

Open Systems for Open Minds: Building the Library without Walls

John R. Sack

As scholars are more frequently connected to electronic networks allowing access to research information and collegial interchange, the roles of the library and the computer center will need to shift from those of a central repository holding information and technology to that of sleuths and integrators of disparate information sources. The malleability of electronic information, the openness of systems containing it, and the expectations of scholars as they become less "patrons" of the library and more "users" of electronic information services will drive us to develop systems and organizations that readily facilitate the transmission and transformation of knowledge.



To sharpen the point of my topic, I will begin by asking this question: *when, how, and by whose hand will libraries disappear?*

There are several ways in which libraries might disappear, not all of them bad, and I suspect that many in RLG libraries are actively working on effecting the disappearance.

Of course, the most obvious way libraries might disappear is through disuse, that is, through a shift of scholarly research away from libraries towards other places and other media. According to this scenario, libraries might disappear because they lack significance in the academic program—because they are not essential. Many campus organizations are vulnerable in this way: one might suggest intercollegiate athletics; another might suggest government or faculty committees.

But a second way libraries might disappear is not so frightening: the library might disappear simply because it

blended so successfully into the background of a scholar's activity that the scholar never needed to regard it explicitly as a place to go, or an interruption in an ideally seamless activity of research and reference. According to this second scenario, using a library becomes so effortless and natural an activity that scholars no longer have to think of it as a special (and time-consuming) component of their research. Thus, libraries disappear because they become invisible and because their location is wherever you are: "without walls," if you will. More than a physical location, the library becomes a medium or ubiquitous utility, a service always ready at hand. Perhaps an example of such is the telephone or television.

My last variation on library absconditus is a challenging one: the library may disappear by becoming something so different that patrons are tempted to call it by another name, as they treat it less as a storehouse than as a vehicle or conduit or service. If Wittgenstein is right, when this

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happens we'll notice it by the way scholars begin speaking about libraries. Perhaps *library* will become an odd sort of verb (e.g., *I libraryed that topic and found new approaches*) much as *telephone* became a verb soon after it was established as a noun. What I have in mind is an extension in the scope of what *library* connotes, a change as substantial as the change from portraiture to photography. The important factor is not extension so much as *extensibility*, in which the ability to change becomes fundamental to the medium. The new library might differ from the old one the way a television differs from a window.

By whose hand will libraries disappear? This question involves the control of destiny: the disappearance can come about at the libraries' direction or by the scholars' defection. Let me also assure you that similar questions of destiny weigh on the technological professions, where there is far less of a ballast of tradition to rely on for safety. In fact the most fruitful transformation for each of these professions will come with the assistance of the other.

EXPANDING THE VIEW OF LIBRARIES AND COMPUTER CENTERS

Let me suggest some elements of a critique that would encompass libraries and computer centers at the same time.

Both libraries and computer centers have "high visibility" to scholars; they are modest hurdles, with immodest potential. Both institutions are hard to use, distant, rule-bound, inflexible; they aren't readily assimilated for the scholar's work-space and -time. Both sometimes appear to be devoted to a "divide and complicate" philosophy when the best scholarship tries to integrate and unify.

The value of the library and the value of the computer seem to increase for the scholar as their nuisance factor—the interruption of a line of inquiry to deal with the opacity of a foreign place, culture, and procedures—disappears. That is, as each institution becomes more malleable, open and translucent, it becomes more able to shape itself to the scholar, becoming less a specific place than a service and a near-transparent medium. The tool can then be

tailored the way one has a suit tailored, or the way one arranges an office. The key to achieving this malleability and placelessness is technology that can be shaped by imagination.

The plight of libraries and of computer centers a decade or two ago was that they provided very small windows on a very large world. If one's view of the world were limited to what one could see out the window of one's home (particularly in downtown Palo Alto), then that view would be very limited indeed; the panoramic extensions to this view have come from technologies that let people be where they were not, such as the telephone and television. The telephone-answering machine and the videocassette recorder even let these technologies act as our *agents* when we are not present, shifting time as other media shift space. While we may have personal antipathy for these technologies, their unique effects on information access and distribution are undeniable.

