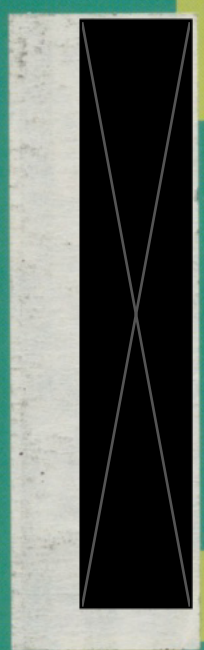


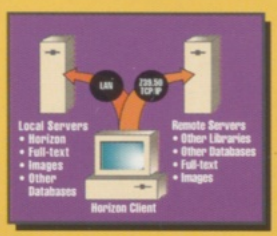
Information Technology and Libraries

Volume 15 Number 1 ISSN 0730-9295

March 1996

The standard by which other client/server systems are judged

Horizon™ is the information management system that sets the standard by giving your library all the benefits of client/server computing.



A true client/server system

The flexibility of an open systems environment means you can add to the system as needs change and adapt to future technologies while leveraging your investment.

Expanded patron access

In addition to your own Horizon database, patrons can use Horizon to gather bibliographic data from any Z39.50-compliant system and connect to global resources over the Internet.

Graphical user interfaces

The Horizon client software offers the familiarity of Microsoft Windows,® System 7 (Macintosh®), or OS/2® interfaces. Patrons can search effortlessly with icons, pull-down menus, and point-and-click commands.

Proven by libraries like yours

You need a system with a history of success, one designed by library professionals. Horizon has met those requirements with thorough testing by libraries around the world.

Horizon is available today

You can bring the benefits of Horizon to your library today. Let us show you the leading client/server system.

Ameritech Library Services

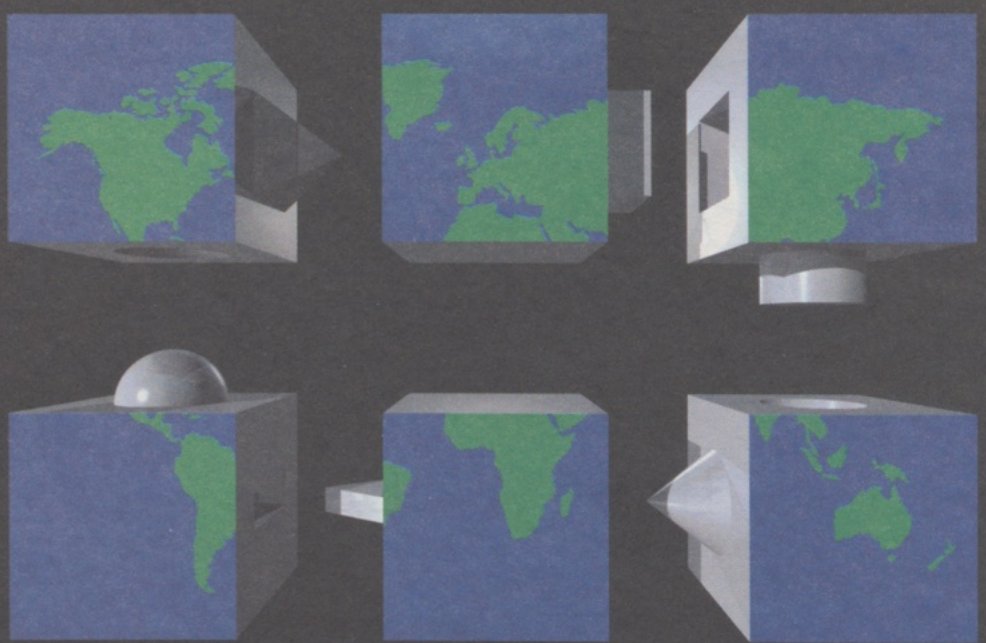
Academic Division
1007 Church Street
Evanston, IL 60201-3665
(800) 556-6847
Fax (708) 866-0178
academic@amlibs.com

Special & Public Divisions
400 Dynix Drive
Provo, UT 84604-5650
(800) 288-8020
Fax (801) 223-5202
special@amlibs.com
public@amlibs.com

Ameritech

Our customers worldwide want a third-generation system that's virtual by design, inherently flexible and intuitive. We're building them Virtua.

VIRTUA



Backed by market analysis and more than 10 years of VTLS research and development, Virtua's truly open and solid design is built with the latest technological innovations:

- Three-Tier Client/Server Architecture
- Object Oriented Design with Rapid Development Tools
- Relational Database Management Systems
- Distributed Data Warehousing
- Unicode™ Support
- ATM Network Applications

Discover why Virtua is The New Era in Library Automation.

VTLS

VTLS Inc. • 1800 Kraft Drive • Blacksburg, VA 24060 USA
1-800-468-8857 • www.vtls.com

Information Technology and Libraries (ISSN 0730-9295) is published quarterly in March, June, September, and December by the American Library Association, 50 E. Huron St., Chicago, IL 60611. It is the official publication of the Library and Information Technology Association, a division of the American Library Association. Subscription price, $22.50, is included in membership dues. Nonmembers may subscribe for $50 per year in the U.S.; $55 in Canada, Mexico, Spain, and other PUAS countries; $60 in other foreign countries. Single copies, $15. 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.

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 8 of the March 1996 issue. Manuscripts of articles, communications, and news items should be addressed to the editor-designate: James J. Kopp, Library Director, Wilson W. Clark Memorial Library, University of Portland, P.O. Box 83017, 5000 N. Willamette Blvd., Portland, OR 97283-0017. Copies of books for review should be addressed to: Barbara Kemp, *ITAL Book Reviews*, Dewey Graduate Library, University of Albany, SUNY, 135 Western Ave., Albany, NY 12222. Copies of software for review should be addressed to: Tom Jevic, *ITAL Software Reviews*, University of Illinois at Chicago, Main Library, 861 S. Morgan, Chicago, IL 60607. ADVERTISING: Contact Todd Goldman, Todd Goldman Associates, 3418 Handy Road, Suite 201, Tampa, FL 33618; (813) 264-2772.

As a matter of policy, *Information Technology and Libraries*, as the scholarly organ of LITA, does not review LITA publications. Notice of new publications from LITA will generally be found in the "Other Recent Receipts" column following reviews.

Production: ALA Production Services (David Epstein, Eileen Mahoney, Bruce Frausto; Christine Squires, Leslie Stella, Laura Tillotson, and Donavan Vicha),

Information Technology and Libraries

Volume 15, Number 1 **March 1996** **ISSN 0730-9295**

Cover Design by Jim Lange. Interior Design by Dianne M. Rooney

American Library Association, 50 E. Huron St., Chicago, IL 60611.

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 239.48-1992. ∞

A New Service on the Information Superhighway

If you have been searching for an easy way to authority control your library's current cataloging, try LTI's ***Authority Express*** service.

With ***Authority Express,*** a library uses the Internet to transmit a file of newly cataloged bibliographic records to LTI (via FTP). Overnight, LTI processes the records through its state-of-the-art authority control system. Then, at the library's convenience, it logs into LTI's FTP server to retrieve fully authorized catalog records, along with linked LC name and subject authority records.

Authority Express

- Keeps authority control current at an affordable price
- Integrates easily into existing workflows
- Lowers cost by reducing staff time spent on catalog maintenance
- Provides next-day turn around for up to 5,000 catalog records
- Accepts records for processing even if LTI did not perform the original authority control

"Authority Control for the 21st Century"

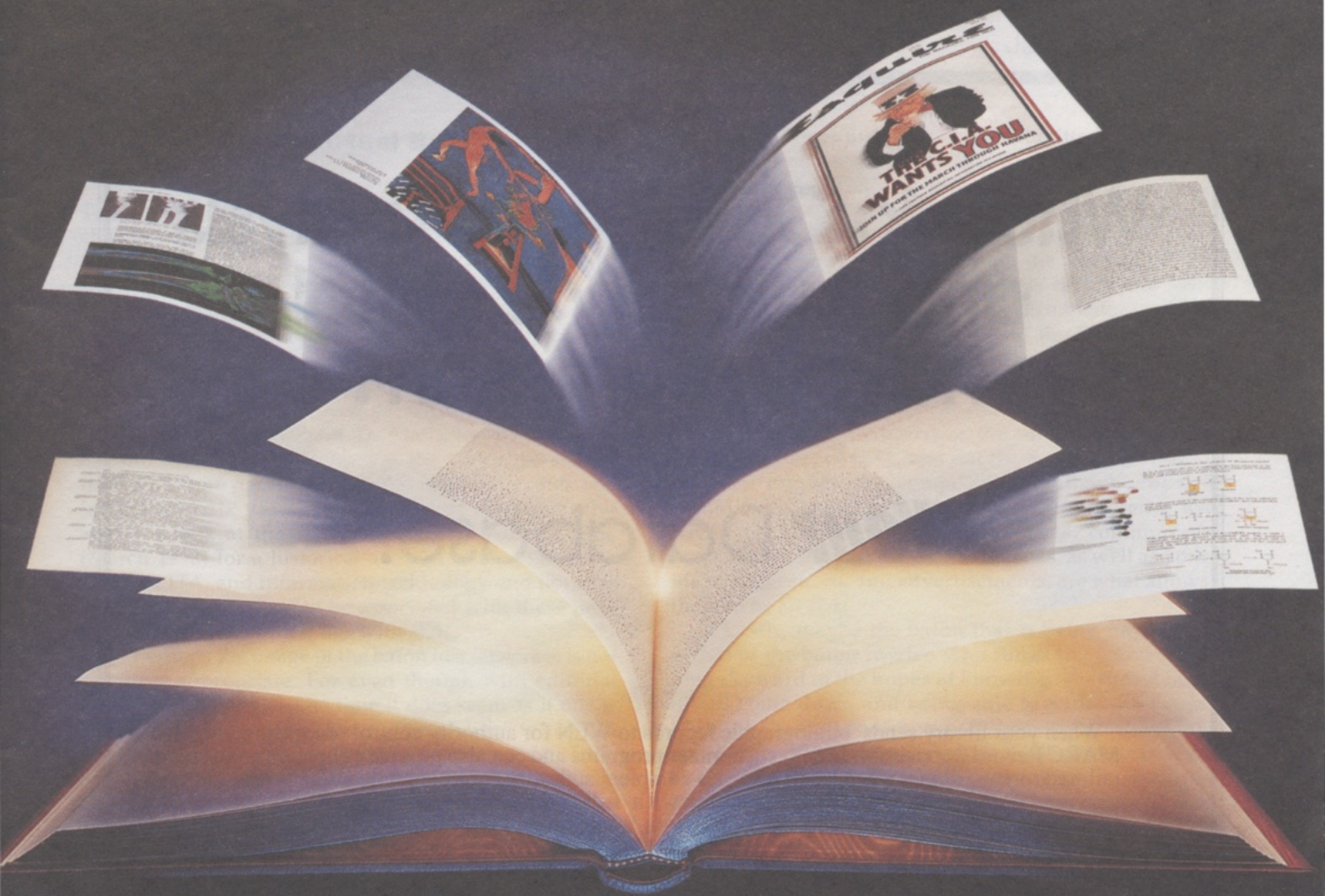
LIBRARY TECHNOLOGIES, INC.

1142E Bradfield Road Abington, PA 19001

(215) 576-6983 Fax: (215) 576-0137

(800) 795-9504 email: LTI@LibraryTech.Com

Set your information free!



Introducing Minolta EPIC 3000

Scan any bound document face up and damage-free in seconds.

IMAGING MAGAZINE PRODUCT OF THE YEAR 95

Scan, copy and send information from any bound document interoffice, interlibrary or internationally.

Bound up by bound documents? Digitize and distribute information worldwide with one of the EPIC 3000 systems. Scan fragile books, documents and even 3-D objects face up and damage-free. Then archive or distribute the information however you please. EPIC 3000 for Windows™ lets you print or fax. E-mail information. Store it on any form of media. Or put it on the Internet. The patron-friendly EPIC 3000 with touch screen comes ready for paper or electronic output. Don't get caught in a bound document bind.

For more information call *1-800-9-MINOLTA*

Simple touch screen monitor lets patrons print or store to disk.

Copiers
Cameras
Faxes
Digital Systems
Document Imaging
Camcorders
Binoculars
Color Sensors

Only from the mind of Minolta

MINOLTA

Editorial

James J. Kopp

Passing the Virtual Baton

This issue of *Information Technology and Libraries* marks a change in editorship. Tom Leonhardt has passed on the "virtual baton" in the editorial relay of *ITAL* (and the *Journal of Library Automation (JOLA)* that preceded it). The handoff has been completed, and it seems to have been a smooth one. It is my turn to carry the baton, but I am in awe as I look to see who has carried it in the past. Starting with Frederick Kilgour and the premier issues of *JOLA,* the baton has been passed to A. J. Goldwyn, Susan K. Martin, William D. Mathews, back to Sue Martin, Brian Aveney (who was the editor during the transition from *JOLA* to *ITAL*), William Gray Potter, and for the past six years, Tom Leonhardt. (I recommend taking a look at the silver anniversary issue of *ITAL* (March 1993) for a historical account of the journal, as well as LITA, and information technology and libraries itself.) It is a privilege to be associated with these individuals in terms of their ties with *ITAL.*

Perhaps the image of the baton in a relay race is not the most appropriate. For even though with editorial deadlines looming all the time it does seem as if one is in a race, there is no permanent "finish line" to cross in this metaphor. Rather maybe the baton is that of the orchestra conductor, who with it brings together the wonderful expression of a symphony from the workings of so many other individuals. I recall hearing one conductor note that he had the easy part of it all as he had neither to compose the music nor to play it but had the honor of conducting it. Such, it seems, with the baton of editorship. The editorial symphony consists of the *ITAL* editorial board (listed on the masthead of the journal), which plays a pivotal role in setting broad directions for the journal as well as the important role of serving as the principal referees for manuscripts submitted for consideration. Special acknowledgment goes to the other editors involved in *ITAL,* all three (like myself) assuming their new responsibilities with this issue. At "first chair" is Ann Jones, who is the managing editor and like the first chair is responsible for tuning the "orchestra." In addition, Barbara Kemp, book review editor, and Tom Jevec, software review editor, are instrumental (pardon the pun) in the roles they play with the journal. Todd Goldman serves as advertising editor and is an important part of the "symphony" as are the staff at LITA and within Production Services at ALA. And finally, it is all of you—the LITA membership, the authors and reviewers, the readers of *ITAL,* and not the least, our advertisers. You provide the compositions without which I would have nothing to "direct" and no audience for whom to "perform." Your manuscripts, communications, letters, book and software reviews, as well as your ideas, suggestions, and advertisements, are what allows there to be an *ITAL.*

Lastly, maybe the baton that is being passed on is that of the baton twirler, who flings the baton spinning skyward in the hopes of knowing where and how it will come down and being able to make the catch. With the changes confronting information technology and libraries in the last years of this century, as well as the potential transformation in publishing (including that of this journal) it will seem as if there is a spiraling baton that is going to be difficult to catch. Although hardly the stuff of what baton twirlers are made, I hope to be able to make that catch!

In whatever shape, form, or metaphor the virtual baton exists, I am pleased and honored to have been handed it. I look forward to serving LITA and all the readers of *ITAL* in this multifaceted capacity.

Let the race, symphony, or parade begin!

Instructions to Authors

Information Technology and Libraries welcomes manuscripts related to all aspects of library information technology. Some specific topics of interest are mentioned on the masthead page. Feature articles, communications, letters to the editor, and news items are all considered for inclusion in the journal. Feature articles are refereed; other items generally are not. All material is edited as necessary for clarity and length.

Manuscripts must be typewritten and the original submitted with one duplicate. All must be double-spaced, including footnotes and references. Manuscripts should conform to *The Chicago Manual of Style*, 14th ed., rev. (Chicago: Univ. of Chicago Pr., 1993). Illustrations should be prepared carefully as camera-ready copy, neatly drawn in a professional manner on separate sheets of paper. Manuscript pages, bibliographic references, tables, and figures should all be numbered consecutively. Final versions of papers accepted for publication must be submitted on floppy disk (3.5 inch only) in WordPerfect (DOS versions 4.2, 5.0, and 5.1 accepted) along with two printed copies. If WordPerfect is not available, an ASCII copy is acceptable.

Feature Articles consist of original research, state-of-the-art reviews, or comprehensive and in-depth analyses. An abstract of 100 words or less should accompany article on a separate sheet. Heading should be used to identify major sections. Authors are encouraged to relate their work to other research in the field and to the larger context of economic, organizational, or management issues surrounding the development, implementation, and use of particular technologies.

Communications consist of brief research reports, technical findings, and applications notes. An abstract need not be included.

Book Reviews are assigned by the book review editor. Readers wishing to review library-related software for the journal are invited to contact the software review editor indicating their special areas of interest and expertise.

Tutorials are brief, how-to-do-it articles that may include coverage of computer programs.

Letters to the Editor may offer corrections, clarifications, and additions to previously published material or may be independent expressions of opinion or fact related to current matters of concern in the interest area of the journal. A letter commenting on an article in the journal is shared with the author, and a response from the author may appear with the letter.

News and Announcements items may refer to publications, conferences, meetings, products, services, or other items of note.

The names and addresses of the journal editors can be found in paragraph two on the masthead page. In all correspondence please indicate your name, institutional affiliation, mailing address, and phone number.

Developing Eureka: Rapid Access to Very Large Databases

Walt Crawford

As RLG's first foray into end-user searching, Eureka's design draws on extensive study of online catalog practices and on advice from librarians and feedback from users. The service was designed so that untrained users without printed documentation could successfully search a database of more than twenty million titles within three minutes of first encountering the system. The process of designing and developing Eureka offers some lessons for others planning systems for better end-user access.

Introduction

Eureka, RLG's patron-oriented search service, is a convenient way for libraries to provide campuswide or library-wide access to a huge secondary "online union catalog" and article citation databases. As RLG's first foray into end-user searching, its design draws on extensive study of online catalog practices and problems, as well as on advice from librarians and feedback from users. Our goal was to create a system that most users can search successfully within three minutes of first encounter, with no printed documentation or advance training.

The process used in designing and developing Eureka offers a number of lessons for others planning systems to provide better end-user access. As one of few search systems designed from the beginning for use with—and tested almost exclusively with—very large databases, Eureka shows the advantages of knowing limits and using iterative development.

Defining the Need

The RLG bibliographic database, commonly referred to as RLIN (the Research Libraries Information Network), has grown to be one of the two largest components of the *de facto* national bibliographic system. Of the more than 24.5 million titles (as of early 1995), many represent resources to be found nowhere else but at the holding institution—including hundreds of thousands of archival and manuscript records, a massive database of pre-LP sound recordings, cataloging from the United Nations library, and many others.

RLG needed a way to make this database available to end-users worldwide. RLG's members also called on the organization to expand its specialized article-level databases and add document delivery options, creating CitaDel. For both CitaDel and the RLIN database, RLG's traditional integrated technical processing system (RLIN/ITPS) offered sophisticated, flexible search capabilities but little online help, no forgiveness, no labeled displays, and generally little to make the database's richness meaningful to untrained library users.

Additionally, we were aware that a growing number of libraries and campuses had widespread access to library resources over computer networks, and that in many cases those networks could go beyond the library to the Internet. We saw real potential for enriching library services by making CitaDel and the RLIN database part of that next step. While RLIN had been available for searching on the Internet since 1989, the new service would be oriented to the end user.

Database Size and Content

The primary RLIN database consists of eight files: books, serials, printed musical scores, sound recordings, maps, visual materials, computer files, and archival materials. In all, those files—treated as the single "BIB" file within Eureka—contained more than twenty-one million titles and more than sixty million records when work began on Eureka in 1992. (RLIN databases hold each library's own version of a cataloging record, with records clustered automatically into edition-level groups.) The database grows rapidly; as of early 1995, more than eighty million records represent more than 24.5 million titles and editions.

RLG has had some specialized databases for years, including the *Avery Index to Architectural Periodicals* and the *English Short Title Catalog* (originally the *Eighteenth-Century Short Title Catalogue*). As Eureka was being designed and developed, additional article-level files were procured. At this point, there are twenty CitaDel files. The *English Short Title Catalog* (ESTC) became available through Eureka in September 1995.

The BIB file represents the holdings of many of the world's leading university libraries as well as dozens of museums, state archives, law firms, special libraries, and public libraries. The database is rich in international and non-English materials, as well as historical materials. It is generally perceived as being especially strong in literature and the humanities.

The growing collection of CitaDel files includes distinctive scholarly files only available online through

Walt Crawford is a senior analyst with the Access Services Group and Development Division of the Research Libraries Group. He would like to acknowledge the editorial assistance of Liz Chapman, Joan Aliprand, and Lennie Stovel.

RLG, as well as a selection of commercial citation databases. While none of the CitaDel files approaches the size and variety of BIB, taken as a whole these files add another eighteen million titles to the bibliographic wealth available through Eureka.

The range of files—and the range of cataloging practices represented within BIB (and for that matter CitaDel)—offered particular challenges. Archival and manuscript control records can be enormous (up to 30 thousand characters), with more than two hundred access points in many records, making orderly display and access somewhat difficult. Because RLG does not own the bibliographic records in its files (and has never asserted copyright for those records), and because so many specialized practices are represented, the database is not under programmatic authority control. For Eureka to succeed, it needed to handle the huge, complex BIB file adroitly and display the wide and sometimes wild range of records within.

Anticipated User Population

We knew that Eureka would be used over the Internet: that was part of the basic service definition. We anticipated that most users would reach Eureka through gophers or other menu systems on campuswide or librarywide networks, and that most campuses would establish subscriptions allowing for relatively unlimited campuswide use.

Although Eureka should be useful for most academic and public libraries, we assumed the initial customers would be large universities and colleges, primarily RLG members. Unlike most services from RLG, the library staff would not be the main users: Eureka was to serve students and faculty members, not just librarians, although we expected librarians to use it as well.

No assumptions were made about *which* students and faculty would use Eureka, but we did assert that it was hopeless to assume training or access to printed documentation. No library can assure that every user receives bibliographic instruction every year. As a new service in most institutions, Eureka had to work well without such instruction. As for printed documentation, we knew that a growing number of campuses have computer connections in every dorm room (and, in some cases, computers in every room as well). Quite apart from the expense and complexity of producing appropriate printed documentation for such a widespread audience, we doubted that any assumptions could be made about access to printed documents at the point of use.

