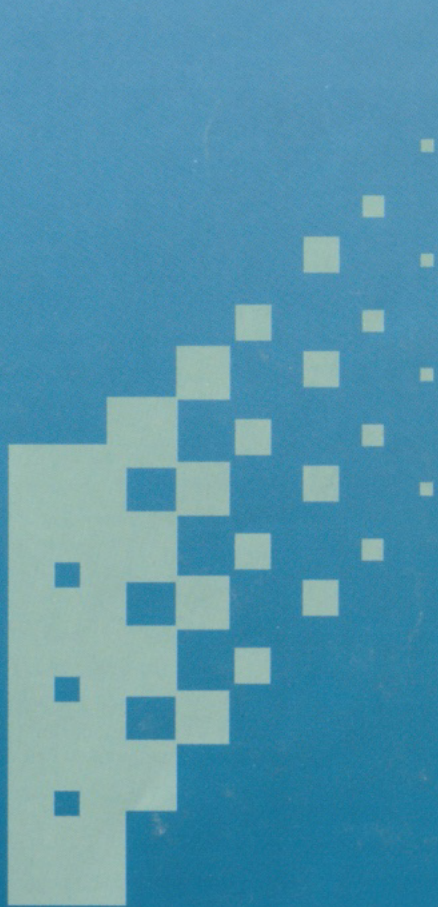
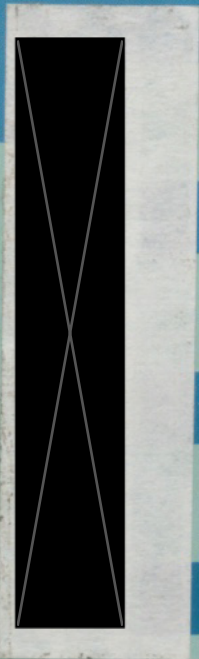
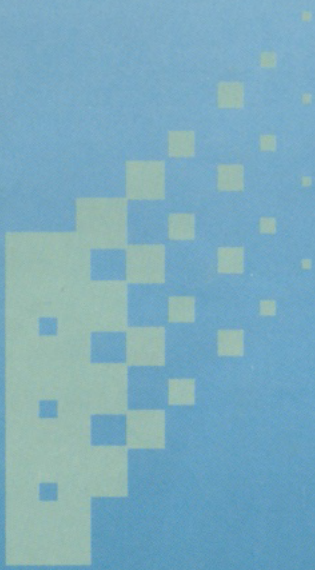


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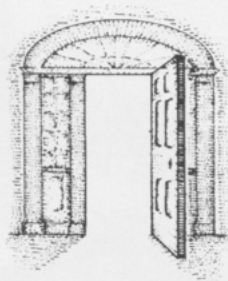
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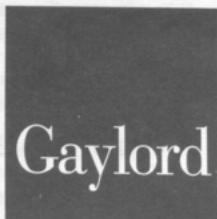
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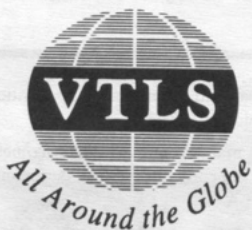
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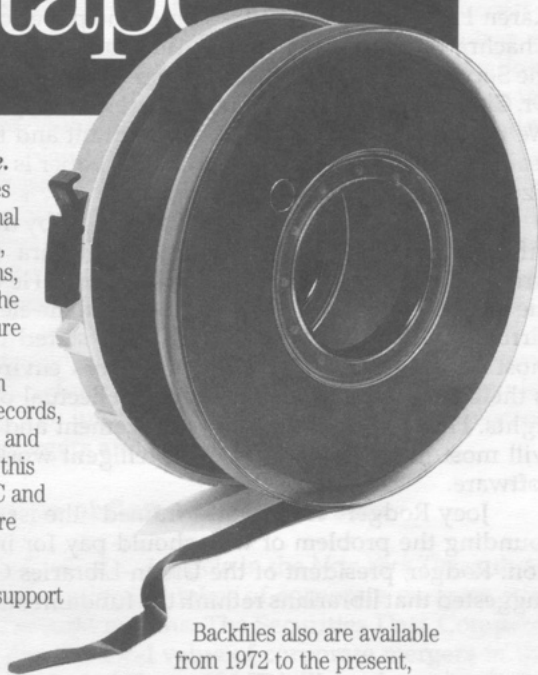
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## For Fee or Free: Trade, Technology, and Training in Multimedia Virtual Libraries

There was plenty of knowledge to be gained by the sixty-three participants at the third annual Directors' Conference held October 10-12, 1993, in Charlotte, North Carolina, and sponsored by VTLS. Ten presenters addressed the theme "For Fee or Free: Trade, Technology and Training in Multimedia, Virtual Libraries." A brief summary of the informal presentations given and the formal papers of Chuck McClure, Peter Young, and Karen Hunter follow. [Editor's note: The paper of Vinod Chachra was not ready for this issue but will appear in the September issue of *ITAL*. We regret this split because Dr. Chachra's paper is an integral part of the conference. We thought, however, that it is important and that our readers ought to have access to it. His paper is summarized below.]

Displaying the latest technology used by the VTLS InfoStation, VTLS President Vinod Chachra demonstrated the essence of a multimedia library. He defined the differences and relationships between the electronic, virtual, and digital libraries. Chachra stated that the most critical aspect of creating a network environment is the control and management of intellectual property rights. He predicted that this management and control will most likely be handled by intelligent workstation software.

Joey Rodger "named and framed" the issues surrounding the problem of who should pay for information. Rodger, president of the Urban Libraries Council, suggested that librarians rethink the fundamental ethics

of their profession to serve the public equally and without charge.

Eileen Henthorne, project director for Princeton University Libraries, spoke about the university's imaging project, which allows faculty members and students easy access to materials that predate the library's automation. Henthorne covered every phase of the project, from the initial selection of VTLS Inc. as the software vendor through putting the imaged card catalog online for everyone to use.

Martin Dillon, of OCLC's marketing division, told the audience that "the preeminence of the book as the packager of knowledge is declining, and we as a society are shifting from paper knowledge to electronic knowledge."

John Saylor, director of the engineering library at Cornell University, and David Martin, professor of materials science and engineering at Iowa State University, demonstrated the NEEDS project, an experiment using multimedia "courseware" to teach students in K-12 and college.

Frederic Glazer, director of the West Virginia Library Commission, closed the conference with a practical but exuberant presentation on the who, what, why, when, and how of gaining recognition for libraries and thus getting the funding to implement the projects and products introduced during the conference.

The fourth annual Directors' Conference, sponsored by VTLS Inc., will be held September 18-20, 1994. For an invitation to the conference write to Barbara Scheid, 1800 Kraft Drive, Blacksburg, VA 24060; e-mail address [scheidb@vtls.com](mailto:scheidb@vtls.com).



# Changing Information Access Economics: New Roles for Libraries and Librarians

Peter R. Young

*Fundamental changes in the economic structure of library and information services over the last several decades are forcing a reexamination of the values and policies that serve as the basis for our practices and services. Complex questions about equitable information access, barriers to free access to public information, and direct charges to library users for value-added services have sparked sharp debate in the library community for decades. However, recent advances in multimedia and network information technologies are shifting the nature and terms of the debate from "fee" or "free" services to broader global policy concerns. Attention is focusing on defining the "public good" in public service institutions. Changes in the way information is created, shared, controlled, transmitted, valued, protected, distributed, and exchanged are also changing public- and private-sector roles and organizational relationships. These changes have the potential for creating new service opportunities for libraries, librarians, and information service providers. National policy leadership is required to ensure continued balance between the social interests of the community and economic progress in the information age.*

## □ Introduction

It is always a pleasure to receive an invitation from Vinod to participate in these Library Directors' Conferences. It also provokes a feeling of excitement, mixed with anxiety. Over the last several years, I have discovered Vinod's gift for selecting a controversial and challenging conference theme, one that invites reflection, demands growth, and encourages learning. He also has the uncanny ability to select a topic that questions the basic, subconscious assumptions that we hold about libraries, technological change, and where this industry is headed in a future where the horizon is continually changing.

In the fall of 1991, just as I was concluding an exhausting and exciting year at the National Commission helping to plan the White House Conference on Library and Information Services, Vinod called me with an invitation to address the first VTLS Directors' Conference. The subject of my talk was the role of the federal government in relation to libraries and information services.

In a way, the first VTLS Library Directors' Conference allowed me an excellent chance to reflect on the recommendations resulting from the White House Conference concerning networking technologies and the use of these recommendations as the basis for redefining the federal role for libraries. This thinking has, over the past two years, provided the foundation for much of what has become the commission's program focus on the developing National Information Infrastructure.

At last year's second Library Directors' Conference, Vinod asked me to read and to comment on Congressman Rick Boucher's talk, titled "Legislative Review on NREN and Perspectives on Home Access." Reviewing Rep. Boucher's paper brought attention to the influence that the commercial telecommunications and cable television industries have in determining the future of libraries and the availability of information services. National Information Infrastructure policies are as important to libraries as they are to the private-sector firms involved with developing and deploying the communications networks, computers, databases, and consumer electronics that constitute the digital network infrastructure. Congressman Boucher's paper provides motivation to pay close attention to the flood of recent developments in the entertainment, telecommunications, information systems, and cable television industries. The implications of these activities go beyond simple mergers and acquisitions.

## Confluence of Commercial Interests

According to a recent article in the *New York Times*, there have been a record number of corporate mergers over the past several months. The Securities Data Company reports that the total value of corporate mergers in the third quarter of 1993 was \$86.77 billion, almost triple the third quarter of 1992.<sup>1</sup> The number of billion-dollar megamergers in this year's third quarter was the second highest on record, with twelve deals valued at a total of \$54.5 billion, up more than sevenfold from a year earlier. Not surprisingly, telecommunications and the motion picture industry were dominant themes. The largest deal of the quarter was the American Telephone and Telegraph company's acquisition of McCaw Cellular Communications Inc. for \$17.6 billion.

These frantic billion-dollar deals reflect corporate strategies to assemble media empires based on vertical

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**Peter R. Young** is Executive Director, U.S. National Commission on Libraries and Information Science.

The views expressed in this article are those of the author and do not necessarily reflect the policies or positions of the National Commission or the national government.

integration and segmentation of the emerging interactive multimedia services global marketplace. This new virtual services marketplace is estimated to be worth hundreds of billions of dollars in the very near future. Corporate investments, competition, alliances, and partnerships are forming through the convergence of telephones, computers, and television into applications like videoconferencing and home shopping services. Some of the recent high-profile activity includes the following:

- A high-stakes bidding war by Viacom (a cable television programming and media company) with help from Blockbuster Entertainment Corp. (the video rental store chain) and Nynex (the regional Bell operating company that owns New York Telephone and New England Telephone) against QVC Network (which operates a home shopping service) partnered with Tele-Communications, Inc. (the largest cable television company in the United States), in an effort to purchase Paramount Communications, Inc. (an entertainment empire that includes professional sports teams, book publishing houses, and the last major independent movie studio in America);
- The partnership between Continental Cablevision, Inc. (the nation's third-largest cable television company) and Performance Systems International, Inc. (the nation's largest provider of commercial access to Internet) to offer an interactive data service linking 2.9 million customers to the Internet;
- US West's investment of \$2.5 billion in Time Warner (owner of Home Box Office, with seven million cable subscribers), which means that this regional Bell operating company will develop advanced technology for consumer video services;
- The teaming of Spiegel Inc. (the catalog company with large-scale order fulfillment and distribution operations) with Time Warner (which operates cable systems in thirty-six states serving 7.1 million customers) to create two home shopping interactive cable channels for "video shopping mail" services that will allow "Catalogue Channel" customers to call up any "virtual store" on a television screen, view merchandise from all angles, and place orders interactively<sup>2</sup>;
- The plans of Comcast Corporation (the nation's third-largest cable provider and fifth-largest independent cellular phone company) to link wireless communications services to its cable networks<sup>3</sup>;
- Rupert Murdoch's acquisition of Delphi Internet Services to provide a global gateway to Internet services,<sup>4</sup> together with his acquisition of Star TV, a satellite broadcasting system based in Hong

Kong that reaches thirty-eight countries, which provides Murdoch's News Corp. the capability to extend satellite programming to two-thirds of the planet's population.<sup>5</sup>

The list of commercial alliances and global rivalry goes on and on. Hardly any commercial high-stakes player doubts the emergence of a new global marketplace that combines elements of entertainment media, cable television, telecommunications services, and the digital interactive network system industries. The competitive action between the cable operators and the phone companies is not confined to corporate boardrooms, however. Increasingly, battles are being waged in the federal regulatory and statutory arenas, with unclear results and consequences.

Events and deals such as these in the commercial areas, together with a host of technology-related networking infrastructure policy initiatives from the federal sector, are having a fundamental influence on policies and interests that will have a profound effect on our libraries, our services, our communities, and our society. These factors are also influencing the environment of the "fee or free" issue, which has consumed the library and information services field over the last several decades.

### VTLS Library Directors' Conference Themes

When Vinod called me this past July to tell me that the theme of the third Library Directors' Conference was "For Fee or Free: Trade, Technology, and Training in Multimedia Virtual Libraries," I saw clearly that, by selecting the hottest possible topic, he had thrown me from the frying pan directly into the fire. The themes of the two previous conferences were just a warmup for the explosive debate topic of 1993. The only recent topic that even comes close to the fee-or-free issue in sheer quantity of printed and spoken words is the "information superhighway," which is attracting the attention of editorial writers, conference speakers, and others in and out of the library and information services community. The digital interstate "high-speed" superhighway and the interactive multimedia marketplace are even the subject of recent feature stories in *Time*, *Scientific American*, and *Newsweek*.<sup>6-8</sup>

The element of controversy and debate about the fee-or-free topic is why I am here today representing my personal views. My views may not necessarily reflect those of the U.S. National Commission on Libraries and Information Science or represent the policies of the U.S. government.

This year's conference theme moves beyond an examination of the technological forces that are challenging libraries to integrate digital information with



services based on more traditional printed collections. The topic of fee-or-free directs attention to economic forces that are affecting every aspect of the global information, communications, entertainment, networking, and library fields. The issues are central to public-sector economics and national information policy, and they involve the institutional and professional values that have served as the basis of support for libraries and librarianship since the founding of the Republic.

This year's conference theme positions us to examine the economic consequences of advancing libraries and patrons toward a future interactive multimedia virtual library. Will this future involve free access to the new world of entertainment, information, and education? Or will the future involve payment for access to the interactive multimedia marketplace? The conference theme moves us towards the critical boundary that distinguishes libraries supported by public funds and the commercial world, where information is treated like an economic commodity.

The conference theme invites us to struggle with questions related to access, equity, public good services, social justice, intellectual property ownership rights, service charges, pricing policies, and service subsidies. The topic also highlights the potential for national information policy to create social distinctions between the information poor and a class of information rich with the means to afford access to a wealth of information services available only for a fee. The topic is exactly right for this moment in the development of multimedia virtual libraries amid the emerging national digital information and communications policy infrastructure. However, the topic may, in the final analysis, raise questions and issues that do not have simple, final, and complete answers.

### **Why Fee-or-Free as Conference Theme?**

Why does this fee-or-free issue generate such a flood of heated debate, argument, and controversy? And how can we possibly reach resolution between conflicting values representing the public-service contribution that is implied by public subsidizes for library services and the imposition of direct charges to library patrons for certain services?

One interesting thing about the fee-or-free issue for libraries is the close relationship between this library topic and issues affecting other public-sector institutions that are also encountering strong social pressure for change. From the recent push to restructure the national health-care system, to the growing movement toward reforming public education, to (my favorite) Vice-President Gore's national performance review agenda for reinventing the federal government, public

attention is drawn to "reinventing," "reforming," "redefining," "reinvigorating," and "revolutionizing" the nation's institutions and programs and the policies underlying publicly supported services offered to society.

### **What Is (Are) the Question(s)?**

In preparing this presentation, I considered giving two different short talks instead of one longer talk, and having a vote on which reflected the majority view. Each of the two short talks would have taken an opposite position in the fee-or-free debate. The first would have passionately explained that any imposition of patron fees for library services violates the most basic values of the library profession and of public service institutions, and therefore is morally and ethically unacceptable in light of professional values and principles. The second short talk would have logically explained that charging direct fees to patrons for certain library services is an economic, practical, and managerial necessity if librarians are to provide patrons with the fullest possible range of service options. The second talk would have concluded that librarians must choose to impose charges to users of specific services or be forced to eliminate and reduce services altogether.

The position of the first talk would have represented the view that "charging of fees and levies for information services, including those services using the latest information technology, is discriminatory in publicly supported institutions."<sup>9</sup> Those agreeing with the logic and values represented by the first talk would have argued passionately that to charge certain patrons for fee-based services would inconvenience those clients using free services. Finally, the anti-fee talk would have asserted that fee-based services are no solution for declining library budget support and purchasing power, since fee-services revenue rarely cover the costs of offering the service, much less provide a surplus to subsidize other free service offerings. The anti-fee position can be summed up by the motto of the American Library Association adopted at the 1892 Conference: "The best reading, for the largest number, at the least cost."

However, I decided not to present two separate talks this morning. Put simply, the issues do not allow a simple choice between two mutually exclusive options. The complex issues comprising the "fee service" topic involve questions of who pays for what services, what is paid, how payment is made (indirectly through partial tax support or by direct payment tied to amount of use), where payment is made, when payment is made, and how the payment relates to direct and indirect costs of offering the service.

Complex questions involving public and private service offerings defy a single solution. In addition, I



believe that larger economic, technological, and market forces are having a fundamental influence on the information services available to users/clients/patrons/customers. These forces and developments will have a profound effect on the question of fee-or-free services in the libraries of the future. The ultimate effect of these forces and developments is likely to be the death of our traditional concepts concerning the business of libraries.

The questions that arise in considering the fee-or-free issue in light of recent network and economic changes include the following:

- What new definition of public good is required in the current transition toward a national digital networked information infrastructure?
- When, and under what circumstances, ought the public to subsidize "direct and uninhibited" disintermediated access to information services and resources?
- Is it correct to characterize recent network developments as the formation of a digital interactive multimedia information services *marketplace*? If so, what is the balance between commercial gain and public interest, and what assurances are required to maintain this balance?

Finally, before we explore the various fee-or-free arguments for library services, I want to relate three stories that have struck me recently as offering important comments about the future of libraries. The stories reflect several opinions about where libraries may or may not be headed in the next few years.

The first is a story about a term used by the new chancellor at the University of Wisconsin-Madison. David Ward, in speaking to faculty and administrators earlier this fall about the new university operational context, mentioned "archival libraries" in such a way as to distinguish the university research library system from digital information systems on campus. Are the "archival libraries" different from the "virtual libraries" of the future? This distinction in the minds of certain university administrators (and certain policy makers), which separates information resources printed in book format from digital media resources, may have important consequences for the future of libraries.

The second recent story that struck me was included in a paper by Martin Dillon, director of OCLC's Library Resources Management Division, given in September at a Public Policy Forum sponsored by NCLIS and National Center for Education Statistics.<sup>10</sup> This anecdote concerns a distinguished panel discussing the social impacts of the information revolution. Someone in the audience asked how we could tell when the revolution was completed. One panelist responded, "When a person is able to enter a public library anywhere and

get the equivalent of a Harvard education through multimedia courses delivered on the library's equipment." A second panelist replied, "It won't be necessary for the public library to offer such facilities; they will be available in the home."

The remark reveals the belief that in the future all our information needs will be met through information appliances in our homes. In this version of the future, there is little need for libraries as educational institutions, except, perhaps for the poor, who must still use older paper text materials in "archival libraries" because they can't afford to purchase the multimedia interactive "Harvard" education available to other, more fortunate citizens.

The third and last story involves a comment by a government official closely associated with the Information Infrastructure Task Force, which is planning to "unleash an information revolution that will change forever the way people live, work, and interact with each other."<sup>11</sup> In a conversation this past summer, this OSTP official observed that if libraries were not currently scanning copies of print collections into digital format to respond to the patron demand for electronic access, then libraries would rapidly become irrelevant and would cease to exist in the next several years.

This view of the impending demise of print-based libraries is not altogether surprising. It reflects popular opinion. It also illustrates that if change occurs without the opportunity for policy makers and the general public to rethink the balance between public good and commercial profit, the nature of our social service and education systems, including libraries, will undergo dramatic change in the future.

## □ Terms of Fee-or-Free Debate

Complex questions about equitable information access, barriers to free access to public information, and direct charges to library users for value-added services have sparked sharp debate in the library community for decades.

Previously published arguments for and against charging fees to library patrons in publicly supported institutions can be summarized by the following points, which are taken from a study performed by the National Commission in the spring of 1985.<sup>12</sup> The points have a particular relevance today.

### Anti-Fee Arguments

1. Library services are a public good. Free access is a

fundamental right of each citizen in a democratic society.

2. The American tradition of free library services is damaged by charging fees. The introduction of fees is the beginning of the end of free library services.
3. Fees are illegal. (Some state legislation supporting library service is ambiguous and has been interpreted to exclude fees.)
4. Fees are discriminatory. Only those who can afford to pay may use special services. Fees negate equal access to information. They discriminate against those users who either lack the resources to pay for services or are unwilling to pay for services. An individual's access to information will be based on ability to pay rather than on need.
5. Fees represent a form of double taxation. Users are charged first by taxes to operate public services and then by charges for special services.
6. Libraries will place emphasis on revenue-generating services. Libraries will shift from nonrevenue-producing services to those which generate revenue, even if the nonrevenue services are vital to a part of society that cannot afford the fee.
7. Fees will have the long-term effect of reducing public support for libraries.
8. Fees might not be used to support library services. Revenues received from fees may be returned to the general revenue fund and allocated for nonlibrary uses. No one has shown that revenue has actually increased after imposition of fees, when all costs are taken into account.
9. The social benefits of library services are difficult to measure; therefore a fee cannot be efficiently assigned. Fees charged have been set by tradition and habit and not out of any analysis of market demands or costs.
10. It is difficult to define special services and basic services and to distinguish between them. Should citizens be expected to pay extra for better fire department equipment or additional police security assistance? Services once viewed as special are now viewed as basic.
11. Private- and public-sector markets are separate and should remain separate. The private sector should charge fees, reap profits, and compete in whatever manner is appropriate. Publicly funded libraries should provide services out of their budgets and should not provide services for a fee.
12. The cost of administering and collecting fees outweighs the financial benefits of fees.
13. Most users have little need for fee-based online services. Users don't need a speedy response; they simply want an answer. Fee-based online services

are really a convenience for the librarian, not the user.

14. If the service cannot be provided without a fee, the service should not be provided.
15. Improvements within library management and delivery of services would diminish the need for fees.
16. There is considerable staff resistance to fees.
17. Charging for a service subjects libraries to liability risks because of the responsibilities implicit in providing a service for a fee.

### Pro-Fee Arguments

1. Charging fees increases recognition of the value and importance of library services.
2. Fees encourage efficient use of public resources. Those who benefit from a given service should pay for its associated costs. An efficient pricing system allows the consumer the flexibility to choose from a variety of public goods and services and pay an amount that is in proportion to the amount consumed.
3. Fees promote service levels based on need and demand. The willingness of the public to pay for a service is a good indication of the public's demand for the service. However, willingness to pay is not the only indicator. By pricing public goods and services, local government is demonstrating the need to diversify its revenue base, and provide those services supported by the community.
4. Fees encourage management improvements. Examples of such improvements include increased productivity, better time management, better organization and control, and the establishment of a management plan based on staffing, equipment, and available resources. Accurate financial control is an ongoing responsibility for the departments that administer fee-based facilities.
5. Fees limit waste and overconsumption. Setting a fee can lessen inefficient or wasted use of public facilities. Fees have a rationing effect on user consumption. Indeed, a pricing plan may be structured to limit "peak load" situations or encourage use in off hours.
6. Fees enhance investment in ongoing maintenance and repair of public facilities. Fees improve the level of facility maintenance in providing revenue dedicated to maintaining the service.
7. Fees encourage a better understanding of the financial limitations of the local government. Pricing public facilities indicates that there are financial limits to what government can provide.
8. Premium service should be provided only to those willing to pay a premium. Users should be given



the choice of having these services. These are services not traditionally provided by the library.

9. The tradition of charging for services is part of American culture. Users pay fees for other public resources and services such as bridges, highways, museums, and parks.
10. Fees control growth of and lower demand for service. If service demand is greater than capacity to meet that demand, fees help to discourage "frivolous" use of services.
11. Escalating service costs make user fees a necessity. Information has economic value. "Free" access to information is not the same as "without charge." Adopting a no-fee policy forces substantial limits to service. "Free" services are unrealistic in times of tight budgets.
12. Most library users can afford to pay a fee. The public library serves a relatively young, educated, middle-income segment of the population. Low-income persons make limited use of the library. A fee-based library would relieve the poor of the tax burden associated with the free library.
13. Without fees, public and academic libraries could not serve the larger community or nonresidents. Fees for nonresidents are equitable since this group does not pay the taxes levied on residents. Fees for non-students are equitable because this group pays no tuition.
14. Fees cover only a small portion of the total cost of service provision.
15. Fees for most services are simple and inexpensive to collect.
16. Local policy may require libraries to charge for services.

These pro- and anti-fee arguments cover a number of general topic areas that can be summarized under the following two broad views about information as a public good and information as a commodity.

### **Information as a Public Good: Pros and Cons**

A concern about social equity, the public good, and the negative social impact of establishing economic barriers to differentiate and segment markets for library and information services is reflected in the logic underlying arguments against charging fees for library services. This line of reasoning involves the economic nature of the services provided by the library and the extent to which these services should be made available for the benefit of the entire population.

Stated in an extreme, either/or case: either the library provides services that constitute a public good, or information is a commodity. If library and informa-

tion services are beneficial to the entire society, then they represent a public good and should qualify for tax support outside the considerations of the marketplace.<sup>13</sup> If, on the other hand, information can be bought and sold at a profit, and the judgment is made that libraries providing information services are not necessary to the society as a whole, then information constitutes a commodity and should be handled by competitors in the private sector, subject to the values and rules of the marketplace. The important distinction between information as a public good and information as a commodity rests on the difference between information serving a social equity purpose and offering an array of services representing various degrees of efficiency and price available in a competitive market.

Those that argue that libraries provide public-good services see tragic consequences resulting when shared public resources functioning as a public economic "commons" are destroyed by individuals who are allowed unrestrained freedom for exploitation resulting in personal gain.<sup>14</sup> The argument for information as a public good posits that the introduction of fees will result in discrimination and inequalities.