Libraries and computer centers have taken steps to enlarge their windows, in a sense. They have both connected themselves to networks, for example. But they have not really taken the steps to shift from windows to television, if you will. The current networks are still very limited, rather like TV with only three broadcast channels.

Just as there is vastly more information available on television than there is out the window, there is vastly more information available to the fully networked scholar than in the utility-connected library. And yet the profession's capacity to handle information has been increased only by adding more people as specialists in new or growing areas, rather than adopting a new strategy. The current strategy may not be sufficient to keep pace with arithmetic growth in information and access; it certainly isn't sufficient to handle exponential growth in the number of information providers and the amount of information accessible to individuals. We are, in a sense, running along as if we simply had to flap our arms harder to take to the air.

New approaches are needed, and a novel one has been suggested by Alan Kay, now an Apple Fellow, and inventor

of the "dynabook" concept when he was at Xerox Palo Alto Research Center (PARC). When Kay was at Atari he built a working model of a semiintelligent process, called an *agent*, which would scan various electronic news services at night and build a custom newspaper for you, based on its knowledge of what you would be interested in. Thus the headline might be that U.S. planes were bombing El Salvador or it might just as well be that your afternoon appointment was cancelled (which the agent learned by reading your electronic mail). Kay is now studying how one imprints agents with a character that allows them to recognize information of value to particular individuals.

Society already has many models for such agents. The stock broker and real estate agent come readily to mind, and even the private eye is functionally similar. And SDI (selective dissemination of information) searches are a primitive, automated example from our own profession. At Stanford, as part of a project to study electronic communication of research materials (Project Concourse), we will be allowing faculty and students to "characterize" agents that will examine bibliographic and nonbibliographic databases and bulletin boards, retrieving new items of personal interest and placing them in electronic mail boxes.

THE CAPACITIES OF THE RESEARCH LIBRARY

The possibility that the library will disappear for the research scholar is also suggested by the Newman Report on Higher-Education Policy commissioned for the Carnegie Foundation for the Advancement of Teaching. The report states flatly that "the research community is moving beyond the capacity of the research library" (*Chronicle of Higher Education*, Sept. 18, 1985, p.17-29). Indeed the report's section on research libraries is worth a brief review here, since it argues that our patrons have supplanted the libraries—appropriately or not—by means of outside technologies and services available to them.

The Newman report argues the need to find ways of defining the function of the library. Because of the cost of materials,

interlibrary cooperation will clearly be necessary to provide researchers with the products of the "knowledge explosion." But by itself membership in a network will not be enough—not even membership in several networks. The fact is that despite patron confusion about widespread electronic information, use of the upcoming tools will be easy enough to allow each person to be his or her own librarian. What is more, many of us believe electronic access will be the way out of the paradox that some materials are needed infrequently but needed urgently and quickly when they *are* needed. Still there are several interesting problems with electronic access that the report emphasizes:

- You first need to know where to look in order to find what you're looking for; this clearly penalizes patrons working outside their "home" discipline, for which they presumably know standard bibliographic sources and practices.
- The refereeing and public criticism found among printed works is not part of the electronic journal article.
- It is hard to establish an orderly historical record online.
- Funding problems arise because the library traditionally discriminates in favor of *acquired* as opposed to *accessed* material. Funding discriminates in favor of the haves as opposed to the have-nots.

The last particularly affects librarians managing collection development and/or public service functions. For traditional acquired materials, the charge is levied only when the library gains ownership; but for electronic media, the charge is levied when one gains access.

The Newman report suggests that electronic access will require a shift in library service outlook from "owning to sleuthing." (This electronic access should not be confused with automation of technical processing, of course.) The role of the sleuth "requires an educational and emotional [philosophical] commitment to the shift in outlook required to change from owning, cataloguing, and lending, to becoming electronic data sleuths ready to link a student or faculty member to someone else's data bank." The Newman report's section on research libraries ends by calling for something with the unfortu-

nate name of "Scholarship Information Systems." In any case, whatever the name, this transformation would fit my third notion of the disappearance of the library (qua warehouse) and the emergence of the library as the integrator of information.

To begin this shift of emphasis, library staff will need many of the same tools that have started their faculty colleagues down the path of electronic access. Many researchers, for example, among science and engineering disciplines, frequently communicate electronically with their colleagues, sharing text, experimental results, citations, and abstracts. The tools that have allowed some scientists to move away from the library are the same tools to which library staff need ready access.