Anticipated Use Patterns

Most library users should use their local catalog first. We saw the BIB file as a second source (or possibly a third source, after a regional or consortium catalog). Given that BIB would be a secondary source, we anticipated that most users would want to start a session, do one or two searches, look at a few results, and quit. We also assumed that most users would prefer to do all this within five minutes or less from start to finish. Some would do more exploring, and some would do serious research.

While CitaDel files might be the first files searched for some projects, most of that use would also be fast-in and fast-out, with only some sessions involving many searches or investigating many records.

It was important to serve not only first-time searchers and one-search users, but those who needed to explore more thoroughly. One primary assumption was that Eureka would "stay out of the way" for experienced searchers, allowing them to move as rapidly and flexibly as possible, but would also ease entry for the uninitiated.

The Freedom of Restrictions

While the project that became Eureka formally began in the fall of 1991, several years of ongoing analysis of issues and trends in online catalog design preceded the project. At a LITA screen design preconference to the 1991 ALA Annual Conference, I showed screen simulations of one possible overall interface design for the new system (then unnamed) in conjunction with the keynote speech.[1] That design concept, combining Common User Access (the basis for Windows) and Common Command Language (NISO Z39.58), posited software running on end-user workstations and was not based on detailed analysis.

Before serious design work began, we determined the real-world limits within which Eureka needed to operate. That determination immediately eliminated much of the design sketch shown at ALA, although most of the basic principles discussed in that keynote are followed in Eureka.

The most important limitation, and one that will continue to be valid for a few years to come, was that we could not reasonably provide software to run on end-user stations, for at least three reasons:

1. The universe of likely and possible users included too many varieties of personal computers and workstations, with too many variations even within single platforms. It appeared, in 1991, that we would need to write at least half a dozen different programs on half a dozen different hardware-software platforms to serve even 80 percent of the potential market—and we lacked the time, money,

and range of experts needed to write, support and maintain such a variety of diverse programs.

2. Even if we could write half a dozen client programs, many of the libraries likely to use Eureka had (and still have) networks of "dumb" terminals that are incapable of running end-user software. Thus, we would either need a terminal-oriented version or need to write new programs for every minicomputer and mainframe platform that these local systems used—clearly a gargantuan task.
3. Our desire was to make Eureka broadly useful across campuses and libraries, requiring little effort to start using Eureka, perform needed searches, and quit. Expecting every campus user to acquire front-end software before first using Eureka was inviting failure, particularly since we knew that campuses and libraries were migrating to gopher-based or other menu-based approaches to campuswide information. We wanted to fit into the existing frameworks, not require totally separate procedures. Eureka design began before the explosion of the World Wide Web and its browsers, but those browsers still do not provide universal access to a robust and consistent environment—particularly not in those libraries still using terminals.

The only reasonable course was to take as a given that the new system would use terminal emulation. Initially, we assumed VT100 emulation, knowing that such emulation is offered by nearly every telecommunications program and most other terminals. While that turned out to be too sophisticated an assumption, Eureka has survived as a terminal-emulation program.

Eureka is actually a Z39.50 client, communicating internally with RLG's Zephyr Z39.50 server. The early decision to develop Eureka as an internal client took advantage of RLG's early work in the Z39.50 arena, leveraging Eureka's development from the work done on Zephyr. Because Eureka runs as a Zephyr client, RLG could honestly assert that Zephyr was not only robust but proven under ongoing real-world loads, even before Zephyr itself was offered as a production RLG service.[2]

We posited that the Internet would be the primary communications mechanism for Eureka, although Eureka is also available as a dial-up service. Most RLG members and large RLIN customers already had robust Internet connections, and most were expanding Internet-based access to off-campus resources. We would become another such resource.

As an Internet system using VT100 emulation, Eureka was inherently character-based, assuming an 80-character by 24-line available screen. Given the flexibility and power that we expected to offer in Eureka, it was clear that the system should be command-driven rather than menu-driven. A menu-driven system would either have such long and involved menus as to be cumbersome, or would hide many of Eureka's capabilities. In any case, such a system would slow down the repeat users that we expected Eureka to attract.

Initially, the design posited lines of options, with the tab key highlighting each option and providing quick explanation for its significance, to provide near-menu ease for those uncomfortable with pure commands. This proved to be unrealistic. Recognizing the tab key and moving a highlight, while simultaneously changing a prompt line, would mean transmitting each character as it was keyed and parsing each character on RLG's mainframe. The Internet is a packet-switching network of networks. Treating each character as an independent packet would add substantial overhead and lead to slower, less consistent operation—too high a price for a pseudo-menu mode. After a few tests on existing systems, the design team agreed with RLG's systems programmers that the system should not recognize keystrokes until the Enter key was pressed.

As the principal designer for Eureka, I was surprised to find that these restrictions did not make the basic design more difficult to craft. Instead, these restrictions, and the principles stated below, simplified and clarified the design process by freeing effort for more specific decisions. We knew what was not possible, which made it easier to explore how to do the best with what *was* possible.

Following Principles

RLG is dedicated to the use of standards and has contributed to standards development. I had spent years studying user interface issues, decrying certain trends, and publishing books and articles that asserted principles for user interfaces. Naturally, the new system needed to follow standards (where feasible) and adhere to those principles (where appropriate).

While NISO Z39.58, the Common Command Language, has not become as widely established as seemed likely a few years ago, it is still a widely used and fairly well understood standard. It is really designed for traditional online database retrieval more than for end-user retrieval-and-display systems such as Eureka, but the syntax and command set still make sense for such a system. We established as a starting point that Eureka would adhere to Z39.58 where feasible, and avoid outright violation of that standard in all cases. Full compliance was not possible (for example, we are not in a position to build a default all-word index, handle adjacency or proximity searching, or support single-character wildcards), but Eureka never explicitly violates Z39.58.

In most areas, Z39.58 compliance has served us well. It is familiar to RLIN users, although RLIN, which preceded Z39.58 by more than a decade, adheres to it less well. A similar syntax and vocabulary are used in the University of California's MELVYL system (probably the nation's most widely used secondary online catalog), and many other catalogs and systems either use Z39.58 as a primary mode or accept Z39.58 commands as secondary commands.

Perhaps the most controversial fundamental principle, but one that has consistently proven worthwhile, is that Eureka would have only one mode, only one interface. There would be no "beginner's mode" and "expert mode," no menu-versus-command choice. I have consistently argued that such dual-mode interfaces turn the learning curve into a cliff, allowing no reasonable way for users to move from beginner to expert or to move partially back to assisted mode for new functions. Occasionally, analysis of user transaction logs shows a "MENU" command that appears to be a request to switch to a nonexistent menu mode, but, in general, the single mode has worked as we expected it would. (Eureka treats "MENU" as a synonym for "OPTIONS," which displays and defines the currently available commands. The options list provides the same information as a menu, but does not stay in place or function as a command replacement.) As discussed later, a combination of design elements provides much of the ease of menu systems to Eureka users—so much so that at least one commentator actually called Eureka a menu system!

Pure menu systems can be diagramed as control trees. Each menu choice branches to a new set of options, and the user moves up and down the layers—or, if the layers go deep enough, the user restarts the system with each new search in order to save time. Menu systems restrict the user's flow to what is currently offered; they are inherently closed systems.

Eureka needed to offer a broad range of functions, and our observations suggested that menu systems increased user frustration as the systems became more functional. A basic principle, given both observation and analysis, was that Eureka should have an open structure. A user should be able to do anything that was logically feasible from any point in the system, with no needless intervening steps.

As an open-structure system, Eureka could either be a prompted command system or a pure command system; it could not reasonably be a true menu-based system.

These and other principles entered into preliminary thinking during the summer and early fall of 1991, as we sketched out the range of functions that the new system could or should support.

Bringing in the Advisors

Whatever experience and analytical strength RLG staff could bring to the new design, we knew that we could benefit greatly from the advice and feedback of staff at our member institutions. After sketching out the issues to be addressed in a system design, but before filling in the design itself, we identified some interested and experienced parties and put together a small working group.

In November 1991, a group of knowledgeable representatives met with two RLG staff members in Philadelphia at the University of Pennsylvania. Representatives from Princeton, Emory, Pennsylvania, Dartmouth, Temple, and Columbia spent two intensive days going through every aspect of the potential design. The session included brainstorming, arguments, freewheeling discussions, compromises, and lots of good ideas.

By the end of the meeting, we had pages of detailed notes and initial decisions on key design issues, paving the way for a coherent system design. The overall design that emerged from the Philadelphia sessions was quite different from—and better than—the conceptual design offered as a starting point.

We continued to seek advice, from this group and later from others, during the design and preliminary implementation of Eureka. The Philadelphia session clarified the fundamental system, and was invaluable for the success of Eureka. As principal designer, and as one who does not claim to practice "egoless design," I strongly suggest to others that they bring in outside advisers *early on* in the design phase of systems that will be used by the public. When done early and openly, such sessions can shape the system design without resulting in hostility or wounded feelings. Later, no matter how "egoless" the design process, fundamental changes will be more difficult.

Unified Design: The Designer's Signature

I deeply appreciate one current RLG practice for new system design: a service or system is fundamentally designed by one analyst. That does not mean designing in a vacuum. It does not mean that the analyst's decisions can't be reviewed and changed by the project team or project manager. It does mean, however, that a design will normally be unified, with a consistent approach representing the designer's signature.

I believe that design by committee tends to compromise both the consistency of a design and an efficient

design process. The working group that met in Philadelphia contributed many excellent ideas at both general and detailed levels, but that set of ideas did not constitute a coherent design. The Eureka-related teams within RLG provided feedback and advice at every stage of development, but never went through step-by-step decision-making on aspects of the design.

Most organizations and consortia need committees for many purposes, and most new developments will require agreement from one or more committees before they can commence. It would be absurd to suggest that a single analyst should have veto power over the responsible committees or that the analyst should be able to determine overall priorities. But committees do not make good designers or create coherent designs, at least not inherently. That process can best be carried out by a single responsible person with as much advice and feedback as possible.

Should the designer be the project manager? For small projects in small organizations, this may be inevitable, but that is not generally how RLG works, and I do not recommend it as a general practice. Combining the principal design and management roles in a single person *does* make that person too much the key element in the project, eliminating one of the checks and balances that makes project teams work effectively. There is an inherent conflict of interest in combining design and management responsibility; the two roles work better separately.

The design phase for Eureka was a particular pleasure not only because we had input from potential users from the beginning, but also because Eureka was an internally funded project. We were not at the mercy of external agencies or subject to unexpected midstream policy changes. Such changes can turn a coherent design into a patchwork quilt, and can sometimes be more demoralizing for a designer than seeing a project canceled midstream.

Thanks partly to RLG's design and development process, and partly to the people involved, the coherence and overall unity of the system have been (and, I believe, will continue to be) maintained.

New Ideas from Old Practices

For all its conservatism as a character-oriented, command-driven online catalog, Eureka stands out as an original design, with some features that have been called new ideas. Realistically, many of these so-called new ideas came from old practices in several fields, pulled together to help craft a workable search system. Three of the more interesting aspects of Eureka—ones that have drawn favorable comment—follow. While this article does not include the extended set of screens that would be needed to illustrate these aspects, such screens are always available over the Internet—either by telnet to eureka-info.stanford.edu, or through RLG's World Wide Web home page, http://www-rlg.stanford.edu/home/.

All the Help They Need

Most command-driven systems require complete commands: efficient for experienced users, but tough for first-time users or those using new functions. Many systems accept commands, but only one word at a time, essentially functioning as word-driven menu systems: helpful for first-time users, but slow and inflexible beyond that first search.

Eureka accepts full commands, or even chains of commands if people are aware that the semicolon is the chaining character (following Z39.58). But Eureka only *requires* one or more beginning letters of a valid command sequence; it will prompt the user through whatever more needs to be done. Thus, if you know enough to submit a complete browse request (e.g., "browse au crawford, walt"), Eureka will process the complete command and present the appropriate browse screen. But if you know you want to browse, but have no idea what browsable indexes exist, just enter "browse" (or "bro"). Eureka goes into a partial command state, filling the screen with your possible next steps and echoing back what you have already keyed. You can cancel the command, provide an index name, or provide both the index name and value. If you provide only the index name, Eureka goes to a different partial command state, showing how to formulate values for that index.

The same procedure is used throughout Eureka, with the exception of a few commands that *require* partial command states for specific reasons (e.g., DOC, REQUEST, SEND). Additionally, Eureka will accept as few characters of a command as are contextually unambiguous, and if you don't key enough characters it will provide the list of currently meaningful commands beginning with the characters you keyed. As long as you can key at least one character of a currently meaningful command, Eureka can help you through the rest.

Log analysis demonstrates that this facility serves the user. Many sessions begin with a step-by-step search or browse, followed by any number of single-command searches and browses as the user comprehends the methodology. There is never a penalty for forgetfulness: if it is a new function or you are unsure, just key as much as you know.

I would love to claim credit for this innovation, which does appear to be something new in end-user

search systems. However, it really goes back to very early versions of WordStar, back before function keys and MS-DOS. In those early versions, commands were special key sequences, normally beginning with the Ctrl key and another key, frequently followed by one or more other keys. Typically, nothing was on screen except your writing. If you knew the Ctrl-key sequence, WordStar carried it out directly. But if you pressed Ctrl and another key, then didn't complete the sequence within half a second or so, the appropriate menu appeared on the screen—offering you specific help because you appeared to need it. That WordStar functionality (so critical in days of 2MHz Z80-based computers with 64K RAM) served as the inspiration for the assisted command system used in Eureka today.

Like: Related Record Access

Some online catalogs have offered related-record access for more than a decade. It is a sensible feature, replicating in the online environment what experienced card catalog users have done for years. In perhaps the most typical case, a user interested in a subject but unsure of the subject heading finds a known title on that subject. Looking at the tracings at the bottom of the card, the user finds an apparently appropriate subject, then searches that subject.

That is related-record access. There is no reason that such access should be limited to subjects. It is equally reasonable that a user would wish to track down items by an author who appears in an added entry, items in the same traced series, or even items with the same title (particularly for musical scores and sound recordings).

For reasons that have never been clear, related-record access came to public libraries long before large academic libraries and is still not found in some recent catalog designs (or is found in limited versions, such as those that only show subjects). This is unfortunate because related-record access should be relatively simple to provide.

Even the command finally used for Eureka's related-record access is not new: Sirsi's UNICORN uses that name for an essentially similar function. Or is it a function? In early versions of the Eureka design, LIKE was a command, forcing a partial state showing a numbered list of headings. The user needed to cancel the command, choose a number, or key some other command—and that latter option was unlike normal partial-state handling. Lennie Stovel, project manager for Eureka, finally convinced me that LIKE was not really a command at all. Rather, it was (and is) a variety of display—like LONG and RECORD—and should be treated as such. That decision made LIKE easier to implement and more coherent.

One aspect of LIKE is indeed new, but that aspect was added as a refinement after the introduction of Eureka. Most related-record commands result in immediate searches on the chosen heading. Instead, Eureka now goes to a browse if possible. This helps users to choose the most useful subjects, authors, or even titles, which are not always the ones used in a particular record.

LIKE and several of Eureka's other interesting features are not used all that often. That may be partly because it is not possible to show all available options in Eureka on the screen at all times, and only a few options appear on most screens. Then again, most Eureka sessions are quite brief and consist of one to five searches. The user has something specific in mind, looks it up, checks the records, and leaves. For those who are exploring, however, LIKE can be enormously useful: not original—although yielding a browse is new and a good idea for other systems to copy—but useful.

SEND: A Little Help from Our Friends

We knew that Eureka should provide facilities to print out a result set or download it to a diskette at the searcher's workstation, preferably in some neater way than capturing a series of screens. The Philadelphia meeting yielded another possibility: allowing users to send result sets as electronic mail to their own accounts or other accounts. That would mean that a user in the library could download the results later, when using his or her own system. It would also mean that the user could send a result to someone else.

SEND has proven to be popular and extremely useful. For Eureka, we expanded the set of output options somewhat, to cover the three most popular bibliography programs and add a comma-separated-values format that allows import into almost any spreadsheet or database program. SEND is used more frequently than PRINT: it's a more flexible function, and avoids the hassle of configuring local terminal software for continuous printing or downloading. A later refinement made it possible to add a subject heading to the SEND message—and SEND served as the basis for the REQUEST function for interlibrary loan, added in late 1994.

I am not sure there are any truly new features in Eureka, but the combination of borrowed and old features, carried out as they are, do constitute an original design. As with any good new development, we stood on the shoulders of many giants in the library field and elsewhere.

Iterative Design

Design and development of Eureka proceeded in an iterative manner. Internal design (and, later, programming) began considerably before all external design issues were entirely settled. Nobody in the development team assumed that the first version would be the final version, or that there would ever be a "final" version.

An early visual prototype of Eureka, prepared as a set of PC screens using Dan Bricklin's DEMO II software, helped to surface design issues before a detailed specification was prepared. It was possible to play with the prototype as a way of exploring the design, revise the prototype as a result of discussion, and use the prototype itself and a printed version of the screens as a way of pulling together the extensive and somewhat scattered specification.

A critical milestone in the Eureka schedule was completion of the first *useful* version: that is, the first Eureka in which it was possible to search for, retrieve, and display records. The programming and development teams established a target for such a version and a definition of how complete that first version needed to be. As with most aspects of the development, the first useful version was ready slightly ahead of schedule. That version was fully tested and debugged—not as a complete Eureka, but as a functioning search-and-display system. Significantly, the Eureka development team coped with problems of scale right from the beginning. Even the first version ran against the complete "BIB" file—at the time, some sixty million records representing some twenty-one million bibliographic items.

Once that version was in place, we were able to refine the design based on limited real-world experience. We were also able to show Eureka to others, both within RLG and outside. It was not very long before the first useful version was sufficiently amplified—and sufficiently tested—to become the pilot production version in January 1993. Eureka had been established as the first development priority within RLG—a single-priority definition that is not always easy to confirm and maintain—and the team justified that priority by getting the work done rapidly and well.

One key aspect of keeping Eureka on track and ahead of schedule was to maintain reasonable control over design enhancements. While several of us, and some of our advisors, continued to come up with good ideas for making Eureka better, the project manager maintained a clear understanding that good ideas could not be slipped into an established timeline.

Thus, testing was (as it should be) a process of finding and correcting errors; that is, discrepancies between the established design and the system. It is too easy for testing to become a way of slipping in new features: "well, this would really work *better* if . . ." That way invites delays and, in extreme cases, failure.

We did add many good ideas to Eureka—before pilot use, during pilot use, and finally within the production system. But those refinements were clearly defined as new development, to be added if and as milestones had already been met. You can have continual design improvement going on at the same time as programming, or you can meet tight schedules; it is not at all clear that you can do both.

Another key to Eureka's timely and successful development really cannot be overstated. RLG employs very talented and thoughtful people, many of whom were involved at all levels of the Eureka project. Those qualities particularly describe the programmers/analysts who built Eureka, the testers, and the writers who worked on the project. The designers and managers of the project relied on the builders, staying out of their way as much as possible and giving them the trust that they demonstrably deserved.

Bringing in the Users

By January 1993, Eureka had enough functionality for pilot use. The main indexes worked properly for browsing and searching, the most important displays were in place, the parsing engine worked, and all critical support functions were available.

We had invited a few people at some RLG institutions to test Eureka earlier, but those tests were limited to library staff who understood they were seeing a work in progress. In January and beyond, Eureka would be available for *patron* use. RLG needed to see how students and faculty would get along with Eureka, and needed to see how Eureka would work under reasonably heavy loads. With those needs in mind, pilot campuses were *not* asked to limit use in any way; indeed, they were encouraged to publicize the pilot system.

The primary file for pilot use was BIB—all twenty-one million titles. Would users be able to make sense of the results? Would they find result sizes overwhelming, or find searching and retrieval too clumsy or slow? We knew that those answers could only come from real-world use of real-world files. Fortunately, the answers were positive: even in its first pilot-use form, most users found Eureka a valuable, efficient tool.

Dartmouth College was the first of five pilot sites to make Eureka available, adding the service to its library information system on January 18, 1993. Emory, Columbia, Rutgers, and Pennsylvania turned Eureka on

over the following weeks. More preview sites were added during the spring of 1993.

In all, some 60 thousand searches were done by pilot users. That is a remarkably large number for a test run, and it provided confidence that Eureka would stand up to full production and that we had achieved our aims. An interesting milestone was reached in the fall of 1994, a few weeks into the second production year of Eureka, when *weekly* searching exceeded the total searching for the eight-month pilot run.

Using Feedback Effectively

Every good designer relies on feedback from design reviewers, to validate and improve the design. Even more important to the long-range success of a system is effective use of *user* feedback, both direct and indirect. Eureka includes provisions for both forms of feedback, and both have been important to its development.

The procedure that initiates Eureka sessions selects a fraction of those sessions for full command logging—that is, writing each command or command equivalent and its results to a disk file. Command logs are designed to preserve user anonymity, although Eureka's typical use as a campuswide service using multiple-session accounts provides strong anonymity in any case. Initially, 25 percent of all sessions were logged. As use grew, that percentage was reduced to 10 percent. As use grows further, we will reduce logging once again to the 5 percent level that RLIN uses.

Command logs show actual commands as keyed (or Enter for the many cases in which no command need be keyed), the current result size as a number of headings or records, cumulative elapsed time, and CPU time. The logs also show the names of help files that are consulted and system messages that result from problems and errors. We also defined normalized versions of all commands—including the significance of "Enter" in all cases. (Most often, it means "Forward," but not always.)

An automated SAS routine (SAS is a statistical analysis software program) provides daily and weekly summaries of logged system use, both by individual command and by command type (e.g., navigation commands, partial commands, errors, find-equivalents), as well as showing activity within each file by command type. Those daily and weekly summaries provide spot checks on the health and use of the system, and are used to prepare a weekly usage graph. The weekly summaries are also massaged (using Quattro Pro) into several monthly summary reports, providing useful information on the continuing growth and use of the system.