Those who see information as a public good emphasize the unique economic nature of information. Information has many unusual economic characteristics that distinguish it from more tangible commodities: information is expandable, compressible, substitutable, transportable, diffusive, and sharable. As a commodity, information does not depreciate but is freely available, has value that often increases with reuse and repackaging, and is extremely difficult to control. Thus, the public-good argument maintains that broader access to information results in increased use that benefits society as a whole, rather than only certain portions of the public.

### **Information as a Commodity: Pros and Cons**

A managerial concern for improved service efficiency is reflected in arguments in favor of charging direct fees to users of library services. The important operational issue here is the competitive incentive for improving efficiency and adding value to services offered through diverse commercial and public channels. This position rests upon an inherent belief that conditions of free choice for consumers and profit maximization by producers result in socially desirable consequences.

One controversy in this area of information as a commodity arises when public institutions attempt to enter the marketplace with services that are seen to compete directly with private commercial offerings. An example of this is the Library of Congress fee-service authorization legislation introduced to Congress last



year. S. 345 proposes to allow the Library of Congress to offer costly services that appropriations or donations cannot support, such as detailed legal analysis or extensive computer searches. The proposed legislation has been stalled by intense debate over the library's right to charge for its services and distribution of copyrighted publications.

Supporters of the bill argue that it would allow the Library of Congress to keep pace with new technology and provide users with specialized information services unavailable otherwise. Librarians, publishers, and information-service providers complain that the library would set a dangerous precedent by charging user fees for its most technologically advanced services. Information-service providers fear the library could put them out of business.<sup>15</sup> The larger issue framing this controversy is defining the appropriate role for libraries as publicly funded institutions in an era of reduced budgets and advancing technology.

This same issue complicates the publicly regulated fields of telephone and cable television services. When government involvement is required to balance market conditions in the public interest, policy issues become complex and solutions do not always produce the desired results. Further adding to the complexity, competitive and regulatory controls make it difficult to identify the proper balance of public-good interests and private-sector profit potential. The complexity increases when the interests of different industries and business sectors converge, as is the case with the current corporate battles in the telephone and cable television industries.

The decision to charge direct user fees for library and information services is not simple. Complex operational questions arise along with policy concerns. The determination of pricing policies and practices for public institutions charging for information services raises complex questions. Alternatives include fixed fees, subscriptions, use fees, pay-per-item use, and time-sensitive charges by hours of use. Further, the treatment of information services as a commodity requires pricing decisions regarding fully, partially, or nonsubsidized service offerings, along with decisions about charging differential prices to segments of the patron population.

The successful marketing of fee-based services involves a different process from the traditional marketing techniques commonly used for free services offered to the entire community. Finally, the decision to charge for information services runs the risk that the service may fail to achieve institutional objectives. What constitutes failure of publicly supported "free" libraries may not be the same as failure of fee-based services. The lessons from the recent Library of Congress fee-for-services proposal need to be studied to understand that careful planning and coordination are needed to successfully

introduce the fee concepts, policies, procedures, and practices.

One of the values in thinking about fee-or-free is that thoughtful consideration of the issues underlying public interest and commercial activity eventually leads librarians into thinking about the value and price of what they do and to focus on managing resources rather than on managing information.

## The Changing Economic Structure of Libraries

Fundamental changes in the economic structure of library and information services over the last several decades are forcing a reexamination of the values and policies that serve as the basis for our practices and services. These changes, which are fueling the fee-or-free issue within libraries and information services, are not unique to libraries. The economics of the publishing and bookselling industries are changing as well. In an article in the September 13, 1993, *New York Times* titled "Rewriting Rules for Book Sales," Sarah Lyall writes of a "sea change taking place in bookselling across the country." She continues:

What is happening . . . around the country, is nothing less than a full-scale war over the future of bookselling—not just over where books are sold, but very possibly over how they are published, distributed, and marketed. On one side are the independent bookstores, many founded years ago by people who always seemed to know more about books than about business, and who made their mark with intimate understanding of their customers' tastes. Opposed are the national chains, which are using classic retailing strategies to flood the market with stores that offer discounts, coffee bars, and reading nooks but which, in the minds of independents, seem to care more about profits than books . . . all the major chains have moved decisively, taking the example of retailers in industries like home furnishings and toys to open one-stop shopping behemoths.<sup>16</sup>

The traditional economic model for a library is not that different from that of the independent bookseller. We all know examples of both libraries and independent bookstores that reflect a passion for books and readers. However, neither institution is designed to compete with mass-marketing techniques involving discount merchandising, large-scale inventory, and massive retail services that are modeled on those of WalMart and other super-discount retail outlets. The traditional model of library economics involves investment in a carefully selected collection, housed in a grand but static facility, with internal support systems and procedures

designed to provide limited bibliographic access to local collections with human resources arrayed in a hierarchical management structure designed to provide services to support location-specific populations. Change occurs slowly in such cultural climates, especially when the average tenure of staff is numbered in decades, not years, and the average system is expected to last over ten years.

Standard measurement systems in this traditional library economic model collect quantitative data about collection and staff size as indicators of quality and effectiveness. Within this traditional library model, there are few generally accepted standards for measuring effectiveness, assessing organizational performance, or evaluating the overall success of the institution. The fact that libraries have not related service offerings in terms of economic value serves as a disadvantage when confronted by stiff competition for declining tax support.

Changes in publishing are also fueling changes in the economics of libraries. In a perceptive article in the June 1, 1993, *Wall Street Journal* titled "Technology Threatens to Shatter the World of College Textbooks," Meg Cox explores the "technology revolution sweeping higher education." She writes:

Coming soon, leading educators say, is a world where college students will buy more computer disks than books and most of the books remaining will be printed just days before class. Students will use personal computers to search whole libraries' worth of research books without leaving their dorm rooms. Assignments will routinely include multimedia projects, mixing words with sound and video.

Some publishers see the writing on the screen. "If textbook publishers don't wake up and learn how to make, market, and distribute something other than a book, the rug will be pulled right out from under us," says Robert Lynch, director of McGraw Hill Inc.'s Primus service, which allows professors to customize its textbooks. "On the other hand, if we do things right and develop the full potential of high-tech educational publishing, this could be a \$50 billion business instead of a \$2.6 billion business."<sup>17</sup>

Research institutions, universities, and colleges are experiencing a decline in the proportion of budget resources devoted to libraries over the past twelve years, according to a recent study by the Andrew W. Mellon Foundation.<sup>18</sup>

The study suggests that libraries have embarked on what promises to be a period of tumultuous change, as the computer revolution redefines scholarly publishing and transforms the library from a warehouse of printed materials to a gateway for gaining electronic access to information.

The study says that the portion of library budgets spent on salaries declined to 52 percent in 1991 from 62

percent in 1963, while the portion spent on operating expenditures—including technology—rose to 14 percent from 6 percent. The portion of the budget spent on materials and binding remained at about 35 percent during the period.

The authors indicate that they expect the trend to continue as technology changes the role of libraries. "In particular, technological advances support suggestions that management of scholarly communication can now begin to separate access from ownership and concentrate on assuring access to scholarship and research, with questions of physical location of materials becoming secondary," the study says.<sup>19</sup>

Our traditional model of public support for public institutions is significantly different from the commercial institutional model, in which performance measurement is based on revenue which represents a return on investment. You know when you have failed to make sound projections of customer demand in a commercial enterprise if your expenses exceed revenues. Few private companies continue to be financially viable if their sole purpose is to serve the public interest.

Symptoms of change in the traditional economic model of a library include the following:

1. Rapidly increasing costs of materials, human resources, and facilities maintenance resulting in a gradual shift in library expenditure patterns over the last three decades. The percentage of library expenditures for salaries has declined from 62 percent in 1963 to 52 percent in 1991, while operating expenditures have increased from 6 percent to 14 percent. Expenditures for collections have increased modestly from 33 percent to 35 percent in the same period.<sup>20</sup> Similarly, over the last fifteen years, the prices of U.S. books and serials have increased 218 percent and 307 percent respectively. This represents an average annual increase in material prices of 17.5 percent. With shrinking staffs, declining acquisitions, and increasing operational expenditures, the library would seem to be in danger of becoming a warehouse.
2. Growing reluctance or inability of public support sources to provide sufficient resources to continue to maintain institutional effectiveness, much less to meet the growing demand for enhancements to existing service delivery capabilities. With local and state expenditures for health care and prisons increasing at a more rapid rate than expenses for other public services, pressures are growing to reduce support for libraries. As a result, the traditional justifications for increasing library budgets are encountering stiff opposition from competing social services arguing for a greater share of a diminishing public purse.



3. There are significant increases in the quantity, range, and variety of globally published resources available for acquisition. Especially in the academic, research, and scholarly arena, tremendous and explosive growth in the volume and kind of material produced challenges the collection-development objectives and resources of the national system of university libraries. This growth is fueled both by the drive toward specialization—creating subdisciplines, interdisciplines, and cross- or multidisciplines or “twig subjects”—and by technology’s ability to create greater volumes of research data. We now have terabit data files transferred and exchanged among scholars and researchers, where once there were only articles in printed scholarly journals.
4. Pressure has been coming from library patrons and information system vendors to acquire systems and capabilities that provide access to a wider range of information resources. This challenge to the traditional economic model of the library is perhaps the most profound. While the pressures of reduced budgets call for responsible management, the vision of the multimedia virtual library raises the expectations of both library staff and patrons.
5. Library economics are threatened by changes in the economics of publishing, the increasing vertical integration of information suppliers, and the ability of electronic publishers, information system providers, and authors to bypass libraries with services delivered directly to customers and patrons. Direct personal access connections to fee-based commercial information-delivery services can be seen as a threat to the library’s mediating role in providing access to information resources.

Libraries are organized and structured to expend resources on acquiring materials and delivering services; they are not well equipped to support fiscal and administrative operations, which require processing and accounting for service payments. In this respect, libraries are unlike the national and regional telecommunications companies, which have transaction-based accounting systems that are required to bill customers by category for a wide variety of services, some of which are time-sensitive.

In order to appreciate the extent to which the economic model of the library is facing the threat of radical change, it helps to understand that the most basic assumptions underlying research, communication services, and information-delivery systems are called into question. Changes to the library economic model are raising questions about the values supporting our traditional policies and practices.

## Impact of Network Technologies on Fee-or-Free Debate

Recent advances in multimedia and network information technologies are shifting the subject of the nature and terms of the debate from “fee” or “free” services to broader global policy concerns.

If it were simply a matter of libraries’ weathering another period of evolutionary change and economic transition, there would be a good chance that sound managerial practices would, in time, address the challenge of declining budgets and enable libraries to take advantage of opportunities presented by network-based technologies. However, network technologies are effecting basic changes in the way information is created, shared, controlled, transmitted, valued, protected, distributed, and exchanged. These technologies are changing public- and private-sector roles and organizational relationships. Digital multimedia and network technologies are fostering a paradigm shift toward a digital “superhighway” enabling access to multimedia virtual libraries that exceed one institution’s abilities to build, locate, and preserve the growing electronic store of knowledge.

A paradigm shift is not just another phase of evolutionary change. Rather, the shift in paradigm requires a fundamental and revolutionary rethinking of institutional missions and an examination of the presuppositions involved with information relationships. This same fundamental change-orientation is what the National Performance Review is designed to accomplish within the federal government. The review represents a commitment to change, to move from red tape to results, to create a government that works better and costs less. The recently published report of the National Performance Review issued September 7, 1993, coupled with proposed cutbacks in the federal workforce, calls for putting customers first, empowering employees to get results, and cutting back to basics.<sup>21</sup>

Those in the library and information services fields also need to refocus institutional services to meet client needs. If libraries are called upon to mediate access to network information resources unavailable in local collections, librarians will be required to develop the skills, abilities, and tools required to assist patrons in negotiating and interpreting these resources.

Questions about the nature of the public good provided by library and information services arise quickly within the emerging information network infrastructure. For example, since network users have access to many different global information resources, how can the notion of public good be applied to a user community as wide and as diverse as the twenty million



Internet users, whose ranks are growing at a rate of 15 percent per month? Also, since a digital information resource accessible on the Internet can be used by and shared among many different users, how can traditional structures of property ownership be applied and enforced?

### **Opportunities for Creating a New Paradigm: New Roles for Libraries and Librarians**

These changes have the potential for creating new service opportunities for libraries, librarians, and information service providers.

Network technologies are changing the functional and institutional boundaries between users and information providers. Digital networks allow enhanced accessibility, availability, and delivery of collection resources. If you accept the view that libraries can be seen to be an invention of publishers, designed to link readers with books at a time when the economics of print technology required the library to serve as an intermediary that mitigated the imperfections inherent in an inefficient distribution system, then network technology efficiencies can be seen as correcting the imperfections that resulted in market failure. Under this view, network technologies make libraries obsolete. If you can deliver services to the market effectively with interactive digital network systems, why do publishers need libraries as part of the distribution channel?

As we have seen, there are tremendous external environmental factors in the commercial entertainment and communications sectors exerting momentum for change in development of an interactive digital multimedia services market. The recent highly visible activity in this arena involving giant entertainment, cable television, and telecommunications conglomerates reveals a concern about effective mechanisms for protecting intellectual property content ownership. Copyright ownership of media properties is strangely transformed and confused in an electronic network environment.

The issue of copyright ownership of digital multimedia works has direct bearing on the virtual library of the future. If libraries are to continue to offer public access services without user fees, arrangements between virtual libraries and virtual publishers are required to assure that ownership and use rights structure the virtual patron's use of the virtual multimedia library resource. Sound strange? It should. We lack a definition of virtual copyright, or of virtual property ownership, much less a clear definition of a virtual library. But we must define the virtual user's relationship to the virtual work in the virtual multimedia library if we are plan to

introduce either fee-based services or free-access services to virtual multimedia library collections.

If the library of the future is to serve as a safety net for public, civic, or institutional access to network resources, the library and information services communities need direct involvement in policy discussions and decisions to ensure that public-good interests are balanced with commercial interests. Public servants acting as librarians have the perspective, values, and organizational abilities to propose policies that balance interests. Amid the confusion of cross-industry alliances, commercial mergers, vertical integration, and investment partnerships involving cable television, entertainment program providers, interactive digital information systems, and the telecommunications industry, discussions need to occur which center on the creative potential, access equity, and balance between social values and economic need inherent in determining appropriate public- and private-sector roles within the emerging network multimedia interactive digital services marketplace.

We need to move beyond the either/or, us/them, public/private dichotomy that has characterized discussion and debate of the fee-or-free issues of the last several decades. The library and commercial communities need to recognize that together they constitute an integrated fabric of knowledge services. Libraries, publishers, vendors, and information service enterprises share a basic and primary interest in improving the quality of life, educational attainment, and access opportunities for the general population. We are not engaged in a struggle to justify public support only to keep libraries open. Rather, at a higher level, we are all seeking ways to better serve the public interest.

Cable and phone companies are beginning to cooperate in formulating plans to offer video and interactive services that build on complementary capabilities. Telephone networks can switch millions of phone calls in an instant, but their copper wires lack the capacity to carry an acceptable video signal. Cable networks have high bandwidth capacity, but are largely one-way transmissions with little switching capability. In addition, phone company billing systems are good at tracking billions of small transactions, something cable companies are not good at and for which they will have to develop expertise if they are to offer video-on-demand services.<sup>22</sup>

The complementary capabilities of the telephone and cable industries create a natural tendency toward alliances that build on mutually supportive expertise. Similarly, libraries need to create opportunities to develop alliances with partners from the cable, communications, and information services sectors, as well as with other public and commercial media interests. For example, public television's plans for developing interactive

multimedia education application programming appear to present interesting potential linkages with libraries.

Libraries would be less paranoid if they could see that for-profit and public-service organizations represent similar principles and values that are inherent to a democratic society. Whether they pay for access to information through tax subsidies that come indirectly from individuals and corporations, or whether individuals are charged directly for access, with partial institutional subsidy and overhead, the availability of and access to the information infrastructure are keys to future success. The potential for creative application of network technology must ensure universal availability of vastly decentralized services through every reasonable means.

New service opportunities for partnerships that cross public and private sectors are rapidly arising. Partnership opportunities for interconnection also arise between federal, state, and local governments. An example of this synergy is found in the Iowa Communications Network (ICN), a statewide, publicly financed, advanced information network, providing voice, data, and video information service to state and local agencies, libraries, local schools, community colleges and universities within Iowa. ICN is scheduled for full operation this month [Oct. 1993]. Here is the concluding statement of a Working Group of the Interagency Information Resources Management Infrastructure Task Group published in the April 1, 1993, *Iowa Communications Network Study*:

The tools provided by information technology can improve citizen access to services and information and increase citizen participation in government. Such tools can also assist in developing close cooperative intergovernmental and interagency relationships in order to eliminate unnecessary duplication of effort and promote enhanced citizen access to services and information.<sup>23</sup>

The example of essential public services provided by the Iowa Communications Network presents alternatives to the commercial services currently involved with the Internet. In a recent *Library Journal* article titled "Will Commercialization of Internet Help Libraries?" Michael Rodgers writes:

For the first time since its inception in 1986, the number of commercial networks registered on the Internet outnumber libraries, schools, and other non-profit-educational services. The notion of an information superhighway dominated by commercial entities has, in the past, aroused fear in the library community that Internet's principal function as an educational tool would be altered, that connection prices would rise, and that those pioneers who nurtured it would be forced to the wayside by powerful commercial interests such as banks, cable companies, and communication services. . . . The National Science Foundation (NSF) has . . . begun looking for outside sources to fund Internet connec-

tions by soliciting bids from companies for privatization of the net.<sup>24</sup>

The library function is needed to balance private interests and equitable access to essential information. Librarians also need to assume new roles of information navigators, consultants, and entrepreneurs. This involves migrating from place-specific collections of resources to functional fulfillment capability.

Librarians have the opportunity to develop new roles within the rush of creativity that is being unleashed by networks. The opportunity, however, requires librarians to move beyond questions of free or fee, just as the developing information infrastructure requires that we move beyond doubts about commercialization and public support. It may be true, as Paul Evan Peters of the Coalition for Networked Information says, that "the Internet represents as much a new social frontier—with hunters, gatherers, settlers, storytellers, new tools, and electronic flora and fauna—as it does a superhighway," but it is equally as true that the Internet presents an enormous business opportunity for commercial interests. Infrastructures of the future are probably going to be hybrid commercial/public ventures where entertainment, information, education, and business applications, free and fee, travel the global glass superhighway together, rather than on separate channels.

## Conclusion: Opportunity for National Leadership

National policy leadership is required to ensure continued balance between the social interests of the community and economic progress in the information age.

The creation or emergence of the new virtual interactive multimedia electronic marketplace is rapidly progressing. This is taking shape through the cross-industry alliances that are rapidly dividing turf in the high-stakes maneuvering for market definition, control, and integration covered closely in the business section of many newspapers. Heavy public-policy pressure is shaping and conditioning the statutory and regulatory environment of the new media marketplace. What has not yet emerged is a clear public or civic agenda that represents public interests and that reflects the values and principles of the library community.

If the value interests of the library and information services community are not represented in the formation of market policies, the library perspective on free-or-fee services is likely to be bypassed. Libraries need an to play active role in providing public information services that are critical in maintaining community relationships.



In *Lincoln at Gettysburg*, Gary Wills points out that the 272-word Gettysburg Address provided Lincoln an opportunity both to sweeten the air of the battlefield and to cleanse the Constitution.

He [Lincoln] altered the document from within, by appeal from its letter to the spirit, subtly changing the recalcitrant stuff of that legal compromise, bringing it to its own indictment. By implicitly doing this, he performed one of the most daring acts of open-air sleight-of-hand ever witnessed by the unsuspecting. Everyone in that vast throng of thousands was having his or her intellectual pocket picked. The crowd departed with a new thing in its ideological luggage, that new constitution Lincoln had substituted for the one they brought there with them. They walked off, from those curving graves on the hillside, under a changed sky, into a different America. Lincoln had revolutionized the Revolution, giving people a new past to live with that would change their future indefinitely.<sup>25</sup>

Our future is also changing, 131 years later, through words, images, and sounds interactively blended in the form of multimedia virtual libraries. Just as Lincoln used the Gettysburg Address to reestablish the Declaration of Independence provision that all men are created equal, the library and information services community needs to revolutionize the basic principles of the field. We are approaching a sea change in history, where the public's right to equal access to the tools required to navigate successfully in the global infosphere of the twenty-first century requires a rebalancing and rearticulation in order to assure that democratic principles and basic, humanistic values continue to function as the presuppositions of our society and that these same values and principles are reflected in the information infrastructure available to all Americans.

Librarians need to look for opportunities such as this conference to discuss openly and passionately why we selected careers in the public sector. We also need to recognize that those colleagues who argue for the right to, or even the necessity of, charging fees for services, do so from a position of logic that is just as viable and defensible as those who passionately argue for the maintenance of the public-good nature of free, subsidized service offerings.

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# Network Literacy: A Role for Libraries?

Charles R. McClure

*We're all connected by communications miracles. It's the people, still fumbling with the Switch Hook Flash, who are stuck in the Stone Age (Gleick 1993, 26).*

The skills required to use the switch hook flash on one's telephone pale in comparison to the skills and knowledge needed to use resources and services in the evolving National Information Infrastructure (NII) and the Internet/National Research and Education Network (NREN). While some people begin to develop and others expand and refine their network skills and competencies, the vast majority of the public has no skills related to using these new communications technologies, and many live in fear of a passing thunderstorm that might force them to relearn (again) how to reset the LCD time display on their VCR or microwave.

There is an educational disconnect between the rapidly developing communications technologies and information resources available to the public, and the public's ability to use these resources. An elite few, typically academics, researchers, technology enthusiasts, and "network junkies," are network literate. While the gulf between these network-literate "cyberonauts" and the nonliterate continues to widen, the educational system remains largely oblivious. Individuals in this emerging electronic society primarily learn on their own to be productive in and empowered by this new environment, or they are left behind.

Significant changes in the communications infrastructure are affecting the very fabric of society. Information technologies in telecommunications, cable television, wireless satellite transmissions, the Internet/NREN, and other areas now provide an incredible, and seemingly endless, array of information resources and services. Experts knowledgeable about these technologies tell us that future uses and applications will be limited only by one's imagination (The Info Highway 1993). Network literacy—the ability to identify, access, and use electronic information from the network—will be a critical skill for tomorrow's citizens if they wish to be productive and effective in their personal and professional lives.

The NII, an amorphous term for the collection of these information technologies and the infrastructure that supports them, appears to be taking shape (U.S. Congress 1993a). We are moving toward establishing an ubiquitous electronic network that connects different information technologies to endless streams of digital data throughout the country and the world. Indeed, "network" is an evolving term that includes these various computer, telecommunications, cable TV, and other technologies.

Meanwhile, the telephone, telecommunications, and cable television companies are battling for the rights

for (and profits from) wiring individual homes to a massive array of information providers, resources, and services (Stix 1993). But while the battle for connecting individual homes to this evolving information infrastructure is still developing, it is clear that the Internet/NREN already provides a great deal of connectivity throughout the country and will have a significant impact on society. Indeed, the "networked society" is already taking shape.

While the technological developments related to networking are significant and draw much attention, there is also an infrastructure that supports these technologies. The nontechnological aspects of the infrastructure includes the human resources, political and social processes, organizational support, and tools (both physical and attitudinal) people need to use the new technologies. The technological infrastructure that supports the Internet/NREN continues to grow at a much faster rate than our knowledge about how to use the network (to say nothing of the switch hook flash), the network's impacts, its uses, and its effects on organizations and individuals.

Despite the traditional role of libraries in providing a range of information resources and services to the public, federal policy and planning have been inadequate in assisting libraries to make the transition to the networked environment. Nor has adequate planning or assistance been given to the public in order to learn how to use and access these electronic resources. Making these resources available to the public, learning how to communicate and use the network, and ensuring network literacy among the population are critical to the well-being of people in the networked society.

In our fascination with the new information technologies, we have given inadequate attention to how society will migrate to this networked environment. Will the networked society result in the exclusion of a range of services and opportunities to those unable, for whatever reason, to move to the networked environment? Who will be responsible for educating people to use the networking technologies and to take advantage of the wealth of resources currently available and yet to be developed? How will the public participate in decision making about technological applications that will affect the fabric of their society if they are network illiterate?

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The purpose of this paper is to explore educational and societal issues related to network literacy. How we address and resolve these issues will have a significant impact on how society evolves, how notions of literacy and a literate society evolve, and the degree to which social equity can be enhanced in this country. The country must develop strategies to develop the Internet/NREN as a vehicle for (1) "reconnecting" different segments in our society, (2) promoting a network-literate population as a means to ensure social equity, and (3) enhancing the role of libraries and the educational community to accomplish these objectives.

## A Policy Perspective on the Internet/NREN and Literacy

Although the intent of this section is not to provide a policy analysis of the Internet/NREN and of literacy, it is interesting to juxtapose brief overviews of these two areas. There have been few efforts to consider relationships between these two policy areas. Yet the successful development of the NII will require both a new, expanded information policy system and network literacy throughout society.

Until the Clinton administration, the federal policy framework for creating the Internet/NREN emphasized the development of new networking technologies and the creation of a "level playing field" for the private sector to develop the network. Policy supporting public-sector uses of the Internet/NREN has been inadequate. The library and education communities have had minimal input and impact on developing the NREN plan. The policy framework has promoted the use of the Internet/NREN among researchers and scientists working primarily on "grand challenges" rather than developing it as a "public right" to which all citizens are entitled. This may change with Clinton administration policy initiatives and the introduction of H.R. 1757 in March 1993.\*

Moreover, development of the Internet/NREN is uneven. Gigabyte transmission speeds are being developed while the typical American classroom has no telephone line to connect to the network; some individuals have free (oftentimes subsidized) use of the Internet and others must pay significant fees; the gulf between network literacy and illiteracy continues to widen; and overall, large segments of the population appear likely

to be bypassed as the networked society evolves. How society will migrate to this networked environment is unclear.

Interestingly, the Department of Education has limited involvement in the deployment and planning of the NREN or the NII. Despite some recent activities for promoting literacy and the passage of P.L. 102-173, there is only minimal understanding of literacy in an electronic age or for the networked society. Inadequate thought appears to have been given to the educational roles of national networking or how the network could be used to enhance the country's educational institutions.

Federal policy related to literacy is very decentralized and dependent, to some degree, on a host of private initiatives and local efforts—all largely uncoordinated. In addition, literacy policy is best characterized as developing basic reading and writing skills. Moreover, "OTA finds that technology is not a central consideration for most literacy programs" (Office of Technology Assessment 1993, 15). Literacy in terms of information literacy, information problem-solving skills, or network literacy is not considered in the existing policy framework.