LOCAL AND REMOTE IN DECENTRALIZED INFORMATION NETWORKS

I'd like to suggest a simple conceptual model that shows the topology of research information from the library's and the scholar's point of view. Let me call these the Ptolemaic and Copernican views (see figure 1: of course the library has to deal

with thousands of scholars, and the diagram simplifies the effect by showing only one).

I suspect that, in the scholar's view, the transformation of the library from the Ptolemaic to the Copernican view is already an established fact. The library's adaptation to this transformation is not as well established; neither is the computer center's. Again, we may look at our own language as an indication of our attitudes: we refer to the extra library patrons as "remote users." But from the patron's point of view it is the physical library that is remote from his or her workplace. Similarly, in computer centers five years ago a printer was *local* if it was physically housed with the computer and *remote* if it was at a user's site. The opposite is now the case when we say those words: users now have *local* printers in their offices and think of the large printers at the computer center as *remote*.

The library is a node in the scholar's information web. But the library must take into account the scholar's entire research process and the variety of his or her sources and resources. The library must then comport itself as if it were a responsi-

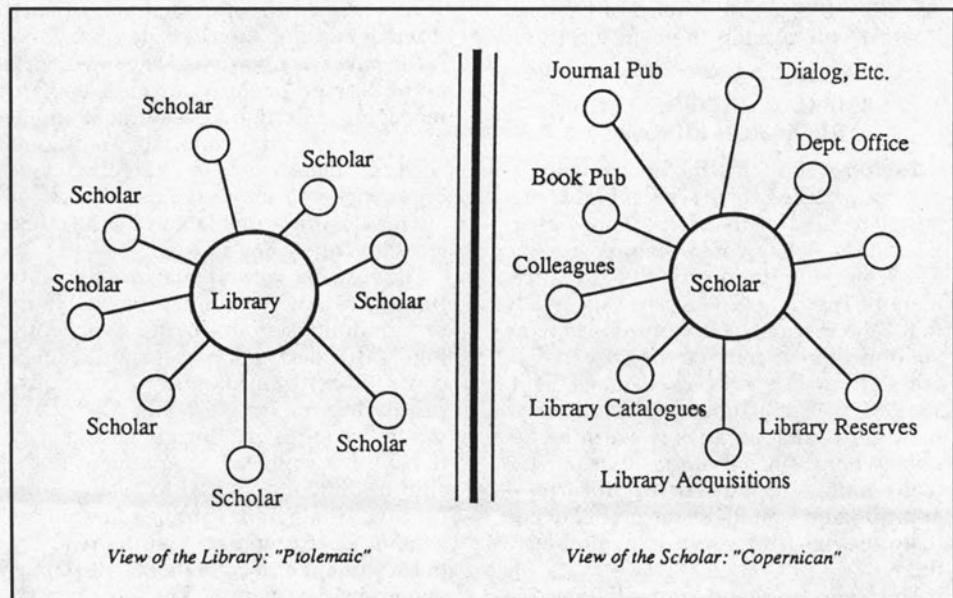


FIGURE 1

ble member of the scholar's "information society." It must develop strong relationships with other information units in and out of the university. The scholar is surrounded by the resources of this society, some of which are facilitated by (not necessarily all "held by") the library.

At Stanford about two years ago we came up with a similar critique of administrative computing architecture (see figure 2). The analogy is not exact but the point is to identify the appropriate "center" for a service system and then to tailor the services to fit the entity at the center. In administrative computing, the center should be the individual department with its comprehensive service needs; in research, the center is of course the individual scholar.

Perhaps it is easier to spot the philosophical transition when the shoe is being worn on the university's other foot. Those who have had university management responsibilities can probably see that in the older architecture the burden of integration of information falls squarely on the smaller unit, with the least talent and expertise to handle it, instead of being shouldered by the larger organizations. The in-

tegration must be performed hundreds of times, being reinvented in each department.

Scholars participate in many different information networks. In some of them the scholar acts as correspondent, in some as passive recipient, and in some as creator or initiator. The intersection of these many networks would be too complex to draw, but you can readily imagine what it would be like: perhaps like a galaxy of solar systems. The drawing would quickly lose any sense of a center even if you tried to draw only a few scholars and a few information providers (which might, of course, be other scholars). Rather than showing one center node intersecting with many lesser nodes or "satellites," the drawing would have to depict many equal units sharing information on an equal basis.