But SAS can only show the overall picture. It can show that 8 percent of all commands were "errors," but makes no distinction between the "error" that occurs when a user attempts to scroll past the end of a result set (by pressing Enter once too often) and an error that occurs because the user really doesn't understand the system or the system is malfunctioning. SAS also cannot do a good job of portraying the course of a searching session: how long it takes, what the user does, and how satisfied the user appears to be. That requires manual analysis.

Once each week, the day's sample logs are printed out for historical review and immediate analysis. I go through those logs looking at each "error" and each zero-result search. From the beginning, errors fell into some fairly clear groups—some of which clearly did not cause users any trouble (e.g., pressing Enter once too often) and others that probably did. Analysis of both kinds of errors has yielded a number of useful improvements in Eureka both before and after initial production. The most important change in terms of errors may have been the "Do What I Mean" changes implemented in June 1994.

When time permits—ideally once a month, but realistically less often—I do full session analysis of a day's sample logs. That means going through a session from beginning to end, seeing how long the session took, how many searches were performed, what portion had no results, how many records were displayed, and—as far as one can tell—whether the user appeared frustrated, happy, or somewhere in between.

Session analysis can be useful and important, but it is also incredibly time-consuming. While session analysis can uncover patterns of use and categories of problems that will help to refine the system, such analysis eventually yields diminishing returns as major use patterns stabilize and problem categories are dealt with.

We were able to determine that most users did indeed start and complete a search, and often finished within two or three minutes, and, not surprisingly, that a majority of search sessions involved no more than two searches and a few record displays. Based on the kinds of searches and the extent of display and SEND commands, we conclude that most quick sessions are successful.

From a fairly early point in pilot use, Eureka offered a facility for direct user feedback. The SUGGEST command allows a user to key a one-line comment that goes directly to the Eureka development team (and if the user does a SUGGEST as a two-step process, the intermediate screen offers an e-mail address for longer comments).

That mechanism has yielded some useful ideas, a few compliments, a few complaints that could not be

handled, and some cases where we were truly befuddled. One or two people said that they could not figure out how to do anything, which—since SUGGEST is never a suggested action but must be found using OPTIONS—raises the question of how they figured out how to tell us that.

All comments received by SUGGEST or e-mail were, and continue to be, distributed to a group of RLG staff particularly interested in the ongoing refinement of Eureka. Comments are also logged into a database. Periodically (and more frequently during pilot use and the first year) all comments are reviewed to see which should be acted on. We also sought formal feedback from pilot sites and used that feedback in developing refinements to the system.

After several months of pilot use, members of RLG's Access Services Group met with representatives from the pilot Eureka institutions to discuss the state of Eureka and what needed to be done next. The all-day meeting, held at Columbia University, was tremendously useful for us in seeing how librarians at the campuses perceived Eureka in action, and in seeing how we could make it more successful. Participants were cordial but candid, raising many issues with the clear intent of improving a service that they saw as worthwhile.

That meeting, in the summer of 1993, was the last extended user feedback session. There have been (and will continue to be) other sessions, much shorter and held in conjunction with the ALA Midwinter Meeting or Annual Conference. Since Eureka is now a production system, changes tend to be refinements rather than overhauls.

Production Eureka: The Change Process

On September 1, 1993, full production Eureka was ready for service—a changeover that had no effect on users at sites that moved smoothly from pilot to production status. Since then, the Eureka story has been one of growing use, additional files, and ongoing refinement. A few notes on the post-production refinement process may be useful.

In the fall of 1993, I suggested (and the Eureka-Zephyr Service Team agreed) that we should establish a Eureka Advisory Group, a small group of library professionals who could discuss and react to possible changes to Eureka. This group would work by electronic mail (using a closed listserv), and would be low-key. We did not plan to demand much time from any participant.

We invited ten participants: some at RLG member institutions using Eureka, some at nonmember users, and one or two invited for their individual expertise in online catalog design. That group has been quite helpful to us, working more actively in late 1993 and early 1994, somewhat less actively since. With a few small changes in membership, the Eureka Advisory Group continues its role.

There are lots of good ideas for Eureka changes, as there are for almost any actively used system. The service team established a periodic process of reviewing possible changes, determining which ones could be useful and nondisruptive, and prioritizing the useful possibilities. That priority process has worked well, allowing the Eureka maintenance team to continue improving the system with limited resources and with the known need to maintain predictability and coherence.

For some time now, RLG has had a change request process that uses an internal database to track proposed changes, provide for comments, store specifications, and determine outcomes. Once Eureka was in production, we began using the change system to track those changes that appeared to be worth doing. That is, once a change was assigned a medium or high priority, it was described in the changes database and made available for comment. A specification was added. Changes are grouped into workable packages, estimates for programming and testing are prepared, and change packages are scheduled for anticipated installation.

We regard Eureka's stability as vital. Changes are not carried out haphazardly, and it would be rare at this point for changes to take place more than once a quarter. Changes are tested as thoroughly as possible, using regression testing and less formal methods.

There have been several significant change groups since Eureka went into production. The most recent changes (as of this writing) add REQUEST (an interlibrary loan request function), provide full support for the first phase of format integration, display holdings information stored in USMARC form, and provide Eureka access to the *English Short Title Catalog*.

The Do-What-I-Mean changes, a set of seemingly minor refinements introduced in June 1994, have turned out to be quite significant in terms of apparent user satisfaction. These two dozen small changes made Eureka more "forgiving," so that it can carry out the action that a user *appears* to desire. For example, Eureka now ignores all but the first three letters of a command, thus reducing the impact of typing errors, and if the user omits FIND or BROWSE, but provides a legitimate index name, Eureka carries out the fastest and least expensive (for the user) find or browse option.

In recent months, significant errors have consistently been around one-half of one percent of all com-

mands, a level that may be impossible to reduce much within a command-driven system. Indeed, most remaining errors are simply terms that have no meaning within Eureka or spelling errors within the first three characters of commands. At this point, I believe that the only way to reduce the error rate much further would be to go to a pure menu system—and log analysis clearly indicates that this would slow most users down quite severely, as well as reducing Eureka's power and flexibility.

Partial Acknowledgments

Almost a third of RLG's staff was involved in developing Eureka, and we benefited from the advice and trial use of many RLG members and RLIN users. It is impossible to name everyone who contributed to Eureka, but a few names should be mentioned in addition to groups credited within the article.

Michael Carroll was programming team leader for Eureka and did an admirable job, as did all of the programmers. Lennie Stovel manages Eureka development and maintenance. Wayne Davison is responsible for Eureka as a production service in his role as Director for Access Services.

Linda A. Driver, who is library director at the College of Notre Dame in Belmont, California (and also my wife), suggested that LIKE should result in a browse rather than a find, based on her previous experience with related-record functions.

Kathy Klemperer, then at Dartmouth College, suggested sending result sets as electronic mail, which became SEND in Eureka. Dartmouth College may have been the first local system to provide this function, although several others have since added the capability. Dartmouth's e-mail function also supports special formats that can be imported directly into bibliography programs, a good idea emulated in Eureka.

Conclusion: If It's Useful, They Will Come

RLG knew that we needed a "user-friendly" way to search CitaDel, the citation and delivery databases added since 1992. We also believed that the twenty-four-million-title BIB (RLIN) file offered resources that students and faculty would find worthwhile, if they could get at them easily.

Eureka was designed to be easy to use and consistently useful, for those engaged in hour-long research sessions as well as for those using it once a year. The numbers suggest that it is both useful and worthwhile.

In the first full year of Eureka use, 1,394,540 completed searches were logged. We knew from accounting reports (and from other information) that Eureka, or any similar system, takes a while to become established on a campus. Our best guess is that it takes about a year for a new service to become an accepted part of the library and campus. Several of the heaviest first-year users were pilot sites, so the acceptance process began early.

The second year of Eureka production, September 1994–August 1995, shows the kind of increase that we would expect as Eureka is fully accepted and reaches more institutions. More than 2,365,000 Eureka searches were logged in that second year, for a two-year total of more than 3,759,000. Direct access to Zephyr, RLG's Z39.50 server, currently available at a handful of institutions, accounts for more than 1.9 million additional searches in those two years.

Eureka will grow to include more databases and more features. It will be refined based on user feedback and log analysis. It will certainly continue as a VT100-emulation character-based system for some years to come, although other options for Eureka-like access may be added in the future. We do not yet know whether it makes sense for RLG to produce its own graphically oriented Z39.50 client for use by institutions, or whether institutions will migrate to Zephyr using their own clients.

Every academic library and every substantial public library with Internet connections should really provide access to both Eureka and FirstSearch, or the Z39.50 equivalents for both services. We anticipate more and more institutions recognizing the need to provide full access to the universe of bibliographic information, and much more widespread use of Eureka and Zephyr.

Eureka is by no means revolutionary. Some would call it boring or old hat: a command-driven, character-based system with nary a graphic nor mouse click in sight. But Eureka meets the needs of today's and tomorrow's libraries for real-world access to the enormous resources in RLG's bibliographic databases. It is a "small solution"—an incremental step to make libraries more effective.

I know of no revolutionary technology that can provide the rapid, precise, *effective* access to enormous databases that such humdrum services as Eureka and FirstSearch provide. What else can yield a small, useful result searching against a single heterogeneous database of tens of millions of records, within seconds or minutes and with entirely meaningful displays?

Eureka builds on three decades of giants: those who developed and maintained the MARC formats, those who developed many generations and visions of online

catalogs, those who built the great bibliographic database and software/hardware combination that makes RLIN work. If it is a small solution and an incremental step, it is nonetheless one that is already used hundreds of thousands of times each month, and will be used far more in the future. It provides rapid access to very large databases while combining ease, flexibility, and speed. That was our goal. I believe we have succeeded.

Notes

1. Walt Crawford, "Starting Over: Current Issues in Online Catalog User Interface Design," *Information Technology and Libraries* 11, no. 1 (1992): 62–76. The article does not include any of the illustrations, which were used purely as one possible design.

2. Z39.50 is a national standard for computer-to-computer communication for searching and retrieval. Zephyr, RLG's Z39.50 server, provides access to RLIN databases through various Z39.50 clients in use by libraries and campuses. By using a single Z39.50 client for Zephyr and other Z39.50 servers, a library or campuswide system offers a single user interface for a variety of files from different sources. More information on Zephyr is available from RLG.

INFOMINE—A Model Web-Based Academic Virtual Library

Steve Mitchell and Margaret Mooney

INFOMINE is a World Wide Web virtual library which provides indexing, annotations and links to Internet resources of scholarly use to the academic community. Thousands of Internet resources covering most major disciplines are present. A custom HTML (Hyper-Text Markup Language, the language used to create Web documents) converter and database manager allow librarians with subject expertise but no HTML experience (or those with HTML knowledge but no time to maintain several HTML indexes) to contribute to and maintain INFOMINE in a time-efficient manner. INFOMINE was developed by the Library of the University of California, Riverside.

Introduction and History

INFOMINE is a unique Web resource featuring well organized access to a substantial number of important research and educational tools on the Internet. INFOMINE is notable for its collection of close to five thousand annotated and indexed records with links to selected, university-level resources in most major academic disciplines. Information in INFOMINE is easy to find given the multiplicity of access points provided. It has received, on average, over twenty thousand accesses per week during the last fifteen months. In addition, INFOMINE provides simple and streamlined capabilities for adding resources (e.g., knowledge of HTML is not required) as well as essential maintenance functions (e.g., a URL Checker ensures that links are good). This article discusses INFOMINE as both a large Internet resource collection, commonly known as a "virtual" or "digital" library, and the custom hypertext database management system, with HTML converter, that has made the collection easy to build, maintain and use. INFOMINE (figure 1) can be accessed at http://lib-www.ucr.edu.

INFOMINE began over two years ago and was developed by the Library of the University of California, Riverside. It was one of the first Web-based, academic virtual libraries, as well as one of the first to develop a system combining the advantages of the hypertext and multimedia capabilities of the Web with the organizational and retrieval functions of a database manager.

Most of its important features and services, described in-depth below, remain unique among Internet resource collections.

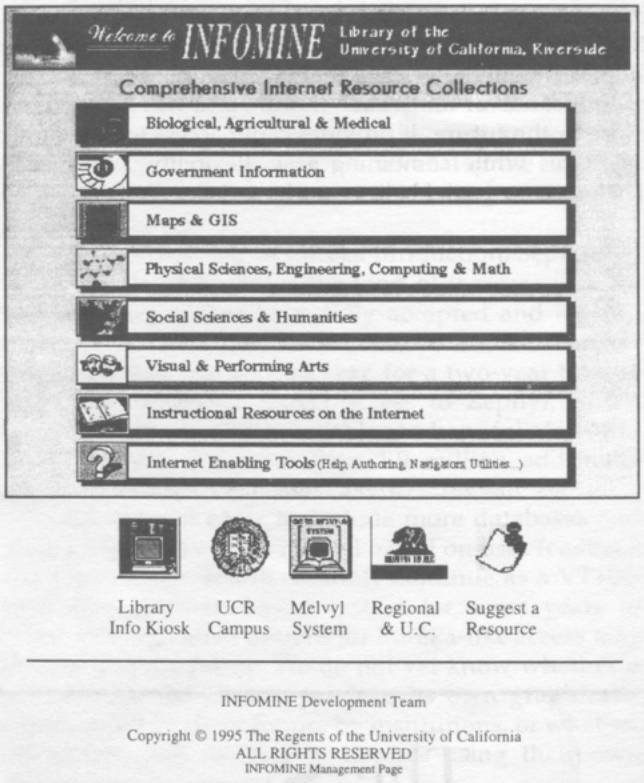


Figure 1
Infomine Main Screen

INFOMINE in Depth

The INFOMINE Collection

INFOMINE contains close to five thousand records. Among these are substantive databases, guides to the Internet and other electronic resources for most disciplines, textbooks, conference proceedings, and journals. The life sciences INFOMINE alone provides interactive access to nearly three hundred databases.

Separate virtual collections or INFOMINEs exist in most major areas of university-level research and educational interests. These include collections in: (a) Biological, Agricultural and Medical Resources; (b) Government Information Resources; (c) Social Sciences and Humanities (included here as well are General Reference, Business, Education, and Library/Information Studies related resources); (d) Physical Sciences, Engineering, Computer Science and Mathematics; (e) Internet Ena-

Steve Mitchell is the Sciences Librarian and **Margaret Mooney** is the Head of the Government Publications Department at the University of California–Riverside.

bling Tools (e.g., help, tutorials, navigators of assistance in Internet usage); (f) Maps and Geographic Information Systems; (g) Visual and Performing Arts; and, (h) Instructional Resources (in all disciplines) on the Internet. These are listed in order of comprehensiveness. The first two collections contain fifteen hundred and thirteen hundred resources respectively. The others are strong and compare favorably with collections at other large university systems surveyed. All files are growing rapidly, reflecting the growth of the Internet, and represent well-organized collections of selected, high-quality resources.

The INFOMINE System

INFOMINE for Users

Among the contributions of INFOMINE is the essential enrichment or "value added" service, as mentioned, of providing annotations as well as in-depth indexing terminology for each record. This greatly helps faculty and students to quickly retrieve a focused results set, examine the relevance of individual records and then choose among them immediately prior to accessing thus saving considerable time.

In addition to providing search capabilities on conventional subject, keyword and title terms, INFOMINE allows retrieval on terms such as "comprehensive," "reference resources," "subject guides," "virtual libraries," and "searchable databases," among other terms, which indicate the depth and scope and/or pathfinding nature of specific resources. These qualities and others are often indicated, as well, in the annotation. Also emphasized is the inclusion of important subject guides to Internet, as well as to other electronic and print format resources in most major disciplines. Concerns regarding resource comprehensiveness, quality, and general usefulness from an academic perspective guide all INFOMINE resource selection activities.

INFOMINE provides a great number of access points, through both browse (What's New, Title, Table of Contents, Subject, Keyword, Title, hyperlinked indexing) (figure 2) and search (title, subject and keyword) (figure 3) modes. Search mode allows the user to quickly retrieve among the collection on the chosen subject(s). Nested, Boolean searching capabilities are featured. Search results come back in the form of dynamically created Web pages which are custom HTML documents created on the fly and containing the results set unique to each search (figure 4). By way of contrast, many conventional Web virtual libraries provide minimal searching and/or depend on displays of static lists of resources. In INFOMINE, each results set record, in addition, features indexing terms that are viewable and in hyperlink form and, when clicked upon, allow further

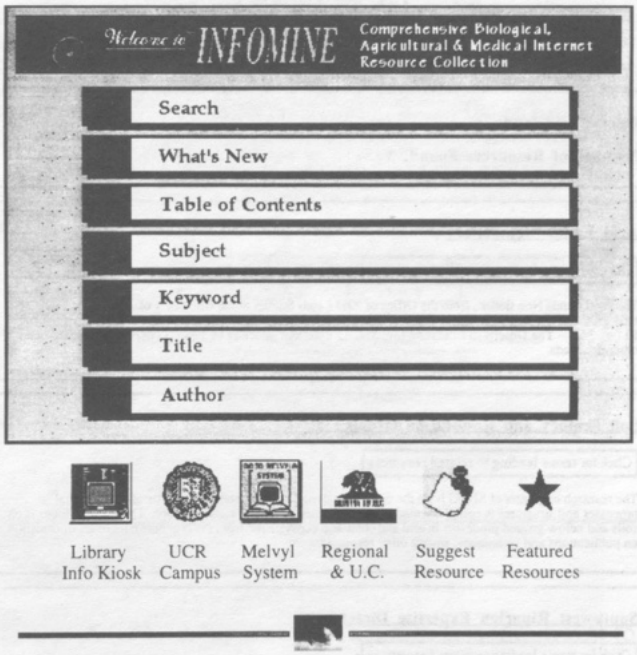


Figure 2
Infomine Access Points

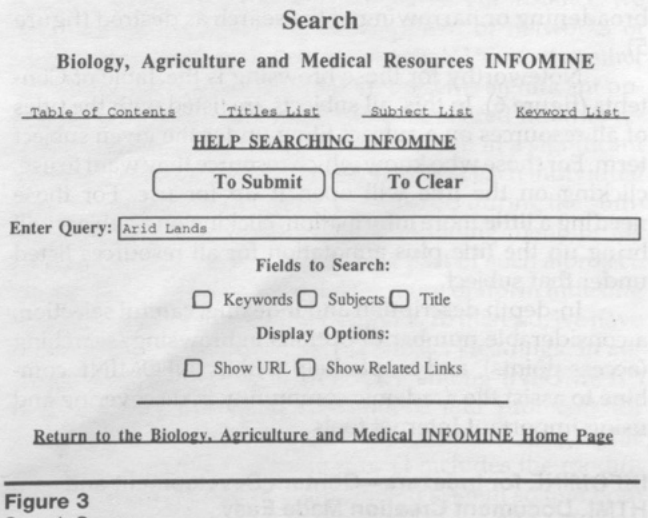


Figure 3
Search Screen

Query Results

University of California

Biology, Agriculture and Medical INFOMINE

Query: arid lands

Number of Resources Found: 3

Arid Lands Newsletter

Click for terms leading to related resources

The Arid Lands Newsletter , from the Office of Arid Lands Studies at the University of Arizona, is available through the Web. Recent issues include: -- Conserving Drylands Biodiversity (no. 37); -- Desert Architecture III (no. 36); -- The Deserts in Literature (no. 35). An excellent selection of papers concerning the desert and other dry lands.

Soil Ecology and Restoration Group : SDSU

Click for terms leading to related resources

The research emphasis of SERG is on the ecosystem dynamics of dry lands. Analysis of fundamental processes and structures is complemented by applied research in dry land restoration. The primary focus is on soils and below ground processes in arid and semi-arid ecosystems (from the brochure). Includes information on publications and techniques, among other resources.

Southwest Riparian Expertise Directory

Click for terms leading to related resources

The information in this searchable database was collected by Barbara Tellman of the Water Resources Research Center, and Roy Jemison of the USDA Forest Service. The print form it is known as the Riparian/Wetlands Research Expertise Directory.

Return to UC Libraries Bio-Ag, Medical INFOMINE Query Page

Figure 4
Query Results

broadening or narrowing of the search as desired (figure 5).

Noteworthy for those browsing is the Table of Contents (figure 6). In this, all subjects are listed with the titles of all resources on a subject filing under the given subject term. For those who know which resource they want to use, clicking on the title will open it up for use. For those needing a little more information, clicking on a subject will bring up the title plus annotation for all resources listed under that subject.

In-depth description and indexing, careful selection, a considerable number of options in browsing/searching (access points), and ample help within INFOMINE combine to assist the academic community in discovering and using important Internet tools.

INFOMINE for Indexers—Content Development and HTML Document Creation Made Easy

Several features and tools for resource description and indexing make INFOMINE attractive among those contributing to the building of the files. They combine to make INFOMINE records easy to add, edit, and maintain. Adding URLs (uniform resource locators or resource addresses), titles, subjects, keywords and annotations is simple and straightforward. Often, within the Windows or Linux environments (among others), adding a record is simply a matter of cutting and pasting.

It is crucial to note that in adding or editing, one does *not* need to know HTML. All new records are converted into this format automatically, when they are displayed, by INFOMINE. As a result, participants with subject knowledge, but no HTML experience, need not be challenged to learn yet another system perceived as complicated.

Moreover, from our central adder document (figure 7), data entered for each record is automatically converted to HTML in each of six dynamically created INFOMINE HTML documents at the time these documents are requested for viewing (i.e., the search results set as well as the following indexes: Titles, Subjects, Keywords, Table of Contents, Date-What's New, and, soon, Author). By way of contrast, in virtual libraries or subject guides made up of static HTML resource lists/documents, data representing each individual record would have to be manually entered in *each* of the separate HTML indexing documents. INFOMINE's ability to allow the adding of record data into

Complete Record Lookup

University of California

Biology, Agriculture and Medical INFOMINE

Record #1070

Subjects:
ARID LANDS
CONSERVATION
ECOLOGY
SOILS

Keywords:
ANZA BORREGO
ARID ZONES
CONSERVATION BIOLOGY
DESERTS
LAND USE PLANNING
RESTORATION BIOLOGY
SOIL ECOLOGY
SOIL RESTORATION
WEB

Title Words:
ECOLOGY
GROUP
RESTORATION
SDSU
SOIL

Title:
Soil Ecology and Restoration Group : SDSU

URL:
http://rohan.sdsu.edu/dept/serg/serg.html

Annotation:
The research emphasis of SERG is on the ecosystem dynamics of dry lands. Analysis of fundamental processes and structures is complemented by applied research in dry land restoration. The primary focus is on soils and below ground processes in arid and semi-arid ecosystems (from the brochure). Includes information on publications and techniques, among other resources.