Apparently the belief is that public use of the network will occur naturally with little or no federal, state, and local planning and support. Either the private sector will provide for public uses and educational applications, or the library and educational community will marshal the resources needed to move the population into the networked environment. *Somehow, someone or some institution will help the country move to the networked environment and provide access to information resources, services, and holdings in an electronic format.*

## Networked Information and the New Literacy

The term *literacy* means many things to different people. In recent years, different types of literacies have been proposed and defined. Introducing the term *network literacy* into this already confusing array of terms and definitions requires some discussion of the various terms and how they are being used.

### Types of Literacies

With the range of services and resources available over the Internet, what constitutes literacy, given this evolving networked society? P.L. 102-173, *The National Literacy Act of 1991*, section 3, states:

\*As of May 1994, H.R. 1757 was passed by the House and is being considered by the Senate as part of the Telecommunications Act of 1994.



The term "literacy" means an individual's ability to read, write, and speak English, and to compute and solve problems at levels of proficiency necessary to function on the job and in society, to achieve one's goals, and develop one's knowledge and potential.

This notion of literacy is the traditional view—and one that is increasingly out-of-date. *Computer literacy*, for example, is an extension of traditional literacy, requiring that individuals can complete basic tasks on a computer such as word processing, creating and manipulating data on a spreadsheet, or using other types of software. The notion of *media literacy* recently has been introduced and is described as follows (Aufderheide and Firestone 1993, 1, v):

Media literacy, the movement to expand notions of literacy to include the powerful post-print media that dominate our informational landscape, helps people understand, produce and negotiate meanings in a culture made up of powerful images, words and sounds. A media literate person—and everyone should have the opportunity to become one—can decode, evaluate, analyze and produce both print and electronic media.

Thus media literacy is a step beyond traditional notions of literacy, although the definition does not specifically mention computing skills or skills/knowledge related to locating, processing, exchanging, and using information in a networked environment.

Probably the most encompassing notion is *information literacy*. The Association for Supervision and Curriculum Development stated in a 1991 resolution:

Today's information society transcends all political, social, and economic boundaries. The global nature of human interactions makes the ability to access and use information crucial.... Information literacy, the ability to locate, process, and use information effectively, equips individuals to take advantage of the opportunities inherent in the global information society. Information literacy should be a part of every student's educational experience. (Breivik 1992, 7)

Although it might be assumed within this definition, the resolution could be strengthened to make clear that information literacy includes an "ability to locate, process, and use information effectively" *regardless of delivery mechanisms and the type of format in which that information appears*; that is, to be literate, one must be literate with both print and electronic formats.

Hancock (1993, 1) provides additional detail describing information literacy, concluding that "education systems and institutions must take seriously the challenges of the Information Age. This includes restructuring the learning process to reflect the use of information in the real world, [and] changing the role of the

teacher from presenter of prefabricated facts to facilitator of active learning." Information literacy thrives in a resource-based learning environment rich in a variety of print and electronic information.

Ochs et al. (1991) provide an excellent literature review of information literacy. They describe a very useful set of goals and objectives related to developing information literacy skills (Ochs et al. 1991). The goals and objectives were developed in the context of undergraduate student skills and knowledge, but they are useful in expanding our thinking toward network literacy skills. Moreover, the objectives on the authors' list suggest that such skills not only are important in higher education, but are basic to leading a productive life in a networked society. At the core of the notion of all the various literacies is the idea of "information problem-solving skills."

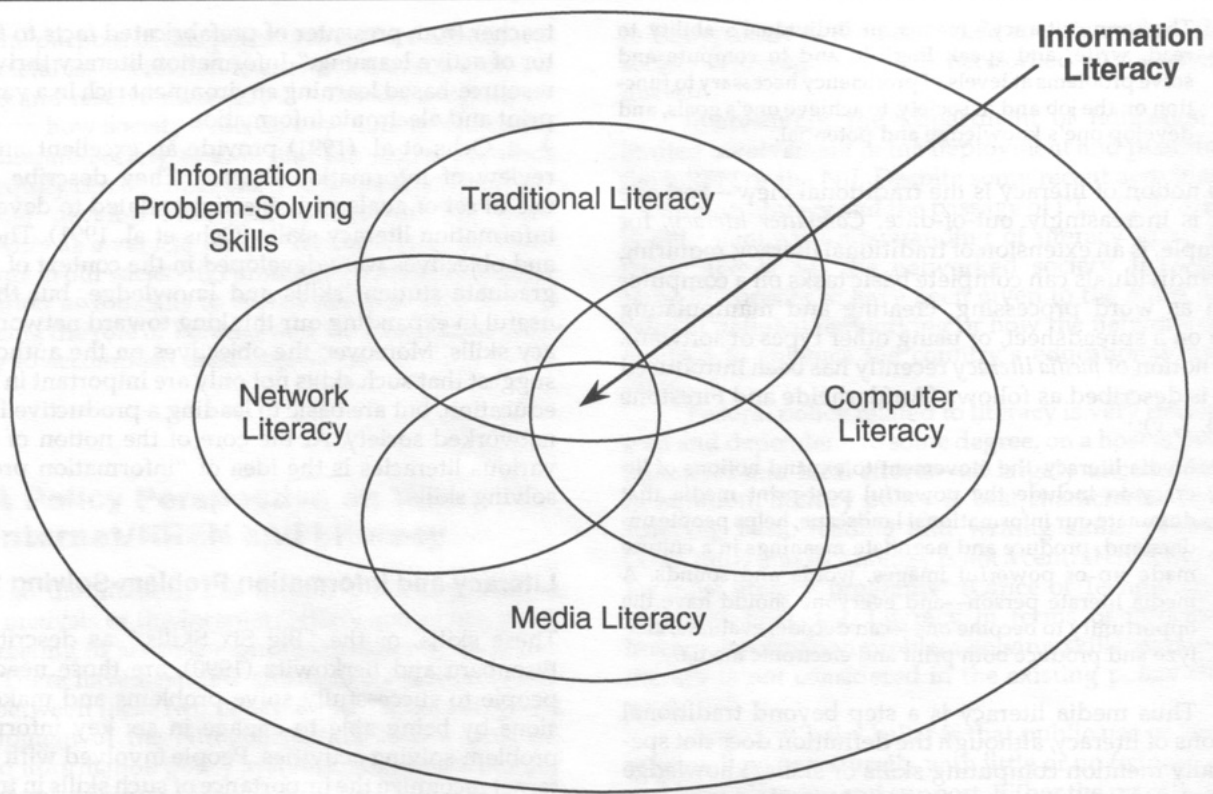
### Literacy and Information Problem-Solving Skills

These skills, or the "Big Six Skills," as described by Eisenberg and Berkowitz (1990), are those needed by people to successfully solve problems and make decisions by being able to engage in six key information problem-solving activities. People involved with the Internet recognize the importance of such skills in training and education programs. What they sometimes fail to recognize, however, is the importance of developing Internet skills within the contexts of (1) real need and (2) the overall information problem-solving process.

The first context is real need: curricular, life, or work. While it is certainly possible to learn skills in isolation, practice and research confirm that people learn best when the use and purpose are clear. Students can probably learn to communicate via e-mail or to access a NASA database, but they will eagerly engage and internalize these skills if they see how they directly relate to their school assignments, personal interests, or work requirements. The second, and often overlooked, context is information problem-solving process itself. Computer and telecommunications technologies are supposed to extend our abilities to solve problems. That sounds fine in the abstract, but what does it really mean? Again, practice and research tell us that when people understand how specific skills fit into an overall model or process, the power and usefulness of the specific skills are expanded.

Task definition is step one of Eisenberg and Berkowitz' Big Six approach to information problem solving. Electronic communication is also a powerful tool for consulting with others about the best strategies for seeking information (step two), to locate and access the information itself (step three), to extract relevant





**Figure 1.**  
Thinking about Literacy Concepts

information (step four), to present the results (step five), and to seek reaction to your work (step six). Therefore, it is essential to design and deliver Internet and technology training within the overall problem-solving context.

The two contexts, need and process, provide the necessary anchors for meaningful technology training—and increasing network literacy. This is true regardless of whether those receiving the training are students getting their first glimpse of the Internet, unemployed workers involved in retraining programs, or corporate executives seeking to stay on top of emerging technologies.

Notions of information problem solving and the Big Six skills can be used to enhance our conceptualization of various types of literacies and how they are related to one another. Of concern is that (1) we cannot wait until college for such skills to be obtained, (2) it is uncertain how individuals who have not gone or do not intend to go to college obtain such skills, (3) the degree to which members of the education and library communities themselves have such skills and can impart those skills to others in the public is also uncertain, and (4) a range of additional skills, unique to the network, need to be added to the list.

### Recasting Notions of Literacy

Recasting information literacy definitions into those of a networked society is mind boggling. Project Literacy U.S. estimated that as many as 23 million adult Americans are functionally illiterate, lacking skills beyond the fourth-grade level, with another 35 million semiliterate, lacking skills beyond the eighth-grade level (White House Conference on Library and Information Services 1991). It must be remembered that these numbers consider literacy in a print-based society and not in a networked society.

At one level, an individual must be able to read and write—the traditional notion of literacy. At another level, the person must be technically literate, e.g., be able to operate computer, telecommunication, and related information technologies. At a third level, people need media literacy, and at yet another level they need network literacy. All of these types of literacies can be cast in the context of information problem-solving skills—as suggested in figure 1.

Papert explores the importance of redefining literacy in a networked society. He discusses “knowledge

machines" that provide children with interactive learning opportunities that include virtual reality and the freedom to explore and interact in an electronic knowledge arena (1993, 50):

School will either change very radically or simply collapse. It is predictable (though still astonishing) that the Education Establishment cannot see farther than using new technologies to do what it has always done in the past: teach the same curriculum. . . . I would go further: the possibility of freely exploring worlds of [electronic] knowledge calls into question the very idea of an administered curriculum.

But what Papert does not tell us is the specific skills and knowledge these children will need to be literate in this networked environment and how they will be taught these skills.

A beginning discussion piece for the knowledge and skills that might comprise network literacy for the general public includes:

#### *Knowledge*

- Be aware of the range and uses of global networked information resources and services
- Understand the role and uses of networked information in problem solving and in performing basic life activities
- Understand the system by which networked information is generated, managed, and made available.

#### *Skills*

- Retrieve specific types of information from the network using a range of information discovery tools
- Manipulate networked information by combining it with other resources, enhancing it, or otherwise increasing the value of the information for particular situations
- Use networked information to analyze and resolve both work-related and personal decisions and obtain services that will enhance their overall quality of life.

Such knowledge and skills should be seen not as "supplemental" to traditional literacy but rather as part of a reconceptualized notion of literacy in an electronic society. These skills and knowledge are targeted at the general public for network literacy. Likely as not, they will require other "literacies" to be in place already (see figure 1). Additional knowledge and skills certainly can be included in this beginning list. But even the knowledge and skills listed above, while seemingly basic and rudimentary to the already network literate, will require national commitment and a range of programs if they are to become commonplace in society.

Answers to what constitutes network literacy and how network literacy relates to other types of literacies require immediate attention and research. But as more information services and resources are networked, those individuals who, for whatever reason, cannot access and use them will be at a severe disadvantage in society. They may be unable to obtain good jobs, communicate effectively with the government, or exploit a range of self-help or entertainment services available over the network; and they may become disenfranchised from mainstream societal goals and values. The implications of such a widening gulf between the network literate and the illiterate are significant and require our immediate attention.

## Information in the Evolving Networked Society

Even those who are creating the networked society cannot predict how it will evolve. It is still too early to determine how the public can best be connected, which applications will be most useful to the public, how to ascertain which types of services should be made available publicly and which will be costed, and what might differentiate roles among the government, the public sector, and the private sector in developing and operating the Internet/NREN.

What we do know, however, is that information in this evolving networked society may have different characteristics from information in the prenetworked society. The following aspects of information in a networked environment will require us to rethink educational programs to ensure network literacy.

### Pervasiveness of Electronic Information

Increasingly, information is in a digital, electronic format. Currently, information tends to be (1) created in electronic format and then, if necessary, transferred into a paper format, or (2) created in electronic format and never migrated into a paper format. The vast majority of Bureau of the Census data, climate and weather data transmitted from satellites, and a range of research data will never be migrated into a paper format. Thus, increasingly, users of information will either have to identify and access information in electronic format or they will be unable to use it at all.

### Convergence of Information Technologies

The computer that sits on my office desk is (a) a computer, (b) a CD-ROM reader, (c) a fax machine, and (d) a

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worldwide telecommunications node. To refer to this machine as a "mere" computer is an insult! Increasingly, it has become almost impossible to determine where a telecommunications technology, a computer technology, and other information technologies begin or end. Mergers among cable TV companies, computer companies, software producers, and telephone companies testify to the fact that the new information technologies will be multitasked and will seamlessly combine many technologies into one package.

### **Transferability of Digital Information**

Related to the convergence of information technologies is the transferability of digital information. Once information is in a digital format, it can be transferred, manipulated, edited, revised, and sent through endless transmitters and receivers. A digital picture of the Mona Lisa can be enhanced, changed, "brushed up," or otherwise manipulated; sent over a network; downloaded; and "brushed up" again with existing software. Once information is digital, it can go anywhere, to anyone, at any time. Society will be in a sea of information, and only those information services and products that meet real needs, offer true user-friendly software, and make life easier (as opposed to more difficult) will prosper.

### **Information for Electronic Services Delivery**

To date, emphasis has been placed on delivery of electronic information rather than delivery of electronic services. Dumping gigabytes of data on the network is not the same as providing services to use that information successfully in one's daily life. The ATM machines, however, at the local banks are only the beginning. Increasingly government services, for example, will be delivered through a range of electronic kiosks and directly to the home (McClure et al. 1992). Shopping, financial services, entertainment, public education, and other services will be commonplace on the network. Individuals unable or unwilling to take advantage of these electronic services—especially government services—will be increasingly disadvantaged.

### **New Information-Navigation Skills**

In the short term, people will be forced to "drink from firehoses" as a glut of information resources and services overwhelm them. New information-navigation skills on the network will be a prerequisite for successful use. Already, it is clear that if individuals cannot use a gopher, a WAIS, or Telnet to a FTP site, they will be hopelessly swallowed in a sea of information and resources—drowned, as it were, in information. Tradi-

tional navigational tools such as the library card catalog or the Sunday weekly newspaper listing of television programs, or reliance on one or two "key" newspapers or journals will be grossly inadequate to identify and retrieve networked information.

### **"Bottom-Up" Information Services Development**

Due in part to some of the above developments, individual info-preneurs have it in their power to develop, test, market, and distribute a range of information products and services. Such services and development efforts have been largely in the domain of large companies. No more. The nature of information technology allows amoebalike developments by individuals with curiosity, perseverance, and good ideas. The rapidly expanding community networking movement is a good example of this phenomenon (Civille 1993). Individuals who wish to take advantage of the new technologies, who know how to operate them, and can see possible applications can develop these services from their home—both to enhance the quality of their life and for economic gain.

### **Filtering and Synthesizing Information**

Filtering and synthesizing the glut of information and determining which information is needed in what situations will be a critical concern for individuals in the networked society. The only way to deal with such large amounts of information is to develop mechanisms to filter and synthesize it. Such information-retrieval techniques will have to be uniquely individualized in their design. "Profiles" of the information needs of individuals will be converted by "know-bots" that scan the network for specific types of information of interest to the individual, synthesize that information, and report it in a timely and organized fashion. Knowledge management will be much more important than information management.

### **Information in Search of People**

In the past, it has been extremely difficult for individuals to "publish" their ideas or make them widely available to a large audience. In the future, the problem will be the reverse. Thousands of messages posted on Usenet discussion groups today are never read; endless papers and articles posted on the network are ignored; and hundreds of unread e-mail messages are deleted from reader files every day. The network has made it easy to produce and send information. The problem is to get people to read or review the information service or product sent them. The tyranny of information overload, despite



sophisticated filters and synthesizing devices, is likely to be resolved by ignoring most information.

## Privacy Protection

Because of many of the developments outlined above, the networked environment will increase the difficulty in protecting individuals' privacy. New information technologies, and the increased use of authentication devices to confirm transactions between sender and recipient (especially for certain personal services, e.g., social security information), will tax our ability to keep private information about ourselves to ourselves. Without adequate policy and enforcement, governments and commercial firms can easily maintain files of personal data linked to specific individuals that can be matched to other files to produce, for example, composite buying patterns that include specific types of purchases by specific individuals, demographic information about that person's household and income, and other types of information.

## Issues and Implications

Literacy in, and for, an electronic society will require a major overhaul and rethinking. As the educational system currently operates, it is ill-prepared for the challenges it faces in migrating individuals from a print-based society to a digital, networked-based society. A number of issues will need to be addressed if we are to move successfully into a networked society where all of its members have "an equal playing field" to be empowered by the network.

### Increasing Awareness of the Importance of Network Literacy

The first issue that must be addressed is increasing the awareness of government policy makers (at all levels of government) and the public at large that notions of literacy have changed and will continue to change in the future. Literacy cannot be defined simply as the ability to read and write at a fourth-grade level. It includes a range of technology-based skills as well as information problem-solving skills.

Increasing awareness is linked to demonstrating the importance of networked literacy and the impact of network literacy on:

- the individual's ability to operate successfully in a networked environment;

- society's ability to empower the individual to be a productive member of society;
- the economic productivity of the country and the ability of the United States to compete successfully with a knowledgeable and technically skilled workforce.

Such impact will have a significant effect on how well this country will maintain leadership not only in industry, but in health care, manufacturing, delivery of services, and the individual's pursuit of happiness.

## Revising the Federal Policy Framework

The brief overview of policy related to the Internet/NREN and literacy suggests that a significant disconnect exists. Not until the proposed H.R. 1757, *High Performance Computing and High Speed Networking Applications Act*, has there been some linkage between development of the Internet/NREN and education and training concerns. While the linkage between the development of the network and education is laudable, current policy initiatives do not address literacy issues, i.e., educating the general population, or in some cases, retraining the population to be able to work and live in "cyberspace" (Communications, Computers, and Networks 1991).

A federal policy initiative that has as its objective the development of a program that will train or retrain—or even make available—network literacy skills to the population is essential. Such a policy could also coordinate and organize the efforts for developing network literacy at state and local governmental levels. Such a policy framework would need to bring together the efforts of a number of federal agencies such as the Department of Education, the National Commission on Libraries and Information Science, the Department of Agriculture Extension Service, and the National Literacy Institute—to name but a few.

In addition, a revised policy framework for this area needs to recognize the importance of libraries in promoting network literacy and serving as a link between networked resources/services and the public. Recent research suggests that the library community is beginning to redefine its roles and responsibilities to move more effectively into the networked society (McClure, Moen, and Ryan 1994). But a clear mandate by federal policy to coordinate the education and library communities to work together in this area is essential.

## Reinventing Education and Libraries for the Networked Society

There has been considerable discussion about "reinventing" a range of services and institutions in this country.

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The Clinton administration, for example, is attempting to reinvent government. Education and libraries are additional institutions desperately in need of being reinvented. *A Nation at Risk* (U.S. Department of Education 1983) identified a raft of problems with the American educational system. Now, in 1993, there is general consensus that those problems still exist and, if anything, have only become worse. Many libraries lack infrastructure, public support, and leadership in envisioning their role in the networked environment (McClure, Moen, and Ryan 1994).

Hughes (1993) notes that the intensified commercialization of the network, the lack of attention to public uses of the network, and our inability to confront issues related to educating the public for the networked society will result in

an acceleration of the decline, or in some places the death, of the public education system. It simply won't be able to compete for the attention of students. And those parents who want a decent education for their kids will get it—commercially. Including offerings over the infotainment net. And then will act to stop or reduce taxes for a broken public system. Which will further decline. And in the long run be reduced to educational welfare for the have nots.

Schools and libraries may not be able to continue what they have always done in a networked environment, since the networked environment is substantially different from the traditional school and library environments. These two institutions need to be reinvented, they need to rethink their roles and services in a networked society, and they need to determine their responsibilities for shepherding the public into the networked society so that individuals are empowered and advantaged.

Libraries can serve as an electronic safety net for the American public to ensure basic access to electronic information. Public libraries are especially well suited to assume this role, as they already have served such a role in a print-based society. Not only can they provide access to electronic information and connectivity for those otherwise unable to link to the network, they also can provide training and education to the public at large in how to access and use networked information. Despite the lack of federal policy supporting libraries' movement into this area, there is evidence that such can be accomplished with adequate planning and resource support (McClure, Moen, and Ryan 1994).

### **Creating a Level Playing Field between Public and Private Interests**

Increasingly, development of the Internet/NREN appears to be a commercial venture. The Bush administra-

tion promoted commercial development of the Internet/NREN, and it appears that the Clinton administration will continue this policy—although with some restrictions and modifications (U.S. Congress 1993b). Investment from the private sector in the national information infrastructure certainly is welcome and appropriate. Such an investment, however, cannot be made without also supporting public and educational uses and access to the network. We cannot afford the development of a national network that provides unlimited access to entertainment, home shopping, and other commercial activities—with hundreds of interactive multimedia channels that are all pay-for-view or pay-for-access (Hughes 1993):

TCI, US West-Time-Warner, At&T and the MCI's of the world are now falling all over each other in the race to push the pipe in your front room, entertain you to death, interactively. . . . This administration is urging these "private companies" on as a way to build the infrastructure. . . . But, with the tidal wave of entertainment/home shopping interactive telecom via fiber, ISDN, cable about to wash over the U.S., the "serious" Internet is going to look like a tiny mountain rivulet in comparison. I think we [the U.S.] are in for some gigantic problems.

Commercial applications cannot be developed to the exclusion of public applications and uses of the network. Public service and educational applications on the network for the nation's elementary, secondary, and vocational schools, as well as independent learners, must be nurtured and promoted.

There are, however, areas where both the public and private sectors have mutually supportive goals. The goal of educating the public to be network literate certainly can be supported by all. From the public-sector perspective, network literacy will be a prerequisite to operating effectively in society. From the private-sector perspective, there must be a network-literate population or there will be no market to purchase the new and innovative gadgets that will continue to be introduced. These and other common goals must be recognized so that partnerships between the two groups can be formed.

### **Promoting Research**

A range of research initiatives related to educational matters is needed to facilitate the transition into the networked society. Research initiatives in the following areas are needed:

- *Policy research:* Two key thrusts can be identified in this area. First, we need a comprehensive analysis of existing policy in the areas of Internet/NREN

development, literacy, electronic privacy, and related policy instruments. Second, we need to develop and assess policy options that have as an objective the provision of educational initiatives to prepare individuals to be productive members of the networked environment.

- *Applied research:* A range of social and technological topics related to educating for the networked environment remain to be addressed. To what degree are those who are network literate more or less productive on what types of tasks? What variables affect the development of network literacy in individuals? Would cost savings result from delivery of networked government services, for example, if we had network-literate individuals in society?
- *Descriptive studies:* Baseline data are needed that describe the number and types of users of the existing network. What are the demographic characteristics of users and nonusers of the network? What trends can be identified in terms of the use of the network among various population segments?
- *Program development:* Currently it is unclear what types, how many, and which sponsoring agencies and institutions will be needed to educate and retrain the population to be productive members of the networked environment. Further, we have yet to understand how best to marshal the new information technologies to help us promote network literacy in our schools, workplaces, and homes.

The above topics are intended to be suggestive, not comprehensive. What government agencies, foundations, or other organizations will be able to take leadership in this area for promoting such research? At the moment, we are woefully ignorant about topics related to how information can be best managed and used in a networked environment.

## The Need for Vision

Probably the most important challenge for exploiting information in a networked environment is extending our horizons of what is possible and developing new visions. A vision is a “dream” of what the network should be in the future and how people and institutions will use that network. A vision statement is a description of a possible future state or set of functions for developing a network-literate society. Getting the “vision thing” right requires that it address “[people’s] physical and economic well-being, their social need to be treated with

respect and dignity, their psychological need to grow and develop, and their spiritual need for meaning and significance” (Lee 1993, 28). Vision-statement development requires that we make explicit our assumptions about the future and envision a future state of the networked society in light of these assumptions and in light of societal goals and resources.

For example, one vision of education in the networked society is that all public libraries would be connected to the national network. Anyone could access the array of information resources and services simply by using the “network room” in the library. Students could work interactively on lessons, while adult learners could utilize endless instructional tools and persons providing support in using those tools. Virtual learning communities (Schrage 1990) can form and grow.

Electronic resources of all types and forms would be publicly available for those who cannot connect from the home. Librarians and educators would serve as electronic intermediaries, navigators, and instructors—actively involved in helping people best use the network. Parents, students, adult learners, educators, and others could work interactively and interdependently on projects and activities that we can only begin to imagine now. The public library, as a nonpartisan, publicly supported institution with strong local community ties, is well suited to serve in this role.

This, of course, is just one of many possible visions. Minimally, the key stakeholder groups that need to participate in such a discussion are information providers from the commercial and public sectors, government policy makers, educators, librarians, parents, and individuals and firms that design instructional materials and equipment. Constructive policy debate among these groups (and possible others) in terms of visioning has not occurred.

Discussions about how the network *should* evolve, how people *should* be able to use the network, and how individuals will be *empowered* by using the network (as opposed to entertained) are essential.

## Reconnecting Society

Maintaining the status quo for network development will ensure an ever-increasing gulf between the network literate and illiterate. Those disempowered from using the network, those without access to a network “safety net,” and those who simply are bypassed by the network will be increasingly disadvantaged and unable to lead productive personal or professional lives. As suggested by the recent report resulting from White House Conference on Libraries and Information Services (1991, 6):



As dependence on information grows, the potential increases for emergence of an Information Elite—the possibility of a widening gap between those who possess facility with information resources and those who are denied the tools to access, understand, and use information. . . . Today, now more than ever, information is power. Access to it and the skill to understand and apply it—increasingly is the way power is exercised.

To not be on the network, to not be able to use networked information, and to not take advantage of a range of networked information services and resources will ensure second-class status in this society. But “information gaps” in our society are widening. Increasingly, various population segments are disenfranchised from accessing information due to race, gender, income, location, and a host of other reasons. A report issued by the Freedom Forum Media Studies Center states:

Neglecting the needs of minorities and others who may be underserved [in the networked environment] would only exacerbate their disenfranchisement from the information marketplace, said Julius Barnathan, senior vice president for technology and strategic planning of Capital Cities/ABC, Inc. “There’s no concern for the minority, for the people who live in rural communities,” he said. “We find that education and illiteracy are getting worse, not better. So we need an information system to do one thing: educate. We’ve got to educate people so they can use these devices.” (Pease 1992, 8)

Disparities between the richest and poorest segments of society continue to widen; and social equity issues, i.e., the degree to which all people may legitimately make the same claims on social resources, are exacerbated by the evolving NII (Doctor 1993). Information in a networked society takes on characteristics and produces impacts that we are only now beginning to identify and recognize. There is an educational imperative to assist individuals—be they in school, in the workforce, or at home. They need to know much more than how to use the switch hook flash on the telephone. They must learn how to use this network and exploit digital information for personal growth, professional advancement, and national economic productivity. Developing formal policy and programs to support this retooling of American society is essential.