Computer networks are ideally decentralized in the same manner as scholarship networks. And I am not using networks merely as a metaphor: here the medium is truly the message. A network, for example, is not centered on the warehouse of the mainframe, but on the medium or service of the wire. Figure 3 shows informa-

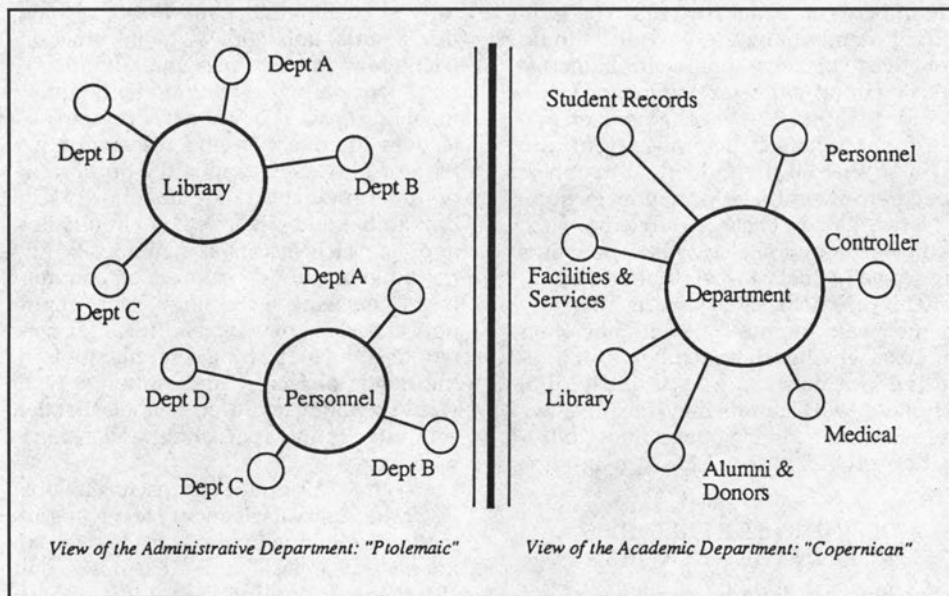


FIGURE 2

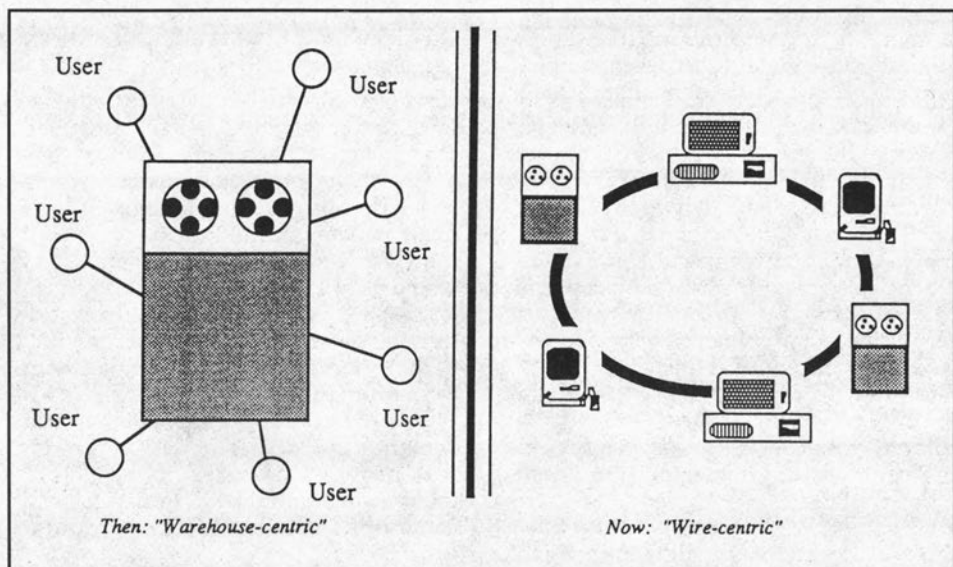


FIGURE 3

tion exchange as it was before and after local computing and networks provided individuals and organizations with direct access to each other as providers and users.

