementation in local catalogs, namely NOTIS at Auburn University and UCLA's Orion system.

A collection such as this necessarily skims over many topics and raises more questions than it answers. One would like to see more on corporate names, on subject authority control, on sharing authority files, on linking bibliographic and authority records, and on authority file design. However, this collection is intended, as stated in the introduction, to "offer background and inspiration for future thinking." In achieving this goal, it has certainly succeeded.—*Susan Jacobson, Hunter College.* ■■

Beaumont, Jane, and Joseph Cox. *Retrospective Conversion: A Practical Guide for Libraries.* Supplements to Computers in Libraries, no.7. Westport, Conn.: Meckler, 1989. $35 (ISBN 088736-352-0).

Many libraries of all sizes are contemplating the costly process of converting all the bibliographic information preexisting implementation of their computer-based systems to machine-readable form, and incorporating it into automated systems. For smaller libraries lacking the resources to hire a consultant to help with planning and decision making, this slim volume will provide welcome assistance.

The authors' stated purpose is "to provide information in non-technical language," and, with few exceptions, they do. From the first page forward, however, retrospective conversion becomes *recon*, now being applied to all sorts of conversions, including reclassification of old Dewey collections to LC classification and revision of pre-*AACR2*, and now-defunct, *LCSH* headings to meet current name and subject authorities.

Fourteen chapters cover the rationale for converting data; an overview of the process; planning for conversion; identifying and choosing a conversion method; developing an action plan; MARC records; implementation and project management; and editing records from a source database. The appendixes include lists of sources for MARC records, conversion services, vendors, sample work forms, and a selected bibliography. The book begins with a short list of acronyms—a relief from those that insert acronymns in every other phrase (EOP).

Chapters are short and include summaries in list or outline form of the information one will want to remember and apply. It is an effective presentation mode for the practitioner expecting to use this as a "how-to" guide, along the lines of the Rush Associates' *Library Systems Evaluation Guides* and Corbin's *Mananaging the Library Automation Project.* Chapters close with bibliographies varying from two or three citations to twenty-five or more. These lists are gathered together in the selected bibliography, which does not seem to include any new citations.

Both authors are affiliated with Canadian institutions, and the book exhibits more equitable treatment of issues and sources of importance to Canadian librarians, e.g., CANMARC, *Canadian Subject Headings*, than many U.S. publications. Meckler is, of course, an international firm with offices in London, too; but the representation of a broader perspective in any particular title does not always follow. U.S. librarians will not feel slighted in any way, as they sometimes are by British-based publications, since issues and sources in the United States are well covered.

The book's formatting is a problem for this reviewer. The size of the print is too small for comfort and margins are narrow, making for pages crammed with text. The book is saved from being painful to read by having numerous section headings and summaries that break up the text as well as extremely short paragraphs. Another quibble is the many typographical errors present. Perhaps the proofreaders also had trouble with all that small print. Formatting aside, the chapters that do least well, in this reviewer's opinion, are the two explaining the MARC format. Distilling all of the essentials of coding all types of materials into fewer than fifty pages is bound to fail; there is simply too much information with too little explanation for real beginners. The examples take a great deal of thought to figure out, being incomplete in many cases. Some of the entry instructions will sound incorrect to OCLC inputters, e.g., entering LC card numbers (the 010 field) solely as eight-digit numbers without hyphens by supplying zeros to fill out shorter numbers.

These quibbles aside, *Retrospective Conversion* is a good book. It is recommended for practical use by librarians trying to manage a retrospective conversion project for their libraries, not for learning how to code data using the MARC format.—*Sheila S. Intner, Simmons College, Boston.* ■■

Berg, Brian A., and Judith Paris Roth. *Software for Optical Storage.* Westport, Conn.: Meckler, 1989. $47.50 (ISBN 0-88736-379-2).

Software for Optical Storage is a highly specialized book focusing on optical storage technology (WORM rather than CD-ROM) and targeting a reader who is a computer professional. The book consists of a series of nineteen separately written chapters organized in a sequence that moves from the general to the highly specific.

Of potential interest to the general reader is Roy Slicker's excellent discussion of "Market Requirements for Optical Disk File Systems." Not only does Slicker discuss the technology's characteristics, but he also analyzes the reasons why the industry has failed to live up to its potential. He cites lack of standards as the major obstacle. He also discusses other issues which need to be resolved in order to make WORM disks an accepted storage medium.

In another chapter of general interest, McDowell echoes Slicker's views and emphasizes the need for standard interfaces. He also discusses ways to emulate erasable storage in a WORM system.

Brian Berg elaborates on the need for interfaces and presents a useful discussion on the "Role of the SCSI Interface," an ANSI standard interface for small systems. An overview of standards by Hallam entitled "Current Status of Optical Media Standards" also is worthwhile.

Most of the rest of the articles will be of interest only to those who are seeking to implement WORM systems in particular environments: MS-DOS, Macintosh, UNIX, VAX-VMS, etc. There also is an excellent chapter by Ranade on benchmark testing of WORM drives.

The appendixes include a very useful directory of companies in the optical storage industry, a brief and not too current bibliography, and an excellent glossary of terms.

This book is highly recommended for computer professionals interested in mass storage. It also should be considered for acquisition by libraries that serve computer professionals.—*Richard W. Boss, Information Systems Consultants Inc.* ■■

Biographic Instruction and Computer Database Searching. Library Orientation Series, no.17. Ed. by Teresa Mensching and Keith Stanger. Ann Arbor, Mich.: Pierian, 1988. 173p. paper, $30 (ISBN 0-87650-251-6).

The May 1986 Fourteenth National LOEX Conference was, by all accounts, both useful and stimulating. The conference theme, "Bibliographic Instruction and Computer Database Searching," was timely. With the advent of a number of reduced-rate online services, an increasing number of libraries were in the process of developing and implementing new search services. The opportunity to talk to colleagues who were coping with similar issues, to analyze successes and failures, and to share handouts and promotional materials, must have been invaluable.

For today's BI librarians, the value of the proceedings of that conference, published in 1988, is less clear. Database searching services are changing and developing rapidly. What was new and interesting in 1986 is by now standard practice, old hat, or too obvious to merit discussion. Not surprisingly, the conference papers that have made the best articles are those that deal with more than the nuts and bolts of setting up a search service or developing a training program.

Joan Lippincott's "Taking a Leadership Role in End-user Instruction" is a thorough and useful discussion of goal setting and planning. In a thought-provoking article David King states that "the mechanics of searching should play a minor role in our educational efforts" and suggests that a number of fundamental issues and problems should be addressed before we can successfully teach end users to search. Of the remaining articles, four discuss specific BI programs, primarily in the context of end-user searching; one summarizes the results of a 1985 national study of end-user search services; and another focuses on faculty as end users.

Much of the rest of the volume is devoted to the reproduction of presearch worksheets, handouts on search strategy design and Boolean logic, class schedules, and detailed instructions on how to search specific systems. Again the focus is on end-user searching of online systems. The collection concludes with a number of bibliographies, including Hannelore Rader's 1985 bibliography on library orientation and instruction.

A librarian starting out today to set up an end-user service would undoubtedly find this collection of articles and handouts useful. However, at the end of the 1980s, the new issues in database searching reflect the shift to CDs and locally mounted databases. Librarians today are grappling with such questions as how to provide instruction to remote users searching from dormitories and offices. They want ideas on how to manage the multiplicity of software and hardware in today's CD environment. They are interested in seeing hand-

outs from courses that teach faculty and students to download and manipulate bibliographic and numeric data. Unfortunately, they will not find the answers to these questions in *Bibliographic Instruction and Database Searching.—Patricia E. Renfro, University of Pennsylvania.* ■■

Building the Twenty-first Century: Proceedings of the Fifth National Conference of the Association of College and Research Libraries (April 1989). Ed. by Janice Fennell. Chicago: Association of College and Research Libraries, 1989. 350p. $30; $22 ACRL members (ISBN 0-8389-7289-6).

The seventy-seven essays collected in this volume are the contributed papers chosen for presentation at the Fifth National Conference of the Association of College and Research Libraries. Twenty-one papers are research papers and fifty-six are position papers.

As might be expected, all aspects of academic librarianship are represented. The papers are grouped into categories of academic/research librarianship, administration, automated services, bibliographic instruction, collection development, international papers, personnel, preservation/special collections, and reader services.

Because the concept of the programs at the ACRL conference called for a less formal presentation, many of the papers included in the volume are very short "thought" pieces. Their purpose, obviously, was to stimulate discussion at the meeting where they were presented. Interesting and thought-motivating papers of this type are represented by Corey's "Who's in Charge Here, Anyway?" Mouw's "Weeding the Collection: Are Libraries Failing Their Charge?" and Bolin's "No More Good Workers: Excellence and the Academic Library Classified Staff."

Other papers were the result of carefully planned research into topics of importance. Glogoff's "'Who Are Those Guys?' A Report on the Survey of References of Library Scholarly Journals" and Gleim's "The Relationship between Cataloging and the Circulation of Books in a Large Research Library" are examples.