Technology in general, and the development of the NII in particular, must be seen as a dynamic social and cultural phenomenon. As Winner (1993, B1–B2) notes, one view of technological change is as a pump for economic development. But it can also be seen as loom on which the fabric of society can be rewoven. He argues that policy makers thus far have inadequately considered “what Walter Lippmann called the public philosophy—a vision of the purposes that bring us together in society in the first place” (B2). Network literacy, recon-

necting society, and ensuring social equity in an electronic society are parts of this public philosophy that still require attention, public policy debate, and resolution.

This challenge is one we cannot ignore. If we fail to act, fail to accept this challenge, the various segments of our society will become increasingly disconnected and intolerant of one another. It is a challenge that will require a long-term program and resource commitment. But perhaps most importantly, it will require a commitment to *people*, a commitment to provide equal opportunity to all members of society, and a commitment to promote the self-worth and individual productivity of all members of society.

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# Issues and Experiments in Electronic Publishing and Dissemination

Karen Hunter

In 1983 I made a speech at the ALA Annual Conference. That speech, titled "Electronic Access to Journals," was a publisher's perspective on the future access to journals. I quoted a Library of Congress staff member who had said to me that "the train of electronic access to journals was leaving the station, and publishers had better get on board or it will leave without them." My response in 1983 was that "publisher activity [in advancing electronic access] will be uneven and that [electronic access] will happen in fits and starts in a patchwork fashion over the next decade or longer."<sup>1</sup>

Well, now that decade has passed. As a planner, I feel slightly satisfied that my analysis ten years ago was reasonably accurate. Improvements in electronic access to journals and other scholarly information during the past decade have been patchy at best. Some progress has been made, but not yet the revolution. At the same time, as an evangelist for electronic access, I feel great disappointment that we as a community—scholars, librarians, and publishers—still seem to be standing on the brink of the breakthrough. But now I would agree with the LC staffer: it is imminent and urgent.

I want to examine three things related to electronic publishing and distribution: first, the national context; second, six specific issues which have to be dealt with; and third, some specific media, services, and experiments.

## **NREN, PDAs, and Ubiquitous Digital Libraries**

First, I want to discuss visions of electronic information dissemination at the national, or macro, level. I do this because these visions have become the context in which we all work, and they will affect the technology and the economics of our work and perhaps even the legal infrastructure.

Ten years ago we were not talking of an NREN or a National Information Infrastructure or a wireless palmtop computer and personal digital assistant. I doubt any reporter had written of cyberspace in the *New York Times*. National Public Radio was not doing stories on electronic journals as they are now. We did not have a president or vice-president who understood the power of networks and who had Internet addresses in the White House. Ten years ago we didn't have the Internet.

Now we live in an electronic field of dreams. We believe that if we build it, they will come, where "they" are every man, woman, and child in the nation. In his introduction to the High Performance Computing and High Speed Networking Applications Act of 1993, Representative Rick Boucher said in April 1993: "Our goal

is for every individual in his or her home or office to be able to obtain access to any library in the nation, to utilize an electronic index, retrieve a particular document, and print that out on his or her laser printer, all within a matter of minutes." A formidable vision and goal. Real-time access to everything and a laser printer in every house. The 1990s equivalent of a chicken in every pot.

In a July 1993 meeting convened by the Librarian of Congress, Vice-President Gore articulated his vision, summarized as that "of a young child at home accessing, in exciting, captivating, and energizing forms, an entire universe of knowledge. This universe would be available in ways that corresponded with that child's natural curiosity, responding instantaneously to questions as they occurred to the child."<sup>2</sup>

At the same meeting, Senator Robert Kerrey of Nebraska and Representative Newt Gingrich of Georgia articulated their visions of the power of the network. Senator Kerrey focused on education, with ubiquitous network access to all information enriching classrooms, improving learning at home, and enhancing remote adult education. Earlier in 1993, Kerrey proposed legislation to seed the establishment of a central digital library in each state, which would make information available to every part of the state and to every citizen and community. Representative Gingrich, as a Republican, was perhaps more reluctant to advocate what could be interpreted as a growth in government. But he also talked of having the average American "hooked on the dream" and of testing the notion of using network-delivered information to help the urban and rural poor.<sup>3</sup>

It is clear that in this future the electronic delivery of information will certainly not be something that you and I—librarians and publishers—have to ourselves. Of course we never have been alone, but in the traditional paper world and even the early electronic world of bibliographic databases on Dialog, there were relatively few other parties who could affect our world or who even cared about it.

Today, the playing field and most likely the rules are being established by others. Those others include our authors and readers on the one hand and such megapowers as the government, the telephone and cable companies, and, as I recently read, perhaps even the power companies. All have the potential to control computerized access to the home and, via the home, to every individual. As an AT&T researcher said to a group of database producers at a recent meeting: "Is there a telecommunications company in your future? Absolutely."<sup>4</sup>

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You had better believe it. And competing for control with these infrastructure behemoths are the existing network operators, hardware and software giants, large retailing outlets, cable companies, and entertainment and mass-market publishing stars and wannabes.

At this same Library of Congress meeting in 1993, the group was told by some participants that if we wanted the power of the network to really draw in young people at home, information had to be made entertaining. "Had to be . . ."—a view I found disturbing. With all due respect to wealthy mice and frogs, this is what I call the Disney or Muppet vision of electronic information dissemination. What they are telling us is that unless it's fun, American kids won't use it. Make the interface not only child-friendly, but lovable, entertaining, and addictive. I can just see our first multimedia journal: *Teenage Mutant Gene Sequences*.

Finally, let me wrap up this section of my talk with a note or comment about Apple's Newton, the first of its personal digital assistant products, and Newton's present or future competitors. This is the picture of the world with wireless, information-on-demand-in-the-palm-of-your-hand. An Apple—or Microsoft—vision of electronic information publishing and information dissemination looks, from the outside, to be more akin to that of the Disneys, Viacom, and ESPNs of the world than the vision we librarians and publishers traditionally embrace. We are too small for them to care about us. There is a mass-market vision, communicating whatever information sells best. Sports? Entertainment? Gossip? Stocks? Travel?

There is nothing wrong with this, but it suggests that we who are trying to convey other types of information—specifically, academic or reference information—will have to fight hard not to get lost in the technology decisions determined by mass markets and mass media. In the end, the entertainment-driven business may be the most exciting and positive thing that could happen—driving a hunger for other types of information. You will pardon me, I hope, if I am skeptical, given what prevails on network television and MTV as examples.

## Issues in Making Visions a Reality

Some of us at the Library of Congress meeting in 1993—particularly those with university or library affiliations—confided during breaks that we found it somewhat difficult to reconcile the articulated visions with present-day reality. If information is believed by government to be so important, why must public libraries close their doors early in the evening or for whole days for lack of funding? Does everyone really want all of the

possible information in the world available to them? Do we really need to have all information in digital form and available in real time on demand? Aren't many of the existing filtering mechanisms—books, indexes, librarians—useful in getting the information best suited to the task to the user? (And frankly, in many urban schools, might not metal detectors be as vital as network links?)

This is not to demean the visions articulated by these leading government officials. On the contrary, they are to be commended for caring about and understanding the power of both the technology and the information transfer it enables. We may need the "vision-thing," as President Bush used to say, to move the Congress and the nation, but we should also not lose sight of reality. Bringing all information to all people at any time in any place is an enormous task and an expensive vision. Being selective and assigning priorities may be more realistic.

What do we need to do to make electronic publishing and distribution happen more quickly? There are at least six issues or questions that need to be addressed by publishers and by libraries.

### 1. Market Readiness

In looking at the introduction of new products or the investment of development funds, the publisher is always trying to judge the readiness of a market for a given product. In electronic publishing, the marketplace is spotty. In business and financial information, the market is hot. In secondary or bibliographic information, it is mature and perhaps declining. In full-text scholarly publishing, the necessary electronic infrastructure is growing but is far from uniform, particularly outside of the United States and in less well-funded parts of the country. It is certainly not such that one can shift existing products from paper to electronic form only. That means parallel publication of both paper and electronic formats, increasing overall costs.

Over the long run, we want electronic distribution to provide both increased functionality and lower unit costs. For the moment, for many types of information and for many markets we are simply not quite there. Consider the much touted "multimedia revolution." Publishers prvy to the truth know that with very, very few exceptions, sales of a multimedia bestseller number in the (low?) four digits.<sup>5</sup> That is very small relative to the cost of creating such products. Increased market readiness will be a catalyst to product introduction. What libraries can do is to think and act more as a market, clearly articulating their needs and product and service wishes in a standardized way.



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## 2. Availability of Public and Private Funding

If markets are not fully developed, in part it is a question of the availability of funding. Business and finance markets are "hot" because industry pays for them and values the information for its competitive advantages. To date, the public sector has not placed the same value on information acquisition and dissemination.

The national network has often been analogized by referring to the national highway system. However, if you are in New York City often, you might not be so enthusiastic about that analogy. The highways are, to be charitable, uneven in their condition. That is certainly not because the city wants it that way, but funds are limited and there are many competing priorities. The same is true for information dissemination. Money will be required for hardware, software, networks, content, and most of all people to make it happen. To repeat what I mentioned earlier, it was difficult for some of us last summer to believe that a nation that permits libraries to close or branches to be open only two or three days a week will be steadfast in funding the information highways. If we build it, not only will they come, but will it be maintained? We must all work for assurances in this area.

## 3. Delivery Standards; Retooling the Content

But let me not make it seem that it is all someone else's responsibility. Publishers have responsibilities as well. We have to standardize the way we deliver information and the access tools we either provide with the product or endorse as being compatible with our files. We need to retool our production processes to build databases, not typesetting tapes, as the result of our publishing efforts. Overall, this should reduce both our costs and those of our customers.

## 4. Enabling Software

I mentioned access tools. As a publisher, one complaint I have frequently heard from librarians concerns the incompatibility of interfaces and search strategies between databases and publishers. I have that complaint myself. I suspect I am not unusual as a relatively infrequent online end user. I often turn first to databases I learned years ago, even though there may be other, better databases now available. I resist having to take the time to learn something new that is complicated or nonstandard, and if it doesn't go well on the first or second try, there will likely not be a third one.

The difference for me was clear, for example, when as an addicted Windows user I got a trial subscription to America Online accessed via Windows-based soft-

ware. The software is completely intuitive. It does not come with a manual and it needs none. There is enough interesting content, it is so very easy—and it is so cheap—that I am "hooked," as Newt Gingrich would say. Maybe this is the level of "entertainment" that the Disney people meant when they spoke of interface requirements: easy, intuitive, appealing. We need to continue to spread that ease of use throughout the information-retrieval process, and as publishers it is certainly our responsibility never to forget that or to introduce yet another search engine or interface just to be distinctive. The unanswered question is, Who will do the software development: publishers, software houses, network providers, purchasing libraries?

## 5. Intellectual Property Concerns

A fifth issue arises in any discussion of electronic publishing or electronic distribution: copyright. I could, I have, and I will again devote whole papers to electronic copyright issues. Suffice it to say that there are a number of concerns to be worked through and that as a community we are far from having resolved them.

Some of those issues relate to use. For example, what constitutes fair use in an electronic environment? Is use of the Ariel technology of the Research Libraries Group—which lets one scan a document, create an electronic image, transmit that image across the network, and store that image—really permitted without the copyright owner's permission? Some publishers would say no. Can a professor make an electronic copy of an article or a chapter of a textbook and put it on the campus network for student use, much as in a reserve room?

Or looking at another set of copyright issues related to the author, what exclusive rights must a publisher have to function? What rights, if any, can be comfortably either left with or shared with the author or employing corporation? What obligations and responsibilities should the publisher accept in return for copyright transfer? Also, what constitutes "publication" in an electronic environment? If an author puts his paper on a file server and then submits it to a journal, has it already been published? Some publishers may not care, but some—such as many of the prestigious medical society journals—will certainly reject a paper which has had such prior public dissemination.

## 6. New Pricing and Licensing Models

My sixth issue is the need for fresh concepts in pricing, licensing, and selling information. I had a wonderful brainstorming session in 1993 with a senior government staffer who asked me what it might cost to get a single



national license for the United States for all scientific and technical journals—not just ours but everybody’s. I could only guess, but I said maybe \$800 million or \$1 billion a year, certainly not more than \$2 billion. He stopped for a moment, reflected and said, “That’s not so bad. That’s two bombers. We could do that.”

That puts information acquisition and dissemination in a whole new context. We’re not going to make that deal—or at least not yet. But it is not so strange. I am asked regularly to consider licenses that might cover an entire state or a regional network. Or a whole country, such as Australia or Canada. The future will include such licenses, because it will ultimately be the sharing of electronic archives or other electronic access that brings cost efficiencies to all parts of the system. I find this whole area extraordinarily exciting and challenging for us all.

And tangentially it touches on a seventh issue: electronic archiving, about which I will only note in passing that we must also collectively decide how and by whom electronic archives will be maintained. In the past libraries have been the archives. There is some discussion about whether this will be a publisher’s responsibility in the future. If so, we need to discuss all the implications thereof.

## **New Services and Experiments: Flexibility and Customization**

Turning to specific commercial services and experiments in electronic publishing and electronic distribution, I would like to first touch briefly on three areas—CD-ROM publishing, customized college publishing, and electronic-only journals—and then conclude with a fourth topic: the electronic distribution of traditional print journals.

### **CD-ROM Publishing**

CD-ROM seems to me to be a technology that has been adopted by both publishers and librarians with a certain amount of ambivalence. The term “interim technology” is frequently used with regard to CD-ROM, and criticism about compatibility in hardware standards and interfaces is steady. Few of the ebullient predictions about the growth in CD-ROMs that were made in the last ten years have yet to come true. Nevertheless, there are a large and growing number of CD-ROM products on the market.

Last month we had occasion to talk in depth with the heads of the information centers at thirteen major

corporations. Collectively, they currently have under local license 118 different electronic publications. Of the 118 titles, only 19 were purchased by more than one of the companies; put another way, 99 titles were unique to a specific corporation. This variety in itself surprised us, particularly as about half of the corporations were from one industry. What also surprised us was that most of the titles were acquired and used on non-networked CD-ROMs. We asked: Why this apparent preference for CD-ROM? Their general answer: While CD-ROM has some good attributes, there certainly is no preference for it at all. CD-ROM is often the only way information is made available electronically, and it may be replaced by some type of online network access if such is available in the future.

This leaves the publisher often uncertain as to what circumstances—what content for what market and at what price—are appropriate for this technology. Individual scientists and other professionals may turn out to be the most viable market in the long run. CD-ROM functions best at the single-user workstation. CD-ROM drives are increasingly being shipped as standard equipment on middle to high-end PCs and workstations, increasing the installed base. We have seen data that suggest a very high penetration of CD-ROM drives among some professional groups. This is a market worth pursuing for tailored packages of information—for personal digital libraries. But is it a long-term product for libraries or, indeed, only interim?

### **College Texts**

A market that must be approached with even more care, in my judgment, is the electronic college text market. McGraw-Hill has pioneered with its Primus electronic print-on-demand system for custom textbooks. The Primus system, as you know, permits professors to select and organize the chapters or sections they want in the course materials for their students. The selection is, of course, not open-ended but is confined to that material for which McGraw-Hill holds the rights to publish in this way. McGraw-Hill has enough material under its control to build a large enough database to make this a viable and attractive program. A smaller college publisher does not. Elsevier, for example, gradually reduced its textbook titles and finally left the college text market two years ago when it decided it would never have sufficient critical mass to compete cost-effectively.

This college print-on-demand market has also been fueled by the growing penetration of Xerox DocuTech equipment and similar high-speed electronic printers on university campuses. University bookstores and campus printing services are, or have the potential to become, packagers or republishers in their own right.

It is too early to gauge what opportunities—or threats—this may have for conventional publishers, but over the longer term this would seem to be an opportunity for publishers to keep their information in database form in electronic warehouses and distribute it to a local site for printing on demand.

In general, Primus and DocuTech scenarios reinforce at least two concepts for publishers: (1) be able to distribute material in a variety of media and to reuse material in a variety of packages, not just the traditional first-paper publication, and (2) pick specialties or market niches in which you can play a meaningful role in the electronic environment.

### Electronic-First and Electronic-Only Journals

The third area of electronic publishing I would like to mention briefly is the journal that is published either first and primarily in electronic form or only in electronic form. The number of such publications is certainly growing, and they are the subject of entire conferences in and of themselves, such as one held recently in Winnipeg. But at the moment they constitute less than one-fifth of 1 percent of the serious scholarly literature in English, perhaps less than one-tenth of 1 percent, depending on definitions of the literature and of the electronic publications. They are still in the pioneer stage.

Electronic-only publications have not been around long enough for us to determine their acceptability to authors, current readers, evaluating authorities, and retrospective users. Some of the better early ventures found that they benefited from either simultaneous or subsequent paper publication, either to reassure the authors or to provide for wider access. The AAAS's *Online Journal of Current Clinical Trials* has a publishing arrangement, for example, with Elsevier's journal *The Lancet*. I assume electronic-only publications will grow in user acceptance, perhaps even come to dominate in the future. In the meantime, however, journal publishers feel saddled with another challenge and are focusing in another direction: namely, converting the present paper journal to electronic distribution. I will focus on this area for the remainder of my discussion.

### Electronic Distribution of the Traditional Journal

Journal publishers have been slower to convert to electronic full-text distribution than our business, financial, or legal colleagues. It is not because we are Luddites or slow-witted and haven't known what to do. It is for the reasons you know well: journals, particularly scientific journals, are sophisticated and complicated information

carriers, with much of the information being conveyed by complex math and formulas and high-resolution half-tone illustrations.

Journals also have a narrow and rather limited audience. Therefore, one cannot recover the costs of handling this complex information through mass-market distribution. It was necessary to wait until the production technologies were sufficiently advanced that the costs of preparing information for electronic distribution and the distribution itself were low enough to compete in the market. It was also necessary for the cost of the required infrastructure and systems on the users' end to drop to build the user base. Those two curves—declining production costs and increasing user base—are now beginning to cross.

Three experiments can be used to illustrate some of the approaches journal publishers are taking: CORE, Red Sage, and TULIP. These are all networked projects and have been selected for that reason. There are other commercial CD-ROM products on the market—such as the UMI business and general periodicals collections, the journals of the IEEE and the American Society for Microbiology, and the ADONIS service of biomedical journals from forty publishers—but I think these services, while certainly adding value today for some libraries and filling a specific niche, are not “pushing the envelope” in quite the same way as the other three.

#### CORE

CORE is an experimental program started about four years ago at Cornell by Jan Olsen, head of the Mann Library. It is a cooperative program involving also the American Chemical Society (ACS), Bellcore (the research arm of the regional Bell operating companies), and OCLC. ACS has provided ten years of its journals, which have been converted retrospectively to searchable electronic form. Bellcore has provided technical sophistication in handling the conversion and in some of the interface and search design. OCLC also contributed to the search engine and system design. And Cornell has provided the organization and labor to make the project come together and to implement it on their campus. In addition, now other publishers have added their titles to those of the ACS, particularly to broaden the database to include books.

CORE is intended to provide chemists and others on campus with network access to this now very large chemistry database, to test a variety of interfaces, and through this to understand user behavior and needs. It was believed that a valid test could only be accomplished with a large database, one of sufficient size to encourage its use and provide a high likelihood of finding useful information. This has been an enormous effort, and CORE is only now being released to the Cornell

community for testing. The results should be very informative for everyone involved and, one hopes, the broader community.

### Red Sage

Named after the Washington restaurant in which the deal was struck about a year ago, Red Sage is also a cooperative project between a university, a telecommunications research company, and a publisher. In this case, the participants are the University of California at San Francisco (a graduate medical school), AT&T's Bell Labs, and Springer-Verlag. A group of Springer's molecular biology and radiology journals will be made available on the local area network at UCSF using The RightPages service software of AT&T. RightPages provides a current-awareness and display function for journal articles, based upon user-created profiles. The contents of the journal issues—now digitized via bitmapped scanning and OCRing, later via PostScript and SGML—are matched against the profiles, and the user is led through a series of browsing interfaces that mimic paper use and encourage serendipity. Red Sage went live at UCSF in January 1994, and publications from other publishers and other test sites have been added.

### TULIP

Finally, my own project, TULIP. TULIP stands for The University Licensing Program. Discussion about TULIP started in March of 1991, and the project will run through the end of 1995. It is also a cooperative experiment, this between Elsevier and nine universities (one of which is the University of California and all of its campuses). The goals for TULIP are to learn about the technical aspects of such systems (production, Internet delivery, local storage and printing requirements, and local network delivery), to study the behavior of the user, and to develop new economic and legal models for information delivery.

TULIP delivers approximately 120,000 material science journal pages per year (more than 4,000 every two weeks) over the Internet to local campus servers. The pages are delivered in bitmapped form and in searchable ASCII (although the ASCII is currently generated by OCR and is not edited or "clean"). Bibliographic information for all editorial items is also provided in an edited, field-structured ASCII file. In 1994, SGML and PostScript files will also be tested.

Each university has chosen its own search-and-retrieval software, integrating the TULIP files into their

campus information systems in the way(s) they feel will best suit their users and be consistent with other information offered on campus. We have encouraged variety from the start and it has been forthcoming. No two sites are alike in their handling of the files. Some of the universities have chosen to provide the type of alerting and browsing functionality present in RightPages, others a more simple access mechanism. Some software has been locally developed, some acquired from third parties (such as an adaptation of the Guidon software from OCLC), and some shared among the participants. Indeed, the chance to share and learn from one another was one of the appealing features of TULIP to the university participants. We also publish a TULIP newsletter as a means of sharing information about TULIP with a broader community.

CORE, Red Sage, and TULIP have taught us all some lessons already. The process is complicated and time-consuming, and everything takes longer than you think. Costs have not been so difficult to predict, but the time to develop and test and correct errors is substantial. Nevertheless, knowing my publishing colleagues within these projects, we all feel certain that these have been the right steps to take. The Media Lab at MIT had a saying at one time that it was not "publish or perish" but "prototype or perish." When one talks of electronic publishing and delivery, there could not be a truer motto to work by. The future requires publishers to get their hands dirty, to try, and to make mistakes. To stand still is to lose the game for certain.

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# Interface Design Concepts in the Development of ELSA, an Intelligent Electronic Library Search Assistant

Rebecca Denning  
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*Several developments must occur before we are likely to see commercially available intelligent intermediary systems for information retrieval. The first, which has received a great deal of attention and research, is the design of appropriate inference engines and knowledge structures. The second is the implementation of computational processes that are sufficiently efficient to handle the potentially overwhelming computational demands of such systems when scaled up. The third is development of full-scale knowledge bases and databases. The fourth is the design of interfaces that support easy and effective use of the intelligent search functions.*

*This paper briefly reviews issues and advances associated with the first concern, designing intelligent search functions. It then discusses in detail issues associated with the design of interfaces to such functions, and describes some general design principles to guide in the implementation of these interfaces. Finally, a functional prototype is described that is based on such principles to illustrate their application.*

## Introduction

Many bibliographic information-retrieval systems are now available to information seekers. Unfortunately, the mechanisms devised to access these databases are often inflexible and difficult to use. As a result, expert search intermediaries are sometimes needed to help information seekers achieve more successful results from these systems.

Since the intermediary is an expensive resource, designers have attempted to incorporate the intermediary's expertise into knowledge-based systems. It is not, however, sufficient to capture such expertise in order to produce useful systems. Instead, potential functions must be evaluated for usability and an interface which facilitates access to them must be developed. The development of ELSA, an Electronic Library Search Assistant, is offered as a case study in such a design process.

## Current State of Information-Retrieval Systems

Bibliographic databases have become commonplace in many library settings. Slightly over 12 percent of all academic libraries now have online bibliographic retrieval systems. Furthermore, 65 percent of those aca-

demical libraries without online retrieval systems have plans to implement such systems in the future (Yee 1991).

These systems provide bibliographic information about published documents such as their authors, titles, journals, and abstracts. Most of these systems allow information seekers to retrieve various types of information. For instance, if the information seeker is interested in a specific author, a list of works published by that author can be retrieved.

## Problems Associated with Current Systems

Often, information seekers encounter a wide range of problems when working with such information-retrieval systems.

For instance, the information seeker may know the author he is interested in but still be unable to determine how to enter that name into the system. This may be because he has not been able to determine what syntax the system expects. If he is interested in the author William James, he might type in a command such as "Search James, William." If, however, the system expects the author's name to be entered using the form

```
aut/James, William
```

then the search will be unsuccessful. Even seemingly simple errors of this sort are often difficult for the information seeker to detect, diagnose, and correct on his own (Janoski, Smith, and Hildreth 1986).

Another possible problem arises when the information seeker manages to execute a query but receives results he did not anticipate. Suppose the information seeker is interested in pollution generated by the use of automobiles. He decides that he would like to see all documents that contain the character strings "pollution" and "automobiles". Given this, he enters the following query:

```
pollution and automobiles
```

(This example assumes he is using a character-string-based search system.) This query returns every document that contains the words pollution and automobiles in the title, abstract, or index terms. Unexpectedly, the items returned to him contain both documents about his topic and documents that discuss pollution produced during the manufacture of cars. In addition, as he tries to decide the appropriate way to eliminate these irrele-

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vant documents, he begins to realize that many synonyms exist for the word *automobile*. An article might be relevant to his topic that uses the word *car* instead of *automobile*. Many other related terms such as *van*, *truck*, *taxi*, and so on might also be used. Thus the information seeker starts to realize that he is missing many documents on his topic and that not all of those that have been retrieved are relevant.

A third type of problem exists when information seekers need help defining their topics of interest (Shute and Smith, in press). An information seeker may know initially only that he is interested in writing a term paper on pollution. This is a very broad topic indeed. Hundreds of thousands of documents have been written about various aspects of this topic. In such a case, the information seeker usually decides he wants to concentrate his efforts on a more specific area of this general topic. Without additional information, however, this is difficult for him to do. To focus his topic, it would help the information seeker to know or be reminded that pollution occurs from many sources and that many different media such as air, soil, and water can be polluted. He might also consider limiting his search to the use of specific methods for removing pollutants from the environment or to the use of particular plants and animals as bioindicators to reveal the presence of specific pollutants at some location. Having recognized such subtopics, the information seeker can then consider the ways he wants to limit his initial topic (Smith et al. 1989a).