The focus is on exchange, on communication between equal partners. The individual members of the network should not have to perceive some central unit dispensing information (or obstructing information); rather the mechanism or medium should itself be transparent and open so that all the individual members need perceive is the information itself.

Networks don't own resources so much as make them *accessible*. Also, networks are typically "peer-to-peer" in the jargon, not hierarchical. This means that any member can communicate with any other member whether that member is an individual or institution. An individual scholar's workstation may ideally have the same access to major and minor information providers that RLG's mainframe has.

DEFINING THE LIBRARY'S ROLE IN THE NETWORKS

But how can libraries facilitate such a network, and how can they understand

and prepare for their own part in the scheme? Two complementary suggestions come to mind.

First, one can look *outside* the library to see where the university nonlibrary information society is tending over the next forty-eight months. Look at both "data flows" and "dollar flows" for information technology in academics and administration, considering in addition both equipment and space. Look at new program objectives in education and research (e.g., Stanford hopes to double the proportion of undergraduates doing honors work in humanities and science). One should also appraise such factors as new faculty appointments and title changes on committees overseeing technology. One might note especially new expenditures for networking and for putting computer tools in the hands of faculty and students. One would certainly take a look at tools that the computer center is teaching and recommending.

A second important approach is to look *inside* the library itself and try to refocus attention for a time on *access to information*, not *material acquisition*. For example, consider the following "thought-experiment": imagine that library staff had only

a micro, a communications line, and a phone, but no building or collection. What sort of services would they offer in order to provide real added value with such minimal tools? One might also consider access in smaller research-oriented branch libraries; the staff in such branches often seem to understand intuitively the library's place in the network of research information communication, when it is situated as one "service station" among many in a department or school.

Perhaps the library should take on more responsibility for providing access to information that it does not possess, order, and control; more and more research information will be of this sort. This parallels the transformation from the library being an owner of books to its being an "integrator of systems." The former is a limited and technical function, while the latter provides a professional service function well into the future. The "integrator" is just another version of the "agent" I described earlier. (A senior Stanford librarian has told me of the problem in definition of the library profession; because technology has been having such a large impact, many librarians feel the future lies in becoming "technologists" in order to be able to build better systems. But there will always be systems of information for the scholar to use outside any one library or field, and this is why the role of the integrator of such systems may be the professional high-ground.)

When a library does buy or build systems, it should make sure the system provides the most general software and hardware possible. This facilitates the system's participation in the networks that scholars are already and will be using. One should assume that extra-library use of library systems will be equivalent in volume to in-library use over the next decade, and that extra-library use will replace only a small part of library use, especially when the system describes materials that are not inside the library. A library ought not to buy anything that can't connect to a network unless it can afford to dispose of the equipment quickly rather than amortize its purchase price over several years.

The library staff should have access to

the same tools that faculty and students are using for electronic access. This will usually mean personal computers, modems, and access to campus electronic mail systems.

EXPECTATIONS OF PATRONS AND USERS

What are the needs and expectations of such "remote" and networked users? Almost all the special needs I can identify can be derived from a basic proposition: the scholar is more a computer "user" than a library "patron." His or her expectations will be derived largely from the culture of computer access and manipulation of information, not from library access to information. This attitude will arise if only because the user is not physically present in the library.

For example, the current "online strategy" patrons use with the online catalog in the library is largely a substitute for that used with the card catalog; the catalog (online or not) is seen as a locator or pointer to materials on a nearby shelf. But outside the library the catalog undergoes a metamorphosis into a research tool in its own right.

For Stanford's online catalog, Socrates, one can compare patron suggestions that come from library terminals with those coming from users in their home, dorm or office: the latter often request nonlibrary information and services. (There are about twelve hundred patrons with access to Socrates outside the Stanford University Libraries. Their use runs to about one thousand sessions per month.) For instance, we've frequently been asked why article abstracts aren't available to Socrates users. We were even asked how to look up monetary exchange rates in Socrates. (We replied to the last suggestion that an on-campus travel agent and bank were good sources of information.) Incidentally, we noted that one community of test users who had problems with the early version of Socrates were computer science professors. They found that Socrates' natural bent was to support a card catalog-style search strategy, and they wanted to manipulate it like any other set of databases they would use in their own work. (Later

versions of Socrates allow this "database" search strategy with greater flexibility.)