Date information:
Originally created on 3/27/1995
Never modified.
URL last checked on: 8/15/1995

Figure 5
Record Lookup

Table of Contents For 'Z'

University of California

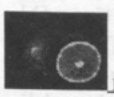
Biology, Agriculture and Medical INFOMINE

Click on a letter to see subjects beginning with that letter

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

0 1 2 3 4 5 6 7 8 9

- Z39.50
  - Willow Information Center
  - Z39.50 Resources : A Pointer Page
  - Z39.50 W3 Page from VTLS
- ZIP CODES
  - Zip Codes : National Address Server
- ZOOLOGISTS
  - Zoological E-mail Directory : Terry Polk
- ZOOLOGY
  - Animal Information Database : Sea World
  - Animals : The Electronic Zoo
  - Biodiversity and Biological Collections : Cornell
  - Biodiversity and Biological Collections : Harvard
  - Biological Journals : CICNET
  - Biological Sciences Database - Marine Biology
  - Biologist's Field Guide : Internet Resources for the Biologist
  - BIOSIS (Biological Abstracts) (on CD-ROM)
  - Bird Photographs
  - Birding
  - Glossary of Zoological Taxonomy Terms
  - Goose Bibliography
  - Herpetology : The World-Wide Web Virtual Library
  - Icthyology Collection : Texas Natural History Collection
  - Museum of Comparative Zoology : Harvard
  - National Marine Fisheries Service
  - Pacific Rim Biodiversity Catalog
  - Paleontology Museum : University of California
  - Photographs : Mammals, Birds, Insects, Flowers : Arizona
  - Primate Info Net
  - Santa Barbara Museum of Natural History
  - Slater Museum of Natural History : Cornell
  - Smithsonian National Museum of Natural History
  - Southeastern Biological Science Center
  - Tropical Data Base : BDT
  - U.S. Fish and Wildlife Service
  - Virtual Frog Dissection Kit
  - Wildlife Management (Agriculture)
  - Wildlife Stewardship Notes North Carolina
  - Wolves on the Web
  - Zoological Information by Animal Group
  - Zoological Record
  - Zoology on the Internet



Return to Bio-Ag, Medical Home Page

Figure 6
Table of Contents

one document and have this data then be automatically expressed in several HTML documents (again, results set pages and indexes) saves substantial amounts of time that would otherwise go into manual HTML work. For this reason, INFOMINE has provided a time-efficient means of building a substantial virtual library for both those with and without significant HTML experience.

Another helpful feature that is indispensable in maintaining large collections of links is a program that will automatically check and flag, at specified intervals, resources which have changed locations. IN-

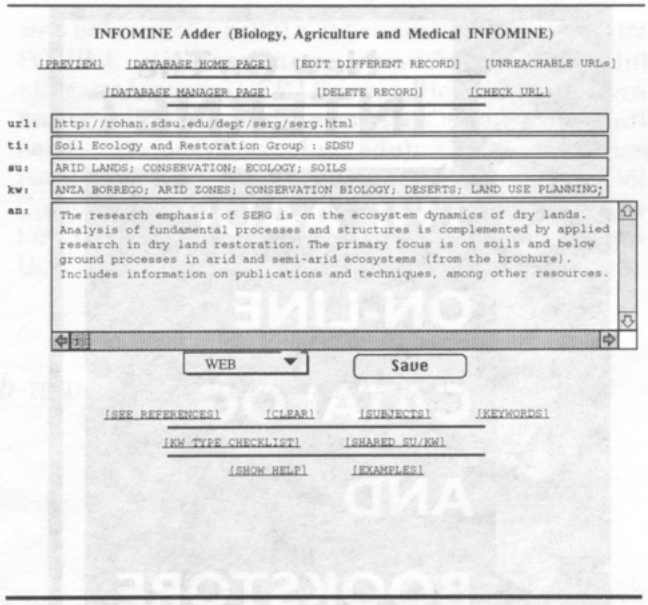


Figure 7
Central Adder Document

FOMINE's URL Checker does just this. It is important to note in this regard, for example, that 5 percent of the resources in the life sciences component of INFOMINE have moved over the last ten-month period checked (the majority of these, though, have simply moved to a slightly different place on the *same* server, thus making them easy to relocate). In addition, a slight variant of the URL Checker has been employed to ensure that the resource to be added is not a duplicate (important with the current size of most of the files).

As INFOMINE has grown, various paths for future development have presented themselves. For instance, we have started exploring the development of networks of cooperating selectors/indexers not only at UCR but at other UC campuses as well. INFOMINE presents significant opportunities for efficient, multi-campus, shared Internet resource collection. Such efforts would result in a significant reduction in redundant collecting efforts at each individual campus. An informal pilot project finished during the summer of 1995 has been successful at outlining many of the issues and concerns that would be a part of such a project. We are also examining the need for more uniform indexing languages for the various INFOMINEs. To this end, we have begun using Library of Congress Subject Headings. In addition, shared indexing terminology among INFOMINEs already exists, providing conventions and protocols for describing document types and approaches to geographic descriptors. Another ongoing project includes the modification of the INFOMINE management system so that both the data files and management programs could be distributed to participating campuses/organizations.

INFOMINE System Technical Details Summary

- The INFOMINE Web server is a 90 MHz Pentium running Apache (httpd server, v. 1.0) on Linux (kernel v. 1.3.45), a form of the UNIX operating system for PCs. Apache and Linux were chosen because of their price (free) and performance. Linux is now believed to be the best operating system, given its overall performance, for the i386 architecture family of PCs (386, 486 and pentium machines).
- INFOMINE, though optimized for the current version of Netscape, can be accessed by all popular Web browsers.
- INFOMINE uses mSQL (mini SQL), v. 1.0.10, as a database management system/server to facilitate indexing and the storage/retrieval of records. This standard SQL-based system will allow INFOMINE to grow substantially in the future. mSQL is known to compile on many popular UNIX systems, such as Solaris and SunOS, OSF/1, among others.
- INFOMINE could be served from very powerful, high-performance workstations when the need for greater performance presents itself.
- INFOMINE utilizes the C++ programming language for all user-interface functions (e.g., searching, displaying the table of contents, adding/editing resources, etc.). The PERL programming language and C++ are used for INFOMINE system maintenance functions/programs.
- For INFOMINE contributors, a Web forms-based record adder/editor is provided which allows easy adding/editing/deleting of multiple HTML documents as appropriate. In adding and editing, INFOMINE features a built-in automatic HTML conversion feature which eliminates the need for contributors to acquire HTML skills or make additions/changes from more than one HTML document (attractive to those with HTML experience).
- Easy, efficient maintenance of a large digital library depends on having an automatic way of checking on the working "linkability" of the records included. INFOMINE provides this in the form of its URL Checker. This checks for and then flags records with links that will not open for later annual verification by databases editors.

Conclusion and Project Personnel

It is important to note in ending that many of us who directly provide Internet access to faculty and students have found that expectations for robotic and other In-

ternet navigational or finding tools which provide very minimal human input have not been met. In comparison, the INFOMINE virtual library is an efficient and academically focused organizing tool which joins the vast, traditional experience of our profession in organizing information with the Internet in order to help create intelligent order among and access to high-quality, well-selected, and annotated electronic resources.

The INFOMINE project development team consists of Steve Mitchell (UCR Sciences Librarian and INFOMINE Co-Coordinator; smitch@ucrac1.ucr.edu); Margaret Mooney (UCR Librarian, Head of the Government Publications Department, INFOMINE Co-Coordinator; mmooney@ucrac1.ucr.edu); Carlos Rodriguez (UCR Sciences Librarian, INFOMINE Graphics/HTML Coordinator and Physical Sciences Resources Facilitator); George Daswani (Programmer/Systems Analyst, UCR Library).

This article is available online at http://lib-www.ucr.edu/pubs/italmine.html.

Evaluation and Support of Internet Software

Mark Watson and Daren Callahan

The Internet has introduced dramatic changes to the nature of library and information services. As network use increases, libraries must determine which Internet software to obtain for computers in order to explore and utilize the network, and they must also generate interest in its use. A recent program for Internet software evaluation at Morris Library, Southern Illinois University, offers a practical solution. Training was initially concentrated on a core group of volunteer staff members who effectively evaluated Internet software and subsequently assisted colleagues in navigating the Internet. Information about availability and selection of Internet freeware and shareware is included.

Evaluation and Support of Internet Software

"The Internet has become the technological trend in academic libraries of the 1990s, as was the microcomputer during the 1980s and the library automation project of the late 1970s."[1] The rapid growth of the Internet has an unpredictable momentum of its own, but there can be little doubt that the network is moving us closer daily to the notion of an electronic library. The resources now available on the Internet are added to other, more traditional print research tools and, as the public increasingly comes to regard these resources as indispensable, they will also expect library staff members to assist them and be efficient guides through the avalanche of new material. Of course, libraries hoping to capitalize on the important offerings of the electronic environment must find an effective method of sorting, filtering, and evaluating the explosion of information.[2]

Internet Software

As the Internet becomes increasingly useful to librarians, both for doing their own research and for providing information for patrons, several questions arise. One is how libraries decide what Internet software to acquire for staff and for patrons. Another question is how to help library staff to overcome the intimidation factor that naturally looms over the Internet for beginners, enabling them in turn to assist patrons.

The market for software designed for the exploration and exploitation of the Internet, such as gopher, TCP/IP (Transmission Control Protocol/Internet Protocol, the software that controls communication between computers), and newsreader software, is not yet dominated by the large commercial companies. Instead, many programs, such as Mosaic, are being created by educational institutions, such as the National Center for Supercomputing Applications (NCSA), or by individuals writing freeware and shareware in programming languages like Visual Basic. Freeware and shareware are available to anyone on the Internet through anonymous FTP (file-transfer protocol). Small commercial firms have been marketing useful Internet products for some time. Recently, the giant software companies have also entered this arena. Before long they will doubtless gain the major share of this market, especially since Microsoft has built TCP/IP (necessary for connecting a personal computer to the Internet) into the new version of its Windows operating system, known as Windows 95. Libraries wishing to make Internet software available to staff and patrons are faced with the problem—or opportunity, depending upon one's viewpoint—of evaluating and determining which shareware programs to acquire. In addition, they are faced with the challenge of generating interest among the library staff in learning and using new Internet software such as Netscape, which uses both text and graphic images and has great potential for library applications. Netscape and Mosaic are programs designed for browsing the World Wide Web, a facet of the Internet that supports multimedia applications.

No matter how strongly one stresses the user-friendliness of a particular program, the average user often does not believe it. For the most part, average users on the library staff are reluctant to try a new program until they see others of comparable experience and ability employing the program with apparent ease. Often they are intimidated by the new product, or they feel unwilling or unable to devote the time perceived as necessary to learn the new software. Another challenge is in demonstrating ways in which the new program can be useful. It must be shown that such software is designed to facilitate the use of the Internet in many ways, such as standardizing the graphic presentation of information, making it more attractive, and much easier to use. With simplified access to the Internet users can, using Archie and FTP, for example, find and acquire material of interest to themselves and their patrons. Archie is software designed to locate material on the Internet. FTP is used to transfer material from a remote computer to one's own. Windows-based versions of Archie (WSArchie) and FTP (WinFTP) have been created to make them simpler to use.

Mark Watson is head of the Undergraduate Library at Southern Illinois University's Morris Library. **Daren Callahan** is Special Collections Cataloger at Morris Library.

Staff Training for Information Technology

Rapid advancements in information technology have made staff training in the use of all automated systems in libraries an essential and ongoing process necessary to keep staff up-to-date and functioning effectively. In addition to providing access to the more traditional print research materials, many employees must also be able to help patrons gain access to the proliferation of information resources on the Internet. Kovacs notes "Librarians, based on their training and experience, are the most appropriate intermediaries to assist in connecting users with these network resources."[3] Training is a key factor in demystifying computer jargon and enabling staff to thoroughly understand and interpret the latest developments in the electronic delivery of information. As the importance of the Internet expands, libraries will be scheduling more workshops for employees to demonstrate the operation of the network, using programs such as Mosaic or Netscape, or Archie and Veronica.

Watching a systems librarian demonstrate the capabilities of Mosaic on an overhead projection panel does not have the same impact as seeing the program being used by a department colleague. Workshop participants are often unable to see what Mosaic, Netscape and other Internet programs can do specifically for them. However, once they see the program being used with apparent ease by their neighbors, they often want to have it installed on their own computers and want to learn how to use it. In addition, envy cannot be ruled out as a factor; if one person has something that is not only useful but is also interesting and entertaining, then it is likely that others will want to have that software on their computers.

The Software Testing Program at Morris Library

Morris Library is a medium-sized academic library with thirty-five professionals and seventy-six staff positions. The systems department is well staffed, and the administration has made information technology a priority. All divisions of the library are fully automated and all faculty and staff have been provided with personal computers.

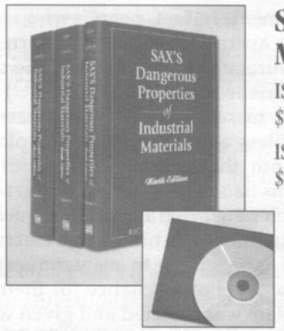
In order to evaluate, select and create demand for new Internet software, a group of library staff was selected to evaluate and promote interest in new Internet software. This group has been jokingly referred to as "guinea pigs," reflecting the dual responsibilities of experimenting with new software and providing feedback. More commonly used was the term "beachheads," which describes the group's role in establishing a program in a particular department and encouraging and supporting its use.

In selecting people for this task, computer expertise was not a requirement. In fact, people who would describe themselves as average users were preferred, in order to provide encouragement to others at the same level of computer experience in each department. However, it was necessary to select people who were not intimidated by computers and who enjoyed exploring and experimenting with the technology. In addition, prospective participants had to be willing to report their impressions about each new program when requested, either through an evaluation form or through electronic mail. Finally, they had to be willing to answer questions and provide a minimal level of assistance for their colleagues once the software was selected and given wider dissemination. From experience in working with library employees over time, the systems personnel had a good idea about which library staff members fit the above qualifications.

In order to encourage the use of the Internet throughout the library, it was important that this group of volunteers included representatives from each library department. For smaller units, one person was sufficient while two were selected from larger departments, and the group of candidates was made up of a combination of faculty and support staff. After being assured that they would receive ample individualized training in any new program under review, the selected volunteers expressed eagerness to be included.

At the time the program began, the library's access to the Internet and to electronic mail was through the campus mainframe computer. The library administration was interested, first, in weaning library staff from the mainframe and connecting directly to the gopher and, second, in gaining access to the Internet without the limitations of working through the mainframe. To accomplish this, the library acquired a small, powerful computer known as a RISC (Reduced Instruction Set Computer) machine to use as its own network server on which the systems department installed gopher server software, selected a gopher client (a gopher client-server is one method of Internet access), e-mail, telnet (for connecting to remote computers), TN3270 emulator (for connecting to IBM mainframes), and TCP/IP software. Mosaic and a graphic image viewer were also added to the package. In general, we were looking for software that was Windows-based, easy to install and configure, reliable in its performance, and easy to learn. As stated earlier, there are commercial products available in the above categories, ranging from cheap to very expensive. The systems department of Morris Library evaluated a number of commercial packages and found much to like about each package, but also found at least one important aspect that was unsatisfactory in each case. For example, the e-mail software might be quite good, but not the 3270 emulator. Another product had good telnet

Distinct, Comprehensive, Powerful...

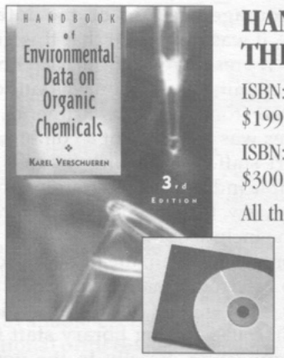


SAX'S DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS, NINTH EDITION by Richard J. Lewis, Sr.

ISBN: 0-442-02025-2 (Three-Volume Set) **Available now**
$499.95 ©1996

ISBN: 0-442-02990-5 (CD-ROM) **Available now**
$650.00 ©1996

A vast, reliable source of critical information on health and safety data, regulatory standards, toxicity, carcinogenicity, and physical properties of over 20,000 chemical substances. New: • 2,000 completely new chemicals, drugs, and biological agents • 14,000 updated entries • New or additional physical data added for 9,000 entries • CAS Registry Numbers for more than 18,000 entries • 100,000 domestic and international synonyms • 3 Instant Locator Indexes • Streamlined toxicity data • OSHA, ACGIH, MAK exposure limits • NIOSH REL workplace air limits • New advanced safety profiles for handling spills, accidental exposures, and fires • Carcinogens and reproductive effects • New European Data. Also available in CD-ROM.

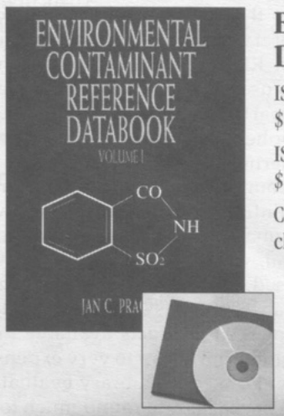


HANDBOOK OF ENVIRONMENTAL DATA ON ORGANIC CHEMICALS, THIRD EDITION by Karel Verschueren

ISBN: 0-442-01916-5 (Print Version) **Available April 1996**
$199.95 ©1996

ISBN: 0-442-02305-7 (CD-ROM) **Available June 1996**
$300.00 ©1996

All the information you need to prudently use potentially dangerous chemicals is in this fully revised edition of our classic handbook. Pesticides, detergents, phthalates, polynuclear aromatics, and polychlorinated biphenyls are all investigated in detail. Includes physical/chemical properties; air, soil, and water pollution factors; aquatic toxicity, and biological effects; odor thresholds; sampling and analysis data; and structural formulas of over 3,000 chemicals. Tables have been refined to focus on environmentally related materials. Also available in CD-ROM.



ENVIRONMENTAL CONTAMINANT REFERENCE DATABOOK, VOLUMES I AND II by Jan C. Prager

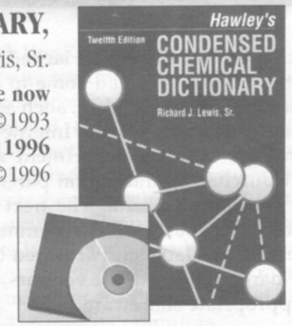
ISBN: 0-442-01918-1 (Vol. I), ISBN: 0-442-01969-6 (Vol. II) **Available now**
$129.95 (each volume) ©1995, 1996

ISBN: 0-442-02304-9 (CD-ROM) **Available June 1996**
$300.00 ©1996

Comprehensive coverage of environmental effects of regulated chemicals. Identifies regulated chemicals and chemicals of special interest to environmental and safety professionals due to widespread contamination or considerable hazard. A reference compendium of physical, chemical, and biological dangers of environmental chemicals and selected simple and complex mixtures. Listings include CAS number; SAX number; sampling, analysis, and detection limits; environmental transport, fate and effects; structural formula; molecular formula; common uses; manufacturers; odor thresholds; regulatory jurisdictions and authorities; standards; reactions; monitoring methods; international data; synonym index. Also available in CD-ROM.

Order from your local wholesaler or order direct from:
Donald O'Connor, National Accounts Manager, Van Nostrand Reinhold
212-780-6129 (Phone) • 212-254-9499 (Fax)
doconnor@vnr.com (E:mail)

that's what sets VNR's chemical and environmental references above the rest (Available in print and CD-ROM)

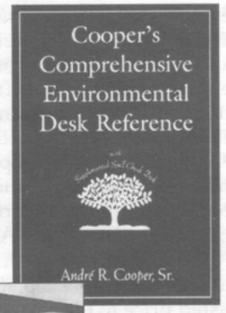


HAWLEY'S CONDENSED CHEMICAL DICTIONARY, TWELFTH EDITION by Richard J. Lewis, Sr.

ISBN: 0-442-01131-8 (Print Version) **Available now**
$79.95 ©1993

ISBN: 0-442-02331-6 (CD-ROM) **Available March 1996**
$150.00 ©1996

The most widely recognized dictionary of industrial chemicals, terms, processes, reactions, and related terminology, Hawley's is an essential reference for all levels of staff in industries where chemicals are used — from management and administrative people to marketing and sales to technical and scientific staff. Hawley's presents three distinct types of information: (1)descriptions of chemicals, raw materials, manufacturing processes, and equipment; (2)expanded definitions of chemical entities, phenomena, and terminology used in every phase of engineering and technical development; and (3)descriptions or identifications of a wide range of trademarked products. Also available in CD-ROM.

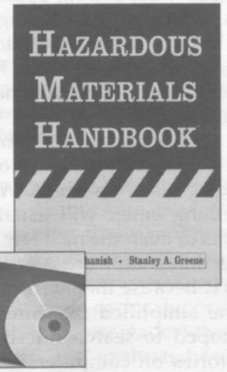


COOPER'S COMPREHENSIVE ENVIRONMENTAL DESK REFERENCE: WITH SUPPLEMENTAL SPELL CHECK DISK by André R. Cooper

ISBN: 0-442-02159-3 (Print Version) **Available now**
$99.95 ©1996

ISBN: 0-442-02161-5 (CD-ROM) **Available June 1996**
$139.95 ©1996

A unique comprehensive reference with more than 1,000 pages of key terms, over 5,000 acronyms and useful, detailed information on: • Superfund • Environmental engineering • Biology • Construction • Wetlands • OSHA • Threatened and endangered flora and fauna • and International organizations and treaties. Information is supplemented by maps, charts, tables, and diagrams, as well as crucial agency contact information to give the professional access to environmental officials who can offer advice and assistance. Destined to become a classic work, essential for all environmental, hazardous waste and safety engineers and managers, industrial hygienists, and environmental lawyers, as well as for students in these fields. Also available in CD-ROM.