These three examples illustrate some of the possible problems that can prevent the information seeker from finding the documents he desires. Because of such problems, information seekers often cannot successfully complete their searches without receiving help from an expert search intermediary.

### Examples of Human Expertise

Given that such potential pitfalls exist, how can an information seeker be assured that he is finding appropriate documents? Traditionally, expert search intermediaries have been consulted to help with these problems. These intermediaries provide a range of services to the information seeker, from helping him learn about and refine his topic of interest to locating specific articles on that topic.

Since expert intermediaries are an expensive resource, many developers of knowledge-based retrieval systems have attempted to incorporate the knowledge of these intermediaries into intelligent systems (Belkin, Oddy, and Brooks 1982; Croft 1987; Fox 1987, Marcus 1983; Pollitt 1989; Shoval 1985; Vickery and Brooks 1987). Thus the goal of such systems is to offer the information seeker assistance similar to that of the hu-

man intermediary. Such expertise may be divided into three main categories: subject-independent, subject-dependent, and database-dependent. These categories are discussed below.

### Subject-Independent Expertise

Subject-independent expertise refers to the skills that allow the intermediary to elicit information from the system without having any special knowledge of the topic in question (Paice 1986). These skills include knowledge about the functions available and the proper syntax necessary to invoke such functions.

As another type of subject-independent expertise, the intermediary may be skilled in using general search strategies and in using logical operators or truncation symbols. For example, if an information seeker was interested in the topic acid rain, the intermediary might first form the following query:

```
Pollut? and acid (w) rain
```

In examining the retrieved abstracts, he sees the term *acidic rain* and discussions about the acid levels in rain. As a result he decides to try another query in order to avoid missing certain important documents. The new query is:

```
pollut? and (acid? and rain)
```

This query will retrieve documents that would have otherwise been missed. His ability to access abstracts of retrieved documents to locate terms and phrases relevant to the topic allows him to form this more specific query. (Note that although such strategies are subject-independent, decisions about how or when to apply them may be enhanced by subject-area knowledge.)

### Subject-Dependent Expertise

Subject-dependent expertise refers to the knowledge of the topic the intermediary uses to find the appropriate documents. This includes helping the information seeker learn about his topic in order to refine or define it. For instance, if an information seeker told an intermediary that he was interested in pollution, she might ask him whether a particular source of pollutants interested him. In doing so she would alert him to the fact that the source of a pollutant is one relevant aspect of the topic that merits further thought. If the information seeker then responded that he was interested in pollutants from combustion, she might further probe to see whether he was interested in particular sources such as automobiles or coal-burning power plants (Shute and Smith, in press).

This example shows how an intermediary can use her knowledge of environmental pollution to help the



information seeker define his topic. Although intermediaries could rely on retrieved document information to generate such questions, it is potentially much more efficient and less subject to chance if they can make use of subject-area knowledge to generate such suggestions. Smith et al. (1989a) provide evidence that intermediaries can, in fact, provide such assistance.

### Database-Dependent Expertise

Another type of expertise the intermediary may possess is special knowledge about the way terms are implemented within the database itself. For example, large, commercial databases have their own controlled vocabulary terms that are used to describe common concepts. Similarly, they have formal indexing policies that dictate how a particular topic will be represented within the database. Such policies are often very detailed, and indexers who enter information into the database must specialize in a particular area of domain-knowledge in order to maintain the consistency required by these policies.

For example, an information seeker might be interested in pollution of the atmosphere by waste gases. An intermediary knowledgeable about the indexing of the *Chemical Abstracts* would suggest the term *waste gases* to describe the general gaseous pollutants. Since she is knowledgeable about the indexing policies used to create the database, she also would suggest the term *flue gases*, which is reserved to describe waste gases that have entered the environment by escaping up a chimney.

### Human Expertise-Summary

As illustrated above, the intermediary's expertise is an invaluable aid to the information seeker in many ways. Unfortunately, this expertise is very expensive, and an intermediary's time is often limited. In an attempt to improve this situation, system builders have attempted to identify the constituent elements of an intermediary's expertise and to implement them as machine intelligence (Fidel 1986; Pollitt 1987; Tong and Shapiro 1985; Shoval 1985; Smith et al. 1989b; Monarch and Carbonell 1987). These knowledge-based systems have attempted to assist information seekers by providing the computer with various forms of expertise and knowledge. In the next section, two examples of such systems are reviewed.

## Intelligent Information-Retrieval Systems: Design Issues

Two major decisions confront designers of "intelligent" information-retrieval systems. The first is the choice of

the form of "intelligence to implement as the underlying functionality for the system" (Chignell et al. 1986). The second is the design of the interface with which the information seeker must interact in order to make use of these functions. The issues associated with these two decisions are discussed below (Hooper 1986).

### Comparison of Current Intelligent Information-Retrieval Systems

To illustrate these issues, two such knowledge-based systems will be examined here. The first, CANSEARCH, is a prototype designed to help physicians retrieve literature on cancer and its treatment. The second, EP-X, is a prototype for assisting in searches of the literature on environmental chemistry.

#### Description of CANSEARCH

One system that attempts to provide certain functions currently handled by human intermediaries is CANSEARCH (Pollitt 1987). CANSEARCH does not actually retrieve documents itself, but transforms a selected topic into a query which is then used by another search system to retrieve documents on that topic. In this manner, the information seeker is relieved of the burden of forming a query.

*Domain of CANSEARCH.* CANSEARCH is a prototype system for providing access to documents concerning cancer therapy in MEDLINE, the database maintained by the National Library of Medicine. The information seeker who utilizes this system is restricted to general information about clinical cancer therapy.

*User Population.* CANSEARCH is intended for use by physicians who are fairly knowledgeable about the general topic area of interest to them. CANSEARCH also assumes that many of these physicians will have had little or no previous experience with document-retrieval systems.

*An Interaction with CANSEARCH.* Using a touch-sensitive display, CANSEARCH presents various menus containing possible topics. These topics have been organized into a hierarchy. To begin the interaction, the physician views the top-level menu and points to the item in which he is interested. Suppose, when presented with this menu (see figure 1), he chooses his topic to be "cancer at a particular site." He touches this item, selecting it, and another menu containing subcategories of the topic just chosen is presented to him (see figure 2). He can now select more detailed items from this second menu. By selecting the term *continue* at the bottom right of the menu, a search is run.



```

frame2          PLEASE TOUCH A TERM OR CONTINUE

all cancers     OR      cancer at a particular site*
                  cancer of a particular histologic type*

therapy*       OR      multimodal therapy*

patient details*
miscellaneous concepts (e.g. recurrence, radiation induced...)*

* Indicates further specification to follow
SELECT EVERY RELEVANT ITEM - ALL must be in document for retrieval
RESTART                NO SELECTION                CONTINUE

```

Figure 1.  
Top-level menu for CANSEARCH.

```

frame15        PLEASE TOUCH A TERM OR CONTINUE

In respect of the sites does the query concern:-

specific primary site(s)*
                OR
specific site(s) which may be either primary or secondary*

specific secondary site(s)  OR  general metastasis
                lymphatic metastasis

* Indicates further specification to follow
SELECT EVERY RELEVANT ITEM - ALL must be in document for retrieval
RESTART                NO SELECTION                CONTINUE

```

Figure 2.  
CANSEARCH display after selecting *cancer* at a particular site.

*Strengths of CANSEARCH.* CANSEARCH encourages the information seeker to define his topic by stepping through the hierarchy in a top-down fashion. Some researchers have suggested that this organization is closer to the structure of human thought processes than other representations (Thompson 1971). At a minimum, such an approach helps the information seeker map his knowledge of the topic into the organization of the subject area as represented in the knowledge base.

Another strength of CANSEARCH is that queries are formed automatically for the information seeker. For each possible topic the information seeker can select, a query containing appropriate search terms and logical operators has already been defined. Thus the physician need not become proficient in a query language to retrieve documents on his topic.

*Potential Difficulties Using CANSEARCH.* As discussed above, the expertise incorporated into CANSEARCH

offers assistance to the physician in mapping his topic into a form the system can understand and in developing actual queries to search MEDLINE. Some potential difficulties exist, however, in using this system.

One potential difficulty lies in selecting the best path through the choices in the menu. Even if the physician knows his topic of interest quite well, he may sometimes be uncertain of the menu items to select using CANSEARCH. Such uncertainty is likely to arise in part because of the terse labels that must be used for menu items. It may also arise because of a poor mapping between the organization of the field implicit in CANSEARCH's menu and a particular physician's mental representation of his specialty in medicine.

A second difficulty can arise due to the fact that each interaction with CANSEARCH requires that the information seeker begin at the top-level menu. This may become tedious, especially if the information seeker's topic is fairly deep within the hierarchy. It

might be more convenient to also provide a mechanism for information seekers to access topics directly, regardless of where they reside in the hierarchy.

A third problem is the insensitivity of CANSEARCH's queries to differences in the needs of searchers. Some searchers, for example, might simply be looking for good review articles on particular topics, while others might need to complete very thorough searches. CANSEARCH does not accommodate such individual differences.

A fourth problem is that CANSEARCH actually deals with only a subset of the needs that searchers of bibliographic databases may have. CANSEARCH does not, for instance, support searches for documents by a particular author or a document with a known title. (As a prototype system, CANSEARCH was not intended to accommodate such search tasks. A fully functional version, however, would have to provide an interface that did incorporate these tasks as well.)

Finally, a fifth potential problem deals with issues of scale. There are significant problems associated with identifying all of the subtopics in a field such as cancer therapy and representing them in a hierarchical structure.

### Description of EP-X

As discussed above, CANSEARCH illustrates one effort to embed subject-dependent expertise in a computerized intermediary system. As also discussed, though, there are some important issues associated with providing access to such expertise in a form that is easily and effectively used.

EP-X provides a second illustration of these issues. EP-X is an early example of such an intelligent retrieval system and was built using the analogy of an "intelligent thesaurus" (Smith et al. 1989b). It has a well-developed knowledge base that is used to make inferences about the information seeker's topic. This knowledge base will be described in greater depth below. Given that such a knowledge base exists, though, the information seeker can enter his topic using keyword phrases that describe it. These keyword phrases are then used by the system to infer his topic of interest and to generate a search based on a semantic representation of the topic. This semantic representation includes knowledge of special cases of any general concepts the information seeker has entered (e.g., EP-X retrieves documents on specific species of freshwater fish even though the information seeker has only entered the keyword phrase "freshwater fish"). EP-X also identifies and requests clarification for any ambiguities in word sense or topic definition that may arise from the information seeker's entered keyword phrases.

*The EP-X Knowledge Base.* In developing EP-X, Smith et al. (1985) took a very knowledge intensive approach. They developed a knowledge base to support searches dealing with the topic area of environmental chemistry. In this knowledge base, topics were represented as frames, an example of which is given below. These frames contained hierarchically defined semantic primitives as slot fillers. Such a structure is necessary both to allow some level of understanding of the information seeker's topic and to make suggestions that would broaden or narrow that topic. These two behaviors, the ability to understand the meaning of the information seeker's topic and the ability to suggest topic refinements, were inspired by observation of performances by expert search intermediaries.

Suppose there exists a document that discusses mercury pollution released from battery manufacturing plants and its accumulation in clams in the Great Lakes. The following frame could be generated to represent the information contained within this topic:

Pollutant:	Mercury or its compounds
Source:	Battery manufacturing plants
Location:	Great Lakes
Media:	Natural bodies of water
Bioindicator:	Clams

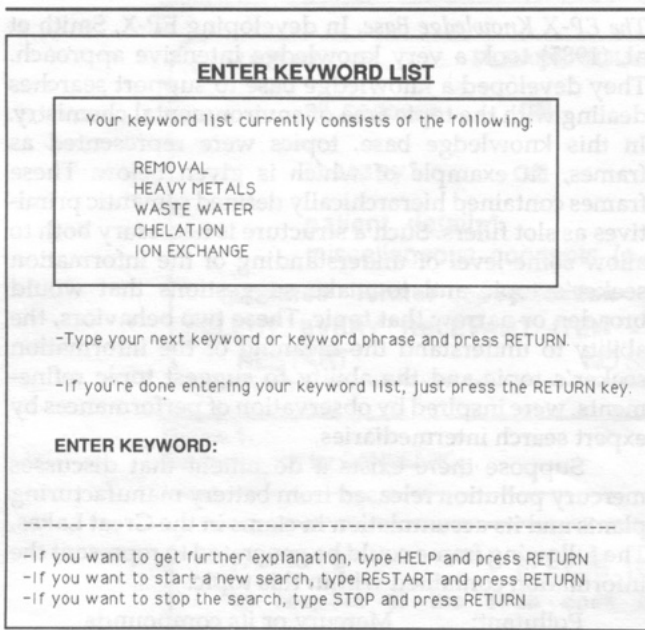
Suppose there exists another document that discusses a similar topic. In the second document, however, snails are discussed as bioindicators instead of clams.

The following frame could be generated to describe the topic of the second document:

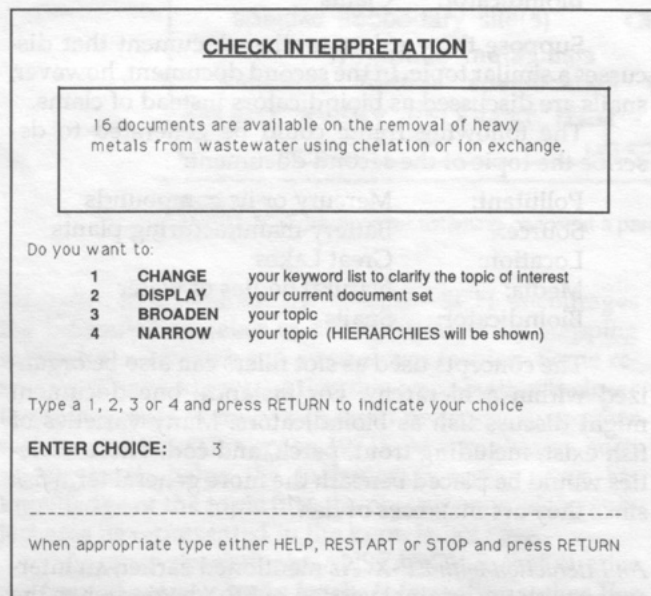
Pollutant:	Mercury or its compounds
Source:	Battery manufacturing plants
Location:	Great Lakes
Media:	Natural bodies of water
Bioindicator:	Snails

The concepts used as slot fillers can also be organized within a hierarchy. For instance, one document might discuss fish as bioindicators. Many varieties of fish exist, including trout, perch, and cod. These varieties would be placed beneath the more general term *fish* since they are instances of fish.

*An Interaction with EP-X.* As mentioned earlier, an interaction with the original version of EP-X begins when the information seeker enters a series of keyword phrases that describe his topic (see figure 3). As each keyword phrase is entered by typing it at the keyboard, it is added to the keyword list. When all keyword phrases have been entered, the information seeker presses the return key to signify that the list of keywords is complete. Once the keyword list is completed, the information seeker is provided with feedback about the program's interpreta-

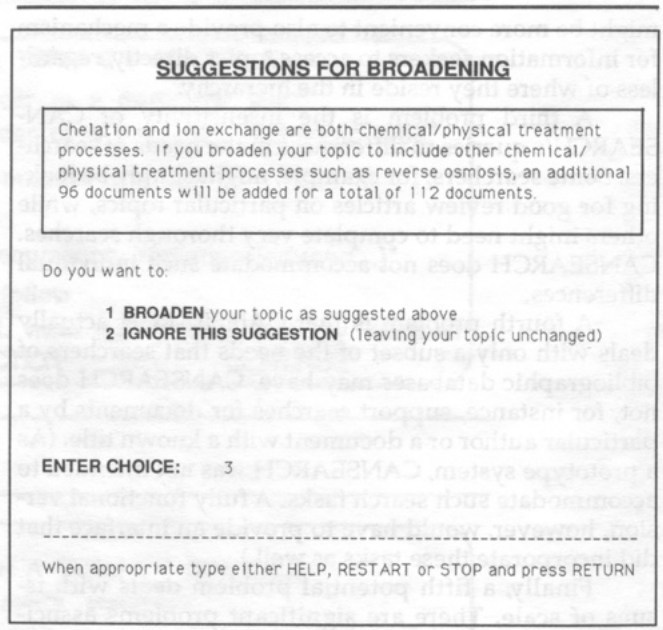


**Figure 3.**  
EP-X screen for entering a topic.



**Figure 4.**  
EP-X screen giving feedback on a topic interpretation.

tion of his input and with an opportunity to edit his keyword list (see figure 4). Providing the information seeker with this interpretation is an important feature of EP-X, as this feedback makes clear what inference EP-X



**Figure 5.**  
EP-X suggestion for broadening a topic.

has made regarding the topic to be used in retrieving documents.

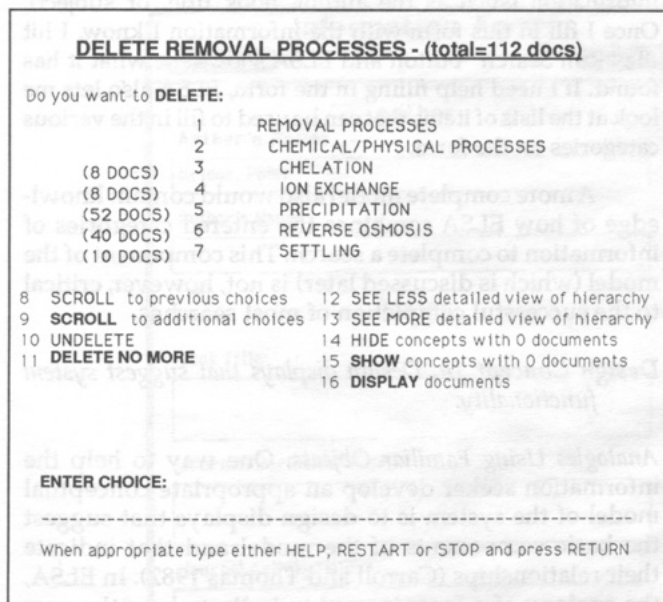
Along with the topic interpretation, the number of documents associated with that topic is reported. By knowing how many documents are available on the topic and by viewing abstracts for these retrievals, the information seeker can evaluate whether his topic is too broad, too narrow, or inadequately defined.

If the information seeker chooses to broaden his topic, for instance, EP-X uses the hierarchical organization of semantic primitives in its database to generate suggestions for broadening the topic (see figure 5). The information seeker is given the option of taking the system's suggestion or ignoring it.

*Strengths of EP-X.* EP-X has several strong points. First, once the information seeker has specified some context with his keyword list, the hierarchies relevant to his topic that are presented to him are pruned to show only concepts relevant to his particular topic (see figure 6). Items in the hierarchy that are irrelevant to his context are temporarily removed. (Relevance is defined by the existence of documents on that topic.) The advantage of presenting pruned hierarchies to the information seeker is that his attention is focused on only those items relevant to his topic. (Complete hierarchies may be viewed at any point by asking for them, however.)

A second strength is that EP-X provides functions





**Figure 6.** Display of a hierarchy (pruned for the current semantic context) to help narrow a topic.

that help the information seeker to explore his topic of interest. By providing its interpretations of a topic and suggestions for broadening and narrowing it, EP-X encourages the information seeker to refine his topic. This is an important function, as expert search intermediaries report a large amount of their time is spent helping information seekers better understand their topics of interest (Shute and Smith, in press).

A further strength is that when using EP-X, as opposed to CANSEARCH, the information seeker may enter the keywords that best describe his topic, no matter where these keywords reside within their hierarchy. This direct access of topic descriptors eliminates a potentially tedious top-down traversal through a hierarchy to reach the information in which he is interested.

*Potential Difficulties with EP-X.* Despite the effort invested in the design of functionality to help with broadening and narrowing topics, empirical evaluations of EP-X revealed that information seekers often chose not to take advantage of these functions:

1. Subjects often did not use the BROADEN and NARROW options when they should have. Instead, they elected to DISPLAY documents and to then CHANGE their keywords on their own. As a result they sometimes failed to sufficiently narrow or broaden particular concepts.

2. Subjects sometimes failed to narrow their topic adequately because they didn't consider adding concepts in some new slot (e.g., restricting the search on "effects of acid rain to a particular location" (the slot) such as the United States (a concept in that slot). Alternatively, they failed to broaden their topic by eliminating unnecessarily restrictive concepts in their keyword lists (Smith et al. 1989b, 141-42).

These results raise an important question: Why did information seekers fail to take advantage of these powerful functions? Our conclusion was that it is not enough to provide powerful support functions for a retrieval system. That functionality must be embedded in an interface that information seekers can and will use effectively. Thus, Smith et al. suggest that the primary problem with this initial version of EP-X was not due to the types of intelligent support functions made available, but rather to the design of the interface that provided access to these functions.

### System Comparisons—Summary

As the previous discussion illustrates, there are a variety of interfaces for intelligent information-retrieval systems. Examples of two such systems have been presented here, along with a discussion of their strengths and weaknesses. Since the two systems presented are both research prototypes, it is to be expected that they have focused on a limited number of design issues. In both cases, the primary focus was on how to capture some of an intermediary's expertise in a computer system. As the critiques serve to point out, though, there are important issues that must be addressed regarding both the range of functions provided and the interface in which these functions are embedded. The goal in designing ELSA has been to explore some of these issues.

### Description of ELSA

As illustrated in the previous section, many different avenues have been explored in the development of information-retrieval systems. The systems presented above demonstrate very different functionalities. Similarly, the ways in which the functionality found in these systems is represented within the interface varies greatly. Such differences in system implementation raise issues about what functionality should be included and how it should be represented (Borgman 1986; Crawford and Becker 1986; Cuff 1980; Janosky, Smith, and Hildreth 1986; Yee 1991; Wixon and Whiteside 1985; Rouse, Geddes, and Curry 1987; Bannon 1986; Suchman 1988).

As demonstrated earlier, merely including the appropriate functionality within a system does not ensure that information seekers will effectively take advantage of it. In order to develop a system that is useful, it is important to represent functionality in a manner that is both convenient and usable.

To accomplish this goal, it is critical that the designer find effective ways to represent system functionality within the system interface. Furthermore, these representations must be consistent with the tasks the information seeker wants to perform.

Thus, in developing ELSA, the interactions of information seekers and expert intermediaries were used as a guide to identify certain types of intelligence and knowledge that are potentially useful (Shute and Smith, in press). Then, since our experience with EP-X indicated that it is not sufficient only to provide information seekers with powerful search tools, ELSA was developed to provide support functions in a usable manner. The implementation of these functions was guided by various design concepts, which are described below.

## ELSA's Target Population

ELSA is not intended for use by uninitiated information seekers. Instead it is assumed that users will be familiar with word processing packages currently available on the Macintosh or at the very least mouse fluent. It is also assumed that these persons will have received at least a single (short) tutorial on the use of ELSA. Despite the fact that the database is composed of documents from the domain of pharmacology, no previous or special knowledge of pharmaceuticals is necessary to successfully use ELSA.

## Concepts Guiding ELSA's Design

The design concepts presented below include those that influenced the selection of the functionality to be incorporated in the system and those that directed the way in which this functionality was organized, arranged, and represented in the interface itself.

*Design Concept 1: Help the information seeker develop an appropriate conceptual model of the system.*

ELSA was designed so that the information seeker would only need a simple conceptual model of the system in order to interact with it (Mark 1986). The simplest form of the conceptual model for ELSA is:

To retrieve information about a published document, I simply fill in the form which lists various categories of

information (such as the author, book title, or subject). Once I fill in this form with the information I know, I hit the "Run Search" button and ELSA shows me what it has found. If I need help filling in the form, ELSA also lets me look at the lists of items that can be used to fill in the various categories on the form.

A more complete model also would contain knowledge of how ELSA combines the entered categories of information to complete a search. This component of the model (which is discussed later) is not, however, critical to the successful completion of most searches.

*Design Concept 1a. Design displays that suggest system functionality.*

*Analogies Using Familiar Objects.* One way to help the information seeker develop an appropriate conceptual model of the system is to design displays that suggest the basic components of the model and that indicate their relationships (Carroll and Thomas 1982). In ELSA, the analogy of a form is used to indicate how the user should enter the information known to him at the start of the search. For instance, the area for an author's name is clearly labeled, and a blank area is provided for entry of the name itself. Such a display helps the information seeker recognize where to place the information he knows and identify the kinds of information that can be entered (see the windows on the left in figure 7).

Providing a display that is suggestive of the user's mental model of the system and its functionality makes the system easier to learn and helps trained information seekers remember how to use the functionality that exists in the system. This is especially important for information seekers who use the system infrequently; these individuals need help in recalling how to communicate their needs to the system. In ELSA's case, the facade itself provides cues or reminders to help infrequent users recall how it is used.