As would be expected, many of the papers draw heavily on the innovative or not-so-innovative projects or programs in the writers' libraries. While these "how we did it good" papers might not be considered to be of importance, many presented interesting ideas. After all, an essential purpose of such conferences as this is the sharing of ideas, and the volume is a rich compilation of good ideas.

Jan Fennell has done an outstanding job pulling the volume together and seeing it through to publication on a timely basis. Because the papers were submitted in final camera-ready format to expedite production, type fonts and clarity of illustrations vary widely.

The volume includes capsule descriptions of the thirty-two workshop forums, panel presentations, and group discussions. A subject index based on keywords submitted by each of the authors is a useful feature as are the brief abstracts of each paper.—*Barry B. Baker, University of Georgia.* ■■

Defining and Applying Effective Teaching Strategies for Library Instruction. The Library Orientation Series, no.18. Ed. by Mary Beth Bunge and Teresa Mensching. Ann Arbor, Mich.: Pierian, 1989. paper, 133p. $30 (ISBN 0-87650-252-4).

Defining and Applying Effective Teaching Strategies for Library Instruction is a compilation of papers and poster sessions presented at the fifteenth LOEX (Library and Orientation Exchange) Library Instruction Conference held May 7–8, 1987, at Ohio State University. The annual conference attracts beginning as well as veteran bibliographic instruction librarians for two intensely focused days of shop talk. Each year a different theme is chosen: the 1987 anchor took participants "back to the basics" of teaching strategies. The selection of presentations reflects the organizers' objective of assisting the beginner looking for formulas and guidance as well as the seasoned practitioner seeking a stimulating shot in the arm. Editors Mary Beth Bunge (Ohio State) and Teresa Mensching (LOEX Clearinghouse) offer five lead-off articles, sixteen poster sessions, pages of sample curricular materials, topical bibliographies, and a list of attendees.

In the first article, "Teaching: No Greater Professional Role," Keith Cottam (University of Wyoming) offers anecdotal, sentimental, and, at times, motivational testimony on what being a teacher means. In response to the mandate for teaching excellence prompted by

the recent educational reform manifestos, he offers practical advice for librarians striving to be excellent teachers. Joan Ormondroyd's (Cornell) "In-House Training of Instruction Librarians" is an abridged version of her chapter in *Teaching Librarians To Teach* (Scarecrow, 1986). Her primer on how to organize in-house training programs is helpful to anyone contemplating such endeavors, not just those involved in bibliographic instruction. Thomas McNally (Ohio State) is known for his engaging multimedia presentations on BI (bibliographic instruction) videotapes, but none of the entertainment value comes through in his short and dry "Producing Library Instruction Videotapes: Avoiding the Mistakes of the Past." If only a videotape illustrating the worst and best of BI video could have been tucked inside the proceedings! Mignon Adam's (Philadelphia College of Pharmacy and Science) "Evaluation for Teaching Effectiveness" is a beginner's lesson in the hows and whys of evaluation, complete with a list of fundamental sources. A trio from Ohio State (librarians Mary Key and Victoria Welborn and School of Natural Resources faculty member David Johnson) detail the collaborative process of successful course-integrated instruction in "Teaming Up with Classroom Faculty."

The five articles create an encouraging, definitely "can-do" tone for the work. Specificity and often more enduring substance is found in the poster session abstracts. Several abstracts and their illustrative materials deserve special mention. Scott Davis and Marsha Miller's (Indiana State) "Advances in Projection Technology for Online Instruction" provides a consumer evaluation of projection panels, lists librarians experienced in their use, diagrams how to cable up the machines, and reviews relevant literature. William Frost and Chris Pfaff (Bloomsburg University) detail an audio, computer, and video script in "Instructive Library Orientation Through Interactive Video." "Active Learning Methods in the One-Hour Bibliographic Instruction Lecture," authored by Trish Ridgeway (University of Pennsylvania), is a masterful articulation of how to apply active learning theory.

Keeping with the Clearinghouse tradition, the book is full of sample hand-outs, guides, and other aids. Unfortunately, some are so poorly reproduced as to be unreadable. Substantial bibliographies on course-related instruction, credit courses, media techniques, evaluation, computer-assisted instruction, workbooks, and teaching librarians to teach round out the publication.

This is another work in a long line of useful Library Orientation Series publications. However, sloppy proofreading resulted in numerous errors, many glaring enough to be quite distracting. Given the lack of meticulous editing and the simple reproduction of the papers as articles, it is puzzling why so much time has elapsed between the conference and the publication. The delay diminishes the usefulness of some of the information on emerging technologies. Overall, the intensity and focus of the conference comes through in a publication that is of particular value to those new to instruction.—*Betsy Wilson, University of Illinois at Urbana-Champaign.* ■■

Dykhuis, Randy. *Template Directory for Libraries 1989–1990.* Westport, Conn.: Meckler, 1989. $45 (ISBN 0-88736-384-9).

A new entry in the literature of librarianship, the *Template Directory for Libraries* is, as the title claims, a list of templates useful for libraries with the source given for each. All are for Apple II, Macintosh, or MS-DOS computers; many cost under $10 and almost all less than $15. Sources of templates include user groups and software exchanges.

The directory grew out of a column the author has written for *Small Computers in Libraries* since 1987 and covers a broad range of applications, from accessions and accounting to vertical file and volunteer lists. Not all templates included were developed for functions specific to libraries; however, the business applications included, like those in time management and word processing, are appropriate for library use. Most support staff functions. A few are of more interest to the library user, especially those in the food and recreation sections. Three-fourths of the entries are for the Apple II and of them all but three are designed for AppleWorks. The ninety entries for the Macintosh depend on a broader group of programs including MS Works, Excel, and MultiPlan. The 195 entries for MS-DOS are designed primarily for Lotus 1-2-3 and Symphony, but there are templates for Microsoft

Works, dBase III, and others.

The arrangement and indexing make this directory very easy to use. The main body is in three sections, one for Apple II applications, one for Macintosh applications, and one for MS-DOS applications. Within each section is an alphabetical list of categories such as circulation, interlibrary loan, and scheduling, which makes it possible to find a list of templates quickly for a specific use and system. The table of contents serves as a useful guide. The index is an alphabetical list of template applications further defined by systems and is very helpful for the user with more than one system available. Unlike the index headings found in many software manuals and guides a decade ago, those chosen for this index will make sense to anyone who works in a library and has even the slightest exposure to automation.

The entries themselves are somewhat disappointing. Each one includes title, source, price, and software required, but few give any further description. The usefulness of this guide would be increased immeasurably by the inclusion of descriptive details.

Well arranged and well indexed, this first general guide to templates for libraries is sure to support increased use of automation for numerous library applications. Meckler plans to publish the directory annually, with new editions appearing each September. Hopefully, the next edition will include more descriptive information.—*Deanna Nipp, Rutgers University, Piscataway, New Jersey.* ■■

Hyman, Richard Joseph. *Information Access: Capabilities and Limitations of Printed and Computerized Sources.* Chicago: American Library Assn., 1989. 192p. $35 (ISBN 0-8389-0512-9).

Many of us have become so bored by the clichéd phrases "information revolution" and "technology revolution" in our field that we forget that there is truly great change going on, that the changes we are seeing in information systems engineering *do* involve the replacement of a whole suite of methods for doing things by other means. Such changes affect not only the ways that the information systems work, they affect *people* as well, for they increase or decrease the value of intellectual capital, they may redirect expected career paths, and they influence the conduct of occupational education in significant ways. Living through such changes, however, does not always mean that we are fully aware of them; depending on the perceived future value of our intellectual stock, some of us may be motivated to shore up the past rather than recognize the changes that devalue older knowledge. Richard Hyman's monograph *Information Access: Capabilities and Limitations of Printed and Computerized Sources* offers a case in point.

Information Access offers an overview of literature retrieval systems that are based on bibliographic records of the type librarians have been working with for over a century. The author's introduction identifies his audience as the library school student and the practitioner. Following two opening chapters that review pre–twentieth-century retrieval systems and traditions, Hyman organizes his discussion of contemporary systems into four chapters, two on printed access (descriptive cataloging and subject access) and two on computerized access (online catalogs and commercial bibliographic retrieval systems like BRS). Within the limits imposed by his announced concentration on the utilization of "surrogates" as the principal method through which librarians engineer retrieval systems, Hyman treats at least to some extent a fairly wide-ranging array of topics, from Panizzi's Rules to ISBD and PRECIS, from systems for alphabetization to Dialog Blue Sheets and CD-ROM. There are in the book such things as discussions of retrieval systems based on classification schemes, a comparative overview of the major bibliographic utilities, descriptions of the arrangement of major national bibliographies, and comments on the major OPAC research studies. This wide variety, all within the space of 170 pages of main text, suggests the primary market for this work is students in library school, and there is no question but that the author's intent to fill a void with such an overview for library education is commendable.