HAZARDOUS MATERIALS HANDBOOK

by Richard P. Pohanish and Stanley A. Greene

ISBN: 0-442-02212-3 (Print Version) **Available July 1996**
$149.95 ©1996

ISBN: 0-442-02220-4 (CD-ROM) **Available September 1996**
$199.95 ©1996

This corrected, updated and expanded version of the U.S. Coast Guard's *Chemical Hazards Response Information System (CHRIS) Manual* features widely used and transported industrial materials including, practical hands-on data and technical data as well as chemical properties. This book is a portable and easier to use version of the *CHRIS Manual.* This new resource covers more than 1,240 substances, while also improving on the original by including a CAS index, synonym index, and a helpful identification section with new fields and vital ID information moved to the front of each record for easy accessibility. Also available in CD-ROM.

Van Nostrand Reinhold
115 Fifth Avenue, New York, NY 10003

capabilities, but the e-mail lacked some of the features that the library staff had come to enjoy in the campus mainframe e-mail software, such as the ability to assign nicknames to use in place of Internet addresses. After the review, the systems department approached vendors about purchasing individual parts of the package that were considered useful. The next step was to replace unacceptable parts of the commercial product with shareware available and acquired through the Internet. After bargaining with the vendors, the search began for the appropriate shareware.

Internet Software: Shareware and Freeware

Software found on the Internet falls into two categories, shareware and freeware. Freeware is just what its name implies, software that is free to the user. The author of the software has created a product for which he expects no reimbursement. The software has been placed in a directory on a computer that is accessible via the Internet, and anyone is welcome to download that software and install it on a computer for personal use. There are the usual disclaimers and cautions against using for personal gain; in other words, selling to others. Shareware, however, is not free. Anyone is welcome to download the software, install it, and try it for no charge. If the user intends to keep it, she is asked to send the requested price to the author of the software. In writing the programs, the authors of such software ensure that the user will not fail to see this request for reimbursement, the address to which the money is to be sent, and the amount requested. The amount usually ranges from $10 to $30, depending upon the complexity of the program. However, purchasing the shareware does more than simply fulfill the ethical obligation. Quite often, documentation is available for those who have paid the fee, and it entitles the purchaser to upgrades when they become available.

With the great amount of Internet-related shareware available, it is an arduous task to find the program that best fits one's needs. Whatever product is chosen, something better will usually appear in the next few months or even the next few days. The good news about this is that shareware is easy to acquire on the Internet by FTP. Because the Internet is so vast, finding software can be simplified by using software such as Archie, developed to search Internet archive sites, which are directories on computers that make files available for acquisition by FTP. Another method is to go to one of the major archive sites such as the Center for Innovative Computing Applications (CICA) (whose Internet address is ftp.cica.indiana.edu), Simtel (wsmr.simtel20.army.mil), or Sunsite (sunsite.unc.edu), where a large number of FTP-accessible shareware programs related to Internet use are maintained. Some archives have several mirror sites; that is, alternate Internet locations that maintain an exact mirror image of the files at the primary source. If, for example, access to CICA is unavailable, which is common because there is a maximum number of forty-five users at any one time, one might try a mirror site for CICA. The time of day is also a consideration, as CICA or its mirror sites will be busier during the day than at night. A prospective user might want to select a site in a part of the world where the local time is off-peak. Some of the CICA mirror sites are listed in table 1.

CICA, located at Indiana University, is an anonymous-FTP clearinghouse containing applications and other programs and files. Some of the files are in the public domain (freeware) and some are shareware. Currently, there are over six hundred megabytes of applications that operate under Microsoft Windows, and there are additional directories for files that operate under Macintosh and Unix. At CICA, or any of its mirror sites, most of the Windows files discussed in this article are located in the directory /pub/win3/winsock. Those

Table 1
Center for Innovative Computing Applications (CICA) Mirror Sites

United States Sites	European Sites
wuarchive.wustl.edu	doc.ic.ac.uk
mrcnext.cso.uiuc.edu	ftp.duth.gr
oak.oakland.edu	demokritos.cc.duth.gr
archive.orst.edu	cyf-kr.edu.pl
autarch.acsu.buffalo.edu	nic.switch.ch
grind.isca.uiowa.edu	ds.eunet.ch
polecat.law.indiana.edu	info.nic.surnet.nl
gatekeeper.dec.com	ftp.funet.fi
interaccess.com	olivaw.dc.luth.se
hull.marcam.com	ftp.technion.ac.il
proper.com	
boris.infomagic.com	**Asian/Eastern Sites**
eel.dataplex.net	ftp.center.osaka-u.ac.jp
	nctuccca.edu.tw
Australian Sites	ntuix.ntu.ac.sg
brother.cc.monash.edu.au	cuinfo.netserv.chula.ac.th

files, and others in this directory of possible interest to libraries, are listed in table 2.

In addition to the above, there are three Windows-based image viewers located in the directory /pub/win3/desktop. WinGIF (wingif14.zip) and WinJPEG (winjp265.zip) are shareware, while LView (lview31.zip) is freeware.

The .zip extension of these filenames indicates that they are compressed. Most FTP files are compressed in order to combine several files into one and to take up less space. WinZIP is a Windows interface for one of the standard DOS-based compression/decompression programs known as PKZip and PKUnzip (available through FTP at many locations, including ftp.psi.com in the directory /src/dos). Working together, the programs will quickly "unzip" the files listed above, restoring them to a usable state. Through WinZIP, one can even view setup instruction text files (e.g., readme.doc) contained in the zipped file prior to decompression. WinZIP (winzip55.exe) is also located at CICA in the directory /pub/win3/util. Other methods of discovering what shareware is available include following the discussion on listservs and Usenet news groups related to these topics and checking commercially published directories for FTP sites. Software is not limited to Windows products. At the same sites in the directory /pub/mac are equivalent software programs for the ones listed above that are designed for Macintosh computers.

Table 2
A Sample Of Internet Software At CICA*

Function	Software	Filename
TCP/IP	Trumpet Winsock	twsk20b.zip
Telnet	Trumpet Telnet	trmptel.zip
Telnet	EWAN	ewan105.zip
TN3270 emulator	QWS3270	qws3270.zip
Gopher	HGopher	hgoph24.zip
Gopher	GopherBook	gophbk11.zip
Gopher	Gopher for Windows	wgopher.zip
FTP	WinFTP	winftp.zip
e-mail	Eudora (freeware version)	eudor143.exe
Archie	WSArchie	wsarch06.zip
Usenet newsreader	Trumpet Newsreader	wtwsk10a.zip
Usenet newsreader	WinVN	winvn926.zip
WWW browser	Cello	cello.zip
WWW browser	Netscape	n16e11n.exe
WWW browser	NCSA Mosaic	wmos20a7.zip
WWW browser	WinWeb	winweb.zip
WAIS client	EINet WAIS	ewais200.zip

*Filenames are current as of this writing. As newer versions of these programs are created and made available at CICA and other sites, the filenames will change to reflect the new version number.

Acquiring the shareware does not entail any initial expenditure of funds. This allows the freedom to test the shareware thoroughly before deciding whether to keep it. If electing to keep it, then the requested amount can be sent to the owner. As mentioned above, the price is generally quite reasonable, and one is usually more than happy to pay what is asked.

For the gopher software, the systems department at Morris Library selected the program known as HGopher, which is freeware. In comparison with other gopher clients, it is easy to use and has a very attractive design. For the TCP/IP software, the library chose Trumpet Winsock TCP Manager, freeware that has gained a reputation as a very reliable program in this category. In addition, the Trumpet telnet software and newsreader software were also chosen. For the TN3270 emulator software, necessary for connecting to IBM mainframe computers, QWS3270 (also freeware) functioned quite well in early trials. Like some of the others mentioned above, this program was very basic, lacking the fancy features of a commercial version, but it was simple to learn and very reliable.

Most of the software selected must be loaded and configured by someone familiar with the workings of TCP/IP and Internet connections. Primarily, the installation of the TCP/IP software (Trumpet Winsock, in this case) is the trickiest part of the process. Most of the other programs require the existence of smoothly functioning TCP/IP software for their operation. Once TCP/IP is in place, the others will follow. An average user would experience some difficulty getting these programs to function properly, but the programs are written so that they are not difficult for a knowledgeable user.

Having selected the software in each category (telnet, TN3270, gopher, TCP/IP, and newsreader) that the systems department had tested and evaluated beforehand, the full set of software was loaded on the computers of the individuals chosen to participate, and instruction commenced in the use of the programs. As the Windows-based programs are generally quite user-friendly, this presented no difficulties with such a group. In meetings involving all of the participants, each item

of software was demonstrated in turn. The purpose of the software was explained in detail and an active question-and-answer session followed. A few days later, members of the systems staff met with the program participants individually at their workstations. There, additional questions were posed, problems solved, and their initial progress was assessed.

Feedback

All members of the committee became quite enthusiastic about the new software and their responsibilities regarding it. The new software was designed for the express purpose of making the Internet easily accessible to the average user, and the basic idea behind providing such programs for the library staff was to spur interest in and to facilitate use of the Internet. Before long, the participants provided a great deal of feedback about the various products, through conversations with the systems staff and also through a flurry of e-mail. The abundance of information suggested the need for a more formalized and structured evaluation process. Consequently, an evaluation form for the software was created, and committee members were asked to submit an evaluation for each program that they tested, a sample of which is included in Appendix A. Most of the comments were positive, but there were occasional negative comments, generally about features that were not available in the program but judged to be useful additions.

After testing and evaluating the software, the second mission of the committee was to interest others in trying the software. The committee began receiving requests from others almost immediately. Some were requests in a cooperative spirit, for example, wanting what had been seen on a neighbor's screen. Others, however, wondered why their neighbors should have been singled out for this honor and they had not. It had to be explained diplomatically that this was not an honor but a responsibility. The committee members evaluated these products and reported back on their findings. They also had to endure a fair amount of frustration learning these programs and had to be willing to provide a certain level of assistance in their departments. To those who took exception to the apparently privileged status of the chosen program participants, we stressed the guinea-pig side of the project, noting that the selected participants had endured glitches and frustrations so that the programs might operate smoothly for everyone else. Still, there were some disgruntled would-be committee members who felt slighted.

While the participants created interest in the e-mail, TCP/IP, telnet and TN3270, gopher, Mosaic, Netscape and graphic image viewer software, a program was written that grouped the individual software components into an installation package. This program created the appropriate directories, copied the files, and changed the necessary settings to configure each of the individual software items appropriately, allowing the entire assemblage of software programs to be quickly installed on all of the library staff workstations, once the decision was made to do so. Such an installation package could be placed on floppy disks and loaded onto individual computers or, a better alternative, installed on the library LAN server. Successful testing of the Internet software by the program participants also resulted in some of the above software being placed on public workstations in the library, thus allowing patrons to connect to the campus gopher and to access the Internet.

The committee members have continued to function beyond the initial project, evaluating programs (all described earlier in the article) that facilitate Archie searches (e.g., WSArchie), software that makes the FTP process easier (either WS_FTP or WinFTP were recommended), and WinZIP (shareware for decompression of files). In addition, the committee serves in an advisory capacity to the Library systems department. Some participants are involved in World Wide Web projects that not only test but create Web documents as well.[4]

Summary

Freeware and shareware that provide ready access to electronic information for library patrons and staff can be acquired without a huge investment. Using a select group of employees to evaluate software products and make recommendations achieves a dual goal of efficiently educating staff about the operation and use of the Internet and motivating interest throughout the library. While a large, well-staffed systems department in Morris Library directed this project and made it a success, this evaluation method can be employed by any library, if the library has access to the Internet. The person or unit responsible for maintaining the academic institution's connection to the Internet will have the knowledge to acquire, configure, and install the software discussed in this article, and will be able to train people to train others in its use. When one or more individuals in the library has the ability to use the Internet software, the process of selecting a core group of evaluators can begin. Concentrating the initial preparation on a small group optimizes the training time and allows the systems staff to move onto other projects. The individuals effectively evaluate software and subsequently assist colleagues in navigating the Internet. Once selected because they were average computer users, the program participants have evolved into computer gurus, a more impressive title than guinea pigs or beachheads.

Notes

1. Margaret Lippert, "Continuing Computer Competence: A Training Program for the '90s," *Bulletin of the American Society for Information Science* 20 (February/March 1994): 18–19.

2. The literature dealing with the Internet is increasing as rapidly as its development. A few good publications include Harley Hahn and Rick Stout, *The Internet Complete Reference* (Berkeley: Osbourne McGraw Hill, 1994); Roy Tennant, John Ober and Anne G. Lipow, *Crossing the Internet Threshold: An Instructional Handbook* (Berkeley: Library Solutions Press, 1994); Philip Baczewski and others, *The Internet Unleashed* (Indianapolis, Ind.: Sams, 1994); "Libraries and the Internet: Education, Practice, & Policy," ed. Thomas D. Walker, *Library Trends* 42 (Spring 1994) [special theme issue]; Martin Dillon and others, "Assessing Information on the Internet: Toward Providing Library Services for Computer-Mediated Communication," (Research Report)(Dublin, Ohio: OCLC, 1993); Ed Krol, *The Whole Internet: User's Guide and Catalog* (Sebastopol, Calif.: O'Reilly, 1992).

3. Diane K. Kovacs, Barbara F. Schloman and Julie A. McDaniel, "A Model for Planning and Providing Reference Services Using Internet Resources," *Library Trends* 42 (Spring 1994): 638–47.

4. A recently completed project mounted Ralph E. McCoy's *Freedom of the Press: An Annotated Bibliography* (Carbondale: Southern Illinois University Press, 1968) onto the World Wide Web.

Appendix A
Evaluation Form For Internet Software

Name: _____

1. Software name: _____

2. Features you liked: _____

3. Features you disliked: _____

4. What features or improvements would you like to see added to this program?

Please use the following scale to answer questions # 5 and #6:

1 = very easy 2 = fairly easy 3 = had problems understanding it 4 = very difficult

5. How easy is this program to learn?

6. After instruction, how easy is this program to use?

7. Do you feel that the instruction you received in the use of this software was adequate? Yes No

8. Would you recommend this program to other users? Yes No Please explain:

9. How do you think this software can best be utilized by the library staff?

10. Would you like to continue to assist with software evaluation? Yes No

SPECIAL SECTION
VTLS Proceedings

Introduction

Barbara Scheid, VTLS

The Fifth Annual Directors' Conference, sponsored by VTLS Inc., was held October 1–3, 1995, at the Hotel Roanoke, Roanoke, Virginia. The theme of the conference, "Back to Basics: Rethinking Libraries," inspired the speakers to examine five fundamental questions in library service:

1. What is the library's role in our communities as an institution and how are we advancing the library as the valuable institution it has always been?;
2. What are the technological advances being made today and how is the library industry, including our library schools, incorporating them?;
3. How do we manage collection development in light of the evolving digital library?;
4. What types of applications are currently being pursued that demonstrate the usefulness of the digital library?; and last, but most importantly
5. Who are our clients and how can we best serve them?

The formal papers given by Jordan Scepanski, Eileen Hitchingham, Elizabeth Roderick and John Kneebone, Howard Harris, and Marilyn Miller are included here. A brief overview of the entire conference follows.

Faced with budget cuts and the loss of personnel, librarians now have a new task of serving customers located around the globe with all levels of technical expertise. This new type of customer is the impetus for the new developments being made in technology. And together these two factors are the driving force in transforming libraries from automated libraries to virtual libraries, reported Vinod Chachra, president of VTLS Inc.

Helping to assure that the products and services inspired by these technological advances meet a recognized level of quality are standards agencies such as NISO, reported Pat Harris, Executive Director of the National Information Standards Organization. Harris gave the audience a complete overview of NISO. She discussed why standards are necessary, how we use standards today, how we will use them in the future, and how standards are attained. She explained that standards are the products of consensus and that consensus is achieved by collecting each organization's viewpoint to create the best solution for all of the communities who will use the standard. Harris also overviewed the current standards NISO is developing such as Z39.50, the information retrieval standard; ISO 12083, the standard generalized markup language that defines the document type definitions; and 14, an old standard that is being rethought to define what is needed in terms of abstracts for electronic databases.

Reengineering public service does not mean automation or total quality management, said Jordan Scepanski, Senior Advisor for Library Affairs at the California State University. Reengineering is the analysis of what we do in public service and then ensuring that what we do is for the good of our customers, he said. Today's librarians must balance the old way of doing business with the new way of doing business. During this transition, "librarians must become the transformational leaders," added Scepanski.

The library as a building, a physical structure where one goes to get information, is also under transformation and rapidly evolving to a library as many places. This change is challenging libraries to reconsider collection management, reported Eileen Hitchingham, Dean of University Libraries, Virginia Polytechnic Institute and State University. For example, ten years ago resource-sharing meant the printed word; today it includes the electronic word and the sharing of special collections over the Internet. Hitchingham stated that as more and more information sources become available electronically, librarians will not only consider what we collect, but also how we connect our collections.

How are we preparing new members of the profession to meet the technological and information demands of their customers and to deliver the information in a legal and timely manner? Fortunately, graduates from MLS programs are not fearful of technology in libraries and, in fact, expect to be involved in the development of the library as the information center, reported Marilyn Miller, Chair, Department of Library and Information Services, University of North Carolina at Greensboro.

"Change flowing from these paradigm shifts will be characterized by rapid, volatile, and continuous change, but these changes will be protracted over the next fifteen to twenty years," commented Howard Harris, consultant for RMG Associates.

For more information on the Annual Directors' Conference, write to Barbara Scheid, VTLS Inc., 1800 Kraft Drive, Blacksburg, Va. 24060; e-mail at Scheidb@vtls.com, or call (540) 231-3605.

Advancing Your Library through High Technology: He Who Hesitates Is Lost; or Fools Rush in Where Angels Fear to Tread

Elizabeth Roderick and John Kneebone

The Library of Virginia has initiated several digitization projects that will soon provide new, more modern ways to find research materials in the library's extensive collections. The new finding aids and databases of images use technologies in digital imaging and document preservation, resulting in more efficient and more extensive access to library materials than currently available, as well as the protection of fragile and aging materials. From our experience with these projects, the authors believe that the new technologies present both challenges and opportunities for library professionals and, more important, will enable libraries and archives to continue traditional professional activities in new guises. The essay below summarizes the transcript of our original extemporaneous presentation.

The Library of Virginia (LVA), located in Richmond and founded in 1823, serves as the repository for state and local government records, and as the reference library at the seat of government. We are a major research library, with comprehensive collections of materials on Virginia's history and culture, and with a long-standing historical publications program featuring our popular quarterly magazine, *Virginia Cavalcade*, now in its forty-fifth volume. We provide services to other Virginia libraries—the LVA initiated the Virginia Library and Information Network (VLIN) in 1993, which provides Internet access and electronic communications to more than twenty-five hundred Virginia librarians at more than five hundred library sites.

The patrons who visit our public reading rooms, and the ever-increasing numbers of patrons who access our collections from a distance, are primarily interested in genealogical and historical research, but their skills, training, and experience in research vary as widely as their needs. The phrase "customer service" has become something of a managerial buzzword lately, but at the Library of Virginia customer service is taken seriously.

In May 1995, the authors and the library were presented with a unique challenge and incredible opportunities. The LVA made a decision to discontinue development of a major initiative for which a significant amount of federal grant funds had been earmarked, funds which had to be expended prior to September 30, 1995. VTLS Inc. (VTLS) was under contract to complete the original project. The challenge was to identify and develop viable electronic information products from the library's collections that would benefit our primary constituencies, other Virginia libraries, and researchers around the world. The opportunities came in the form of the existing contract with VTLS, and the staff's realization that finding aids to provide better access to collections might finally come to fruition.

Key members of VTLS staff spent many hours working with LVA staff to explore the library's numerous and diverse resources and to identify viable electronic projects. Many LVA staff members enthusiastically recommended collections and finding aids for inclusion.

Selection criteria were as follows: (a) the project's implementation must be straightforward, with few or no obvious or inherent complications or idiosyncrasies; (b) the tasks required for project completion must be achievable and billable within four months; (c) the project would require no additional LVA staff; (d) the materials selected for digitization were in the public domain and/or did not violate intellectual property or copyright policies; (e) the project must make a collection or finding aid more accessible to the public; (f) the final product must be made available over the Internet, and will not require any additional proprietary software other than standard web browsers and viewers; and (g) the project should be a model for similar or expanded implementations.

One of the first issues we addressed was the need to preserve and expand access to the information contained in over one thousand card catalog drawers comprising thirty-eight different finding aids, primarily to our archival collections. The library's monographic collection is available via an Internet-accessible online catalog, but only actual visitors to the library had access to the information located on these catalog cards. In addition, each finding aid gave scant information regarding the collections they described, how the cards were to be used, and how to obtain desired items from the collections.

Many of the more than 850,000 cards were in deteriorated condition, with the hand-written entries swiftly fading. These cards were the only finding aids to valuable archival collections. Their unique contents, and diverse formats, precluded conversion to MARC for inclusion in the main LVA database.

VTLS had previously designed for Princeton University a method-

Elizabeth Roderick is the Assistant Director of the Library Development and Networking Division, and **John Kneebone** is the Assistant Director of the Publications and Cultural Affairs Division at the Library of Virginia.

ology to scan catalog cards and to provide an electronic index to them. We chose to emulate this model to create a "virtual card catalog" for staff and patrons. LVA staff created more than fourteen thousand index points within a ten-day period in preparation for scanning, and VTLS completed the scanning and returned all of the card catalog drawers within forty days.

Associated with one of these card catalog finding aids is an extensive microfilm collection of Virginia's Land Office patents and grants. Previously, to access a specific grant or patent, patrons searched the card catalog, requested the reel of microfilm from the stacks, then waited in line to view the film on heavily used microfilm readers. As part of this project, images of more than three hundred thousand original manuscript Land Office records have been scanned from the microfilm. Each image will be electronically linked to the catalog card index, allowing patrons at the LVA and via the Internet to search the card file, then click on a button to view an image of the actual record.