*Spatial versus Temporal Cues.* In the example above, formatting is heavily used to suggest the analogy of a form to be filled in. To help the user learn how to access the lists of items available for each category on this form, however, temporal cues are used (Lewis 1986). Figure 7 shows the display provided by ELSA when the user has selected the "Author's Name" box for entry. Figure 8 shows the display when the user has moved the cursor to the box for entering drugs of interest. What the user sees is a very obvious change in the list of available items whenever a new box is selected for entry. The old list is first erased and then a new list is generated. This obvious temporal sequence implicitly tells the information seeker that the list of available items for a particular

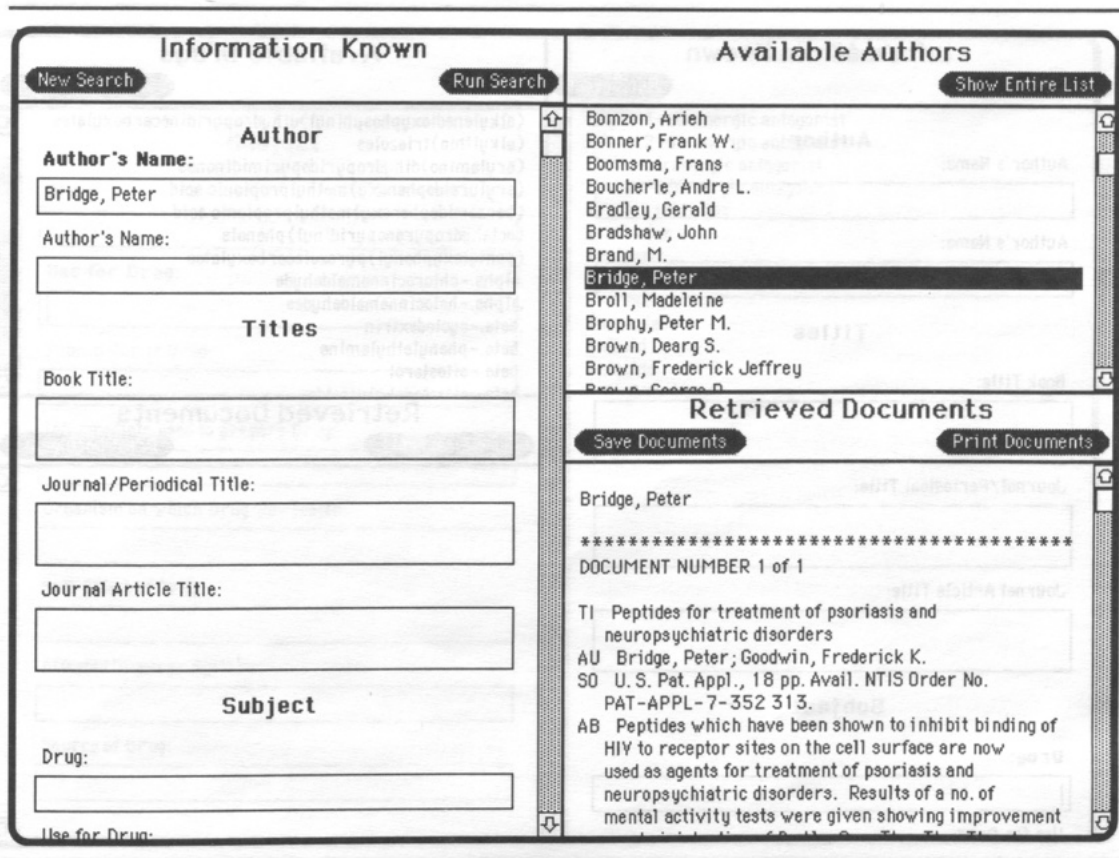


Figure 7. ELSA screen after entering "Peter Bridge" as the author of interest.

category (box) will be displayed as soon as he selects that box for entry with the mouse.

*Explicit Representation of the Structure of the Knowledge Base.* In using many existing library systems, some information seekers fail to differentiate between the titles of books and the titles of specific journal articles (Rashid 1990). In order to reduce this problem, the underlying organization of ELSA's database is made explicit in the left-most column. Not only are the author, title, and subject areas divided into different locations, but the places to enter titles are separated into three distinct types. Titles to be searched include book titles, journal article titles, and titles of journals or periodicals.

In addition, explicit categories are provided to help the user in formulating a subject search. As illustrated earlier, one of the main activities of expert search intermediaries is helping the information seeker explore his topic (Shute and Smith, in press). Included in that task is making explicit the structure that has been imposed on the domain of interest and its organization

within the knowledge base. Such information is crucial if the information seeker is to successfully define and refine his topic in terms the system can use.

Just as the left-most column makes clear what types of documents are available, it also makes clear how the domain of pharmacology can be described. For instance, labels to enter subject information include *drugs*, *uses of drugs*, *side effects of drugs*, and so on (see figure 9). By showing the relevant topic descriptors, ELSA gives the information seeker a way to describe his topic. Furthermore, making explicit the dimensions on which the knowledge base is organized also helps him to map the knowledge he possesses into this organization. Like title and author labels, any of the subject descriptor labels can be selected, and a list of valid entries for that category will be presented in the right-hand column.

The assumption that the information seeker is fully aware of his topic and can easily express it using natural language is often incorrect (Coombs and Altay 1980; Carroll and McKendree 1987). Many information



Information Known		Available Drugs	
<input type="button" value="New Search"/> <input type="button" value="Run Search"/>		<input type="button" value="Show Entire List"/>	
<b>Author</b>		(alkylenedioxyphosphinyl) dihydropyridinecarboxylates (alkylthio)triazoles (arylamino)dihydropyridopyrimidinones (aryoureidophenoxy)methylpropionic acid (benzamidophenoxy)methylpropionic acid (octahydropyranopyridinyl)phenols (pentyloxyphenyl)pyrazolecarboxylates .alpha.-chlorocinnamaldehyde .alpha.-halocinnamaldehydes .beta.-cyclodextrin .beta.-phenylethylamine .beta.-sitosterol .beta.-sitosterol glucoside	
Author's Name:			
<input type="text"/>			
Author's Name:			
<input type="text"/>			
<b>Titles</b>			
Book Title:			
<input type="text"/>			
Journal/Periodical Title:			
<input type="text"/>			
Journal Article Title:			
<input type="text"/>			
<b>Subject</b>		<b>Retrieved Documents</b>	
Drug:		<input type="button" value="Save Documents"/> <input type="button" value="Print Documents"/>	
<input type="text"/>		<input type="button" value="Use for Drug"/>	
Use for Drug:			

**Figure 8.** ELSA screen when the cursor is placed in the box for entering a drug.

seekers cannot describe their topic either because they do not know what reasonable descriptors of the topic might be or because they are not sufficiently familiar with the topic. With ELSA, because the organization of the domain as represented in the knowledge base has been made explicit, the information seeker can use the system to learn about his topic. Such knowledge helps him both to state his topic and to evaluate whether new concepts are relevant to it.

*Representations Suggestive of Functionality.* It is important to make clear the way functionality is to be invoked. For instance, if a displayed object is intended to be a button to be selected using the mouse, it should look like a button (Norman 1988). This design concept applies to the design of the "New Search," "Run Search," and "Show Full List" buttons.

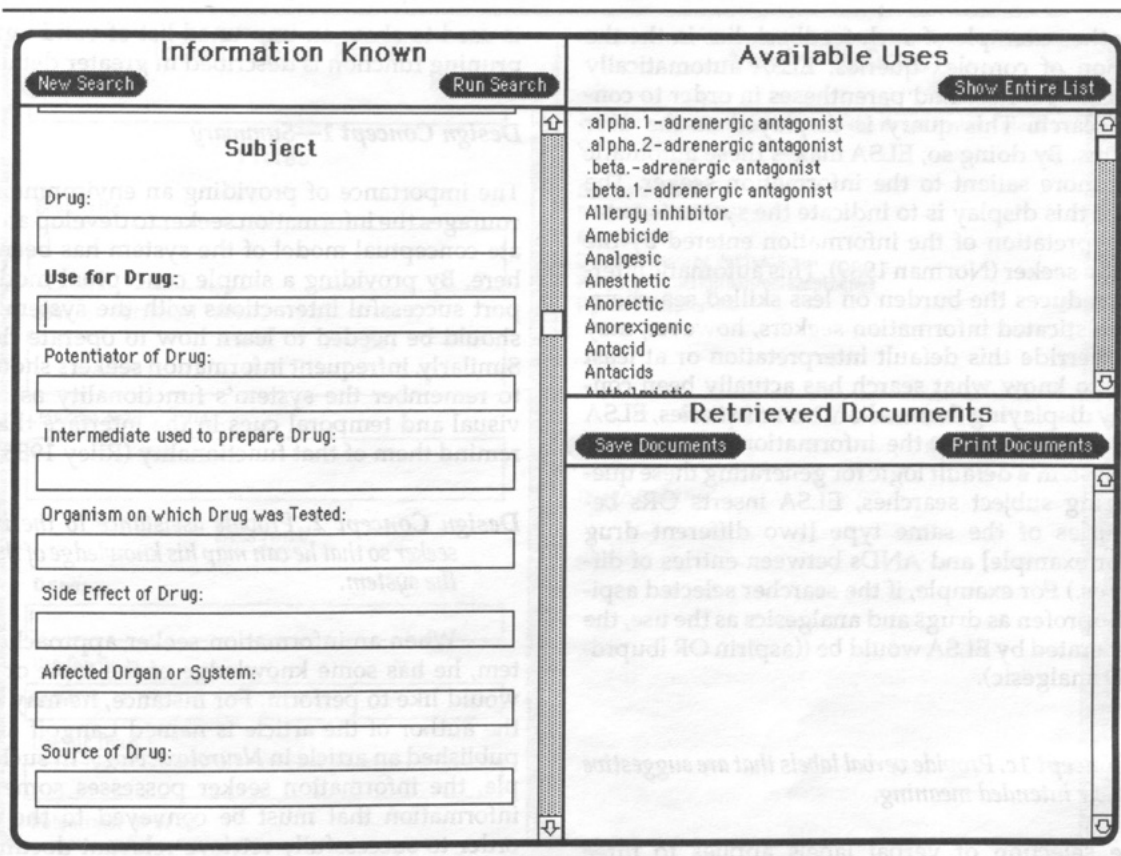
Similarly, areas where entries are to be typed should look as though they are places where information can be entered. The labeled boxes are meant to convey this idea. Furthermore, when the information seeker selects a label so the entry can be typed in the

associated box, the label becomes boldface, the corresponding list is made visible, and a blinking cursor is placed within the area that will accept typing.

*Suggestive Displays—Summary.* As discussed above under "Design Concept 1a," ELSA employs a number of techniques to indicate to the user the available functions and the methods for using these functions. The use of analogies, spatial and temporal cues, explicit representation of the system's organization, and suggestive representations are all powerful design strategies illustrated in ELSA.

*Design Concept 1b.* Make system actions explicit to the information seeker.

ELSA uses two techniques to make its actions clear to the user. One method is very explicit, namely displaying a cautionary message in a pop-up window when it detects an error made by the searcher. The other is more implicit and is accomplished by changing some aspect of the displayed windows.



**Figure 9.** ELSA screen with the Information Known window scrolled up to show the available concept classes.

**Cautionary Messages.** One example of such a message arises if a term is entered that the system does not recognize. Immediate feedback to this action is provided in a message window.

The system further suggests that the searcher check the list of available concepts for a term the system can use in a search.

A second example of a cautionary message occurs if the information seeker enters a term in the wrong box (enters analgesics as a drug, for instance). In such a case, ELSA points out that drugs are used as analgesics. ELSA also asks if the searcher wants the system to automatically move his entry to the right box (Use of Drug).

Note that in both these cases (1) the searcher gets immediate feedback and (2) the feedback states the nature of the problem and suggests a solution.

**Implicit Messages.** It is also important to provide feedback indicating actions the system has taken in response to valid entries. For example, if a valid term is entered for a category, ELSA indicates that the term is valid by

highlighting that item in the list of valid entries. The entire term is highlighted and scrolled to the center of the list of available concepts (see figure 7).

If the information seeker has partial knowledge about an author, he may still locate relevant documents by entering the author's last name only. If several authors listed among the valid entries have that last name, then all of these authors are highlighted and scrolled to the center of the right-hand column. By highlighting all the relevant names, ELSA indicates that a search will be run on all highlighted authors.

Finally, if the information seeker types an invalid term, ELSA indicates that a search cannot be run for that entry. ELSA first scrolls to the area of the list of valid terms that is closest alphabetically to the information seeker's entry. Next, a red question mark is placed at the position where the invalid entry would be found in the list, if it were actually an item in that list. By not highlighting any terms in the list, ELSA indicates that the entry is not a valid term and that no search can be run for it.

Another example of such feedback lies in the the construction of complex queries. ELSA automatically adds logical operators and parentheses in order to conduct the search. This query is displayed as the user enters terms. By doing so, ELSA makes these automatic additions more salient to the information seeker. The purpose of this display is to indicate the system's automatic interpretation of the information entered by the information seeker (Norman 1989). This automatic interpretation reduces the burden on less skilled searchers. More sophisticated information seekers, however, may want to override this default interpretation or at least will want to know what search has actually been conducted. By displaying the resultant search queries, ELSA provides such searchers the information necessary to infer the system's default logic for generating these queries. (During subject searches, ELSA inserts ORs between entries of the same type [two different drug names, for example] and ANDs between entries of different types.) For example, if the searcher selected aspirin and ibuprofen as drugs and analgesics as the use, the query generated by ELSA would be ((aspirin OR ibuprofen) AND analgesic).

*Design Concept 1c. Provide verbal labels that are suggestive of their intended meaning.*

The selection of verbal labels applies to three classes of objects in ELSA (Barnard et al. 1982; Norman 1988). First there exist window labels, which denote the type of information or functions associated with a particular window. Examples of window labels include "Information Known," which denotes that the information known about the topic is to be entered in that window. Another example of a window label can be found in the right-hand column; this label changes according to the category of information being entered by the user. If the author's name box is active, the label will be "Available Authors." If, however, the box for entering a drug name is active, the label will be "Available Drugs."

Another class of objects found in ELSA is the label that denotes areas where terms can be entered. Since there was ample space available around these labels, they were developed to be as informative as possible about the category of information to be entered beneath them.

The final class of objects bearing a verbal label consists of buttons. There are three buttons, which have the names "Run Search," "New Search," and "Show Full List." The "Run Search" button is used to initiate the retrieval of documents. The "New Search" button is used to remove all terms used in previous searches so a new search can be executed. The "Show Full List" button

is used to show an unpruned list of valid entries. (The pruning function is described in greater detail below.)

### *Design Concept 1—Summary*

The importance of providing an environment that encourages the information seeker to develop an appropriate conceptual model of the system has been explored here. By providing a simple conceptual model to support successful interactions with the system, less time should be needed to learn how to operate the system. Similarly, infrequent information seekers should be able to remember the system's functionality as a result of visual and temporal cues in the interface that serve to remind them of that functionality (Riley 1986).

*Design Concept 2. Provide assistance to the information seeker so that he can map his knowledge of the topic into the system.*

When an information seeker approaches the system, he has some knowledge of the topic or search he would like to perform. For instance, he may know that the author of the article is named Langolf and that he published an article in *Neurotoxicology*. In such an example, the information seeker possesses some pieces of information that must be conveyed to the system in order to successfully retrieve relevant documents. The information seeker must express this information in a form the system understands.

One way ELSA assists with this communication is to provide lists of available concepts (as described earlier). A second way is to use a list of synonyms to trigger concepts in the available lists. A third way is to be flexible in accepting different syntax. (ELSA allows authors' names to be entered either last-name or first-name first.) In addition, ELSA helps the searcher with only partial knowledge to express his interest. If the searcher enters two authors' last names, or one author's last name and a subject (or a journal), ELSA still completes the search.

*Design Concept 3. Actively help users explore topic areas.*

One service provided by the expert search intermediary is that of focusing the information seeker's attention on only those items relevant to his topic (Shute and Smith, in press). Once he has explained the organization of the domain as represented in the knowledge base, the information seeker can choose those aspects of the domain that he finds most interesting. For instance, if he expresses his topic as the uses of the drug morphine, the intermediary will no longer discuss all possible uses of



Information Known	Available Drugs
<p data-bbox="254 410 359 435">New Search</p> <p data-bbox="666 410 772 435">Run Search</p> <p data-bbox="459 482 535 506"><b>Titles</b></p> <p data-bbox="258 533 349 558">Book Title:</p> <input data-bbox="254 564 731 629" type="text"/> <p data-bbox="258 639 474 664">Journal/Periodical Title:</p> <input data-bbox="254 670 731 735" type="text"/> <p data-bbox="258 746 439 770">Journal Article Title:</p> <input data-bbox="254 776 731 842" type="text"/>	<p data-bbox="1170 410 1321 435">Show Entire List</p> <p data-bbox="802 451 1276 496">&lt;The following list shows only those drugs that co-occur with Sedative.&gt;</p> <ul data-bbox="802 517 1105 656" style="list-style-type: none"> <li>Benzodiazepines</li> <li>Benzoxazocine analogs</li> <li>Diazepam</li> <li>Di benzoxazocine derivatives</li> <li>Polyhydroxyalkyl benzodiazepinones</li> <li>Pyridodiazepinones</li> </ul>
<p data-bbox="439 860 535 885"><b>Subject</b></p> <p data-bbox="258 911 314 936">Drug:</p> <input data-bbox="254 942 731 977" type="text"/> <p data-bbox="258 993 374 1017">Use for Drug:</p> <input data-bbox="254 1024 731 1058" type="text" value="Sedative"/> <p data-bbox="258 1075 374 1099">Use for Drug:</p> <input data-bbox="254 1105 731 1140" type="text"/> <p data-bbox="258 1156 424 1181">Potentiator of Drug:</p> <input data-bbox="254 1187 731 1222" type="text"/>	<p data-bbox="904 737 1211 762"><b>Retrieved Documents</b></p> <p data-bbox="807 772 943 797">Save Documents</p> <p data-bbox="1165 772 1301 797">Print Documents</p> <p data-bbox="807 823 934 848">Query: Sedative</p>

**Figure 10.** ELSA screen showing the drugs discussed in the available database that are used as sedatives.

all drugs. Instead, he will focus the information seeker's attention on the uses of morphine, which will be far fewer in number than those for all possible drugs. Thus the intermediary helps the information seeker use his time efficiently by suggesting only items relevant to his topic.

*Application of Knowledge Base.* The knowledge base in ELSA is built using a frame-based indexing strategy like that found in EP-X (described earlier). These indexes serve as an episodic memory and are surrogates for a human intermediary's knowledge of the domain. ELSA uses this knowledge base to implement a support function to help the information seeker.

For example, consider an information seeker who is interested in drugs used as sedatives. He may identify these drugs in the following way. First, he establishes the context in which he is interested by typing the word *sedatives* as the "Use for Drug." Next, by selecting the box for entering "Drug:" with the mouse, he makes it

clear that he wants to know what drugs are used as sedatives. At this point, ELSA by default shows a list of only those drugs discussed in the database for the drug morphine. This pruned list only displays drugs used as sedatives and therefore focuses the information seeker's attention on only those entries relevant to the context he has established (see figure 10).

Similarly, the information seeker can select other labels, such as the side effect of a drug or the organism on which a drug was tested. Such functionality allows ELSA to serve as a tool for exploration.

**Design Concept 4.** Accommodate different styles of interaction.

One way to make a system more flexible is to offer different styles of interaction (Feldman and Rogers 1982). ELSA allows the information seeker to enter search items either by typing them or by selecting them with a mouse from the list of valid entries. Similarly, an

information seeker may begin by typing the first portion of the word, then letting the system scroll to the term closest to that entry. At this point he can select with the mouse the item he wants. This is helpful when lengthy drug names or titles are being pursued. Some individuals have a strong preference for one style over another. Providing a choice of entry accommodates that preference.

### Future Enhancements of ELSA

ELSA illustrates the *integration* of several design principles to produce a functional system. While any one such principle (such as helping the user to develop an appropriate conceptual model) may seem straightforward, finding an implementation that successfully incorporates a large set of such principles is very challenging. In order to make significant progress, therefore, there is a great need to (1) explicitly identify relevant design principles, (2) propose and develop alternative implementations based on these principles, and (3) use these implementations as test beds for empirically evaluating the usefulness of various support functions and interface design features.

ELSA provides an interesting environment for conducting such empirical studies. In addition to testing the design features described above, ELSA might include a variety of other interesting functions to be explored.

One such enhancement would be to add another class of knowledge to the system, knowledge of hierarchical relationships. Another would be to allow character string searches in addition to the frame-based controlled vocabulary search currently supported.

Each of these extensions raises significant challenges in reworking the interface design to achieve a usable system. By combining the use of explicit design principles to guide system development with empirical evaluations to test specific implementations, we may be able to systematically evolve toward more powerful and usable systems.

### Note

Copies of ELSA are available from the authors at no cost for experimentation by other researchers.

### Acknowledgments

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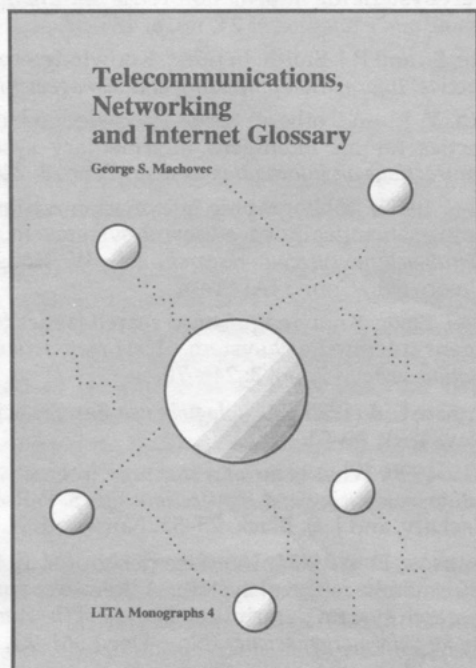
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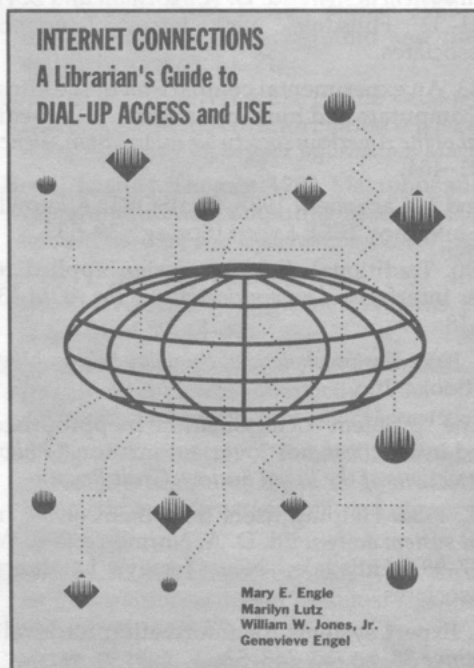


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This guide is for librarians and library patrons who are not already members of the Internet family of users. It is a snapshot of the networking services available at the time of publication, a discussion of the concepts and terms in use, and a bibliography of the notable guides that document the search techniques, navigational tools, and information resources available. It is designed to help you get started right away.

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## Biblio-Link II for Pro-Cite 2.1

Personal Bibliographic Software, P.O. Box 4250, Ann Arbor, MI 48106; (313) 996-1580; Internet sales@pbsinc.com. Price: \$195. System requirements: Pro-Cite 2.1 or greater for the Mac, System 6.0.2 or later (System 7-compatible), Macintosh Plus or later, hard drive.

Creating a large database of bibliographic records has always been an arduous task involving hand entering data or, in the case of Pro-Cite, buying expensive translation packages for every information service. Because Pro-Cite only imports data that is already in a Pro-Cite format, transferring online search results into a Pro-Cite database involves filtering the saved search results through software that translates each search field to a corresponding Pro-Cite field. Personal Bibliographic Software has called these stand-alone translation packages Biblio-Links, and in the past, PBS has sold separate Biblio-Links for each information service. For the Macintosh, Biblio-Links were available for DIALOG, MEDLARS, and BRS information services. But at \$195 each, transferring from multiple information services has been an expensive endeavor.

Biblio-Link II for the Macintosh integrates three Macintosh Biblio-Links into a single program: DIALOG, MEDLARS, and SilverPlatter. The sixty-nine databases included in the SilverPlatter file are new for the Macintosh. The DIALOG and MEDLARS Biblio-Links duplicate what was previously available. At \$195 for the integrated package, it is considerably less expensive than purchasing the separate Biblio-Links. But it also provides a common, customizable platform through which search results can be translated into a Pro-Cite database. Moreover, Biblio-Link II provides users the means

to create new translators for databases not included in the package.

The core of the software consists of three configuration files, one each for DIALOG, SilverPlatter, and MEDLARS. Since bibliographic databases format records and fields differently, Biblio-Link II must interpret a variety of formats and transfer data to the correct Pro-Cite work-form and field. The configuration files contain the detailed instructions Biblio-Link II uses to transfer and translate information into Pro-Cite. For example, the MEDLARS configuration file contains the detailed instructions used to translate the twenty-seven databases offered by that service.

The general operation of the Biblio-Link II software is similar to the original Biblio-Links. Using Biblio-Link II to translate records into a Pro-Cite database is a four-step process: (1) tagged search results are saved onto disk as an ASCII-formatted download file; (2) using a word processor, the download file is purged of unwanted records and extraneous data; (3) Biblio-Link II is opened and, after selecting the appropriate configuration file and database, translates the download file into an existing or new Pro-Cite database; (4) the resulting Pro-Cite database is opened and cleaned up.

Depending upon the size and source of the data file, this can take anywhere from a few minutes to a few hours. For example, a seven-hundred-record ERIC search from SilverPlatter took nearly three hours to convert into Pro-Cite using Biblio-Link II. Less than ten minutes was required for the actual translation and transfer of records. Most of the time was spent customizing the Biblio-Link II software so that it correctly transferred all fields within the records. For example, as the Biblio-Link II software comes predefined, it does not transfer the ERIC document number into any Pro-Cite field. Setting the software to transfer

that information required selecting the appropriate configuration file, opening the correct database, indicating which tagged field contained the document number, and, finally, indicating which Pro-Cite field the contents was to be transferred. This relatively minor change required only a few seconds.

But customizing Biblio-Link II is not always that straightforward or quickly accomplished. Occasionally source fields must be modified to correctly transfer, and these can be particularly frustrating. For example, the tagged source field in SilverPlatter's ERIC database is formatted as:

```
JN: Journal-of-Education-
for-Library-and-Infoma-
tion-Science; v33 n2
p151-55 Spr 1992
```

From this single field, Biblio-Link II must identify the title and move it to the appropriate Pro-Cite field, the volume number and move it to the appropriate Pro-Cite field, the pagination and move it to the appropriate Pro-Cite field, and so on. It must also discard the dashes and colon, most of the alpha characters, and some of the spaces. This is a difficult task for any software to perform, but long as the download file itself is consistent, Biblio-Link II is capable of performing this reliably. The software provides menus and dialog boxes that step the user through the process, but it is a time-consuming process requiring tinkering and experimentation.

However, not all Biblio-Link II database files require such customizing, and once customized, future transfers become routine. For example, a five-hundred-record ERIC download file transferred to Pro-Cite in less than seven minutes including abstracts, document numbers, and correctly parsed source fields.

Still, cleanup within Pro-Cite is often necessary after transferring a download file. No matter how accu-

rately Biblio-Link II transfers records, most databases contain inconsistent data formats, input errors, and other problems that require manual editing to correct. While this is certainly not a Biblio-Link II problem, potential users should be aware that pristine bibliographies cannot be created directly from a file transfer. Biblio-Link II facilitates this cleanup by creating a useful log of inconsistencies encountered during file transfer. Using the log, it is easy to go directly to the record in question to do manual cleanup.

To accommodate databases not included in DIALOG, MEDLARS, or SilverPlatter, Biblio-Link II offers users the opportunity to create new Biblio-Links. Instructions can be scripted to transfer OCLC, RLIN, or even local PAC files into Pro-Cite. Writing such a link involves creating a new configuration file, specifying the format and contents of each record and the format and contents of each field within the record. That information is then mapped to the appropriate Pro-Cite record and field. Creating a custom Biblio-Link is a time-consuming process that makes sense only if you use a database frequently. However, once created, custom links can be shared between several Biblio-Link II users.