The point of these anecdotes is that Socrates is already expected to be or perceived by its extra-library users as the integrator of diverse systems of information. This is partly due to a "critical mass" phenomenon in which any large and seemingly comprehensive source of information is expected to absorb subjects that are on the fringes of its mission: the size and sophistication of a medium attracts the attention of information users and providers who become progressively more interested (and demanding) as the size increases. The interest of users increases as the investment of suppliers increases, and vice versa; and more use breeds even more use.

The shift in expectations from those of the "patron" to those of the "user" is of course gradual and stratified. It will presumably happen first in disciplines whose primary sources are already online. The computer science discipline was the first to shift; physics and engineering have largely done so by now. These cultures and others now have many of their secondary sources online (e.g., works of scholarship including bibliographic and numeric databases, largely because of the critical need for timeliness in some fields). The shift will also come earliest in those disciplines, such as education and librarianship, where electronic access is itself an object of study, or as with many undergraduate students, an object of pleasure or recreation. It will spread to some degree to most disciplines, no matter how "paper-oriented" a discipline may seem at the present moment.

Incidentally, many scholars are going to expect some things to carry over from the "patron" culture. Undoubtedly many will expect these new forms of electronic access to be free of charge to the individual (as Socrates is at Stanford now). Certainly this expectation will be weaker for services available outside the library.

I will note some of the characteristics of the "online culture," and I think we should particularly consider the points that run orthogonal to current and traditional library procedures and/or patron

culture. The theme connecting most of them is increased *immediacy of access*.

- Users focus on results, not procedures; the computer user usually doesn't care about how or why something is done (the "hacker" mentality is an extreme example of this).
 - Users demand speed, not deliberation. The computer user will often have chosen the computer because of its ability to provide instant results; spreadsheets and electronic mail are examples here. Users are impatient with any process that leaves their minds idle while they wait for something external to catch up.
 - A corollary to the above: most users prefer a fast but incomplete answer to a late and encyclopedic response. The scholar usually needs completeness eventually (particularly in central research areas); but in the short term a single citation may be enough to supply a missing fact or direct a search further; the user, of course, wants to make the final judgment of sufficiency/adequacy versus completeness.
 - Users demand two-way communication, rather than passive acceptance of whatever comes down the wire. In Socrates, we receive between five and ten communications ("suggests") a day from users. We answer any suggestion that is signed, and this sometimes leads to a dialogue on a specific issue. Frequently we receive acquisition suggestions, rush processing requests, and, on occasion, a reference question; we've even received compliments about staff and complaints about bats and bathrooms—suggesting that this is an alternative communication tool for some. We respond as quickly as possible (sometimes within a few minutes) and use electronic mail whenever possible; two-way communication allows the human aspect of a service to be perceived, and reduces the isolation of "remote" users (who are perceived as remote by the library but naturally not by themselves). Such service must be responsive and quick, if it is to be perceived as helpful at all.
- The remaining expectations worth noting derive from the principle practiced by

many software and hardware vendors who realize that, to survive, their systems must connect with other systems. This is the general principle of "open" systems architecture, which finds specific expression in the ISO/OSI system interconnection standards, the MARC data interchange standard and even the Macintosh clipboard. Fulfilling such expectations is easiest with the use of general-purpose hardware and software, particularly with respect to user interaction ("interface") and capabilities and data and network communications.

- Users expect you to provide a relatively seamless integration of your system with whatever other systems they use. You must understand what other information systems scholars use and how those systems might influence expectations for your system. At Stanford, Socrates users frequently send citations to colleagues via electronic mail or incorporate citations into mainframe and microcomputer documents and databases.
- Users expect electronic information to be malleable, and expect the library's system to be flexible. They judge what computers can do from their own experience with personal and departmental computers. So, for example, they will expect to be able to reformat citations to meet various publications' style requirements. After all, it is not the transmission, but the transformation of knowledge that occupies the attention of most scholars.
- Users expect the library and its system to be ready to change to meet the expanded potential of electronic catalogs over manual ones. As one example, the office responsible for facilitating the use of Stanford facilities by the disabled asked us to enhance Socrates displays so that blind students can more conveniently search and display records via a voice-output unit that is already familiar to them from other contexts.
- Users have little sense of library tradition and will not readily make a distinction between owned-by-library and nonowned information, or between traditional library materials and those not