Another of the LVA's digital projects, the Virginia Colonial Records Project (VCRP), was established in the 1950s to reconstitute the archive of colonial Virginia, which was decimated by fires, wars, and other disasters. The VCRP sent agents to more than one hundred libraries and archives in Great Britain, Ireland, and France to identify and obtain copies on microfilm of documents relating to colonial Virginia. Despite more than twenty-eight thousand pages of Survey Reports and nearly one million images on microfilm by the mid-1980s, the VCRP's huge potential for scholarship remained unrealized for lack of a finding aid, and the project drifted toward antiquarianism.

Disappointed at this prospect, the Virginia legislature in 1985 gave the LVA a one-time appropriation to support computerization of the half-finished VCRP index. The LVA already utilized the cataloging software of VTLS, so project staff readily accepted an offer to employ it for the indexing and to take advantage of the availability of existing technical staff for advice and guidance. This decision also committed the project to using MARC bibliographic formats to create the database. By using a standard format rather than proprietary database software, we have been able to migrate our data to newer versions of the VTLS software and utilize advances created for this standard, particularly those associated with hyper-media links. Finally, the rigidity of MARC formats facilitated gaining editorial control over the disorganized information in the existing incomplete index.

Thanks to this challenge and opportunity, the Library of Virginia will soon provide to researchers a searchable index of personal names and ship names, with electronic links to digitized images of the Survey Reports that describe the documents where these names appear. VTLS scanned each page of the Survey Reports and linked the images of each report to its respective MARC bibliographic record.

A similar, albeit smaller, project is the U.S. Army Signal Corps Photograph Collection, which includes more than thirty-four hundred photographs from the Hampton Roads Embarkation Series, 1941–1945, depicting all military activities at these ports during World War II. After extensive preparatory work by LVA staff, including the creation of a new slide of each photograph, VTLS staff scanned the images onto a photo-CD, created a MARC record for each image, using the descriptive text provided by the original photographers and Army historians, and linked the image to the bibliographic record. Researchers can search more than a hundred thousand surnames, ship names, geographical locations, and other relevant topics, then retrieve the image associated with the record. As with the VCRP, we utilized an existing standard (MARC) in a unique manner.

A MARC bibliographic database is already available for the library's extensive Bible Records collection, which is frequently the only source of Virginia birth and death information prior to 1853 and from 1896 through 1912. Many of the original Bible records are extremely fragile and will not withstand repeated handling by even the most careful researchers. VTLS is scanning the more than one hundred thousand Bible records and will link the images to the existing bibliographic records. Digital scanning will protect these original documents at the same time that it makes accurate images of them more readily available to patrons in the reading rooms and to those with Internet access.

Finally, a small portion of the library's historically significant map collection will be scanned as a pilot project and the images made available to researchers in the reading rooms and on the Internet.

For all of their virtues, MARC formats are not always suitable, especially for finding aids that devoted archivists and librarians arduously created by hand over very long periods of time. For example, one of the card catalog finding aids that we scanned was the "S. Bassett French Biographical Sketches" collection. Samuel Bassett French was a political insider of the late nineteenth century who decided to create a biographical record of the great Virginians of his day. He traveled around the state interviewing people and making hand-written notes about birth dates, family connections, where people went to school, service in the Civil War, and so on. The work was never published, but French's daughter sold his notes to the Library of Virginia.

Someone many years ago began

creating a card file index, but stopped. Some years after that, someone else with different handwriting picked the index up and carried it forward a bit, and so on. The completed index displays four different hands and three different typewriters! We're able to save this kind of work done for love—indexes that are not arranged according to any particular indexing standard, archival standard, or library cataloging standard, but that still provide access to information—if you can figure out how to use them. Unfortunately, unless these card files are alphabetical they are not self-explanatory.

To find out how a particular finding aid worked, we turned to our staff members and probed their corporate memory. What is this collection? How does this card file work? What does it serve? What would patrons need? On a wonderful afternoon, one of our senior archivists walked around the reading room with a microphone and a tape recorder and recorded for about three hours his observations about each card file—strengths, weaknesses and idiosyncrasies. This tape, along with information from many interviews with other staff members, forms the basis of the explanatory introductions for each finding aid. Descriptions never existed for some collections.

Electronic finding aids will not satisfy our patrons' need for intermediation by skilled librarians and archivists, but they may help all of them. Information is useless without a context. The World Wide Web's continuous and limitless text and linkages allows for presentation of comprehensive information about finding aids within a logical and integrated context. For one thing, the LVA's Internet presence already enables us to provide advance information about the library's resources and services to people before they actually travel to Richmond.

One extremely important issue that did not figure directly in our projects is that of copyright and intellectual property. The library cannot give away valuable intellectual property, nor can we ignore the revenue generated from research fees, copying and reproduction services, et cetera. We resolved this issue by determining that we would expand access to our intellectual property over the Internet in order to increase our opportunities for marketing and increased exposure.

The other extremely important issue is the impact that repackaging of information will have upon library staff. Staff may oppose introducing new technology in public service under the assumption that patrons will reject it or prove incapable of using it. There may be some initial fear of a new product, but if handled correctly, patrons will instead become excited about these new ways to access information. Management must recognize the critical importance of adequate staff training as well as be sensitive to the apprehension that new finding aids will increase the amount of time that staff will have to instruct patrons in their use. Public service staff may also feel threatened; now patrons will be empowered to obtain materials without staff intervention. Projects such as those described above cannot serve patrons unless staff are involved as fully as possible in translating old methods into new.

Combining the adages "He who hesitates is lost" and "Fools rush in where angels fear to tread" may seem contradictory, but both of them are valid in this environment. We must be able to assess our situations, quickly identify problems and opportunities, and be prepared to take advantage of our existing and anticipated resources. You never know when you might get a windfall.

We cannot hesitate, yet we need not be fools. We should approach new technological applications as "pilot projects," so that if we do make a mistake, all of our eggs are not in one basket.

We must study and be prepared to learn new concepts and new terms. Ask questions and don't accept easy answers. If we don't understand a proposal, or how the end product will look, we must work closely with our vendors until we are satisfied. We must be prepared to justify what we're doing and we must be able to speak intelligently about it. We must get the buy-in from our staffs. We must adhere to standards. Don't be afraid to make a decision. Weigh the pros and cons, then act.

The resources and finding aids described in this article may be found on the Library of Virginia's Home Page (http://leo.vsla.edu/lva/lva.html).

Collection Management in Light of Electronic Publishing

Eileen Hitchingham

In Virginia we have been doing a lot of rethinking about higher education in the last several years. There is a general restructuring going on. Many programs in higher education are being examined, with the intent of focusing our goals and learning to maximize what are likely to be stable or slowly growing resources. Libraries are a part of that, too. Since I am new to Virginia, having been at Virginia Tech for just the last several months, thinking about collection management was a fruitful exercise for me. I hope it will be useful to you also.

I would like to start with a little bit of personal history. Almost thirty years ago I took my first job at Harvard as a MEDLARS Analyst at the Countway Library of Medicine. MEDLARS was the early version of MEDLINE. I would like to walk you through what was involved in doing a search at that time.

We would interview physicians, hospital staff, researchers, and students who were interested in getting information to solve research or clinical problems. We would try to talk to them about all the parameters of their search. Then they would walk away. Afterward, we would go through the MESH thesaurus and map out terms that described, or at least we hoped described, the kinds of information that they were looking for. When we had selected the terms we then formulated them into what was usually a fairly complex Boolean statement, often with lots of nested parentheses. The piece of paper, with the terms and the statement combining the terms, was then carried down to the nether regions of the Countway. Down there, on a large machine that looked something like a casket-sized rolodex, we had thousands of punched cards representing all the terms in the MESH thesaurus. An assistant would pick out the cards that matched those on the search form, arrange the cards, and then keypunch a statement card with the ands, ors, and nots to match the way that the terms were to be searched.

The search cards would then be bundled up with other searches, shipped off to the National Library of Medicine in Washington, and if all went well, a week or ten days later, I would get the citation results back. If lucky, and if I hadn't used "or" when I should have said "and," and if I had selected good representative terms, the search was successful. The results would be mailed to the client, or they might come over and pick it up in a few days. Generally we had a process that could take from two to three weeks from the time that the user first wanted the information.

When I had been searching like this for approximately six months, I experienced what I think of now as one of the most significant events in my entire professional life. On that day, they rolled in our first terminal, we hooked up that acoustic coupler, zapped in some terms, and had instant gratification with instant information. The results were immediate. We could change our strategy based on what we were finding. We could give something to the users with no delays. We could even have the user present as the search was being done, so that she or he could also become part of the process.

I think you would agree with me that as similar events happened in libraries all across the country, as we all slowly went "online," we were experiencing the initial tremors of a change process that had a profound effect on us, on our user expectations, and on how we view library services.

Today, thirty years later, we see the emergence of technologies that seem destined to cause not tremors, but cataclysmic earthquakes across the familiar topography of library operations and services.

I am talking today about collection management and electronic publications. I say management, rather than development, because I see this as being more inclusive of the concepts of what we do in libraries.

I would first like to go through a traditional understanding of libraries and their roles, and then look at how the emerging age of electronic publishing is changing this tradition. For many years, perhaps most of our history, we have had the concept of the library as a place—bricks and mortar. If we look at what activities we did and what we traditionally provided in those libraries, I think we could say that we focused on selection of resources or collection—the purchasing or getting of materials, how to organize them once we had them, how to disseminate the information that was in our collections, how to instruct others so that they could use our collections, and how to preserve the collections that we had.

Our new vision has the concept of the library as many places. We have the ability, via our Web pages, to connect our users with resources that are all over the world. A collection—our collection—is no longer bound by the structure of four walls. For example, we can direct our users to an electronic version of selected news from the *London Telegraph* that is available today rather than waiting for a mailed publication. This creates the opportunity and an envi-

Eileen Hitchingham is Dean of Libraries at Virginia Polytechnic Institute and State University, Blacksburg.

ronment for new services unlike any we have had before.

How, then, does this affect the functions that I previously mentioned as traditional for libraries? Actually, I don't think it is terribly different in a functional sense. Selection is still important. We have a collection function that now might be expanded to include a connection function as we consider collecting by "connecting." We still have an organizational function. We have a dissemination function. The need to instruct is still there. The need to preserve is still there. We will be doing the same things, but we will do them in very different ways.

Selection

In selection, we are seeing a great multiplication of the resources that we can consider for our users. Today approximately 2 percent of the publishers account for 75 percent of the U.S. titles produced. Within an electronic environment the opportunity for publication, particularly private publication, is much greater. Private publication will not necessarily have the vanity connotation that it often does now. Instead, we are likely to see a number of extremely useful electronic resources emerge because of need or the personal interest of the originators. You may be familiar with examples like *Current Cites*, edited by Teri Andrews Rinne; the *Hot-List of K-12 Internet School Sites—USA*, edited by Gleason Sackman; and the *Directory of Scholarly Electronic Conferences*, edited by Diane Kovacs and others.

We also have a broadened range of media available to us. Over the years we have given lip service to selecting all types of media that are appropriate for our users, but in practice most of our selections have focused on traditional print. Of the twenty million items held by the Library of Congress, perhaps thirty thousand or so are digitized materials. Our library selection now emphasizes print resources, but we are quickly moving to an environment in which we will have a multiplicity of media that we cannot push to the bottom of our selection lists. If we wanted, we could make linked connections to the actual resources from our catalogs, with instant presentations of the theses, oral histories, or archival photographs that the catalog record refers to.

We will have to know our users better. Niche knowledge of users, with tailored services based on our knowledge, is increasingly important. It is important in the academic environment. We have fewer resources—not just dollars, but people. We have to understand how our collections are being used, who is using them, who needs them for what, and what they are going to do with them. We will have the opportunity, as we look at electronic publications, to more clearly understand what people actually use as opposed to what may fill emotional needs. In some cases we may find that the emperor has no clothes, i.e., if use is one measure of importance, we might realize that some important publications are actually less important to our users than we might expect.

Collection/Connection

If we look at collecting as connecting to resources, some of the first questions that we need to clarify are things like where is the collection and how permanent is its location? Just before I came to Virginia Tech, a team was commissioned to look at the issue of cataloging electronic texts for the online catalog. The report considered electronic texts to be any network-accessible electronic text, whether it was stored on a server locally, or was stored at some location external to the Virginia Tech campus. With this viewpoint we might formally catalog *The Journal of Computer-Aided Environmental Design and Education*, a publication originating at Virginia Tech, and also *Current Cites*, mentioned earlier, giving a URL, or with some catalogs, creating linked access.

From the user's perspective, I would want to be careful of doing a formal cataloging process on resources that were outside Virginia Tech's management domain—not because I'm a control freak, but because we still exist in an environment where some electronic resources, particularly on the Web, may exist for a very short time, or may move around a lot. We do not want to create catalog pointers to thousands of things that are no longer "there."

Another opportunity that will come with electronic publications is the ability to become serious about joint purchasing. We have talked about this one forever and ever. Too often with print we finally say "but I need it on my shelf, too." And if we are dealing with our constituents, they also may say "but I want it at my place, too," despite use patterns or cost indicators that might show that joint ownership could benefit all.

Virginia, like some other states, is looking at collective electronic purchasing. The VIVA project—the Virtual Library of Virginia—is a legislatively funded consortium of public academic libraries. The purpose of VIVA is to create a network of shared electronic resources for students and faculty, and to facilitate cooperation among its members. With cooperative electronic purchasing VIVA participants have been able to offer such publications and indexes as *Britannica Online*, FirstSearch databases, and full-text offerings from Chadwyck-Healy to their users at costs less than if each institution had purchased them separately. Full-text access to a significant number of periodicals is also being explored.

Organization

Our perspective on how we organize our collections may also change with electronic publications. Paul Saffo has suggested that neither conduit nor content providers will be the most important information players in the future; rather it will be those who provide the filtering, searching, and sense-making services for users. Users suffer less from lack of information than they do from information overload. Our users may look to us to make those judgment calls that will allow us to hand them the *ten best* things that will meet their information need, rather than to point to *all* the relevant information and asking them to sift through it.

Earlier I mentioned the difficulty of pointing from our catalogs to things that might no longer be there. I think we have an even bigger issue to consider with our catalogs. We are quickly creating a generation of users whose understanding of information searching will be programmed by how they have learned to interact with apparently easy-to-use Web search engines like Lycos, Alta Vista, or Infoseek. To the extent that our traditional catalogs are unlike these services—no live links, no Web interface—they are increasingly in danger of being search sites of last resort, rather than the one information source that all our users will first turn to. We are already seeing a movement to centralization on library home pages, with the catalog as only one of several organized information services—databases, how-to handouts, reference request forms—that are offered.

Instruction

A recent *Campus Trends* issue (American Council on Education) gave the results of a survey of technology predictions at colleges and universities. The report indicated that 68 percent of the colleges and universities see more courses using electronic materials in the next year, 47 percent foresee more courses offered through distance learning, and 34 percent see more assignments submitted electronically. The trends suggest that many academic institutions have reached a point of critical mass with their incorporation of electronic publication and other information technologies in teaching.

This growing change in the way we are teaching gives additional support to the movement I noted earlier away from a bricks-and-mortar concept of libraries. We not only will be called upon to get the publications to users who may be quite distant from our campus, but we will also have to reconsider the ways that we work with students to give them the skills that make them successful users of the information resources they need. Interactive instructional segments on our web sites can replicate a significant part of the show and tell part of our current instructional efforts, and can be available as and where students need to use them. I can imagine, for example, a webbed introduction to FirstSearch techniques that might incorporate some live connections to the database. For example, at Virginia Tech one of the collegiate librarians has worked with faculty teaching in the Clothing and Textile department to design a web page that incorporates information searching techniques into the general structure of the course program and assignments.

Our concept of electronic reserve systems is also growing out of the need to make many kinds of materials accessible to both local and remote users. For our local students it is a convenience not to be undervalued, and for remote students it may be a significant part of what we can offer them.

Dissemination

Dissemination of information has always been an important role for us and will continue to be important. In an age of electronic publications, however, the issue of copyright, copyright, copyright continues to dog us. We do not have the answers yet. Our professional organizations are working in conjunction with publishers, the Commerce Department's Information Infrastructure Task Force, and other key players in the copyright arena.

We have many wants. We want to use electronic technologies to preserve copyrighted materials. We want to provide copyrighted materials as part of electronic reserve. We want to provide copyrighted materials as part of interlibrary loans. We want to avoid liabilities for what our users may do, after posting appropriate copyright notices. We expect that the terms of licenses will not restrict the materials that we purchase electronically in ways that were not restricted in more traditional purchases. We want our compliance mechanisms to be easy to administer. We expect that U.S. Government works will be made accessible to those who have paid for them once through our taxation system.

Many wants, few definitive answers. One special challenge associated with the dissemination of electronic publications will be to remain proactive and informed regarding the rights and responsibilities that are evolving as we create new products and services for our users.

Preservation

Preservation has been at the core of library activities for all of our history. Right now this may be one of the more active ways that we can build our worldwide collections. Almost every library has exciting and unique materials that are be-

yond the copyright timeframe. Local history, special letters, fashion illustrations, old postcards—many beautiful and rich resources that chronicle how we looked and what we thought many years ago. With the appropriate technologies, large and small libraries can begin to make these publications available. Distance will no longer be a factor for accessing these rich resources. Our challenges will lie more with assuring that what we have published or preserved in an electronic format remains accessible as technologies change.

With electronic preservation we may also be able to tackle some of the thornier issues of storage that have haunted us. I believe that we may be experiencing the last wave of library building expansions. Increasingly, libraries will be asked why many of us should keep the same materials. We know that for some of these materials, particularly journals, there is a short period of active use and then access falls off sharply. Although it would deplete our volume counts we may finally agree to store fewer of our older, replicated-everywhere resources. With joint agreements about who keeps what, we can learn to rely more heavily on things like the Ariel technologies to get these materials to our users' desktops—maybe even more conveniently than if we continued to hold the original materials.

Finally, I think that our planning windows are becoming increasingly smaller. Where earlier we might have thought about doing five-year planning, I think we are now more in the range of working with "long range plans" that might consider operations for the next year or so. Some of the most important collection management skills will call for us to be aware of changes in publications and technologies, aware of changes in our user environment, and to be flexible enough to adapt to these changes within an increasingly tightened timeframe.

The challenge of doing all of this seems to me to be equally exciting as mastering that first MEDLINE terminal many years ago.

Public Services in a Telecommuting World

Jordan M. Scepanski

Society today is amidst profound change, change of a political, social, economic, and technological nature, change in educational and cultural institutions, change that is affecting everything. And the changes underway in the information professions and the institutions with which they are associated may be the most far-reaching of all. In the corporate sector significant restructuring is occurring. Whether it be the automobile, computer, fast food, or pharmaceutical industries, or any of hundreds of others, competitive forces and a vastly different environment are resulting in radically new ways of doing business, ways that center significantly on satisfying the customer. In their book *Reengineering the Corporation*, Michael Hammer and James Champy write ". . . American corporations must undertake nothing less than radical reinvention of how they do their work . . .."[1] Such radical reinvention they term "reengineering," which they define as "the fundamental rethinking and radical redesign of . . . processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed."[2] They stress that reengineering is not intended to result in things being done faster or better or at lower cost, although all of these may indeed happen. Rather reengineering raises the question of why something is done at all.[3] It is about radically changing what is done by an organization. They suggest that there are three types of organizations that undertake reengineering: (1) those that are in deep trouble, (2) those not yet in trouble but which have the foresight to see it coming, and (3) those that are in peak condition.[4] It is instructive to think about libraries, or the parent institutions of libraries, in these terms. How many libraries would undertake radical reorganization when they are doing well?

Change is all about us, forced by economic considerations, prompted by technological opportunity. But controlling that change and directing it is a most difficult proposition. This is especially so if significant rethinking or reorganization is not occurring in the parent organization. Higher education supplies good examples of that problem. So many of the professorate think that recent economic difficulties represent just one more down cycle from which there will eventually be recovery and a return to business as usual. They have always been valued and protected by society; why should that not continue? Too many just don't see that higher education is as vulnerable as any societal institution and that the good old days are indeed gone forever. They certainly are for libraries. A university president on the VTLS board of directors

Jordan M. Scepanski is the Senior Advisor for Library Affairs at the California State University.

recently said that corporate leaders tell him higher ed has not begun to come to grips with the need for restructuring in ways the business world has. The same can be said about school systems, municipalities, and state governments. If this is the case, then libraries cannot wait for their parent institutions to engage in significant change efforts. They have to do their own restructuring and thereby bring about necessary change on the larger scene. Some far-sighted administrators think that the library profession may lead the way in dealing with the technological imperative. A vice president in the California State University system has characterized librarians as "transformational leaders" who, because of their training and their knowledge of information resources, can be examples for the faculty. A heady challenge that, but even some faculty see the possibility that it is the librarian who might be their model for the future. A paper prepared by a faculty union group in California a few years ago suggested that, in the future, instructional faculty might very well take on librarian-like roles, coaching and guiding, rather than directing their students. In fact, the roles of librarians and faculty might very well change in the direction of each other.

Back to Basics

The overall theme of the conference suggests that "rethinking libraries" should lead "back to basics." One might argue, however, that a radical reexamination of institutions and the profession should perhaps lead to an outright rejection of many of the "basic" things done. And, indeed, that might be the case if "basics" are interpreted as the age-old functions carried out in libraries, e.g., selecting book and journal materials library users might want, making those available through elaborate storage and lending systems, and providing information from those items in response to inquiries made at a reference desk or in some other way at our institutions.

But if "basics" are considered the essence of what librarianship is, the distillation of what the profession is about, then rethinking the library might lead to a focus on that which is required to bring about necessary change. "Basics" might be defined as the identification, acquisition, organization, and dissemination of information sources, the construction of finding tools, the teaching of methods for accessing information, and advising on appropriate informational and recreational reading materials. Note that management isn't included in this list. Confusion of the function of management of professionals with the profession itself has been the source of many problems. Looking at what librarians do in another way—they deal with people, with information, with making information available to people—these are the things that need to be concentrated upon, these are what the profession is about, these are the "basics" that need to be kept in mind as we consider the purposes of libraries.

Public Services

Library public services and telecommuting can be approached in a couple of ways: first, how libraries might respond to populations which increasingly expect to have goods and services delivered to them, just as they, in their own professions and occupations, are beginning to do so for others; and second, how, in the interest of providing the best service possible to clienteles, methods might be devised for delivering "telecommuted" services. In considering both of these, there must be better focus on clients, and on potential clients, information in all of its manifestations must become more accessible, and all services offered must be thoroughly scrutinized to assure not only that they are being delivered in the most effective way possible, but also that they are indeed the ones in which limited resources should be invested.