Library school faculty seeking a well-rounded overview of information retrieval issues for a textbook adoption, however, will unfortunately have to wait for a usable text to be published. This work has a number of shortcomings, some minor but some major, and students would be ill-served by having to

read it. Though the production quality of the book is high (as is true with most ALA Publishing offerings), the book's content holds too many stumbling blocks to learning. The writing style is at some points lively but in many areas is so cloudy as to be nearly uninterpretable, such as the sentence "To summarize how classification notation can be used for search and retrieval in printed bibliographic surrogates, although classification by nature militates against retrieval of specific items, such retrieval is possible with difficulty in American bibliographic surrogates" (p.80). There are occasionally embarrassing errors arising out of some lack of understanding about newer technologies, such as "Current digital CD-ROMs can hold up to 550 megabytes of information . . . accommodating the equivalent of . . . a 28-megabyte hard disk" (p.164). Often, technical or idiosyncratic terms appear without prior definition, making the text a possible minefield of confusion for the library school student.

A more fundamental problem than the stylistic and sometimes factual quirks that mar this book is the narrow perspective from which the author views information retrieval. This is not a survey of the possibilities offered by printed and computerized retrieval systems. This is a review of the tried-and-true, a compendium of the common, practical lore that might be gleaned from the news notes of *American Libraries* or *LJ*. The "principles" of journal article indexing, for instance, are described as if the H.W. Wilson Company had discovered and promulgated a law of nature, fixing for all times and places how a journal article citation is to appear. There is an obvious bias toward traditional, controlled-vocabulary, fielded data formats for retrieval, and though in the review of OPAC developments there are many references to events taking place in 1987 and 1988, there is no indication that other retrieval models are possible, being developed, and meeting with some degree of success in certain application areas. Citation indexing is badly mischaracterized. Probabilistic models and systems involving weighted terms for retrieval are not mentioned. Retrieval systems oriented toward full text are not mentioned, and the discussion of full-text databases on such systems as Dialog is quite narrow. Nowhere in the text is there treatment of information retrieval fundamentals, such as inverted file structures and indexes.

One of the ideas offered by Thomas Kuhn in his *Structure of Scientific Revolutions* (unfortunately a book as misunderstood nearly as often as it is quoted) was that in a period of rapid change in science, a new way of looking at things does not capture all the scientific minds, but only some of them who may be in situations that are conducive to promote the changed view. Most scientists in such a period cling to the established view, and that view becomes passé only after the passage of time and the deaths of those in that majority. For a period, then, both old and new views coexist in history, and there is *not* confrontation between the views, though it may appear so later in time, looking back. Kuhn's idea suggests that, in our time, a disjuncture between old and new views about the direction of information systems engineering might go undetected or unacknowledged, especially among those who assume that the change is essentially gradualistic, as the author of *Information Access* clearly does. Our library school students must certainly understand the mechanics of extant manual and automated retrieval systems, but to lull them in to thinking that there are no alternative ways of thinking about retrieval is to do them, and the future of our libraries, a disservice. Hyman's book offers little for the reader who is seriously interested in an overview of information retrieval technologies today.—*Brian Nielsen, Northwestern University, Evanston, Illinois.* ■■

Kershner, Lois M. *Forms for Automated Library Systems: An Illustrated Guide for Selection, Design and Use.* New York and London: Neal-Schuman, 1988. 307p. looseleaf, $99.95 (ISBN 1-55570-026-8).

The forms reproduced and discussed here are representative of manual forms that have evolved with the implementation of automated library service. Computer processing may replace some forms used with manual systems, but more likely the forms must be modified or completely redesigned. New forms are also needed to accompany automated routines. The book is a compilation of off-line manual forms needed by automated libraries rather than forms generated by online systems. Illustrations were culled from contributions by automated system vendors

and a diverse group of academic and public libraries and library systems, largely American. Reproduced in their original format and looseleaf bound, the forms may he adapted to suit local needs, giving readers the advantage of others' experience by saving time and avoiding the design of forms from scratch.

Kershner has collected forms for nine categories of technical and public service activities: (1) acquisitions control; (2) bibliographic database conversion and maintenance; (3) patron registration/patron record maintenance; (4) circulation control; (5) patron requests; (6) online reference searching; (7) public use of microcomputers; (8) automated systems operations; and (9) administration and management reporting. Each chapter discusses relevant functions and the type and organization of forms selected and, when available, includes for comparison several different forms used for the same function. Examples of forms are annotated with captions on usage. A large selection of newly designed forms needed as a result of library automation are gathered under system operations; chapter 9 includes activity checklists and logs, job requests, performance logs, backup and tape logs, system or equipment failure logs, and equipment repair records. On the other hand, a multitude of manual forms for circulation control persists despite the relatively long experience and sophisticated techniques for handling all functions online. Forms applicable to both manual and online circulation control are amply represented in chapter 4.

In writing this book, Kershner has drawn on twenty years of library automation experience designing system functions, implementing systems, documenting policies and procedures, training, and managing system user services. The particular value of her book lies in the compilation of the material in one handy reference. She has chosen an apt subtitle, for the book is best used as a guide to ideas that have worked in other libraries.—*Marilyn Lutz, University of Maine Library System.* ■■

Management Issues in the Networking Environment. Ed. by Edward R. Johnson. New York: Haworth, 1988. 141p. paper, $24.95 (ISBN 0-86656-692-9).

Management Issues in the Networking Environment is a compilation of eleven essays that attempts to identify some of the problems and issues facing library administrators involved in networking. This work was also published as the *Journal of Library Administration*, volume 1, numbers 3/4, Fall/Winter 1987.

The work is divided into two parts: "Current Networking Problems and Prospects" and "The Future of Networking." Its primary focus is the evolving relationship between libraries and regional bibliographic service networks such as Amigos and Nelinet. An introductory essay by Thomas Shaughnessy identifies the major issues facing these networks as the cost of participation, network governance and priorities, interagency relationships among different types of networks and state agencies, and future directions. The role of networks and the major bibliographic utilities such as OCLC, UTLAS, and RLIN; the impact of off-line products; and efforts to link local systems were identified as issues individual libraries must examine in their quest to provide efficient and cost-effective service.

One chapter discusses the issues and needs of a local library consortium in the context of the broader networking culture of which they are a part. The continual need to define roles and missions of the local consortium was explored, along with issues of technology, bibliographic control, direct access in a resource-sharing environment, governance, and financing.

Louella Wetherbee presents a model for lay, i.e., nonlibrarian, representation on library network boards. She reviews the organization of governing boards of multistate library networks and discusses the major roles and responsibilities of such boards. Four categories of lay trustees are identified: academic administrators, civic management, private or corporate management, and nonmanagerial experts, such as library trustees or professors. Also noted are the critical skills needed by lay trustees, the need for commitment and objectivity on the part of these individuals. and the necessity of providing orientation in order to maximize their contributions.

Another paper discusses a variety of trends in research libraries as they impact participation in networks. The author forecasts less interest in egalitarian resource sharing and more emphasis on the development of local systems. He predicts that support of regional

networks will diminish in favor of a more direct relationship with OCLC. The research library role as a gateway for end users to a multitude of information in a variety of formats was examined in several essays.

Two chapters discuss the relationship between libraries, regional networks, and OCLC, along with the issues relating to ownership of bibliographic data and copyright of the OCLC database. The authors conclude that OCLC and the regional networks must develop an ongoing, cooperative relationship in order to optimize service to libraries and end users.

Part two, "The Future of Networking," begins with "Library Networking: Statement of a Common Vision," developed by the Library of Congress Network Advisory Committee. Papers by Henriette D. Avram, D. Kaye Gapen, and Susan K. Martin respond to the basic premise that a "diverse but coordinated structure of networks rather than a monolithic one" will be the model of the future. Henriette Avram discusses the role of the Network Advisory Committee and briefly reviews the successes and failures in the area of networking for the past twenty years. She views the development of the MARC record standard and the Linked Systems Project as major accomplishments. The lack of a coordinated retrospective conversion program along with political and economic barriers to LSP are regarded as failures. Avram concludes we need a method for future planning and network development in a more orderly fashion and suggests the Network Advisory Committee as a planning forum.

Kaye Gapen focuses on the changing roles of libraries as gateways to electronic information and explores how we can adapt our resource-sharing mechanisms to include electronic information. In her essay entitled "Balancing Needs: The Ideal Network of the Future," Susan K. Martin contends that regional networks were organized to provide libraries financial relief and functional benefits. She believes competition from commercial services and the fiscal burdens of local systems may cause libraries to rethink participation in regional networks. The perceived benefits of networking are identified and a checklist of how well the four models of service (utility, private, regional networks, local systems) meet these needs is developed. Martin foresees competition from small, local consortia but predicts regional networks will survive if they are flexible and creative and continually examine their roles and services to fill needs within library fiscal restraints.

This volume will benefit library administrators who wish to gain an understanding of evolving networking issues in a relatively compact presentation. It will also be useful for students studying relationships between OCLC, individual libraries, and bibliographic service networks. The references and bibliographies following most of these papers will guide those interested in pursuing a broader perspective on library networking and cooperation. Also recommended is Betty Turock's *The Public Library in the Bibliographic Network* (Haworth, 1986) for coverage of a topic not directly covered in this volume.—*Joan Kuklinski, Minuteman Library Network, Framingham, Massachusetts.* ■■

Nauratil, Marcia J. *The Alienated Librarian*. New Directions in Information Management, no.20. New York, Westport, Conn., and London: Greenwood, 1989. 129p. lib. bdg., acid-free, $35 (ISBN 0-313-25996-8).