typically managed by libraries. In commenting on this, one scholar remarked that his primary need was for a research tool, not an inventory system. It is sometimes more important to know of an item's existence than to know whether the library owns it or not. Interlibrary loan has to some extent made "not owned by library" just another citation status; the library already fills the "integrator" role here on a special-request basis.

The principles of openness, interconnection, and extensibility were so important to the design of Socrates that more than half of the desiderata developed by the design team support them. I'll note those items that directly reflect the principles:

- The system must be accessible from any terminal device at any speed.
- The system must be accessible from every campus network and beyond.
- The system must support more than two hundred simultaneous users.
- The system must provide the base for MARC and non-MARC data files, and for library and nonlibrary services and functions.
- The system must provide for two-way communication between staff and patrons.
- The system must be available twenty-four hours a day, seven days a week. Scheduled downtime is never acceptable.
- The system must suggest to the user that it is not solely an online version of the card catalog by providing noncatalog services.
- The system must be adaptable to use on microcomputers and electronic mail networks and must support formatted file transfer.
- The user must not need any documentation except what appears on the screen.

Other expectations will develop as the library meets current ones. I think one way to anticipate some of these is to observe what today seem to be some of the more atypical or advanced uses of library information. Such uses can show how people define information by showing

what they do with it. I will mention a few from Stanford:

- One of Stanford's foremost researchers in artificial intelligence frequently appends bibliographies derived from Socrates to notices he posts on electronic bulletin boards. The latest was a "flame" (electronic mail heatedly expressing an opinion) on South Africa.
- A graduate student regularly searches Socrates before he attends a lecture by a visiting scholar to see what the lecturer has written. Another student looks up additional works by authors cited in journal articles as she reads at home.
- Members of a fraternity that was already on probation for sexism began electronically sending Socrates citations on risqué topics to other individuals, not realizing that the sender's name was displayed to the recipient.
- An M.B.A. student reinvented copy cataloging when she started a project of using Socrates citations to index her personal library.
- A radio announcer uses Socrates to find unusual works to play on his program.
- The student newspaper carried an article entitled "Socrates Could Teach Them a Thing or Two at MIT," indicating students' pride of ownership in the system.
- Frequently the first search a faculty member does outside the library is to check that the library has acquired all of his or her work.
- Several people have described "doing random searches for fun" and using Socrates for "fishing expeditions" and "whimsical browsing."
- A student show this year features a skit in which the founders of the university get lost inside a Socrates terminal.
- A staff member sent us a somber authority correction noting her father's recent death and asking that it be recorded in the main entry for works he authored.

- It has been suggested that Socrates should "contain everything," but most people would settle for retrieval of journal articles, complete retrospective conversion, and access to other libraries' holdings (UC Berkeley and LC are mentioned most often).
- One person suggested that Socrates note which items were available for purchase in the bookstore and another suggested online ordering of pizza. Perhaps the most pleasing report from a user was that "Socrates was the biggest library improvement since open stacks." That comment certainly puts "openness" and access in perspective.

A PARADOX FOR PROFESSIONALS

I began this paper with something of a paradox, talking about building the library without walls—an open system readily facilitating transmission and transformation of knowledge.

The real revolution, if there is one, is not so much in the amount of information available but in the way individuals will adapt to this wealth using technological tools. That this technology will have an effect as lasting as Gutenberg's technology is a commonplace, but I have chosen to focus on the malleability of electronic information and the increasing openness of systems containing it as the distinctive characteristics to watch and respond to. These characteristics combine to encourage the spread of information and ideas beyond the capacity or control—for better or for worse—of information specialists.

If ready access to and demand for great quantities of information by individuals defines the next decade, then those of us in the information professions should define ourselves in a positive relationship to the trend—as agents, as sleuths, as integrators of systems. Avoiding for ourselves the fate of our own card catalogs, we will find that sharing information, not merely holding it, is the key to our own future.