The weakest part of this package is the manual, which is redundant and confusing. This is particularly unfortunate, since this is relatively complex software. A well-written manual with a good index would benefit this application immensely. Online help is available but does little more than offer definitions and descriptions of dialogue boxes. Telephone help, however, proved prompt, courteous, and very knowledgeable.

While this software is not as automatic as the packaging implies, it is well designed, flexible, and realistically priced. Creating or sometimes customizing Biblio-Links can

present a steep learning curve, but many users will find the preset mapping adequate. If you transfer medium-sized or large files to Pro-Cite frequently, Biblio-Link II can be a real time saver.—*Scott Seaman is Head of Circulation Services at the University of Colorado, Boulder. His Internet address is seaman@spot.colorado.edu*

### ABI/Inform Ondisc

(Research Edition). University Microfilms, Inc., 300 North Zeeb Rd., Ann Arbor, MI 48106; (800) 521-0600. Price: \$5,500/year. Recommended hardware: IBM AT or greater, 640 KB RAM, 7 MB free space on a hard disk, 5 1/4- or 3 1/2-inch diskette drive, EGA or VGA color monitor, at least one CD-ROM drive controller card, and printer. Minimum hardware requirements: IBM AT, IBM 286 or IBM PS/2 compatible, 640 KB RAM with 484 KB available to run the ProQuest software, 7 MB free space on a hard disk, 5 1/4- or 3 1/2-inch diskette drive, monochrome monitor, and one CD-ROM drive and controller card. Requires DOS 3.3 or higher to run the ProQuest software.

A member of UMI's ProQuest family, ABI/Inform Ondisc is a substantial undertaking. ABI/Inform Ondisc indexes and abstracts articles from approximately nine hundred periodicals. Resembling the online version, ABI/Inform Ondisc focuses on a wide variety of business periodicals. However, many other subject areas are indexed in this product, including industry and technology publications.

The material studied for this review includes three CDs, one of which contains the installation program. The other two CDs together include more than five years of indexing/abstracting coverage. According to UMI promotional material, backfile coverage also may be acquired to 1971. The 4.10, Research Edition, using ProQuest Search-

ware. The product review package also included a ProQuest Business Vocabulary thesaurus, ABI/Inform Ondisc Interim Users Guide, and ProQuest Searchware/Software Installation and Library Holdings Administrator Users Guide.

### Installation

The installation of ABI/Inform Ondisc was tested on an IBM-compatible 486DX computer with one double-speed CD-ROM player. The installation was run from the software contained on the setup CD and was largely completed by responding yes or no to a series of on-screen prompts. Installation was completed in less than ten minutes. If necessary, the ProQuest software may be quickly removed from the hard disk by running a menu-driven "uninstall" program from the setup CD.

Ideally, ABI/Inform Ondisc runs best with each searchable CD loaded in a separate CD-ROM drive. The product, however, will operate from only one CD-ROM player. Since the index/abstract portion of the product runs on a CD-ROM player, the amount of hard disk space required to operate the system is not large. With the TEMP file empty, the ProQuest software requires less than 1.5 megabytes of space and includes four directories.

### Operation

Visually, ABI/Inform Ondisc is designed to catch the attention of potential users. In a public place, such as a library reference area, the product's attractive screen saver will draw patrons to use the system. However, if loading the ProQuest software onto a LAN, system administrators may choose to remove the screen saver because it takes up unnecessary disk space and would be



of little use on a multiple-use network terminal.

The ProQuest system is both user-friendly and menu-driven. Also, the system responds quickly and smoothly to the easily identified menu choices. The product runs well with only one CD-ROM player, although operational use with only one player requires users to switch CDs when searching more than one date range. If using multiple CD-ROM players to run the two or more index/abstract CDs, users will first be asked to select a specific date range to be searched. Once selected, a window appears near the top of the screen that prompts users to key in the word or phrase to be searched. Individual words may be searched with the traditional Boolean operators. ProQuest searches the bibliographic citations, abstracts, and index field for the desired results. Gener-

ally, searchers will be more than pleased with the number and quality of the search results.

The searches conducted for this review resulted in accurate bibliographic citations, excellently written abstracts, and high-quality indexing. Searchable index options include subject, company, geographic location, periodical title, author, index term code, and keyword. Options also include the ability to set a search to retrieve singular or plural word forms and spelling variations. Users may select their own words to be searched, or the system may be prompted to retrieve existing subjects and keywords. As with most electronic indexes, however, the quality and number of entries diminishes when searching phrases.

System help screens are clearly identifiable and provide the information necessary to conduct high-

quality searches. ABI/Inform On-disc allows users either to print or to download to disk the search results. The system also includes a library holdings administrator option that allows the systems manager to enter and update simple or detailed holdings information for individual titles or groups of titles.

### Summary

ABI/Inform Ondisc essentially delivers the same content and quality as the online version. The product is user-friendly and, with suitable computer equipment, should operate with little or no difficulty. ABI/Inform Ondisc is highly recommended for corporate libraries and academic institutions.—Gary L. Cheatham, *North-eastern State University, Tahlequah, Oklahoma*

## Opening

Are there any LITA members who want to become the "Tutorials" editor? If so, please let the editor know, either by U.S.P.S., telephone, or e-mail (send to [leonhardt@ardvark.ucs.uoknor.edu](mailto:leonhardt@ardvark.ucs.uoknor.edu)). State your interest in the job (the editor is a member of the *ITAL* editorial board) and your qualifications—for example, your job assignment, your LITA interest group memberships, etc.

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### **The Challenge of Technology: Action Strategies for the School Library Media Specialist**

By Kieth C. Wright. Chicago: American Library Assn., 1993. 122p. paper, \$22, \$19.80 ALA members (ISBN 0-8389-0604-4).

In *The Challenge of Technology: Action Strategies for the School Library Media Specialist*, Kieth C. Wright presents a full discussion of the place of computer-related technologies in the library media center and, to a lesser degree, the role of the library media center and the school library media specialist in the emerging information society. Wright, professor of Library and Information Studies in the School of Education at the University of North Carolina at Greensboro, has previously authored works on technology and on libraries and the disabled user. He capably handles the difficult issues and problems surrounding technological change and correctly suggests that *change*, including fast-moving technological change, is here to stay and that school library media specialists must formulate strategies proactively to overcome program and technical barriers that prevent the integration of computer-related technologies into the library media center and into education as a whole. In a step-by-step fashion he offers worthwhile practical suggestions for overcoming these barriers, providing detailed assistance with the automation of catalog and circulation databases. His advice includes everything from selecting a vendor to establishing local guidelines and standards, and he offers assistance with equipment purchases and redesigning the library media center to reduce glare and noise and to provide efficient check-

out of materials. Wright reminds the reader that human problems and issues come before technical and technological problems and issues and that these human problems and issues are nearly always more complex and difficult to solve.

Although there is a discussion of the place of the school library media specialist in the educational system, Wright does not present enough specific evidence of how the new computer-related information skills can be used by librarians and teachers in education. Wright is aware that technology has often been misused to reinforce old procedures, in both the classroom and administration. However, the reader is led to expect more discussion in these areas in a manner similar to Wright's analysis of the varied skills acquired when a student fully learns to use an information-retrieval system. Although Wright mentions new classroom configurations (more small group learning and individually paced study), I hoped for more coverage of actual technologies and their application to school assignments. Perhaps Wright did not intend to provide detail at this level, although he was quite specific in other matters, listing particular vendors and computer journals in his bibliography. I believe there is also a basic distinction between the search for *information* and that for *knowledge* that might have been addressed. This discussion could help clarify the role of computer-related technologies in the library media center and the role of the school library media specialist within the educational system. For example, will school library media specialists focus primarily on the teaching of information-seeking skills, or will they also join other creative teachers in helping students learn how to learn, how to think critically, and how to seek knowledge through whatever formats or technologies they need to use?—Alan Bern, *Oakland Public Library*

### **Guide to Technical Services Resources**

Ed. Peggy Johnson. Chicago: American Library Assn. 1994. 545p. \$60, \$54 ALA members (ISBN 0-8389-0624-9).

When I first flipped through the pages of this book I thought, "This looks just like *Sheehy*." Indeed, the introduction states that this guide was inspired by the *Guide to Reference Books* by Eugene P. Sheehy and was intentionally organized in the same way.

Johnson has assembled an annotated bibliography with the ambitious goal of gathering and organizing "the most important recent information resources in the full range of technical services" (p. 1) and has succeeded splendidly. Its chapters are "Technical Services: An Overview" by Sheila S. Intner, with Samson C. Soong and Judy Jeng; "Acquisitions" by Karen A. Schmidt; "Descriptive Cataloging" by Janet Swann Hill; "Subject Analysis Systems" by Nancy J. Williamson; "Authority Work" by Stephen S. Hearn; "Filing and Indexing" by Sarah E. Thomas and Anne Blankenbaker; "Serials" by Marcia L. Tuttle; "Collection Management" by Peggy Johnson; "Preservation" by Wesley L. Boomgaarden; "Reproduction of Library Materials" by Erich J. Kesse; "Database Management" by Christina Perkins Meyer; and "Access Services" by Farideh Tehrani. The chapters are divided into sections, many of which are consistent throughout. Yet each chapter is unique in accordance with the scope of its topic. All chapters include an interesting section called "Sources of Expertise," which lists professional organizations, conferences, electronic discussion lists, etc. An introduction to the topic opens each chapter. These introductions provide an overview of the type of work performed in the area as well as current trends, and a review of them



equips the reader with the general concepts of technical services work in the early 1990s. The introductions also give information as to the content and organization of the chapter. Some of the chapters' sections also have introductions.

Heavy emphasis was placed on the currency of a work as a criterion for inclusion. Most items cited were published since 1985. Those published before 1985 were chosen because they still contribute to understanding current theory and processes. Other criteria included that works serve as basic resources, contribute to the theory of the field in a significant way, or address a unique problem. Like the chapter introductions, the annotations are uniformly well written. Cross-references are abundant and relevant. Items may be listed in more than one chapter, but each annotation relates to the topic of the chapter or refers to an annotation in another chapter. There seems to have been no restriction on the format of the works included. The reader will find books; chapters in books; periodicals; regular columns in journals; articles and special issues in journals; audiovisuals; electronic discussion lists, electronic journals, and files that can be downloaded, with instructions for accessing each; standards; and even IRS regulations. In some chapters, the majority of items are from the mid-1980s, but this is likely due to the lack of recent publications in those areas.

Two of the chapters are worth particular mention. "Descriptive Cataloging" and "Preservation" are especially broad in coverage in terms of the types of items included. And if you wonder why Johnson included a chapter on access services, it is because of "the increasing interrelationship of access services and technical services" (p. 238).

The guide includes a list of acronyms, an author/title index, and a subject index, and is updated by

supplements. It is strongly recommended for all libraries.—*Janet McKinney, University of Missouri-Kansas City*

### **High-Performance Medical Libraries: Advances in Information Management for the Virtual Era**

Ed. Naomi C. Broering. Westport, Conn.: Meckler, 1993. \$39.50 229p. paper (ISBN 0-88736-878-6).

Advances in information technology have led to an extraordinary transformation in libraries, changing not only the way libraries provide services to users, but also the nature of these services. Medical libraries especially have been in the forefront of these changes. In this compilation, Broering, director of the Biomedical Information Resources Center and medical center librarian at Georgetown University Medical Center, brings together a series of case studies that describe some of the most innovative and unique projects in medical libraries in recent years, projects that set the stage for the next generation of virtual medical libraries.

The work is divided into individual sections including "Network and Resource Sharing," "Document Delivery and Full Text Systems," the "Extended Online Catalogue," and "Computer Training Labs and Medical Education Software." In each section, case studies are chosen to illustrate the impact of technology on traditional library functions. The section on document delivery, for example, focuses on automated techniques that link search results to the automated access and retrieval of the document itself. One study describes a prototype system under development at the National Library of Medicine to retrieve documents

automatically and transmit them to the user by fax. A second study takes the process one step further, describing Georgetown University's project to deliver full-text digitized images to the end user.

One of the strengths of this volume is that it highlights activities that serve as paradigms for libraries to recast their roles for the virtual era. One such instance is the collaboration on the GenInfo online search system between the National Center for Biotechnology Information and Washington University Medical Library and Biomedical Communications Center. The library's role in managing the database and providing user-support services serves as a model for new directions in library programming and responding to research needs. Another example is the development of bibliographic standards to describe images available through the OPAC at the Georgetown University Health Sciences Library, an innovative approach to achieving bibliographic control over nontraditional information sources.

No work on technological changes in medical libraries could ignore the leadership of the National Library of Medicine, and several articles focus on activities initiated under its aegis. One of the most important has been IAIMS, the Integrated Advanced Information Management System, an initiative designed to integrate and improve the flow of information in medical centers. The section on IAIMS outlines the goals and evolution of the project and describes the IAIMS initiative at Georgetown University Medical Center, one of the initial IAIMS sites and an excellent prototype of its achievements. A second major NLM initiative described in this work is the Unified Medical Language System (UMLS), a research-and-development program to help users retrieve and integrate information from a variety of disparate information sources, and a project whose outcome will have impli-

cations for information retrieval and management far beyond the medical library community.

The only weak section of the work is that on integrated hospital, corporate, and society libraries. The case studies examined do not represent the same level of advanced technology as other studies in the volume, though they may be helpful to libraries contemplating similar projects.

The studies presented in this work represent but a fragment of the exciting advances occurring in medical libraries. This compilation may prove useful to smaller medical libraries planning to implement advanced information technologies or as a textbook for a class on medical librarianship. For nonmedical librarians, the work provides a useful guide to directions in the medical library field.—*Susan Jacobson, Columbia University*

### **Hypertext and the Technology of Conversation: Orderly Situational Choice**

By Susan H. Gray. Westport, Conn.: Greenwood, 1993. 261p. \$59.95 (ISBN 0-313-28962-x).

This book is primarily for hypertext designers, information science researchers, and social science researchers. It explores computer-human interaction difficulties with hypertext from the ethnomethodological and social-construction-of-text approaches. Readers should understand basic hypertext design concepts in order to better comprehend the book. Readers who have experience in navigating hypertext and have a social science background will benefit most from this book.

Gray presents here an examination of hypertext use that is informed by conversation analysis techniques derived from ethnomethodology and

elements of social-construction-of-text approaches. Approaches used more generally to study human-human interaction are here applied to computer-human interaction. It is an alternative to the more traditional cognitive approach to studying hypertext navigation. In this, mechanical actions taken by the actors and conversation (thinking aloud about the searching of the database) are viewed as texts containing socially constructed meanings based upon assumptions taken for granted by the actors. These assumptions concerning text and information organization, including linearity and the shared literalness of meanings for categories by actors, can be routinely violated in hypertext navigation. When these assumptions are violated, the content of the actors' taken-for-granted realm, which is vocalized in this study, becomes more explicit. As software designs become increasingly more complex, the author hopes that this study concerning human-machine interaction will bring hypertext designers to focus on the interactional elements and their systemic components.

In the first section of chapter 1, the author defines ethnomethodology and the elements of social-construction-of-text. Brief introductory paragraphs about the following chapters with concise research background are illustrated in the later part of chapter 1. In chapter 2, the theory and practice behind computer-human interaction, ethnomethodology, and the social construction of text are discussed in detail. Description of the specific method used to obtain the data used for analysis is in chapter 3. Transaction logs containing links navigated and thoughts articulated by ten users of a hypertext on violent crime are collected as the data. Common category troubles in hypertext use resulting from the lack of shared literal meanings for categories by social actors and the software found in

transactions logs are illustrated and examined in chapter 4. Another kind of trouble—navigation problems resulting from actors' expectations of linearity and its structural dearth in a nonlinear medium (a book metaphor design in this hypertext) are described in chapter 5. In chapter 6, indexicality—the context dependence is defined and examined in order to better understand actors' routine assumption in hypertext navigation and how they affect the interaction. The concept is explicitly illustrated by actors' accounts—transaction logs and drawings of assumptions. Through an examination of these sequences, it is argued that actors' error-making activities may be seen as resources in that a sequence of errors becomes an accessible repair mechanism for attempting to avert complete interactional breakdown. Using profound troubles as a way of illustrating the retrospective and prospective nature of actors' resources, differences between the approach illustrated in the previous chapter and a more cognitive-science-based microanalysis are discussed in chapter 7. In chapter 8, profoundly troubled paths are examined. The troubles generated from insufficient correct information and the lack of search-based validation of what are essentially paths are reviewed. Actors' attributions and structural metaphors are further examined in chapter 9. Various patterns in metaphor mapping are discussed. Gray concludes that actors over time have the capacity to alter their preferred metaphors for an information system. Systems designers who design systems for more long-term use may wish to exploit actors' capacities to revise visualization.

As the author indicates in the closing remarks (chapter 10), the methods used are largely based upon the researcher's own consciousness and social construction. The author offers here an alternative approach to studying hypertext. The



book is well organized, clearly written, and well documented. However, the research methodology, the validity of the text, and its conclusions will need further confirmation from researchers. Chapter 1 contains research theories which might frustrate readers new to behavioral science and information science. More background information and an explanation of theories behind human-human interaction and human-machine interaction would make the text clearer, since a lot of information science workers and programmers lack a social science background.—*Birong Ho, Wayne State University*

## **Organizational Decision Making and Information**

By Mairead Browne. New York: Neal-Schuman, 1993. 272p., \$55 (ISBN 0-89391-870-9); paper edition, Ablex, 256p., \$26.95 (ISBN 1-56750-017-X).

In a highly readable text, the author reviews the process of high-level decision making, describes research undertaken on decision making in a higher education institution in Australia, presents the results of the research, and develops a model for the design and development of information systems to support decision makers.

The book builds upon earlier theoretical works on high-level decision making. The author uses a method of analysis introduced by Graham Allison in his 1971 classic, *Essence of Decision: Explaining the Cuban Missile Crisis*. Allison analyzed the Kennedy administration's decision-making process during the Cuban missile crisis from three distinct perspectives: rational, organizational, and political. The important breakthrough in this work was the notion that multiple perspectives are helpful as one attempts to analyze, understand, and develop workable solutions to complex human problems.

After providing a very clear introduction to the evolution of the concepts of decision making in an organizational context, Browne describes the two dominant decision-making theories used in organizational analysis today. Herbert Simon and his colleagues at Carnegie Mellon University first developed the "bounded rationality" theory of decision making in the late 1950s. They argue that organizational decision making is not purely rational but is rational within the context of the organization. The opposing "political theory" maintains that decision making within organizations is essentially political in nature. In this model decisions are made based on influence, power, coalitions, bargaining, and compromise.

Browne proceeds to integrate the two dominant theories of decision making and the major theoretical contributions on information use into two models which describe the use of information within the context of nonroutine organizational decision making. The models are developed for testing in an Australian institution of higher education involved in a federally mandated organizational restructuring. The study, first written as a doctoral dissertation, covers a six-year period and follows the well-documented efforts of a college council charged with making recommendations for restructuring and contraction. For anyone working in higher education today, the context will be all too familiar.

Browne first constructs a "structured model" of decision making based on the literature of bounded rationality. Propositions are constructed related both to the decision-making process and the use of information throughout the stages or phases of decision making. Secondly, an "anarchic model" is constructed based on the literature of the political or "garbage can" model of decision making first introduced by Cohen, March, and Olsen in 1972.

Again, propositions are constructed for decision making and use of information.

The propositions in each model are tested against the college council's record of decision making and use of information. The results of this study are a new set of propositions and a generalized model for decision making and information. The model is used to suggest specifications for the processes and output of a system to support decision making in an organization. This work should clarify why efforts to develop decision-support systems within organizations are so difficult and so often fail. The information support required by high-level decision makers is both complex and continuous and requires output that includes qualitative and quantitative information in highly refined states.

Browne makes a significant contribution to the current literature by presenting specifications for an information system to support high-level organizational decision making. The book will be particularly useful for management and information science students and for information systems managers charged with providing decision support to high-level decision makers. Chapter 7 is a must read for anyone thinking of purchasing decision-support software or considering building such software. The complexity of the issues involved must be understood for any such efforts to be successful.—*Carolyn M. Gray, Brandeis University*

## **Teleworking Explained**

By Mike Gray, Noel Hodson, and Gil Gordon. New York: Wiley, 1993. 289p. \$44.95 (ISBN 0-471-93975-7).

While we Yanks would probably use "telecommuting" as our term, the British authors of this very thor-



ough treatment define their subject carefully: "Teleworking is a flexible way of working which covers a wide range of work activities, all of which entail working remotely from an employer's site or from a traditional place of work, for a significant proportion of work time. Teleworking may be on either a full-time or a part-time basis. The work often involves electronic processing of information, and always involves using telecommunications to keep the remote employer and employee in contact with each other" (p. 2). The book itself is the product of teleworking, as the authors add in an amusing appendix, showing how the twenty-three collaborators on both sides of the Atlantic shared their work. In six large sections, the book covers all aspects of the subject, and while the tone is positive (virtually all of the collaborators are employees of British Telecommunications, and the BT symbol appears on the cover), sensitive issues involving working conditions, insurance, and supervision figure prominently.

The first section is an introduction to the many technical and human issues of teleworking. The second section deals with organizations and employers, providing a strategy for implementing formal teleworking programs and detailing related matters such as contracts, unions, safety, training, tax treatment, and the management of dispersed teams. The point of view shifts for the third section to the individual worker, touching on tax deductions, equipment, family issues (work invades the home), and support. The fourth section treats the economic aspects of the topic and presents a number of case studies. In section five the topic is security, and much of the discussion is extremely relevant to current Internet concerns. Technology is woven throughout the book as the underpinning of teleworking, but the sixth section deals with key

aspects explicitly: ISDN, competition in telecommunications, electronic mail, facsimile, mobile phones, and video telephony, among other topics. The British origin of the collaborators does not limit the scope or relevance of the book, since the team went to great pains to use U.S. examples, U.S. terminology ("billion" in the book is the U.S. one, and monetary measures are always converted), and U.S. workplace issues. For an employer contemplating the use of teleworking or for the individual beginning to experiment with it, this book is an excellent source. There are many illustrations, diagrams, and floor plans (one of which, for a "telebusiness center," shows a terminal for a library catalog [p. 14]), and the text bristles with useful statistics on the current extent of teleworking. Libraries, unfortunately, do not even appear in the index, a message we should take to heart.—John Blegen, *Glenview Public Library, Glenview, Illinois*

### Other Recent Receipts

Auger, C. P. *Information Sources in Grey Literature*. 3d ed. New Providence, N.J.: Bowker-Saur, 1994. 170p. \$65 (ISBN 1-85739-007-5).

Beghtol, Clare. *The Classification of Fiction: The Development of a System Based on Theoretical Principles*. Metuchen, N.J.: Scarecrow, 1994. 376p. \$39.50 (ISBN 0-8108-2828-6).

Bessler, Joanne M. *Putting Service into Library Staff Training*. Chicago: American Library Assn., 1994. 70p., paper, \$14, \$12.60 ALA members (ISBN 0-8389-3437-4).

Butler, Joel. *High-Technology Degree Alternatives: Earning a High-Tech Degree while Working Full Time*. Belmont, Calif.: Professional Publications, 1994. 182p. paper, \$21.95 (ISBN 0-91204-61-2).

Cawkell, A. E. *Encyclopaedic Dictionary of Information Technology and Systems*. New Providence, N.J.: Bowker-Saur, 1994. 339p. \$75 (ISBN 1-85739-036-9).

*CD-ROM in Libraries: Management Issues*. Ed. Terry Hanson and Joan Day. New Providence, N.J.: Bowker-Saur, 1994. 296p. \$60 (ISBN 1-85739-086-5).

Dewire, Dawna Travis. *Application Development for Distributed Environments*. New York: McGraw-Hill, 1994. 298p. \$40 (ISBN 0-07-016733-8).

Dickinson, Gail K. *Selection and Evaluation of Electronic Resources*. Englewood, Colo.: Libraries Unlimited, 1994. 110p. paper, \$21 (ISBN 1-56308-098-2).

*Election Results Directory: A Complete Listing of State and Federal Legislative and Executive Branch Officials*. 1994 ed. Washington, D.C.: National Conference of State Legislatures, 1994. 278p. paper, \$35 (ISBN 1-55516-743-8).

Estrada, Susan. *Connecting to the Internet: An O'Reilly Buyer's Guide*. Sebastopol, Calif.: O'Reilly, 1993. 170p., paper, \$15.95 (ISBN 1-56592-061-9).

Gilster, Paul. *The Internet Navigator: The Essential Guide to Network Exploration for the Individual Dial-Up User*. New York: Wiley, 1993. 470p., paper, \$24.95 (ISBN 0-471-59782-1).

*Guide to Special Issues and Indexes of Periodicals*. 4th ed. Ed. Miriam Uhlán and Doris B. Katz. Washington, D.C.: Special Libraries Association, 1994. 216p., paper, \$56, \$45 SLA members (ISBN 0-87111-400-3).

Hernon, Peter. *Statistics: A Component of the Research Process*. Norwood, N.J.: Ablex, 1994. 248p., paper, \$22.50 (ISBN 1-56750-093-5).

Hoskins, Jim. *IBM RISC System/6000: A Business Perspective*. 4th ed. New York: Wiley, 1994. 356p., paper, \$27.95 (ISBN 0-471-59935-2).

*Information Management and Technology in Healthcare: A Guide to Education and Training*. Ed. J. Michael Brittain and W. Abbott. Los Angeles: Taylor Graham, 1993. paper, \$110 (ISBN 0-947568-59-X).