This comprehensive treatment of the subject of burnout, one of few outside of the journal literature, is a useful addition to the literature of library science. Extremely well documented, it includes an eleven-page selected bibliography drawn from writings in librarianship, the human services professions, and beyond.

Other authors, such as Katz and Fraley in *Reference Services Today: From Interview to Burnout*, have approached the topic from specific perspectives. Nauratil takes a more generalized look at the profession, beginning with its nineteenth-century roots. By tracing the history of American librarianship, she makes a case for the inevitability of burnout in our work. A number of factors lay the groundwork for discontent: feminization of the profession, lack of professional autonomy, and increasing bureaucratization. These together, especially in a context of male authority, lead to a feeling of powerlessness and a perception by others of weakness.

In the present climate four factors further contribute to the situation: tight fiscal constraints, burgeoning technology, library man-

agers from outside the profession, and the increasing need to market our services. Money problems are not new to librarians but are especially troubling when we must also face the twin explosions in publishing and computerization.

Curing or coping with burnout is difficult. Most authors concentrate on individual solutions, confronting the worker's perception of stressful situations rather than eliminating the causes. Individual solutions, according to Nauritil's research, are not useful and are more likely to lead a person into assuming an even heavier work load. Somewhat more effective are collegial coping mechanisms rising out of the quality-of-worklife movement: job redesign, participative management, and such techniques as quality circles. Real solutions, however, should alter the structure of the work situation, intervening at the organizational level. Her personal bias seems to be for unionization; she also suggests roles for the profession and for library schools.

The Alienated Librarian is well researched and well written: better editing would have eliminated numerous typographical errors. Most libraries with library science or management collections will find it a worthwhile purchase.—*Nancy Magnuson, Goucher College, Baltimore, Maryland.* ■■

Neill, Shirley Boes, and George W. Neill. *Only the Best, The Cumulative Guide to Highest-Rated Software, 1985-89 Preschool-Grade 12.* New York: Bowker, 1989. 313p. $49.95 (ISBN 0-8352-2851-7).

All public and school libraries that provide microcomputer services for children from preschool through the twelfth grade, whether in a classroom setting or through individually scheduled appointments after school, will benefit from purchasing *Only the Best: The Cumulative Guide to Highest-Rated Educational Software, 1985-1989.* The one-volume format combines the annual guides for those years into one easy-to-use title and briefly analyzes software released from 19799 through 1988.

The editors cite all thirty-seven evaluation services used. They range from departments of education in Canada and in the United States to magazine evaluations such as *Classroom Computer Learning* and *Electronic Learning* to industry awards such as the Software Publishers Association's Excellence in Software Awards. The editors consider that software recommended by the Curriculum Support Branch of Alberta Education (Canada) is particularly "excellent" based on their multilevel evaluation process. *Booklist's* annual list of "Software's Greatest Kits" is also considered an excellent recommendation.

The software titles are first listed alphabetically with producer, area of curriculum, computer compatibility, and page numbers so that the reader may quickly find information on a known title. The body of the text is organized by subject areas such as arts, college entrance exams, early childhood, math, problem solving, language arts, business education, and science. Each entry lists producer, copyright, grade level, subject, hardware requirements, cost, type of program, description of program in three or four sentences, and evaluation conclusions of good or excellent. References to magazine reviews are provided if the software was reviewed and occasionally tips for use are given. The book concludes with addresses and telephone numbers for publishers. An annual guide is also published.

Teachers will find the information well organized and to the point. Public libraries will also find it an excellent buying guide and reference tool. Parents who own computers or are considering purchasing one will find this a useful guide in terms of types of software available and system compatibility.—*Susan Pine, New York Public Library.* ■■

Neill, Shirley Boes, and George W. Neill. *Only the Best 1990. The Annual Guide to Highest-Rated Software, Preschool-Grade 12.* New York: Bowker, 1989. l36p. paper, $26.95 (ISBN 0-8352-2766-9).

The editors have compiled 185 software programs for use by preschoolers through high school seniors by using evaluation ratings from thirty-five American and Canadian educational groups and eight library, computer, and curriculum periodicals. Information is provided on how each department of education and magazine tests software, and addresses are provided.

The programs, released from 1984-1989, are first listed alphabetically by title and then listed by subject area with full documentation. The subject categories follow a school curriculum orientation: arts, college entrance

exams, early childhood, foreign language, health education, language arts, math, science, and tool programs such as typing and word processing. Each entry includes producer, copyright, grade level, subject, hardware requirement, cost, type of program, a three- to four-sentence description, evaluation conclusions of excellent or good, and magazine reviews where available. Occasionally tips for use are provided.

The descriptions are concise and allow potential buyers to know exactly what they will receive and how best to use it. Teachers will appreciate knowing whether or not there is a teacher management option.

For all those who use software in either school libraries or public libraries, this annual guide is indispensable in allowing one to avoid wasting time and money on inferior software.

Part 2 is an "Alert" that highlights forty-six 1988 and 1989 programs. These are titles that received at least one rating of "excellent" and none that were negative. Educators and librarians will find this helpful in accessing new materials. Part 3 looks back at the 1989 winners with brief annotations.

The *Annual Guide* is an excellent yearly addition to the *Cumulative Guide*, which can stand by itself in terms of documentation but which is best used together.—*Susan Pine, New York Public Library.* ■■

Nobari, Nuchine. *Books and Periodicals Online: A Guide to the Publication Contents of Business and Legal Data Bases.* Medford, New Jersey: Learned Information, 1987. 376p. $125 (ISSN 0951-838X).

The primary stated purpose of this directory is "to help researchers use online search time efficiently" by enabling users "to ascertain the availability of a needed publication from one of the many computer databases currently in operation before spending money and time online." An impressive alphabetical listing of over 6,800 periodicals and serials that are included in databases is supplemented by appended lists of databases, producers, vendors, and publishers.

The databases selected for inclusion in this directory are bibliographic, numeric, source, or full text in format and cover the fields of business, advertising and marketing, government, taxation, accounting, bibliographic, general, news, law, accounting and auditing, insurance, and commodities. Only databases published or produced in the United States are included in this directory.

Each directory entry contains: the name of the publication, its country of origin when not the United States, and its journal code as used by the database producer; the name of the publisher; the name of the database in which it appears; the name of the producer; the scope of editorial coverage of the specific database producer; and the name of the vendor(s) through which the database is available. Information was verified with the database producer and by searching periodicals in OCLC, Ulrich's, and Standard Periodicals Directory.

Cross-references are provided to link variations among producer's codes, title changes, and abbreviated titles; cross-references mentioned by producers are traced. Notations are made about title discontinuation dates. The directory's coverage is extensive and entries are thorough and informative. The organization and layout contribute to the tool's ease of use. However, some noticeable omissions in the guide detract from complete fulfillment of the directory's stated purpose.

A key motivation for creating this directory is the desire to assist users in utilizing of online databases. The major contributions to users' abilities to lower search expenses in recent years have been the increase in optical storage applications (e.g., CD-ROM) to database availability, and the "off-hour" access systems directed to end users (e.g., BRS After Dark). This directory omits reference to both. Its scope includes databases available by "interactive access" requiring telecommunication links; no mention is made of the impact of CD-ROMs on the availability of some of the machine-readable tools referenced in the directory. Also, the explicit decision not to mention the services directed to end-user searching, Knowledge Index and BRS After Dark, seems to be a disservice to users evaluating where to seek access to needed information. The inclusion of these services' host carriers, Dialog and BRS, does not bring attention to the searchers' option to reduce access costs by using these specially targeted services.

This guide is not unique in identifying serials available online. A separate chapter, as well as entry annotations, provides similar identification in *Ulrich's International Peri-*

odicals Directory, for example. Many directories, such as *Directory of Online Databases* and *Data Base Directory*, exist to identify online databases and include more frequently updated information than this guide; some offer online access to the most current updates. Also found elsewhere but not here is pricing information, a valuable factor in evaluating use of online systems.

This guide is extensive in its title coverage and is organized for easy use. However, its price may limit its appeal to libraries or business offices with a limited subject interest. One should evaluate the extent to which its unique coverage will be useful beyond similar information found elsewhere in tools serving multiple bibliographic functions.—*Danuta A. Nitecki, University of Maryland at College Park.* ■■

Principles and Applications of Information Science for Library Professionals. Ed. by John N. Olsgaard. Chicago: American Library Assn., 1989. 152p. $30 (ISBN 0-8389-0507-0).

I remember reading a comment a few years ago to the effect that "any discipline with the word *science* in its name probably isn't one." Think about it. We have chemistry, physics, biology—all generally accepted as scientific disciplines. In addition, we also have social science, decision science, and political science. Each of these fields has come under attack from time to time as not being a true science. Adding the word "science" to the name of a discipline somehow is expected to confer a higher level of prestige. In each of these cases, the criticism stems from a concern that these disciplines lack rigorous theoretical foundations and may not adhere closely to the principles of scientific method in their research.