As is the case with the for-profit sector, or at least with those businesses that are finding success, there has to be total and meaningful focus on the customer, the client, the user, the patron. In the terminology of reengineering, there must be a focusing outward toward the customer rather then inward toward a department or upward to a boss.[5] By and large, libraries as institutions have been much more user-oriented than many so-called service operations, profit or not-for-profit. Nevertheless, they can do better. Perhaps because in many settings there appears to be no payment for goods received does it seem that there is not a customer relationship in the library. This is especially true with treatment of students. Their youth, the generally dependent nature of their relationship, their inexperience combine to have them thought of differently than if they were perceived as potential customers seeking a good or service. If, instead, library users were genuinely valued as clients, new service possibilities might arise.

In higher education there is a complication that impacts this client-centric approach, one that K-12 shares to a small degree. That is, there are two major customer bases and at times these are in conflict. Academic libraries serve both students and faculty. Too often faculty are seen as primary, students as secondary. Think about the many esoteric periodicals too many academic libraries still subscribe to because of the demand by a few faculty members. Think how the funds spent for such could enhance services to undergraduates. Students ought to be

treated at least as equal to the faculty with respect to library expenditures. With some good part of the financial support for the library coming directly from students and/or their parents, a case can be made that they are the most important customers for the library. Unfortunately, the reality of power on campus makes it very difficult for student interest to prevail in any contest with that of the faculty.

Ways must be found to make the vast array of information resources, those in both electronic and print formats, more accessible. That means having much more sophisticated finding tools for items held in local collections and seeing to effective delivery of the items identified to the place of the client's choosing and at the time of the client's need. It means providing means and opportunity to go easily beyond local holdings and analog resources. Doug Davis of California State University, Los Angeles, has characterized the wishes of the information seeker using libraries (and, perhaps more important, those who do not use libraries) as wanting everything that can be gotten while sitting at a workstation. Barring that, the user wants citations or pointers to information sources that are right nearby, perhaps across the room or upstairs in library stacks. The third, and least desired, of information retrieval possibilities is to identify a source available elsewhere that can be obtained, but with some delay involved; that is, through use of interlibrary loan or document delivery. As important and as good as ILL and swiftly developing document delivery services are, it should be kept in mind that to most library customers they are but the third alternative, to be settled for when customers cannot get the information they seek immediately or within a few minutes. That means work needs to be done to bring as much full text, audio, graphic, and video resources to the desktop. It means that local collections remain important and that providing more sophisticated access to them is essential. The reality, however, is that those collections can no longer be built comprehensively or even adequately.

Given that continued maintenance of traditional collections is no longer possible, there is a need to move from an approach of supplementing print resources with electronic ones to the reverse. That is, there should be a bias toward digital materials. This is not to say that print materials are unimportant. They remain essential and will for a good time to come. If, however, libraries are to be responsive to their users—and their potential users—then access has to be provided to as much of the universe of information as possible. That cannot happen by continuing to emphasize print.

Another service that can be provided to the public of the telecommuting world is delivery of library materials. At many libraries this occurs to some limited degree; articles are faxed to the desktops of many users and libraries with branches have regular runs to get materials from one place to another, closer to where the requester is. But how many provide the type of service that, under the leadership of the late Hugh Atkinson at Ohio State, was being offered as early as 1973? The OSU library enabled anyone affiliated with the campus to call and learn if the library held a particular item, and if so, whether it was available. If it were, the caller had the option of having it paged and held for pickup or mailed to a campus address. Atkinson once said that freshmen using the service thought that it was common to all academic libraries. Would that it were now, some twenty-five years later. With much more sophisticated online systems equipped to authenticate legitimate users and to permit easy identification of available resources, delivery services of the OSU type should be available everywhere.

If radical rethinking of libraries is to take place, each and every service offered must be placed under intense scrutiny. There needs to be a determination of how services are being carried out, and more importantly, why they exist at all. Every assumption about every service requires challenge.

One might start by asking if there is a justifiable need for reference service, or at least reference the way it is offered at most libraries. Should expensive librarian talent be used for a function that, again and again, has been shown to require but infrequent need for professional personnel, a function that we know is reaching but a fraction of relevant populations, be they city taxpayers or university students? Granted, there are those who need reference help and there are talented individuals on library staffs able to provide it. However, is the service cost-effective? With all the other resource requirements that exist, can it be afforded? Might not users be better off having professionals devote their time to developing effective finding tools and self-teaching aids that could be used online, thereby creating a more information-literate populace and empowering a much larger percentage of our potential clienteles? A much more important and cost-effective role for the librarian is that of teacher, especially in the academic and school setting, but to a degree in the public library arena as well. There is a need to go beyond the relatively informal teaching done at reference desks and the limited contact afforded through bibliographic instruction sessions. Substantive courses in accessing and assessing information resources are required. But librarians will be unable to engage in such time-consuming activity if they must continue to carry out traditional functions.

For such teaching, but even in providing a more traditional type of reference service, technological tools that allow communication beyond the confines of library buildings is essential. Distance education is becoming increasingly practical, and in support of it online reference services should become the norm. How about online interactive video reference service? Technology exists that allows client and librarian in different places to interact face-to-face, if you will, viewing documents or sending and receiving materials. Why not make that type of reference commonplace?

Among the first steps that can be taken in rethinking how service to the public is rendered is for librarians to assert their professional expertise. The obvious problem with information today is its overabundance. There is more of it than can be handled. Peter Lyman, of the University of California at Berkeley, has pointed out that libraries originally were created to deal with the problem of information scarcity; that is, to bring together in one place, for the use of the many, items that were few in number so that they could be shared. Now there is too much rather than too little. There also is too much of too little. That is, so much of the information that is overwhelming everyone is of poor quality or of little value. There is a lot that is of little consequence. If the traditional library, then, was the answer to a paucity of information, the new librarian is the solution to its plenitude. There has never been a more critical need for the talents of professionals who not only know how to find information, but how also to evaluate it. The role of the librarian can no longer be one of pointing the way for the user, nor even of just teaching that user how to find what is needed. The librarian must now teach both how to find what is needed and how to assess what is found. Librarians are information experts, and that expertise extends beyond knowing where to look for things. Librarians do know how to differentiate good data from bad, current information from that which is dated, reliable sources from those that are less so. And given the intense subject specializations of content experts—most especially faculty members at universities—and their subsequently narrowly drawn knowledge of their fields, coupled with the extraordinary expansion of scholarship in every field, good librarians frequently know the literature of a given discipline better than many of its practitioners and teaching and research experts. To change public services librarians have to be recognized as information experts and accept that they are so. No longer can they, or society, heed that old admonition, drilled into so many in library schools, that librarians don't make judgments about the information they help people find. If they don't make such judgments no one will, and clients will be the worse for librarian timidity. The profession should return to the public librarian's approach of an earlier era, that of the "reader's advisor," the librarian whose knowledge of the disciplines and of their literature and of the reader's interest and needs allowed functioning as a guide and a counselor. Librarians once again need to guide and counsel. They need to advise and to teach.

Another area long in need of attention is the poor use made of nonlibrarian staff. For too long a valuable resource has been wasted through relegation of those without library science educations to jobs below their abilities while assigning professionally trained librarians to tasks that have little directly to do with the basic functions mentioned earlier. If reference or any of the other traditional functions are to be reconsidered, then meaningful use of these vital library personnel is essential.

Better use of the nonlibrarian staff would permit librarians to leave the library. One of the most important questions to be asked in rethinking how library business is done is why it is done in the library. If, by and large, the clientele (especially unreached clientele) is elsewhere, and if technology permits work from afar, then why not go where the customers are? Why not practice where clients need help? Why not function in a classroom building unconnected with the library, in a shopping center, or at home electronically connected to customers? Librarians should abandon their buildings. The resources found in those buildings are but a part of the resources available; an important part, but not one that should take librarians away from where they can be most effective. The physical structure that is the library building will remain important for some time to come. Let us no longer confuse, however, what librarians do with where librarians work.

It is the manager's role to lead these far-reaching changes. It is the manager's role to urge colleagues, in and outside the library, to abandon the centuries-old paradigm that is comfortable but under great stress. It is the manager's role to initiate a serious rethinking of the library and to do so by focusing on basic purposes, by placing clients front and center, and by rethinking everything libraries and the personnel who work in them do.

Notes

1. Michael Hammer & James Champy, *Reengineering the Corporation: A Manifesto for Business Revolution* (New York: HarperBusiness, 1993), v.
2. Ibid., 32.
3. Ibid., 4.
4. Ibid., 34.
5. Ibid., 28.

What to Expect from Library School Graduates

Marilyn Miller

What to expect from library school graduates is an interesting topic. Ten years ago I could have told you with some certainty. Today, I am not so certain because library education is no longer as homogeneous as it once was. When I attended the University of Michigan as a graduate student, I had the same curriculum choices I would have had at any library school in the country. Gaining an understanding of the historic role and function of libraries in society and being introduced to the basic theories of librarianship were common to most students in all programs: to build/develop collections of resources, to organize collections, to develop services to make collections usable to those who need, want, and/or enjoy the right to those collections. We did not talk about access then, but when access became the driving word, the concept made sense. The other basic thing I came to understand is that implementing the basic tenets of librarianship in a practical sense, with integrity and understanding, means lifelong self-education and the ability to adapt to change, because change is a constant.

Library education programs have changed a great deal in the past twenty-five years, and they have become less homogeneous in some ways. In the mid-sixties and early seventies, in response to demands by the school field, the curriculum in some schools expanded with the addition of courses in multimedia acquisition, organization, production, and use, and courses for school librarians in instructional design and program development, that would encourage the integration of school libraries into the instructional program of the school.

Close on the heels of this expansion of a very traditional curriculum came the need for students who knew about computers. All schools began to change curricula in the late seventies and early eighties, some faster than others, and some with more sophistication and dedication to computer hardware. Embracing a range of communications technologies began for most schools with the addition of some computers (a few affluent ones put together a whole computer lab). It continued with renaming of schools to include information and management or science, and adding a few courses in information science, online searching, database construction, programming languages, et cetera. But the content of basic core courses (whatever their titles) remained pretty much as usual.

In the past ten years, however, very distinct changes have been sweeping library education programs. More radical curriculum changes to strengthen and enhance the involvement of libraries with technology applications and information dissemination have occurred, along with changes more radical than the mere renaming of schools. For example, we have seen the reorganization of schools, the development of specialized tracks, collaborative programs with other academic units, and the move to distance education via telecommunication.

When we review curriculum changes across the range of library schools, we find that students have been moved far beyond knowing about technology to learning about its applications, and even the design of applications, as is being implemented, for instance, at the University of Michigan. Some schools are no longer requiring cataloging as a core course. Other schools require a very small core, or no core at all. Library history, courses on the book, foundations or library in society are disappearing from curricula in some schools. Older existing cataloging and classification courses have given way to information storage and retrieval course offerings. Reference courses have been recast as reference and information packaging courses, and courses in library administration have broadened into a much broader study of generic administration and managerial strategies.

We are also seeing other changes in the curriculum as educators address wider issues of professional preparation than some once saw as being within their purview. For instance, we are constantly being confronted by graduates who tell us of the vastly more complicated work environment in which they operate. They must organize huge quantities of information resources within and outside the library. They must adapt quickly to new technologies. Moreover, they must educate and reeducate their clienteles about new technologies. For instance, innovations involving computers—laptops, local-area and national networks, integrated systems, sophisticated online retrieval, CD-ROM databases, and interactive audiovisual systems such as computer-linked videodiscs—continue to transform the curriculum related to library information search, acquisition, retrieval, processing, and storage to an extent unimaginable a quarter century ago. And this is happening in all types of libraries, from the elementary school to the university.

For years, some members of the library education profession have been recommending that library education programs should become more unique, with schools varying specializations, concentrations, et cetera. The original idea was that some could specialize in academic libraries, some public, some school, or types of special libraries; schools could concentrate on specific func-

Marilyn Miller is the Chair of the Department of Library and Information Services, University of North Carolina at Greensboro.

tions and that potential students could flow to those programs. That idea was never given serious thought by most library educators for a variety of reasons, mostly economic. For the past two decades or so, geography has dictated student selection of programs. Most students give as a major reason for attending a specific program the geographical proximity and ease of access.

In the nineties, library schools are moving into more speciality options beyond the core course. First of all, there are no more schools of just library science. Upon reviewing the names of all forty-seven ALA-accredited programs, you will find that information science or information management dominates the choice of titles. So we now have an interesting collection of names. The University of California at Berkeley went through an historic upheaval three years ago and managed to survive, but their program name does not include the name "library" at all. Drexel has changed its name for the third time since the early eighties, when the "School of Library and Information Science" was superseded by "College of Information Studies." Effective July 1995, the name of the program is College of Information Science and Technology.

Name changes are important to reflect realistic programmatic options and directions. They are also psychological and useful for public relations and marketing to indicate to the rest of academe that we are changing and keeping up, and to recruit students who will be responsive to the new options in a traditional field, but who also had not realized that our field was an entrée into other kinds of information service agencies.

Just a few words about some of the program options. The first options were, of course, in advanced degrees; the availability of the Ph.D. in a few schools has spread to many, with certificates of advanced study and sixth-year degrees—the specialist, if you will—becoming more prevalent. Several programs concentrated on technology by adding a second track in information science with an entire degree sequence, while others required a core, then movement into a second track. Others have completely reconfigured their programs with an emphasis on applications of technology, design, and communication.

Some, like us, are still in the more traditional mode, having selected the option of concentrating on the preparation of librarians who are able to respond to new patterns of service that is heavily influenced by technology, and who are able to use the technology to perform organizational and retrieval functions of libraries no longer bound by four walls. To meet this objective, these programs are integrating technology applications in all courses and creating short-term courses that change as new technologies develop.

Programs are developing joint programs or collaborative sequences with policy studies, higher education, journalism, business, history, and education. We are beginning a joint doctoral program with the department of curriculum and instruction which has a Ph.D. in curriculum and teaching. We will be admitting school library media specialists in large high schools and those who want to be district administrators, as well as those who want a better foundation of curriculum and teaching to serve their role as media specialists working with teachers and curriculum development. Our students in this program will have both a concentration of coursework and a dissertation in library and information studies.

Another major change in library education is the apparent return to undergraduate education. During the 1980s, several universities that already offered graduate programs began offering undergraduate programs in library and information fields, such as information resource management. In 1984, Drexel University began a five-year B.S. program in information systems through its College of Information Sciences, its graduate library school. Pittsburgh has entered this area, and several Canadian schools now offer undergraduate programs in archives and records management.

Organizational changes have also been prominent during the past eight to ten years. For a while the library education community was absolutely reeling from closings, and rumors of closings, of library schools. Very few people saw Oregon's closing of its program sixteen years ago as a signal, but by the time the same thing happened at the University of Southern California, Western Michigan University, Case Western Reserve, Peabody, Emory, Genesseo, Denver, then Chicago, and finally Columbia—the closing of which sent actual shock waves across the country—people began to take notice. Today, only forty-seven American colleges and universities offer graduate programs in library and information service that are accredited by ALA. These forty-seven constitute less than three-quarters of the number of institutions that offered such programs in the 1970s.

During the last few years, several programs have avoided closure and discussion of closure, but have not avoided being placed with other administrative units, one of the earliest being Rutgers University's, which was placed with programs in communication and journalism. The latest, UCLA's, has been placed administratively in the School of Education.

Distance education has become a hot topic in library education. Emporia University, the University of South Carolina, Syracuse University, and the University of Arizona have entered the arena of distance education on a large regional or na-

tional basis. Each has varying requirements for students to come to campus for summer sessions or special weekends central to most students in the program, meeting periodically with the instructor, and the technologies used to deliver the instruction. Other universities are developing programs limited to their own and neighboring states. Again, state regulations, technologies available, and needs of the field predominate as determinants of how programs develop.

What should we expect from graduates entering library service? It is evident from my comments that you are going to have applicants representing a broader range of curricula than in years before, and you might have a broader range of specializations presented to you. You may have to decide among applicants who have been prepared in education programs designed to graduate students who will survive the demise of the library. You may be faced with applicants who are highly skilled in technology but who need high levels of socialization into the mission of the profession, or you may be faced with graduates who come from more traditional programs that have been infused with the introductory technological skills, the ideal of accountable public service for diverse populations, and an understanding of the rich potential of the library as a superior educational opportunity for its users. You may be really lucky and be able to build an interesting staff of representatives from all of these directions. But I believe it is safe to say about many of the graduates in 1995 that:

1. They are beginners who have been exposed to more theories of library service than "how to do it good." No library school can prepare students for universal library operations, because there are none anymore. If you disagree with that, read about the early curriculum of Dewey's girls at Columbia and the early recommendations from noted public library directors for curriculum. That curriculum did freeze us in time for decades. There is a relationship between the move away from practical courses in library education to the wonderful development of a variety of service patterns and developments in libraries today.
2. As a corollary to number one, I believe all graduates are entering the field weaned from the idea that librarianship is a good choice for them because they love books and like people and want to spend their working days bringing the two together. I don't believe I need to comment on this, but we still receive personal data letters noting this as a reason for a career choice.
3. I would hope, but I cannot guarantee, that graduates will be socialized to the mission of libraries, their traditional role as repositories of the recorded word, their evolving role as centers for access to information wherever and however stored, and to a philosophy that libraries, as a public trust, owe integrity of access to all in their client pool.
4. I hope that all graduates will have been introduced to the role of professional associations in supporting the development of libraries, in helping interpret the role and value of libraries to their communities, and in providing access to continuing education and lifelong professional learning.
5. I believe most graduates will have a basic knowledge of the importance of planning for accountability and development as well as the basic tenets of planning.
6. Graduates will have knowledge of basic reference sources, both print and electronic, and will have some electronic searching skills. This will vary according to the programs from which they graduate, but none will arrive as full-blown searchers. They will have to be allowed and encouraged to develop their skills.
7. Students will not be fearful of technology in libraries. They have been immersed throughout their coursework in computers, word processing, e-mail, the Internet, faxes, voice mail, and a variety of other kinds of applications. Some will be more expert than others, and few will know every system that is available. Library directors cannot expect every student to be knowledgeable about every system and a master of equipment maintenance and repair.
8. Students have been taught that they are responsible for their own continuing education, and that if they are to have a productive career in their chosen profession they must continue to learn through the literature, through action research, through professional associations, through collegial networks, and through more formal education.
9. Students have been taught to expect and take advantage of the phenomenon of change as a constant.

Students will come back to us and tell us how disappointed they are that their hopes of making a difference are not materializing; they are too far down the line to be heard, the director does not sponsor evaluation, planning, and development.

Of equal importance is what students will find in their first jobs. I hope students will find a library staff that is still excited about what they do as librarians. I hope they will land in a library with a staff that is neither enraptured silly about technology nor scared stiff about the demise of their jobs.

Retraining Librarians to Meet the Needs of the Virtual Library Patron

Howard Harris

Training represents a conventional method for providing a necessary set of understandings to individuals and groups which have new responsibilities or require new or updated understandings of some sort. The assigned topic for this paper represents a point of departure for assessing the understandings that libraries and librarians must acquire to confront and deal with the types of fundamental change which are ushering in the era of the virtual library and the virtual library patron. Given the scope and pace of present and prospective change, training, by itself, will not provide librarians with a satisfactory framework for new understandings, or the basis for responding to the changed environment.

Some librarians believe that they already have implemented the virtual library; others believe that the virtual library represents a distant objective or threat. Neither is entirely correct. The digital, or virtual, library era has begun; many forecasts agree that declining costs and increasing performance in fundamental information technology likely will continue for the next ten years unabated, enabling a host of new systems, services, and products. Widespread applications of such technology, and the integration of such new capabilities into existing systems and services, generally lag behind advances in fundamental technology; modifications in organizational structures invited or dictated by the integration of technology usually follow the integration of new technology. By such reckoning, the introduction and integration of virtual library services may take place continuously over the next fifteen to twenty years. Throughout that period of time what constitutes a librarian, a virtual library, or a library patron will undergo substantial change. Training implies the handing down of well-ordered and well-understood knowledge. Although the overall shape and direction of some technological developments appear clear in outline, training will be no substitute for learning as new technologies, capabilities, and developments emerge during the time ahead and creating an organization capable both of learning and applying what it learns.

Howard Harris is Vice-President of RMG Consultants, Inc.

Paradigm Shifts

Society at large now confronts a number of paradigm shifts which influence the shape, direction, and speed of change for individuals and organizations, including libraries. A paradigm shift represents "a fundamentally new way of looking at something, often imposed by developments in science, technology, or other arenas."[1] Four of these overall shifts which also affect library and information services include (1) a change in the world economic and political order, (2) a new organizational paradigm, (3) a new information technology paradigm, and (4) a new business paradigm.[2]

Today's global economic and political environment is more open and volatile. A global view of production, distribution, and markets, coupled with real economic competitiveness on a global scale, characterizes the shift in the world economic and political order. Although this shift, no doubt, has affected U.S. libraries in some areas, in matters of information technology the global view of U.S. firms in electronics, computers, communications, networking (including the Internet), and library and information systems and services has insulated U.S. libraries to some degree from the effects of this shift. For example, the rapid implementation of information standards such as Z39.50 in the United States, and global sales of systems and services by U.S. vendors, has influenced and substantially affected library planning and investments abroad and influenced standards-making bodies, developers and vendors, and libraries alike. The global view of U.S. vendors and their success in developing and implementing such standards has put U.S. libraries in a good position to reap the benefits of investments in such technologies without the need to change directions as such standards gain recognition.

In the new organizational paradigm, the pace of technological and business change drives businesses and institutions to rethink their structures. Information has assumed strategic importance in this new view of the organization. Organizational responsiveness to new information and the opportunities which it presents have become highly valued. Reengineering the business processes of the organization to enhance productivity, responsiveness to the environment, and the quality of products and services provides additional impetus for organizational change.