Jaffe, Lee. *Introducing the Internet: A Trainer's Workshop* (includes diskettes). Internet Workshop Series, no. 1. San Carlos, Calif.: Library

- Solutions Pr., 1994. 90p., paper, \$45 (ISBN 1-882208-05-6).
- Kehoe, Brendan P. *Zen and the Art of the Internet: A Beginner's Guide*. Englewood Cliffs, N.J.: Prentice-Hall, 1994. 192p., paper, \$23.95 (ISBN 0-13-121492-6).
- Library Without Walls: Plug in and Go*. Comp. Susan B. Ardis. Washington, D.C.: Special Libraries Association, 1994. 213p., paper, \$31, \$25 SLA members (ISBN 0-87111-422-4).
- Martin, Rebecca L. *Libraries and the Changing Face of Academia: Responses to Growing Multicultural Populations*. Metuchen, N.J.: Scarecrow, 1994. 273p. \$29.50 (ISBN 0-8108-2824-3).
- Providing Public Services to Remote Users*. SPEC Kit 191. Comp. Craig Haynes. Washington, D.C.: Association of Research Libraries, 1993. 166p., paper, \$40, \$25 ARL members (no ISBN).
- Quality Improvement in ARL Libraries*. SPEC Kit 196. Comp. Jack Siggins. Washington, D.C.: Association of Research Libraries, 1993. 149p., paper, \$40, \$25 ARL members (no ISBN).
- Research Libraries—Yesterday, Today, and Tomorrow: A Selection of Papers Presented at the International Seminars, Kanazawa Institute of Technology, Library Center, Kanazawa, Japan, 1982-1992*. Ed. William J. Welsh. Westport, Conn.: Greenwood, 1993. 467p. \$95 (ISBN 0-313-28966-2).
- Robison, David F. W. *All About Internet FTP: Learning and Teaching to Transfer Files on the Internet* (includes diskettes). Internet Workshop Series, no. 2. San Carlos, Calif.: Library Solutions Press, 1994. 85p., paper, \$30 (ISBN 1-882208-04-8).
- Rogers, Rick. *Teaching Information Skills: A Review of the Research and Its Impact on Education*. New Providence, N.J.: Bowker-Saur, 1994. 101p. \$40 (ISBN 1-85739-054-7).
- Saffady, William. *Introduction to Automation for Librarians*. 3d ed. Chicago: American Library Assn., 1994. 430p. \$45, \$40.50 ALA members (ISBN 0-8389-0628-1).
- Sever, Irene. *Beginning Readers, Mass Media, and Libraries*. Metuchen, N.J.: Scarecrow, 1994. 214p., \$27.50 (ISBN 0-8108-2756-5).
- A Space Reality-Strategies for Obtaining Funding for New Library Space 2001*. SPEC Kit 200. Comp. Paula T. Kaufman. Washington, D.C.: Association of Research Libraries, 1993. 149p., paper, \$40, \$25 ARL members (no ISBN).
- Unpublished Materials: Libraries and Fair Use*. SPEC Kit 192. Comp. Angie Whale LeClercq. Washington, D.C.: Association of Research Libraries, 1993. 122p. paper, \$40, \$25 ARL members (no ISBN).
- Veljkov, Mark, and George Hartnell. *Basic Internet Utilities*. Pocket Guides to the INTERNET, vol. 5. Westport, Conn.: Mecklermedia, 1994. 68p. paper, \$7 (ISBN 0-88736-947-2).
- Veljkov, Mark, and George Hartnell. *The Internet E-Mail System*. Pocket Guides to the INTERNET, vol. 4. Westport, Conn.: Mecklermedia, 1994. 58p., paper, \$7 (ISBN 0-88736-946-4).
- Veljkov, Mark, and George Hartnell. *Telnetting*. Pocket Guides to the INTERNET, vol. 1. Westport, Conn.: Mecklermedia, 1994. 42p., paper, \$7 (ISBN 0-88736-943-X).
- Wolfe, David. *The BBS Construction Kit: All the Software and Expert Advice You Need to Start Your Own BBS Today!* (Includes disk.) New York: Wiley, 1994. 373p. paper, \$27.95 (ISBN 0-471-00797-8).

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# News and Announcements

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## Irene Hoffman Named Director of OCLC Pacific

Irene M. Hoffman has been promoted to director of OCLC Pacific, the OCLC service center for libraries in Alaska, California, Hawaii, Oregon, Washington, Western Canada, and other Western states.

In her new position, Hoffman is responsible for user training and customer service activities such as workshops and system support, and membership activities.

Hoffman was associate librarian at the University of California at Davis from 1982 to 1985 and was library instruction coordinator at California State University at Los Angeles from 1985 to 1987.

She began working at OCLC Pacific as a marketing representative. She was appointed manager of sales and marketing in 1989.

Hoffman is a graduate of Northwestern Illinois University, Chicago, and earned a master's degree from the University of Illinois Graduate School of Library and Information Science.

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## Free Newsletter

*HOTT—Hot Off The Tree*—is a free monthly electronic newsletter featuring the latest advances in computer, communications, and electronics technologies. Each issue provides article summaries on new and emerging technologies, including VR (virtual reality), neural networks, PDAs (personal digital assistants), GUIs (graphical user interfaces), intelligent agents, ubiquitous computing, genetic and evolutionary programming, wireless networks, smart cards, video phones, set-top boxes, nanotechnol-

ogy, and massively parallel processing. Summaries are provided from the following sources: the *Wall Street Journal*, the *New York Times*, the *Los Angeles Times*, the *Washington Post*, the *San Jose Mercury News*, the *Boston Globe*, the *Financial Times* (London); *Time*, *Newsweek*, *U.S. News & World Report*, *Business Week*, *Forbes*, *Fortune*, *The Economist* (London), *Nikkei Weekly* (Tokyo), the *Asian Wall Street Journal* (Hong Kong); over fifty trade magazines, including *Computerworld*, *InfoWorld*, *Datamation*, *Computer Retail Week*, *Dr. Dobb's Journal*, *LAN Times*, *Communications Week*, *PC World*, *New Media*, *VAR Business*, *Midrange Systems*, *Byte*; over fifty research journals, including all publications of the IEEE Computer and Communications Societies, plus technical journals published by AT&T, IBM, Hewlett Packard, Fujitsu, Sharp, NTT, Siemens, Philips, GEC; and over one hundred Internet mailing lists and USENET discussion groups.

In addition, *HOTT* provides listings of forthcoming and recently published technical books; listings of forthcoming trade shows and technical conferences; and company advertorials, including CEO perspectives, tips and techniques, and new product announcements. *HOTT* features exclusive interviews with technology pioneers—the next two issues contain interviews with Mark Weiser (head of Xerox PARC's Computer Science Lab) on ubiquitous computing, and Nobel laureate Joshua Lederberg on the information society.

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## RLIN Record Task Force Recommendations —RLG Actions

The RLIN Record Task Force (RRTF) completed its recommendations on ways to expedite record contributions to RLIN in December 1993. These recommendations were posted on RLIN-L and sent to all RLG member representatives and directors of nonmember RLIN technical processing libraries for feedback. They were also a discussion topic at the RLIN Forum held at the ALA Midwinter Meeting.

Based on the comments received, RLG is following up on the RLIN Record Task Force recommenda-

tions given in the following three categories:

1. **Recommendations for user action:** Institutions are strongly encouraged to include accurate encoding levels and content designation in their records so that accurate RLIN "CC" values can be set. (Otherwise, records will be loaded with the default CC value of "66" [unknown] in the second and third positions.) The RRTF designated two levels of contribution: "Basic" (current cataloging, including records for preservation masters) on at least a monthly basis, so institutions can become ongoing record contributors as quickly as possible, and "Extended" (including local data, in-process records, retrospectively converted titles, and all updates). Although the RRTF recognizes that updates to bibliographic and volume-level information are more important than copy-level updates, no local system implementation currently makes the differentiation. The main objective is to make it as easy as possible for users to contribute records from their local systems.

2. **Recommendations for RLG action:** RLG is taking action on all six of the task force's recommendations:

a. *Significantly increase record load capacity:* RLG will continue to give priority to its database file server project (which will allow records to be loaded while records are created or updated on RLIN), to be completed by April 1995. RLG will publicize the anticipated impact of this project and its long-range plans for increasing data load capacity.

b. Streamline and enhance the record conversion process (six subpoints): (1) RLG will routinely load *current* records (last twelve to eighteen months of cataloging) from new contributors before loading their older records. (This depends on the ability of new contributors to filter out older records from their initial loads and their collaborating with the RLG Dataloads Manager to make certain that earlier versions do not overlay later versions after the initial load is completed.) (2) Conversion of bibliographic data for records in all formats will be standardized, and new ways to streamline bibliographic data conversion will be investigated as part of RLG's implementation of Format Integration. (3) RLG has started loading older visual materials records. (4) RLG will pursue distinguishing on-order and in-process records from cataloging records as part of its long-term planning on dataloads. (5) The CC value of institutions' batch-loaded records will continue to reflect the records' encoding level, provided that the institution verifies the encoding levels are accurate before the records are loaded. (6) The recommendation to display DCF values with the LI information on MUL and PRI screens was implemented on December 22, 1993.

c. *Formalize and monitor the process of becoming a record contributor:* RLG staff will revise its current documentation to describe more clearly the tasks that must be completed before initial production loads of an institution's records can begin, and the procedures to

be followed. RLG will initiate an evaluation process by contributors to identify areas that need to be clarified.

d. *Complete implementation of the USMARC format for holdings:* RLG is currently working on the second phase (display of USMARC holdings data in RLIN); the specifications have been written and reviewed, and an estimate on when this phase can be implemented will be posted on RLIN-L by the end of March. The third and fourth phases (online input/update, export of USMARC holdings data and conversion of RLINMARC holdings to USMARC holdings for export) will follow.

e. *Complete implementation of FTP capabilities:* RLG has implemented FTP of records to RLIN from the Library of Congress (see *RLIN FOCUS*, issue no. 6), and is soliciting beta sites that now contribute records regularly and wish to migrate from tape to FTP. RLG is currently working on FTP enhancements to PASS for transferring records by FTP to a local host, to be available to beta sites in summer 1994.

f. *Develop pricing mechanisms which encourage frequent record contributions:* In FY 95, data loads of user-contributed records (by tape or FTP) and any conversion needed to load them will continue to be free of charge. Following the RRTF recommendation, RLG will introduce a new charge for the online export of RLIN bibliographic records belonging to other institutions and authority records (by the current PASS or by the FTP enhancements to PASS) at the same



rate as the per-record charge for transaction tapes. These charges will be deeply discounted to institutions that do all their technical processing on RLIN or are contributing current cataloging at least monthly (by tape or FTP) and, for authority records, to institutions that are RLIN NACO contributors. Online export of an institution's own bibliographic records will continue to be free of charge. (See the March 1, 1994, memo on projected FY 95 rates sent to all RLIN users.)

- 3. Recommendations for cooperative action:** RLG will establish a new RLIN Database Advisory Group which will follow up on the RLIN Record Task Force recommendations and coordinate efforts among RLIN institutions, RLG central staff, and local systems vendors. The group will be charged with improving communication between RLG and RLIN institutions about data loads, working with local systems vendors to provide improved record export capabilities, and working with institutions to resolve procedural and technical problems with record contributions. The new RLIN Database Advisory Group and its charge will be announced in the next issue of *RLIN FOCUS*.

RLG wishes to extend its heartfelt gratitude to the hard-working task force: Ross Atkinson (Cornell), Paul Conway (Yale), Chris Meyer (U. Minnesota), Anne Myers (Boston U. Law), Betsey Patterson (Emory), Diane Perushek (U. Tennessee), Julia Van Haften (NYPL), Robin Wendler (Harvard), and Robert Wolven (Columbia).—Karen Smith-Yoshimura, *Library and Bibliographic Services*

## **Applied Physics Journal to Go Online in 1995**

The American Institute of Physics and OCLC have agreed to make *Applied Physics Letters*, AIP's weekly journal, available electronically through OCLC's Electronic Journals Online system. *Applied Physics Letters Online* will provide concise, up-to-the-minute reports of significant new findings in applied physics. It will be available in January 1995.

Emphasizing rapid dissemination of key data, *Applied Physics Letters Online* will offer prompt publication of significant new experimental and theoretical papers on new applications of physics to other branches of science and engineering. Subject areas covered in the online journal will include semiconductors; superconductivity; condensed matter; optics and solid state lasers; nonlinear optics; surfaces, interfaces, and thin films; preparation and properties of materials; and electrical and magnetic device properties.

Pricing for the online journal will be available in early July. Substantial discounts will be provided for institutions desiring combined print and online subscriptions.

*Applied Physics Letters Online* will join three other electronic journals available through OCLC's Electronic Journals Online system. In July 1992, the *Online Journal of Current Clinical Trials*, published by the American Association for the Advancement of Science, was launched. The *Online Journal of Knowledge Synthesis for Nursing*, published by Sigma Theta Tau International, honor society of nursing, became available in January 1994. *Electronics Letters Online*, the prestigious biweekly journal of international electronics research published by the Institution of Electrical Engineers, will be available in March 1994.

OCLC Electronic Journals Online offers fast publication; a graphical user interface that displays figures, tables, and equations; immediate access to timely information—available online twenty-three hours a day; access from the office, dormitory, or library; and optimal searching capabilities. Other features include an extensive help system, toll-free telephone support, and comprehensive user documentation.

## **Minolta Donates Micrographic Equipment for Tibetan Manuscript Project at the Newark Museum**

Minolta Corporation's Document Imaging Systems Division recently donated an RP 605Z Reader-Printer to the Newark Museum Library, where it will be used to view and print from 35mm negatives of the museum's extensive Tibetan manuscript collection. These documents, which are religious and secular in nature, originate from the twelfth through the sixteenth centuries and comprise approximately forty-five books, each containing 400–900 inscribed pages of text.

The initial microfilming has been completed, and materials are being disseminated to a number of scholars worldwide for analysis and codification. Their findings will be published in a major scholarly catalog.

Initial reactions from specialists who have studied the materials indicate that many of Newark's manuscripts are unique and of critical importance for the study of Tibetan literature.

The Tibetan manuscripts in the Newark Museum's collection are

highly valued because of their age and beauty. Each folio is inscribed on both sides in gold or silver ink, and some of the folios are decorated with miniature portraits of Buddhas and saints. The most important religious texts were rescued from destroyed royal palaces and monasteries during the Sino-Tibetan border wars of 1905-1918 and brought to the museum by an American missionary physician, Dr. Albert L. Shelton, between 1911 and 1920.

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## Ansari Donates \$5,000 for GIS Best Reference Work Award

The Geoscience Information Society (GIS) is pleased to announce the creation of the GIS-Mary B. Ansari Best Reference Work Award. The award is funded by a generous gift of \$5,000 from former GIS President Mary B. Ansari, Director for Branch Libraries and Library Administrative Services at the University of Nevada, Reno. The gift will enable the society to include a check for \$500 to the winner of this annual award, now entering its seventh year.

The first GIS-Mary B. Ansari Award will be presented to the author or editor of the geoscience reference work judged the most outstanding. The first presentation will be made at the (October) 1995 annual GIS meeting to be held in Seattle.

Ansari has been an active GIS member over the years. She served as treasurer in 1985 and as president in 1990. She and her husband, Nazir Ansari, have also been involved in the development of the University of Nevada, Reno. In 1991, their donation of \$100,000 established the Mary B. Ansari Map Library, and in 1993 they presented the

university with a gift of \$250,000 for the establishment of a Business/Government Information Center.

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## FirstSearch Wins CLIPS Award

OCLC's FirstSearch Catalog Document Ordering/ILL System has been named winner of the 1994 Computers in Libraries Information Product/Service (CLIPS) Award, which was presented on March 1, 1994, during the Computers in Libraries Conference in Washington, D.C. A panel of five judges, representing different types of libraries from around the country, named the winner.

The document ordering and interlibrary loan system makes items located in FirstSearch databases available for delivery quickly and inexpensively. The FirstSearch Catalog, OCLC's online reference service designed for library patrons, was the 1992 CLIPS Award winner.

The FirstSearch document ordering system allows libraries and library patrons to order articles electronically. Document ordering options include fax delivery, overnight mail, and first-class mail. Fast-Doc, the newest document ordering option on FirstSearch, provides fax delivery in one hour or less of articles found in the serials databases ArticleFirst and Periodical Abstracts.

The FirstSearch ILL system lets library patrons fill out loan requests electronically through a link with OCLC's PRISM ILL system. Already verified, these requests are then transmitted to the library's ILL review file, eliminating the need for staff to rekey the requests from a local system.

The CLIPS Award is sponsored by *Computers in Libraries*, a journal for academic, public, and special li-

brarians; information managers; technical information specialists; and informed scientists. *Computers in Libraries* is published by Meckler Corporation, sponsor of the Computers in Libraries Conference.

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## RLG Hangs Out "New and Improved" Sign at ALA Booth 760

The Research Libraries Group presented a cornucopia of new and upgraded products and services at the ALA Midwinter meeting in Los Angeles. RLG staff members were on hand to show users what's online:

- Eureka, the search service from RLG that provides easy access to the rich resources of RLIN's bibliographic and CitaDel's citation databases. For an online demo, type one of the following commands: telnet eureka-info.stanford.edu or telnet 36.26.0.172.
- Zephyr, RLG's new Z39.50 service, lets users of other online systems search RLIN and CitaDel files using the same commands they use to search their own local catalogs. It also displays the information in the client's own, familiar formats. Even if the two systems run on different hardware or use different commands or screen displays, Zephyr makes the differences invisible. Although several Z39.50 servers are in the testing phase, Zephyr is among the first services to be put into production.
- Ariel for Windows is quick, high-quality document transmission software. It lets users send and receive crisp, clear copies of documents—including photos and diagrams—over the Internet

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with the speed and ease of a fax. Ariel will be able to import TIFF files created by other programs, making connecting a snap. No exotic hardware is required: just a standard PC, scanner, and laser printer. Ariel is ideal for interlibrary loan departments looking to save money and staff time while improving service to users.

- CitaDel, RLG's groundbreaking citation and document delivery service, continues to expand its wide range of popular and special-interest databases. New services include: Anthropological Literature, discussed in detail in the following article; Handbook of Latin American Studies, which joins CitaDel stalwarts the Hispanic American Periodicals Index (HAPI) and the Index to Hispanic Legislation, making CitaDel the single source for current information on Hispanic-American and Latin American topics; and four files from Cambridge Scientific Abstracts—Environmental Sciences and Pollution Management; Expanded Life Sciences with Bioengineering; Marine Biology including Aquatic Sciences and Fisheries Abstracts; and Scientific Conference Papers.

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## OCLC to Test Internet Access to PRISM

In April, OCLC began providing Internet access to PRISM service for cataloging and interlibrary loan on a trial basis for one year.

The Internet connection to the PRISM service will provide full interactive functionality of the cataloging and interlibrary loan systems when accessed via OCLC Passport software.

According to Shirley Hyatt, manager of product services, one of the biggest changes that will come with expanded Internet access is that OCLC and its regional network affiliates will no longer be able to provide libraries with the same "cradle-to-grave" support they currently have with the OCLC network and OCLC workstations and products.

Hyatt also noted that having PRISM services available via the Internet will broaden international access to OCLC, particularly for countries in which high telecommunications costs currently create a barrier.

During the test, if demand exceeds capacity (five hundred simultaneous users), additional users will temporarily be prevented from logging on. Therefore, OCLC encourages users not to disable their other OCLC access methods until they gain more experience with cataloging and resource sharing via the Internet.

Prior to the beginning of the test, users will receive an OCLC technical bulletin with instruction for logging on.

OCLC currently provides Internet access with no connect charge for reference services and the Electronic Journals Online publications. This policy will be continued.

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## Thrower Symposium Explores Impact of Science, Technology on the Courts

Should judges be allowed to decide cases involving complex scientific evidence when they have not been trained as scientists? Is the use of video recordings and other high-tech devices in civil and criminal trials improving the justice system?

These and related issues were explored on February 24 at Emory Law School's "1994 Thrower Symposium: The Impact of Science and Technology on the Courts."

The event included a series of presentations on "Judicial Management of Scientific Issues." "The Courtroom of the Future" was also discussed and demonstrated. Speakers and their topics included:

- Michael C. Gottesman, professor of law at Georgetown University Law Center, "The Standard for Admitting Expert Testimony after *Daubert v. Merrill-Dow Pharmaceuticals, Inc.*";
- Joe S. Cecil, program director in the Division of Research at the Federal Judicial Center, "Defining the Role of Court Appointed Experts";
- Margaret Farrell, professor at Benjamin A. Cardozo School of Law of Yeshiva University, "The Use of Special Masters in Cases That Involve Scientific and Technical Evidence";
- Frederic Lederer, professor at the College of William and Mary's Marshall-Wythe School of Law, showing a videotape of "Courtroom 21, The Courtroom of the 21st Century Today"; and
- Henry H. Perritt, Jr., professor at Villanova University School of Law, "The Use of Video-Recording Equipment for Depositions and the Trial Record."

The symposium concluded with "High-Tech Litigation," a demonstration of the technology used in litigation and a discussion of evidentiary issues. Multimedia demonstrations were conducted by Claire Booth of Multimedia Legal Services, Inc., and John McClaugherty of A.D.A.M. Software, Inc.

The Thrower Symposium is an annual event designed for legal experts, scholars, and the community to address important legal and public policy issues.



## RLG Adds Anthropological Literature to CitaDel

The Research Libraries Group has added Anthropological Literature—a file of over eighty-seven thousand citations compiled by Harvard's Tozzer Library—to its CitaDel citation and document delivery service. The file is the most comprehensive index to research in anthropology available today.

File citations refer to articles from over eight hundred scholarly journals and two hundred monographic series on anthropology and related fields from the Tozzer Library collection. Coverage, dating mainly from 1984 to the present, includes research articles and reports, commentaries, review essays, and obituaries. Subjects include archaeology, cultural and social anthropology, biological and physical anthropology, linguistics, sociology, history, economics, art history, religious studies, music, and area studies. Materials are in a variety of languages. Online records contain English translations of the title if supplied by the journal or edited work.

Anthropological Literature will be updated quarterly with approximately two thousand new citations. In addition, Tozzer Library is working on the retrospective conversion of approximately two hundred thousand article entries in its card catalog that date from the late 1880s through 1983. These entries will be added to the file over the coming year.

Copies of all materials referenced in Anthropological Literature are available by interlibrary loan directly through Tozzer Library.

Access to Anthropological Literature is available by annual subscription. Institutions with subscriptions to Eureka/RLIN or to another

CitaDel file are eligible to receive discounts on Anthropological Literature subscriptions.

For more information, contact an RLG sales associate at 800-537-7546 or send e-mail to [bl.sal@rlg.bitnet](mailto:bl.sal@rlg.bitnet) or [bl.sal@rlg.stanford.edu](mailto:bl.sal@rlg.stanford.edu).

## Pacific Bell to Link Public Schools and Libraries to Communications Network

At a joint press conference with California Governor Pete Wilson, Assembly Speaker Willie Brown, and the California Department of Education, Pacific Bell President Phil Quigley announced that Pacific Bell will offer a \$100 million investment in linkage for computer communications and videoconferencing to each of the nearly 7,400 public K-12 schools, public libraries, and community colleges in Pacific Bell territory by the end of 1996.

Components of Pacific Bell's education initiative include:

- Switched digital service, allowing telecomputing and interactive telelearning capability, will be made available to all public K-12 schools, public libraries, and community colleges in Pacific Bell's service territory by the end of 1996. Subject to regulatory approval, each institution can get free installation of four ISDN lines for these applications, and Pacific Bell will waive the usage charges for the first year after installation.
- The company will work with the California Public Utilities Commission to develop an educational access rate that will ensure

affordable telecommunications connectivity for all schools and libraries in the state.

- Subject to regulatory approval, Pacific Bell will connect public schools and libraries to its broadband network as it is deployed, allowing these institutions access to video-on-demand and other forms of interactive multimedia.
- Pacific Bell will provide intrabuilding wiring at up to two sites at each public school and library—a computer lab for telecomputing and a location for interactive telelearning. The company will also contribute \$5 million in seed money to organize and support a drive to raise the funds needed to wire the remainder of classrooms in the state for full broadband capability.
- Pacific Bell President Phil Quigley will spearhead a public/private consortium to ensure that every California classroom and library is wired and equipped for full access to the national communications network by the year 2000. As part of this effort, Compression Labs, Inc., has agreed to work with Pacific Bell on a program to provide the group videoconferencing systems for the schools.
- Pacific Bell will expand its partnership with the Detwiler Foundation and the California Community Colleges for placing donated computers in the schools.
- The company will field dedicated resource teams that will work directly with schools and teachers to help them fully utilize the new telecommunications equipment and resources at their disposal. At the same time, the company will collaborate with universities and colleges to help increase the emphasis given to educational technology issues in the teaching curriculum.

## Letters

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To the Editor:

In a comment on my article "Improved Browsable Displays: An Experimental Test" (*ITAL*, June 1993) that appeared as a letter to the editor in the December 1993 issue, Prof. Ben-Ami Lipetz suggested that an appropriate measure of the efficiency of searching using such displays would be the time taken by searchers to select the first highly relevant heading. My reaction to his suggestion, also published in the December 1993 issue, was that this measure would indeed be interesting, although I speculated that the relative efficiency of traditional browse displays and hierarchically organized displays might be influenced by different types of cognitive loads incurred in using displays.

I have since completed the analysis suggested by Professor Lipetz and can report that students who searched the traditional alphabetical display took 2 minutes and 38 seconds on average to find the first relevant heading, while students who searched the hierarchically organized display took 1 minute and 49 seconds on average. The number of students searching each display was 40.

## Thanks

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Brian Sealy was the first editor of "Tutorials," a relatively new feature in *ITAL*. Brian did a wonderful job writing and coaxing colleagues in the field to contribute. We appreciate Brian's willingness to take such a new assignment and appreciate even more the enthusiasm and energy that he put into it.

We thank Brian for a job well done and wish him all the best as he relocates (immigrates) to New Zealand. Good luck, Brian!

Although this result might seem to support the idea that a hierarchically organized browse display is more efficient than a standard alphabetical display, this conclusion cannot be drawn. A t-test using separate variances showed that there is in fact no statistically significant difference between these two averages ( $t = 1.152$ ,  $df = 70.4$ ,  $p > .25$ ). There was such a large amount of variation in the time taken by students to use both browsable displays that the difference in average times can be attributed to chance.

The claim in my original article that improved browsable displays lead to more efficient searching must therefore be refined somewhat. Hierarchically organized displays allow users to complete successful searches by browsing fewer headings. But they do not enhance the speed of searching. It seems likely to me that the two types of browsable display impose different types, but roughly comparable levels, of cognitive load. System designers may wish to consider the type of cognitive load that will be appropriate for those who use the information technology they create.—Bryce Allen, Associate Professor, Graduate School of Library and Information Science, University of Illinois at Urbana-Champaign

# Instructions to Authors

Letters

*Information Technology and Libraries* welcomes manuscripts related to all aspect library information technology. Some specific topics of interest are mentioned on masthead page. Feature articles, communications, letters to the editor, and news items 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 one hundred words or less should accompany article on a separate sheet. Headings 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 application notes. An abstract need not be included.

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

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

*Tutorials* are brief, how-to-do-it articles that may include 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 Announcement* items may announce publications, conferences, meetings, products, services, or other items of note.

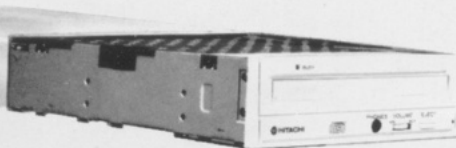
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