In the case of information, researchers in the field (many of whom have come to it from other disciplines, frequently a science or mathematics) have long believed it to be a science. There is, in fact, a significant and growing body of theory underlying both practice and research in the field, as this book makes clear. This slim volume is noteworthy because it draws together in one place most of the theoretical foundations of the study of information. It presents a "hit-the-high-spots" survey of some of the best thinking about information to be gleaned from the past four decades. These ideas have made significant contributions to theory and applications—ideas that have made information systems what they are today and have made the study of information something more than either an extension of librarianship or a subdiscipline of computer science (whatever that may be).

I wish that Dean Olsgaard had called his book simply *Principles of Information* and that it were at least three times as long. As it stands, it provides a useful introduction to the field for librarians who are unfamiliar with the basic concepts. The book contains nine chapters, apparently written especially for this publication, by several well-known authors in the field and several who are new to this reviewer. The chapters are somewhat uneven, but taken together they provide an overview of the field. Some authors have included lists of citations for further reading while others have carefully documented their sources. This book offers tantalizing glimpses of underlying theory and current applications. I urge anyone reading this book to use it as a springboard into deeper investigation of the field.—*Emily Gallup Fayen, University of Pennsylvania, Philadelphia.* ■■

Reaching and Teaching Diverse Library User Groups. The Library Orientation Series, no.19. Ed. by Teresa B. Mensching. Ann Arbor, Mich.: Pieran, 1989. 169p. paper, $30 (ISBN 0-87650-258-3).

This publication is a product of the Sixteenth National LOEX Library Instruction Conference, held May 5–6, 1988, at Bowling Green University and cosponsored by the LOEX National Clearinghouse for Library Instruction. Those involved in any way with library instruction have justifiably come to expect a combination of practical and thought-provoking information from the LOEX conferences and publications. They will not be disappointed in this case.

The publication, edited by Teresa B. Mensching, director of the LOEX Clearinghouse, contains the texts of eight papers presented at the conference, fourteen summaries of round table and poster sessions, and a sizable number of potentially useful discussion group handouts and sample materials, such as worksheets and brochures aimed at special user

groups. Also included are twelve brief bibliographies, each focusing on a distinct library user population group, and a list of workshop participants, with mailing addresses.

Technology and library instruction are a natural combination. Technology has often been used inventively to aid instruction, and increasingly librarians must also instruct users directly in how to use various automated systems. Ellen Broidy, in her thoughtful keynote address, cautions that those involved with library instruction may have come to rely too heavily on easy technological "fixes," becoming overly concerned with the "what" as opposed to the "who" of library service. One might accurately summarize the conference as being concerned mainly with identifying, reaching out to, and instructing that "who."

Broidy emphasizes the need for library educators to recognize the growing cultural diversity of library user populations and to attempt to learn more about each specific population group in order to tailor library instruction more specifically to its particular needs. To judge from the various experiences shared throughout this volume, it would certainly seem preferable to try to anticipate the needs of various user groups; the alternatives would appear either to fail some groups entirely or be taken by surprise by those demanding services libraries are not adequately prepared to provide.

The user groups covered throughout the conference are extremely diverse: high school students, disadvantaged students, extended campus students, dormitory students, physically disabled students, athletes, international students, minorities, teaching assistants, university support staff, adult learners and returning students, and one group that some of us are just beginning to recognize as needing library instruction—remote users of online systems.

Though the majority of presenters at the conference are from academic libraries, the subject content and approach are varied. Most of the material presented focuses on the practical experiences of particular libraries in designing instructional programs for specific user groups. Some also discuss theory, cooperative efforts, and the results of surveys. In short, the contents are well balanced, making the publication potentially valuable to any library or individual engaged in—or even contemplating—offering library instruction. The number of articles on high school students alone is enough to justify the purchase of library instruction by many academic and school libraries, but, as is the case with the subject matter of the conference, the real value of the book lies in its diversity. One is certainly left with the feeling that if you are not presently serving one of the groups included, you soon will be. This book will help you plan ahead.—*Betty A. Gard, University of North Dakota.* ■■

Saffady, William. *Introduction to Automation for Librarians.* 2d ed. Chicago: American Library Assn., 1989. 363p. $40 (ISBN 0-8389-0503-X).

As the title indicates, this book offers an overview of automation intended for librarians or anyone needing a quick tutorial as to what has been going on in library automation for the past twenty years. It has been updated since the 1983 edition to reflect recent developments in automation and includes expanded coverage of prewritten software packages such as those for word processing and desktop publishing; a new section on optical filing systems for document storage and retrieval; a detailed treatment of machine-readable databases and online search services, especially European multidisciplinary search services; and a discussion of CD-ROM reference products. A bibliographyand an index are provided and each chapter includes a summary. The book is divided into two parts of almost equal length. The first deals with automation in general and consists of four chapters concerned with "the fundamentals" of hardware, software, data processing concepts, and automated office systems and related technologies. In this last chapter, librarians are chided, probably correctly, for not making more and better use of common office automation products such as dictation machines and optical filing systems for document storage and retrieval.

Part two also includes four chapters: "Automated Circulation Control Systems," "Automated Cataloging," "Automated Reference Service," and "Automated Acquisitions and Serials Control." It describes library applications of automation and yet manages at the same time to give a broad overview and to be sometimes tediously detailed. In the chapter

on automated reference service, for instance, well over 100 databases both online and in CD-ROM format are mentioned. As in the other chapters, their treatment would not help the reader in selecting an automation product, as no value judgments are made. I would have found it particularly useful if a vendor address list had been included in the book.

Although *Introduction to Automation for Librarians* provides an excellent overview and could be quite useful as a textbook for library school students, it is too general to be very practical. With the possible exception of the chapter on office automation, the experienced librarian who keeps up with the current literature will not find much need for this book.—*Phyllis H. Johnson, Michigan Technological University, Houghton, Michigan.* ■■

Wygant, Alice Chambers, and O. W. Markley. *Information and the Future: A Handbook of Sources and Strategies.* New York, Greenwood, 1988. 189p. $37.95 (ISBN 0-313-24813-3).

Rapid technological change in the past century has outdistanced traditional moral and ethical values. Varying social responses are often in conflict as values are questioned, realigned, and finally resolved through legislation. This handbook is aimed at lobbyists and political activists intent on influencing opinions. As such, forecasting the future has become a significant aspect of the information age. Alice Wygant's 1983 paper in *Studies of the Future at UN–Clear Lake* ("A Guide to the Library for Students of Futures Studies") helped her realize differences between conventional research methods and those necessary in this interdisciplinary field and is the basis of this handbook.

The first part of the book is an introduction to information gathering. Formulation of search strategy is emphasized in order both to maintain precision as well as to widen the scope of the search. However, as the authors stress, strategy need not imply rigidity. Several types of searches are described as exhaustive or precise; others fit in-between. Factors influencing the type of search used are also considered, such as time and financial resources available. Once the goal of the search is defined and the style of search determined, research can begin. Unsatisfactory results, of course, lead to reevaluation of search strategy and goals.

In part two, the authors examine actual sources of information. Foremost is the role of the library collection. As most North American academic libraries depend on LC subject analysis, the authors review its function as a controlled thesaurus as well as its syndetic structure. Unfortunately, LC changed its cross-referencing nomenclature with the eleventh edition released a year after this handbook's publication. The LC change substituted NT for sa (see also); BT for xx (see also from) UF for x (used for); USE for see; and RT for terms that appeared in both sa and xx lists under the same heading. Libraries, however, have the option to continue the old cross-referencing structure in their own catalogs.

Although automated library catalogs are no longer structurally uniform because of the variety of online database systems currently available on the market, the authors describe in general terms the catalogs' basic finding qualities.

General reference tools are outlined, ranging from encyclopedias to citation tools, both printed and automated. The emphasis is clearly on the social sciences and humanities. Two chapters serve as an excellent guide to American government sources. The volume and complexity of government publications can be intimidating, yet these represent an excellent source of information. Networking, often overlooked by researchers, is also stressed. This handbook describes sources for contacting fellow researchers through associations and institutions.

Part three represents the "meat and potatoes" of this handbook: how to synthesize and present research work. Although not a guide to writing, it presents a graphic framework for action. Graham T. T. Molitor's theory of the "issue emergence cycle" is described as a tool for research. Central to the theory is the notion that issues are reported in different media at different phases of their development and that public policy decisions follow a similar pattern. Simply described, public awareness increases as issues become familiar through media exposure and political reaction. As issues pass through to legislative consideration and a seemingly resolutionary stage, awareness peaks and then reduces in

public visibility. Understanding the communication framework helps researchers pinpoint available resources throughout the life of the issue. Early manifestations of issues include artistic expression, science fiction, underground press, unpublished notes, and speeches. In later stages, issues manifest in legislation, newspapers, radio, and television. Thus the framework represents the continuum from visionary expression to historical analysis. The developmental framework lends itself better to social-issue topics rather than the sciences. For example, AIDS was first observed in clinical medical practice. Medical response and communication would normally follow a much different route than that suggested by Molitor. Social response to the disease, however, would follow his prescribed pattern. Even so, Molitor assumes that the pure arts are a prescient expression rather than a reflective expression of social conscience.