The ability in such an environment to develop, implement, and integrate new products, systems, and services often requires skills and understandings distributed throughout the organization or located outside the organization. Businesses and institutions often must put such skills

to work by bringing together teams within the organization or alliances between various organizations, each of which possesses one or more critical human resources, skills, or technology. Organizations often assemble and disassemble such teams as required. Project orientation and team structures place a premium on the commitment of the individual members to the organization, its goals, and the work at hand, since traditional forms of hierarchical organizational control prove less effective in managing such efforts. For libraries, how to obtain needed human resources from within or from outside the organization may influence strongly the design, deployment, and support of successful virtual library services.

A new information technology paradigm has emerged based upon the convergence in technologies and business interests related to computers, communications, content (including traditional and electronic forms of publishing), and consumer electronics. This paradigm shift focuses on networking as the dominant factor in information technology. Effective use of networked information requires open systems and standards-based integration of systems and services, both within and beyond the organization's boundaries. Ultimately, this paradigm shift manifests itself as "social computing," seamlessly linking suppliers, providers of services and products, and their clienteles.

Libraries already have experienced some of the detailed aspects of social computing with respect to providers of services and products, with respect to the ordering of materials and the paying of bills via Electronic Document Interchange (EDI) standard interfaces. On the site of the library's clientele, the battle among major players in the computer, telephone, television, and consumer electronics industries to define the various types of personal network appliances (in addition to current Internet-capable microcomputers) which will provide mass public access to commercial and noncommercial network-centered information has just begun. The introduction of such mass-market, consumer-priced devices inevitably will influence the direction of virtual library services.

The new business paradigm recognizes the impact of shifts in technologies, organizations, and economic activity, in which competitive forces have increased substantially due to the reshaping of traditional markets on a national and a global scale. Scaling the organization to the magnitude of such national and/or global markets becomes paramount to achieve and sustain a share of the market. The accelerated rate of mergers and acquisitions, joint ventures, and alliances in recent years all represent responses to such concerns. Conversely, restructuring an existing organization into separate and independent businesses (notably AT&T twice within recent memory) represents an alternate business strategy designed to narrow the focus of the resulting companies on various distinct markets and business opportunities. Library vendors of information technology have already entered an era of mergers and acquisitions. Libraries will need to assess, on an ongoing basis, the effects of such changes on the marketplace for systems and services.

From Library Automation to Information Strategies and Virtual Library Services

Up until recently the state of the art in library automation has consisted of an integrated library system in which a number of applications, including the online public access catalog, rely upon a common, core bibliographic file. However, the range of information systems and services currently available to libraries reaches far beyond such an integrated library system. Libraries—via CD-ROM, local database hosting, or network access—now routinely subscribe to various types of index, abstract, directory, and statistical and other types of databases. In the full-text arena libraries have begun to implement electronic reserve systems and to make use of combination full-text/full-image systems and multimedia systems and services. Despite significant policy debate in some quarters, some libraries offer combinations of library-paid "free" subscriptions, as well as pay-per-view or user access to systems and services. Libraries increasingly seek to integrate union catalog, interlibrary loan, and commercial document delivery services. Providing users with full Internet access, and providing unified and integrated access not only to traditional (analog) information but also to both local and Internet-based digital information, represents an emerging trend. Interactive video and video conference capabilities have broad implications for the virtual library and await wider application. Beyond such products, systems, and services there exists a broad and expanding spectrum of electronic commerce services and "information superhighway" applications which may have substantial impact on virtual library services.[3]

In a more complex environment where institutions such as libraries integrate various systems and services, the focus has changed from the five-year system and economic life cycle of a single (automated) system, developing strategies to coordinate systems and services with varying life cycles. Managing such a technology portfolio should result in focusing the library's attention

on its overall goals and on information strategies flexible enough to take into account new technologies and opportunities which present themselves over time; such change may or may not require wholesale replacement of systems and services to effect dramatic changes in overall capabilities.

Problems and Issues Related to Virtual Library Services

What issues do libraries confront with respect to virtual library services, given an extended period of substantial shifts in global economic and political order, organizational requirements, information technology, and business structure? The prospect of virtual library services and patrons challenges the notion of the library as a physical place and raises what will become persistent questions about the allocation of human, financial, and other resources among traditional and virtual library services.

Virtual library issues and problems, in contrast, bear on matters of values, culture, and attitudes of the entire organization, its suppliers, and its clienteles. Such issues and problems imply change in technology, organization, services, and management of the institution, and ultimately in its transformation.

The introduction and maintenance of virtual library services will lead to potential (if not actual) conflict, both within the library and between the library and its constituencies, regarding the values and culture of the institution. The challenge for libraries, and for librarians, will be to focus on the ability to bridge these difficulties and to recreate the library in the virtual library era, in which a significant number of the users and the materials which they use may not be housed in the library.

Libraries will not implement virtual library services in a single, short effort. Librarians will gain the understandings necessary to meet the needs of virtual library patrons not primarily by training but by a learning process which will guide librarians in the development, implementation, operation, reassessment, modification, and ultimately replacement or elimination of individual virtual library services. Libraries need to develop the capability to undertake and sustain such services over a long period of time and will need to reassess and modify such services on an ongoing basis.

Adaptive and Generative Learning

Training generally focuses on a set of tools and skills, on the needs of individuals or small work groups, and on the need for integrating and adapting to an existing environment. In this sense, training represents a form of adaptive learning.[4] Generative learning focuses on learning to look at the world in new ways, in making appropriate changes, and ultimately in gaining the perspective required to create the organization's future.

In the virtual library era libraries should consider training within the context of the library's role as a learning organization: reading the environment, including opportunities and threats; charting the way ahead by subjecting the library's mission, goals, values, and policies to continuing scrutiny; developing and implementing new projects, operating plans, and services; and evaluating, reviewing, and revising the library's plans, processes, and strategies.[5]

Leadership and Five Disciplines of the Learning Organization

This paper attempts to make the case that, in order to develop and operate virtual library services, libraries must develop their capabilities as learning organizations. This section of the paper draws extensively on the work of Peter Senge[7] and Pedler, Burgoyne, and Boydell[8] to describe some of the characteristics of such a learning organization.

Leadership serves as a key element in developing the learning organization according to Senge. The leader in a learning organization builds the organizational capacity to undertake long-term learning and organizational change. The leader plays a key role in developing and sustaining a personal vision for the organization and maintaining the effort required to forge an organizational vision. At another level, the leader needs to develop individual capacity for learning by supporting individual learning projects. In an era of profound change, the knowledge which individuals and groups initially bring to their work can become obsolete rapidly; continuing learning projects develop the capabilities of individuals and the organization at large to maintain current knowledge and understandings.

Systems thinking represents the first of Senge's five disciplines. Systems thinking consists of understanding the various fundamental processes and structures of change: reinforcing feedback, balancing feedback, delays, limits to growth, etc., which occur in a variety of contexts. An appreciation of these processes leads to understanding patterns of influence rather than simple cause and effect. Systems thinking calls attention to how per-

ceptions guide individual and organizational actions which, in turn, ultimately influence subsequent perceptions and actions.

Personal mastery, as exercised by organizational leadership, consists in continuously clarifying and deepening a personal vision; learning to see current reality clearly, independent of either a personal or organizational vision; being willing to face honestly the gaps between vision and reality; reassessing mistakes and failures; and having the ability to foster creative tension between vision and reality ultimately directed toward closure of the gap in favor of the vision.

Mental models represent the beliefs which shape the way an individual or an organization makes sense of the world and takes action. A mental model, depending upon its appropriateness, may facilitate or impede the organization's ability to carry out its work. The reference desk, as a concept of how certain services should be rendered, represents an example of a mental model in library service. Senge asserts that the learning organization must identify and question the mental models and the assumptions embedded in each model continuously, build and test new models, assess and ultimately take action on the new model, and review and revise both old and new models on an ongoing basis.

Beyond the personal vision of an organization's leader, but under the leader's guidance, the organization needs to develop and propagate a shared vision expressed as an overarching goal that is compelling enough to warrant long-term effort, risk-taking, and experimentation by individuals and the organization as a whole. The organization needs to accept that realizing such a shared vision will take significant effort and time, and that creative tension—the gap between reality and vision—will persist for an extended amount of time. Through systems thinking and personal mastery, the organization and its leader work through time to close the gap between reality and vision not by surrendering the goal or compromising, but through learning and applying what is learned toward fulfillment of the vision.

The fifth discipline, according to Senge, is team learning. Team learning views learning as a collaborative process achieved via dialogue among individuals in which the organization explores complex and difficult issues from many different perspectives and works to move beyond conventional personal or institutional views. Ultimately, the organization requires decisions, but discussions and decision-making benefit from the process of dialogue in which a variety of points of view have surfaced and been taken into account.

In summary, the learning organization is characterized by:

- encouraging a much wider debate on strategy and policy formation;
- creating an environment where tensions are welcome as possible precursors to creative solutions to problems formerly seen as "win-lose" situations;
- using information technology to inform/empower the many rather than the few;
- exchanging information—getting closer to customers and suppliers;
- using the people in contact with customers to bring back useful information about needs and opportunities;
- collaboration rather than competition and making comparisons of the organization's best practices with the practices of others;
- encouraging self-development opportunities for everyone in the organization and encouraging individuals to take responsibility for their own learning and development.[8]

Conclusion

Libraries and librarians have entered an era of profound change characterized by various paradigm shifts which affect both library and information services and society at large. The effect of various paradigm shifts and ongoing technological advances on society at large will persist for more than ten years. Libraries have recently begun to develop and deploy virtual library services which depend upon these advances and paradigm shifts.

Various issues will arise in the course of offering virtual library services which will require skills and training not currently available within the library organization and which will require training of existing staff or which will require use of outside expertise; however, the critical virtual library issues facing the library organization and librarians will bear on matters of values and culture, will affect the whole library organization, and ultimately will result in the transformation of the library as an institution.

Advances in information technology and its applications in the computer, communications, content, and consumer electronics industries should spur such changes within libraries. Such advances will either invite or demand substantive and continual change in the structure of the library's services and organization. However, such external factors by themselves will not bring about wanted change. The basis for ongoing development of virtual library services should result from continual learning on the part of individuals and the organization as a

whole. Such learning will form the basis upon which librarians will gain the understandings required to provide service to virtual library patrons and to meet their needs.

Notes

1. Don Tapscott and Art Caston, *Paradigm Shift: The New Promise of Information Technology* (New York: McGraw-Hill, Inc., 1993).
2. Ibid.
3. Howard Harris, *From Library Automation to Information Strategies*, overview material distributed at LAMA Preconference in advance of the American Library Association 1995 Annual Meeting (Chicago: RMG Consultants, Inc., 1995).
4. Phil Hodgson, "Learning: The Learning Organization," in *The Financial Times Handbook of Management: The State of the Art* (London: Pitman Publishing, 1995), 694.
5. Jane Cranwell-Ward, "Learning: Overview," in *The Financial Times Handbook of Management: The State of the Art* (London: Pitman Publishing, 1995), 678.
6. Peter M. Senge, *The Fifth Discipline: The Art and Practice of the Learning Organization* (New York: Doubleday, 1990).
7. M. Pedler, J. Burgoyne, and T. Boydell, *The Learning Company: A Strategy for Sustainable Development* (McGraw-Hill, 1991).
8. Ibid.

News and Announcements

The Global Library: NYPL Exhibition

As the second of the New York Public Library's major exhibitions celebrating its centennial, *"The Global Library: http://www.nypl.org"* presents the digital revolution within the context of 5,000 years history of communications. Paul Evan Peters, executive director of the Coalition for Networked Information (and former LITA president), serves as curator for this exhibition with Craig Summerhill, CNI's systems coordinator and program officer (and current LITA board member), and Lisa Browar, NYPL's Brooke Russell Astor Chief Librarian for Rare Books and Manuscripts, as assistant curators.

The exhibition is on view at the Center for the Humanities, Fifth Avenue and 42nd Street, in New York and at http://global-lib.nypl.org from March 23 to August 17. The exhibition offers visitors both a guided tour of the World Wide Web and a timeline of seminal moments in the history of humankind's collective memory of accumulated knowledge and received knowledge.

Final Reports of the U.S. NIIAC

The United States Advisory Council on the National Information Infrastructure (NIIAC) was formally established on September 15, 1993, by President Clinton through Executive Order No. 12864. In January 1994 President Clinton charged a group of distinguished Americans to undertake a two-year effort to develop a national strategy on the development of the Information Superhighway. The council members were appointed by Secretary of Commerce Ron Brown and included Toni Carbo Bearman, dean of the School of Library and Information Science at the University of Pittsburgh. David A. Wallace, also of the Pittsburgh SLIS, was a council staff member and along with Bearman represented the library community on the NIIAC.

On February 13, 1996, the council presented its two final reports to President Clinton and Vice President Gore. The first of these reports, *A Nation of Opportunity: Realizing the Promise of the Information Superhighway*, addresses national goals and critical issues, provides recommendations, and presents the council's vision for the information superhighway. The second report, *KickStart Initiative: Connecting America's Communities to the Information Superhighway*, provides practical information and sources for additional information to community leaders for connecting their communities to the information superhighway through their schools, libraries, and community centers.

Although the council's work is officially completed, the work initiated by the council will be continued by the Benton Foundation, which will create new information services and forums to assist schools, libraries, and community centers in meeting the objectives set forth by the NIIAC.

A limited number of copies of the two reports are available through the National Telecommunications and Information Administration (NTIA) at: NTIA, Openness Center, United States Department of Commerce, Room 1609, 14th Street and Constitution Avenue, NW, Washington, D.C. 20230, attn: Mary Wallach; phone: (202) 482-3999; fax: (202) 501-6198.

When NTIA's supply is depleted, hard copies will be available from the Benton Foundation, 1634 Eye Street, NW, Washington, D.C. 20006, phone: (202) 638-5770; fax: (202) 638-5771.

The reports are also available on the World Wide Web at the NIIAC's official WWW site: http://www.uark.edu/~niiac/ and at the Benton Foundation's WWW site: http://www.benton.org/KickStart/.

A third report, prepared by McKinsey & Company for the NIIAC, is also of note. This report, *Connecting K-12 Schools to the Information Superhighway*, provides detailed data and information on alternative infrastructure deployment and cost models to bring the nation's schools on to the information superhighway.

National Digital Library Program

The Library of Congress's National Digital Library Program (NDLP) received two large donations from corporations in the fall of 1995 to assist in the program's efforts to digitize five million items by the year 2000 and make them available over the Internet. In September Bell Atlantic donated $1.5 million for the program.

In making the presentation, Bell Atlantic CEO Ray Smith also announced Bell Atlantic's own Project CANDLE (Creating a National Digital Library for Everyone), established to improve American education through high technology. In November, Eastman Kodak CEO George Fisher presented a letter committing to the first installment of a $1 million gift to the NDLP. The Bell Atlantic and Eastman Kodak contributions brought the total of private-sector contributions to the NDLP to over $19 million.

Preservation and Access Reports

Two recent reports of the Commission on Preservation and Access highlight the increased use of technology in preserving the historical record and facilitating access to this information. In September 1995 the commission issued *Digital Imaging of Papyri: A Report to the Commission on Preservation and Access* (8pp., ISBN 1-887334-44-0). This report, prepared by Roger S. Bagnall, professor of classics and history at Columbia University, summarizes the study to document how to best scan papyri in anticipation of a major effort among papyrologists to digitize their collections. Accompanying the commission's February 1996 *Newsletter* is a report by Charles S. Rhyne, professor of art history at Reed College, on *Computer Images for Research, Teaching, and Publication in Art History and Related Disciplines*. This is a shortened version of article appearing in *Visual Resources, An International Journal of Documentation*, vol. XI, no. 3 (1995). Earlier reports issued by the commission in 1995 dealing with technology include *Oversize Color Images Project, 1994–95: A Report to the Commission on Preservation and Access* (24pp., ISBN 1-887334-42-4) by Janet Gertz, and *Tutorial: Digital Resolution Requirements for Replacing Text-Based Material: Methods for Benchmarking Image Quality* (22 pp., ISBN 1-887334-38-6) by Anne R. Kenney and Stephen Chapman.

LAUNCH INTO A NEW ERA:

Resources for the Future Librarian from ALA Editions

Academic Libraries as High-Tech Gateways: A Guide to Design and Space Decisions

Richard J. Bazillion and Connie Braun

Finally, in one complete and readable resource, librarians find out what it takes to make academic libraries gateways to vast resources of electronic and printed information. The authors demystify the planning process to help librarians make design and space decisions for online information access, electronic study centers, and other automated systems. Practical topics include attributes of a 21st-century library; creating the "intelligent library"; furnishing, equipping, and testing the building; and, libraries as teaching instruments. If your library belongs to another century, you can't afford to be without this book.

$40.00pbk. • 225p. • 1995 • ALA Order Code **0656-7-0011**

The Internet Troubleshooter: Help for the Logged-On and Lost

Nancy Regina John and Edward J. Valauskas

This compact question-and-answer book is a lifeline for Internet surfers lost at sea. The authors have taught hundreds of Internet users at every level and understand the common problems that arise in the midst of online activity. An index, section dividers, screen illustrations, glossary, and real-life examples make solutions easy to find, understand, and enact. With its spiral binding, the guide is perfect for use by your terminal.

$25.00spiral-bound • 145p. • 1994 • ALA Order Code **0633-8-0011**

Future Libraries: Dreams, Madness and Reality

Walt Crawford and Michael Gorman

Amidst the rush to all-electronic libraries, here's one book that may save your library. This bestseller presents an authoritative counter-argument to the over-hyped virtual library, submits evidence for the continuing value of print collections among diverse media, explains how to deal with the enemies of today's libraries, furnishes a "survival guide to the serials crisis," and exposes the fantasies associated with the electronic-publishing industry.

$25.00pbk. • 198p. • 1995 • ALA Order Code **0647-8-0011**

FROM THE LIBARY AND INFORMATION TECHNOLOGY ASSOCIATION

Internet Connections: A Librarian's Guide to Dial-Up Access and Use, 2nd Edition

LITA Monographs, #6

Mary E. Engle et al.

Includes a snapshot of the networking services available at time of publication, a discussion of the concepts and terms, and a bibliography of the notable guides that document search techniques, navigational tools, and available information resources. Provides a general overview of electronic service providers offering dial-up access to the Internet, along with pointers to other valuable sources of information.

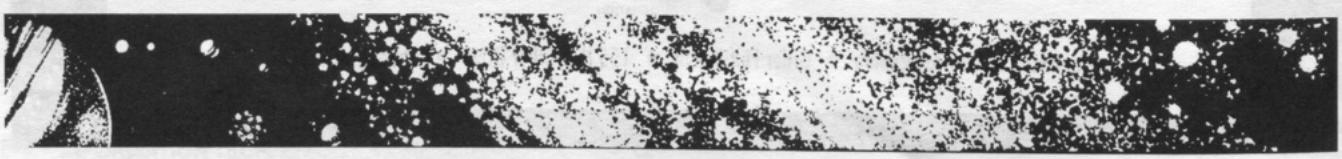
$24.00pbk. • 280p. • 1995 • ALA Order Code **7793-6-0011**

ALAEditions

BEYOND INFORMATION

155 N. Wacker • Chicago, IL 60606

To order, call 800-545-2433 and press 7



His world

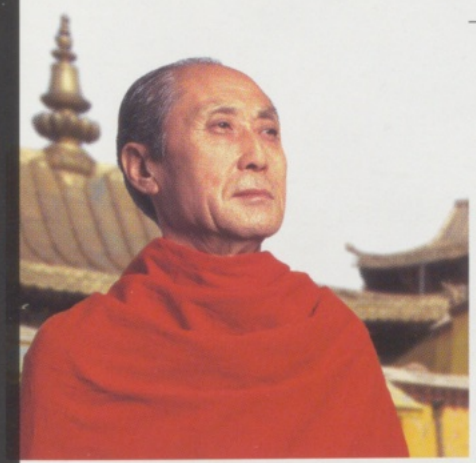
revolves around

silent meditation, yoga

and a library in

www.sirsi.com

pittsburgh.



unicorn™ It is possible, right now, for you to provide your clients and patrons with the absolute finest in library services and support—and extend those services around the world. It's an incredible capability that comes standard with Unicorn, the world's most powerful library automation system. Unicorn was created in 1982 by SIRSI. From the beginning, the right decisions were made to ensure that Unicorn users would always be able to meet change head-on. UNIX™ would be the operating platform. Client/server would provide the architecture. Unicorn would be the perfect blend of power, versatility and adaptability. These early decisions are the reasons why Unicorn is today's continuous source for technological breakthroughs. SIRSI is the only vendor offering complete public and staff functionality for MS-Windows™ and Macintosh™ clients. SIRSI's award-winning WebCat™ is the first product to tap the Web's potential for delivering library catalogs and other Z39.50 databases to patrons around the world. Today, strategic alliances with customers such as Carnegie Mellon and other industry partners ensure that Unicorn and other SIRSI products continue to lead the industry. Tomorrow, there will be new breakthroughs. And Unicorn users will be the first to reap the rewards.

SIRSI®

You need to reach the world. It needs to reach you.™

Worldwide Headquarters:
689 Discovery Drive • Huntsville, AL • Tel: 205-922-9820 • Fax: 205-922-9818

FREE White Papers:
CD-ROM Technology – Making It Work for You.
Call 1-800-445-8633,
Extension 865.

The U.S. Patent Office trusts Todd.

Shouldn't you?

Todd CD-ROM servers make possible high-velocity access to the nearly 6 million patents on file, including the 1,093 patents granted to the prolific Thomas Edison alone.

The Patent Office is just one of the many archival facilities that depends on Todd for database search and retrieval environments. So does the library of the Nassau County Bar Association, as well as numerous other research and circulating libraries nationwide. Since 1986, Todd has led the way in providing safe and reliable network solutions on multiple platforms. Our elegant design allows for easy expansion and/or updating as needed. Todd delivers all this plus toll-free technical support and the industry's longest warranty. No wonder the word is getting around: Trust Todd.

The Todd system in place in the U.S. Patent and Trademark Office includes CD-ROM servers, towers and jukeboxes.

TODD ENTERPRISES INC.

31 Water Mill Lane, Great Neck, NY 11021
1-800-445-TODD • Fax: 718-343-9180

yes It runs with NetWare

Photo: Edison National Historic Site