The second tool is the "strategic intelligence cycle." It emphasizes a proactive approach to research and synthesis. Designed for the activist, it focuses on a more systematic approach to information gathering, coupled with a framework for immediate synthesis and presentation of findings. The authors conclude with a case study for a mid-city strategic development plan using the tools described in the handbook.

Specifically of interest to futurists in the social sciences and humanities, this handbook is also a valuable guide to researchers and librarians in general. It presents a novel and systematic guide to research and effective presentation in many other fields.—*Mary Hemmings, University of Calgary, Alberta, Canada.* ■■

Software Reviews

PC Globe 3.0 and ***PC USA***. PC Globe, Inc., 2100 S. Rural Road, Tempe, AZ 85282; (602) 894-6866. Hardware requirements: IBM PC/XT/AT/PS2 or compatibles with a minimum of 512K RAM, floppy drive or

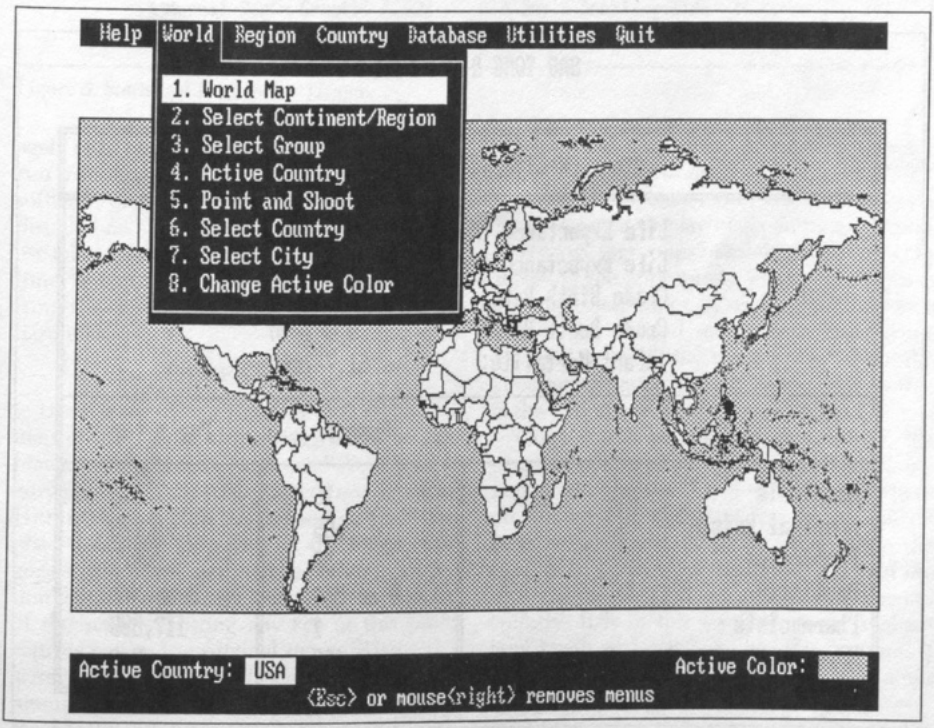


Figure 1. Initial PC Globe Display.

hard disk, DOS 2.0+. Supports Hercules monochrome, CGA, EGA, or VGA displays. Price: $69.95 each, annual updates $20–$30.

Although originally aimed at the elementary education market, these two map and geographic data software packages are attracting considerable attention in other settings as well. What they both do is to display graphically on a PC monitor maps of all or portions of the globe and maps of all or portions of the United States, respectively. They also can display geographic and demographic data both as statistical tables or as bar charts, either for individual countries/states or comparatively for groups of countries or states.

The simplest application for these programs is to use them as one would use an atlas: to display a map of a geographic region, to locate a city or country in relation to other cities or countries, or to ascertain some statistical fact about a region (its population or natural resources, for example). In this respect the programs are probably not cost-effective as substitutes for printed atlases, which, given the expense of the PC required to use the programs, cost less and can display higher-quality map images. The programs, however, have the advantage of running on PCs and being fun to use as well as user friendly.

The most valuable feature of these programs to the user of a personal computer is their ability to produce customized maps on demand, either printed out alone or inserted into the text of a word-processed document. These are things one simply cannot do with a printed atlas.

INSTALLATION

The programs are available on 5.25- or 3.5-inch diskettes and come packaged with thirty-two-page users' guides that explain simply and clearly how to install and use them. Each set of diskettes includes a virtually fool-proof INSTALL.EXE program that leads the user through the installation and customization process quickly and easily. If you manage to bungle the installation process, as I did (intentionally, of course), you can just do it over

SAO TOME & PRINCIPE

Health Statistics

Life Expectancy (Male):	65.0 yrs
Life Expectancy (Female):	65.0 yrs
Crude Birth Rate:	36.3/1000
Crude Death Rate:	8.8/1000
Infant Mortality:	61.7/1000

	Number	Pop'n per
Hospitals	16	7,313
Hospital Beds	665	176
Physicians	38	3,079
Dentists	0 or N/A	0 or N/A
Pharmacists	1	117,000
Nursing Personnel	157	745

Figure 2. Statistical Data in Tabular Form.

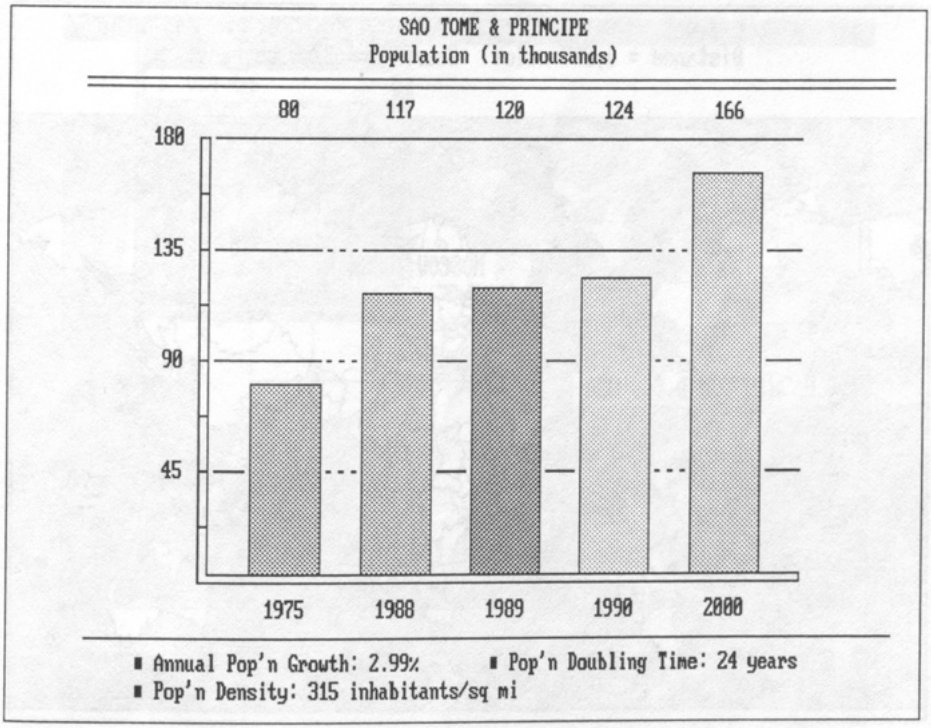


Figure 3. Statistical Data in Bar Graph.

again correctly. Although the programs can be run from floppy disks, as is the case with most software these programs are easiest to use if installed on a hard disk. The installation process takes about three minutes, most of which time is consumed by copying the software from the diskettes to their directories on the hard disk.

OPERATION

Upon execution *PC Globe* 3.0 displays a map of the world with menu categories displayed across the top and the "World" category pop-down menu displayed (see figure 1). Hitting the ENTER key or the Esc key redisplays the world map without the menu categories, pop-down menu, or the other information that had been displayed along the bottom of the screen. Hitting any key at this point returns you to the original screen. Using the arrow keys you can display the pop-down menus for the other menu categories: Help, World, Region, Country, Database, Utilities, and Quit. Hitting the initial letter of the menu category will also cause the pop-down menu for that category to display.

From the World menu one can select a more detailed display of a continent, region, or country (or groups of selected countries) by selecting the appropriate menu item. This is accomplished either by moving the selection bar to the desired menu item and hitting ENTER or by hitting the number of the desired menu item. One very convenient feature is the "Point and Shoot" menu option.

Once you have selected this option, the program displays the world map with a cross-hair target that can be positioned anywhere on the map by means of the cursor control keys or a mouse. Whichever country the cross-hair is over is identified at the top of the screen. The ENTER key selects the targeted country. It is in this mode that one realizes how much easier it is to use the program if one has a mouse. The program includes maps and geographic data for 177 countries.

Moving to the Database menu category the user can display statistical data about the se-

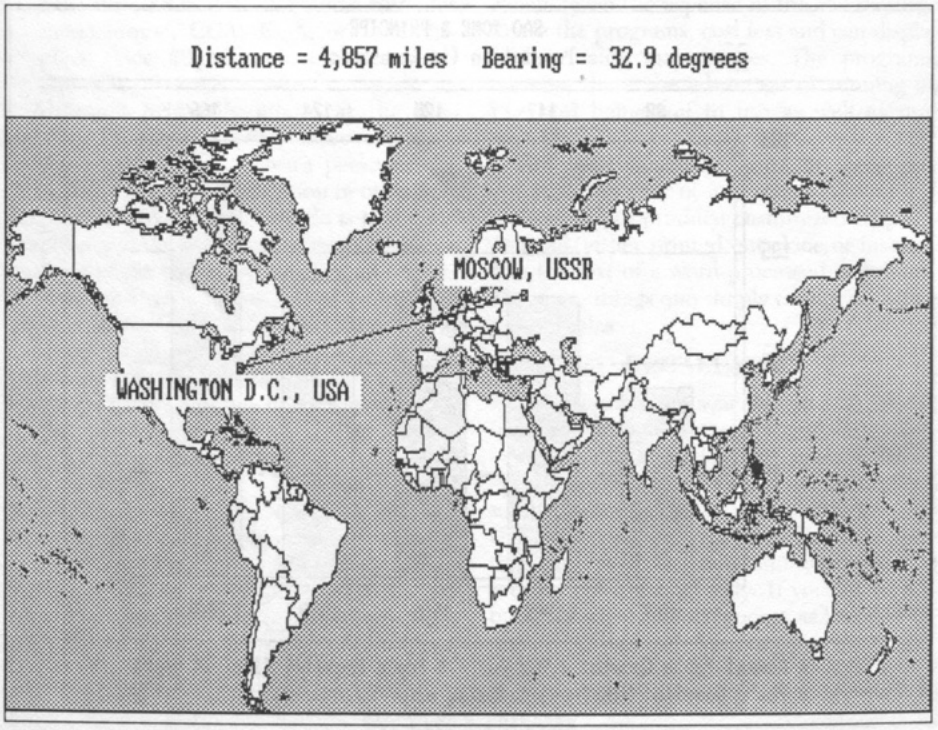


Figure 4. City Distances/Bearings.

lected country either in tabular statistical format (see figure 2) or as a bar graph (see figure 3). The amount of data is what one might expect from a standard atlas and does not include the kind of detail available from CD-ROM-based packages such as *The Mac Cabinet*.

Included among the Utilities are City Distances/Bearings, Currency Conversion, Time Zones, File Import/Export, Change Colors, Print Screen, and Change Parameters. The Change Parameters utility allows the user to toggle between standard and metric measurements, to toggle on and off country borders, to shift the world center, to toggle on and off latitude and longitude lines, and to toggle on and off the display of rivers on the country maps.

The City Distances/Bearings utility is fun to use. This utility allows you to select two cities, which it displays on the world map along with a line connecting the two, showing both the distance between them and the bearing to follow to get from one to the other (figure 4).

The File Import/Export utility provides a means of saving the map graphic for use with another software package, such as a word processing program. The graphic image is saved in PCX format, which is compatible with a variety of software, including WordPerfect 5.0 and Ventura. For WordPerfect 5.0 users, an alternative to the File Import/Export utility is to use the WordPerfect GRAB.COM program. This alternative has two advantages: (1) you can save only that portion of the map desired rather than having to save the whole map, and (2) the graphic file saved by GRAB.COM is in WPG format, which does not have to be translated by WordPerfect in order to be included in a document. The illustrations in this review, for example, were GRABbed.

PC USA is in many respects similar to *PC Globe* but on a different scale, since it covers the United States exclusively. In the case of *PC USA* the initial display is of the entire

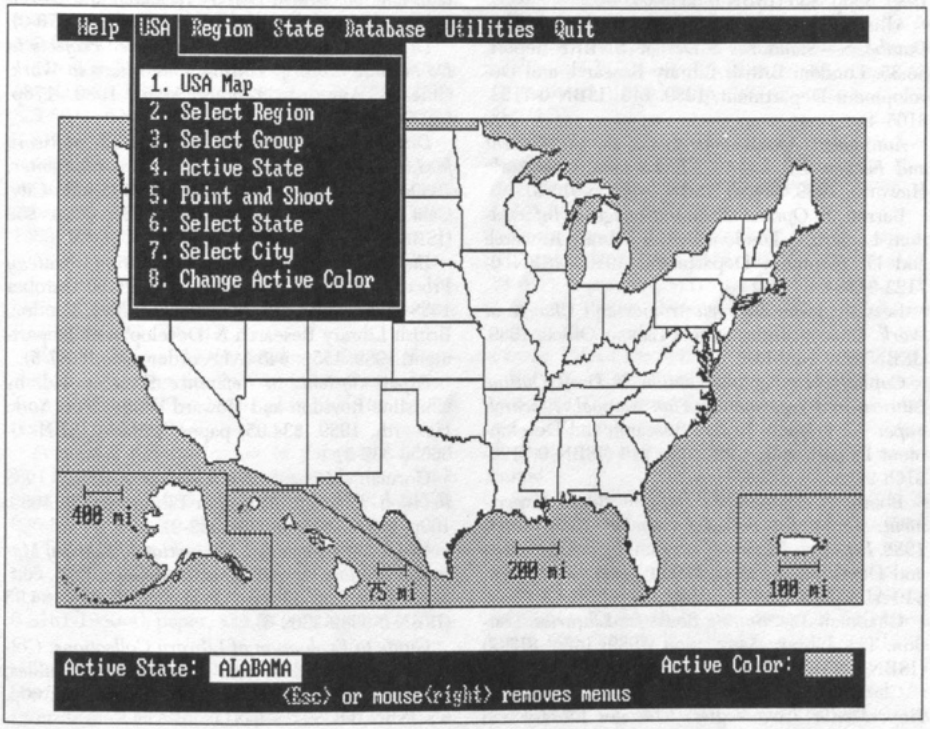


Figure 5. PC USA Initial Screen.

country, with menu options for Help, USA, Region, State, Database, Utilities, and Quit.

PC Globe, Inc., realizing that some of the data in the programs is subject to change rapidly over time (currency values, the demographic statistics in the Database category, and even national boundaries and names of countries, for example), offers annual updates to both the *PC Globe* and *PC USA* programs. For from $20 to $30 they will send the user complete replacement packages so that the data displayed by the programs will be fairly up to date.

The programs are easy enough to use to be loaded onto PCs in public areas. Since graphic images require considerably more processing to work with and display, an 80286- or 80386-based PC with a laser printer is a practical requirement, particularly for public use.

In the final analysis, if you need to produce maps on demand or wish to generate maps to be included in word-processed documents you might find *PC Globe* and *PC USA* worth the relatively modest cost.—*David T. Buxton, Gonzaga University.* ■■

Other Recent Receipts

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

Access to Library Resources Through Technology and Preservation: Proceedings of the 1988 U.S.-U.S.S.R. Seminar. Ed. by Robert Doyle. Chicago: American Library Assn., 1989. 168p. $25 (ISBN 0-8389-7300-0).

Adaption of Turnkey Computer Systems in Sci-Tech Libraries. Ed. by Ellis Mount. New York: Haworth, 1989. $19.95 (ISBN-0-86656-859-X).

Advances in Library Resource Sharing. Ed. by Jennifer Cargill and Diane Cimbala. Westport, Conn.: Meckler, 1989. $55 (ISBN 0-88736-490-X).

ALA Yearbook of Library and Information Services 1989: A Review of Library Events 1988. Ed. by Roger Parent. Chicago: American Library Assn.,

1989. 350p. $35 (ISBN 0-8389-0514-5).

Allison, John. *Publishers' Bibliographic Databases—Standards & Design.* BNBRF Report, no.35. London: British Library Research and Development Department, 1989. £15 (ISBN 0-7123-3165-4).

Automated Acquisitions: Issues for the Present and Future. Ed. by Amy Dykemann. New York: Haworth, 1989. $24.95 (ISBN 0-86656-913-8).

Barrett, R. *Optical Disks Add Images to Information.* Lecture 7. London: British Library Research and Development Department, 1989. (ISBN 0-7123-3178-6).

Bessant, John. *Microelectronics and Change at Work.* Geneva: International Labour Office, 1989. (ISBN 92-2-106514-6).

Capital Planning Information. A Draft Outline Library and Information Plan Manual. Research Paper 43. London: British Research and Development Department, 1988. 75p. $15 (ISBN 0-7123-3168-9).

Booth, A. *Humanities Bulletin Board Experiment: Report for Period September 1986–March 1988. Research Paper 44.* London: British Research and Development Department, 1988. 90p. paper, $10 ALA (ISBN 0-7123-3169-7).

Chapman, Liz. *Buying Books for Libraries.* London: The Library Association, 1989. 142p. $17.50 (ISBN 0-85157-428-9). (ALA order code B428-9).

Chen, Ching-chih. *HyperSource on Multimedia/HyperMedia Technologies.* Chicago: Library and Information Technology Association, 1989. 256p. paper, $27.50 (ISBN 0-8389-7371-X).

Chen, Ching-chih. *HyperSource on Optical Technologies.* Chicago: Library and Information Technology Association, 1989. 312p. paper, $29.50 (ISBN 0-8389-7359-0).

Commitment to Service: The Library's Mission. Ed. by Alphonse F. Trezza. Boston: Hall, 1990. 232p. $22.50 (ISBN 0-8161-1931-7).

Computing Electronic Publishing and Information Technology, v.9. Ed. by Robin Downes. New York: Haworth, 1989. $22.95 (ISBN 0-86656-788-7).

Connecting the Networks: Proceedings of the Joint Library of Congress Network Advisory Committee and EDUCOM Committee December 5–7, 1988. Network Planning Paper, no.18. Washington, D.C.: Library of Congress, 1989. 102p. paper, $7.50 (ISBN 0-8444-0652-X).

Cost-Effective Technical Services: How to Track, Manage and Justify Internal Operations. Ed. by Gary M. Pitkin. New York: Neal-Shuman, 1989. paper, $39.50 (ISBN 1-55570-0411-1).

Creativity, Innovation and Entrepreneurship in Libraries, v.10. Ed. by Donald E. Riggs. New York: Haworth, 1989. $29.95 (ISBN 0-86656-940-5).

Curriculum Development in Information Science to Meet the Needs of the Information Industries of the 1990s. LIR Report no.70. Ed. by Michael Brittain. London: British Library Research and Development Department, 1989. (ISBN 0-7123-3170-0).

Dewey, Patrick. *101 Microcomputer Projects to Do in Your Library: Putting Your Micro to Work.* Chicago: American Library Assn., 1989. 176p. $22.50 (ISBN 0-8389-0518-8).

Directory of Information Management Software for Libraries, Information Centers, Records Center, 1989–1990. Ed. by Pamela Cibbarelli. Studio City, Calif.: Pacific Information, Inc., 1989. 300p. $59 (ISBN 0-8389-2150-7).

Electronic Campus: An Information Strategy Proceedings of a Conference held 28–30 October 1988 at Bowbury. Ed. by Lynne Brindley. London: British Library Research & Development Department, 1989. 155p. $45 (ALA order code R187-5).

Expert Systems in Reference Services. Ed. by Christine Roysdon and Howard White. New York: Haworth, 1989. $34.95; paper, $29.95 (ISBN: 0-86656-839-5).

Gorman, Michael. *The Concise AACR2, 1988 Revision.* Chicago: American Library Assn., 1989. 160p. $15 (ISBN 0-8389-3352-9).

Guide to Performance Evaluation of Library Materials Vendors. Acquisitions Guidelines, no.5. Chicago: American Library Assn., 1989. 24p. $4.95 (ISBN 0-8389-3369-6).

Guide to Evaluation of Library Collections. Collection Management and Development Guides, no.2. Chicago: American Library Assn., 1989. 60p. $5 (ISBN 0-8389-3370-X).

Gurnsey, John, and Martin White. *Information Consultancy.* Chicago: American Library Assn., 1989. 188p. cloth, $32 (ISBN 0-85157-426-2). (ALA order code B426-2).

Hafner, Arthur. *Descriptive Statistical Techniques for Librarians.* Chicago: American Library Assn., 1989. 226p. $20 (ISBN 0-8389-0510-2).

Hardy, Eileen. *Statistics for Managing Library Acquisitions.* Acquisitions Guidelines, no.6. Chicago: American Library Assn., 1989. 14p. $5 (ISBN 0-8389-3374-2).

Information Literacies for the Twenty-first Century. Ed. By Virgil Black and Renee Tjoumas. Boston: Hall, 1990. est. 350p. $29.95 (ISBN 0-8161-1921-X).

Kesner, Richard. *Information Systems: A Strategic Approach to Planning and Implementation.* Chicago: American Library Assn., 1989. 284p. $30 (ISBN 0- 8389-0483-9).

Integrated Planning for Campus Information Systems. Dublin, Ohio: OCLC, 1989. 130p. paper, $13 (ISBN 1-55653-071-4).

Journal of Interlibrary Loan & Information Supply. Ed. by Leslie R. Morris. New York: Haworth,- v.1, 1990. $24.

Lancaster, F. W. *If You Want to Evaluate Your Library....* Urbana, Ill.: University of Illinois, Graduate School of Library and Information Science, 1988. 134p. $34.50 (ISBN: 0-87845-078-5).

Library Systems: A Buyer's Guide. 2d ed. Ed. by Juliet Leeves. Brookfield, Vt.: Gower, 1990. 221p. $89.95 (ISBN 0-566-057514).

Lovejoy, Eunice. *Portraits of Library Services to People with Disabilities.* Boston: Hall, 1989. 176p. $32.50 (ISBN 0-8161-1922-8); paper, $24.50 (ISBN 0-8161-1923-6).

Magrill, Rose May, and John Corbin. *Acquisitions Management and Collection Development in Libraries.* 2d ed. Chicago: American Library Assn., 1989. 256p. $27.50 (ISBN 0-8389-0513-7).

Online Searching: The Basics, Settings and Management. 2d ed. Englewood, Colo.: Libraries Unlimited, 1989. 130p. $33 U.S.; $39.50 elsewhere (ISBN 0-87287-738-8).

Palmer, Roger. *Understanding Library Microcomputer Systems.* Studio City, Calif.: Pacific Information, Inc., 1988. 128p. plus diskette. $29.95 (ISBN 0-8389-2104-3).

Personnel Administration in Libraries. 2d ed. Ed. By S. Creth and Frederick Duda. New York: Neal-Schuman, 1989. 343p. $37.50 (ISBN 1-55570-036-5).

Pfaffenberger, Bryan. *Democratizing Information: Online Databases and the Rise of End-User Searching.* Boston: Hall, 1989. 175p. $32.50 (ISBN 0-8161-1960-4); paper, $26.50 (ISBN 0-8161-1895-7).

Powell, Ronald. *The Relationship of Library User Studies to Performance Measures: A Review of the Literature.* Occasional Paper, no.181. Chicago: University of Illinois, Graduate School of Library & Information Science, 1988. paper, $3 (ISSN 0276-1769).

Preservation Microfilming: Planning and Production: Papers from the TSD Preservation Microfilmining Institute, New Haven, Connecticut, April 21-23, 1988. Chicago: Association for Library Collections and Technical Services, 1989. 72p. $12 (ISBN 0-8389-7324-8).

PrintShop Graphics for Libraries, Volume II: Perpetual Calenders. By Carolyn Leonard and others. Englewood, Colo.: Libraries Unlimited, 1987.Includes diskette for Apple or IBM computers and booklet. 60p. $23 U.S.; $27.50 elsewhere (ISBN 0-87287-606-3).

Pungitore, Verna. *Public Librarianship—An Issues-Oriented Approach. Contributions in Librarianship and Information Science, no.63.* New York: Greenwood, 1989. 240p. $37.95 (ISBN 0-313-26072-9).

Quarterman, John S. *The Matrix: Computer Networks and Conferencing Systems Worldwide.* Boston: Digital Press, 1990. 752p. $59.95 (ISBN 1-55558-033-5).

Sager, Donald. *Managing the Public Library.* 2d ed. Boston: Hall, 1989. 344p. $38.50 (ISBN 0-8161-1898-1); paper, $27.50 (ISBN 0-8161-1899-X).

Stubley, Peter. *Desktop Publishing for Librarians on the Apple Macintosh.* Brookfield, Vt.: Gower, 1989. 218p. $49.95 (ISBN 0-566-03622-3).

SUART: A MARC-based Information Structure and Data Dictionary for the Syracuse University Art Collection. School of Information Studies, Syracuse University, 1989. approx. 223p. spiral-bound.

Subject Control in Online Catalogs. Ed. by Robert P. Holley. New York: Haworth, 1989. $34.95 (ISBN: 0-86656-793-3).

Tessmer, Martin, and others. *A Nonprogrammer's Guide to Designing Instructions for Microcomputers.* Englewood, Colo.: Libraries Unlimited, 1989. 228p. $26.50 U.S.; $32.00 elsewhere (ISBN 0-87287-680-2).

Tischer, Michael. *PC System Programming for Developers.* Grand Rapids, Mich.: Abacus, 1989. 920p. (ISBN 1-5575-035-2).

University of Southern California Preservation Planning Program Final Report. Washington, D.C.: Office of Management Services. 16p. $20.

Veaner Allen. *Academic Librarianship in a Transformational Age.* Boston, Hall, 1989. $40 (ISBN 0-8161-1866-3); paper, $28.50 (ISBN 0-8161-1875-2).

Weihns, Jean, and Lynne Howarth. *A Brief Guide to AACR2. 1988 Revision, and Implications for Automated Systems.* Canadian Library Association, 1988. 84p. spiral-bound, $16.50 (ALA order code C245-X). ■■

Correction

Authorship of the software review of BibBase/ACQ that appeared in the June 1989 issue of *Information Technology and Libraries* was incorrectly attributed to David Buxton. The correct author is David Ritchie, Head of Cataloging and ordering at the State University of New York at Corland. The editor regrets the error.