The sea, the sea, is always rebuilding.
—Paul Valéry

Research libraries have always been constructed and reconstructed within the scholarly, social, and economic tensions of their particular place in time. Inexorably and irretrievably, our great research libraries in this, our time, are becoming part of an even greater whole: a massive relational library of traditional collections, digital libraries, commercial services, multimedia flow, and linked information resources of every kind that can respond to the particularized interests of the individual information seeker on a global basis. Our local institutions, our national library organizations, and this evolving global information structure must be built and rebuilt within these changing tensions to satisfy this very simple thing: serving the present and future information needs of individuals.

Libraries have been constructed by or for the individual user. Research libraries are built and rebuilt by institutions to serve each user. Increasingly, libraries are sharing resources of every sort—collections, digital information, human expertise—in order to meet this mission. And they are moving quickly beyond the physical site and time-bound collections of the past, taking advantage of new models of...
access and delivery to provide more—and more pertinent—infor-
mation services.

The same environment that is facilitating an expansion of
resource sharing among libraries also offers an opportunity for infor-
mation partnering never available before, on such a collective basis,
among entities that have not collaborated in quite the same way in the
past. Libraries, authors, publishers, vendors, and information users
require one another, and should leverage their resources to gain the
most from this new environment.

More formal collaborative collection building among these entities
seems desirable as this informational sea continues to swell whether
we wish it so or no, and as information consumers rush to dip from it.
The massive, twenty-first-century relational tool that is growing
through the present haphazard collection-building of many informa-
tion contributors can become a remarkable digital research library.
More thoughtful collaboration in its construction, and the establish-
ment of discovery devices to wrest what is most useful from it, will be
required. A convergence of public, private, governmental, and individ-
ual efforts, for profit and not-for-profit, to shape this great relational
library will profit our learning selves and those learners to come.

The Relational Library

Libraries have been relational in the fashion of their day. The impor-
tance of library collections lies in their ability to provide the resources
that relate to a user’s needs and interests. Pertinence is what matters.
And information must be related to information, not only in content
but also by connection. Do you recall Marvin Minsky’s oft-quoted
question: “Can you imagine that they used to have libraries where the
books didn’t talk to each other?” Books have spoken to books in the
past when they have been read and connected through a common
reader. The application of new knowledge organizational systems will
eventually allow the linkage of text in books with content elsewhere in
the networked information commons. Ideas will foment within or
beyond walls even more heatedly than ever. For all their reputed quiet-
ness, libraries are loud with the communication between books and
reader, of content with content, and the consequent busy construction
of new ideas.
Librarians and library tools have provided the mediation that helped connect the reader with the content available in library collections—scattered ideas just waiting their assemblage to feed a mind or add a mite to the warehouses of knowledge. In the past, the establishment and maintenance of relationships were a function of the card catalog, indexes, finding aids, and human memory. That was the relational library in its traditional form.

Today, the digital library environment is improving the means by which information seekers can identify and retrieve the content most useful to them. In many cases, the new technologies enable tools that will routinely scout out ideas, an experience, a work of art, or some other construct for a networked user and deliver a personalized package of relevant content directly to that individual.

The information seascape can be scanned and relational linkages can help locate and deliver whatever is most relevant to the user’s needs. This relational construct, this relational research library, will increasingly include content of every kind connected by the hooks and tags of applied metadata. The devising of new means for linking will shape the next generation of knowledge systems. The present Google-type search engine suggests a model from which a killer engine to search the entire contents of the knowledge cosmos will emerge.

Imagine a search engine with access to the total content of the Web, the WorldCat of the OCLC, the growing digital collections of the Library of Congress, the daily physical and digital gatherings of our research libraries and small regional archives, the e-books and e-journal content available from commercial information distributors. Imagine an engine that can retrieve and connect this content and shape it to fit a knowledge seeker’s needs. That engine is certainly under development in someone’s mind, a laboratory, a garage right now. The human knowledge and imagination fields from which this engine can harvest will continue to be constructed from some of the sources described in this paper, but more cooperative and orderly collection building could make that very possible dream a more effective and practical reality.

The development of a global relational research library should become a major cooperative goal of libraries and their many partners in coming years. As this activity is pursued, a better understanding of the “spaces” within which such development and service will take place will be required: private spaces, public spaces, physical spaces,
digital spaces—all of which house data, information, knowledge, libraries. It is almost the library as universe, the universe as library, of which Jorge Luis Borges dreamed—a metaphor for a mix of ordination and chaos, a labyrinth that Borges would surely recognize today as a space in which libraries seek order.

**Personal Space Libraries**

Technology already enables the Internet user to select linkages and content of all kinds, and to gather these into clusters of personalized data behind an icon on the computer display screen. These sites are frequently identified as “My Home Page,” or “My Campus,” or “My News,” or my-this or my-that. The new technologies are also stimulating the construction of personal space libraries—“mylibraries,” they might be called. These are collections of related ideational or data objects, gathered on an individual’s personal computer, or in some other available private digital space, built to satisfy the scholarly or private interests of that person. This is true whether for the short term, in answering an immediate query; or for the longer term, in maintaining a group of selected sources at a personal website for prospective future use.

Nancy London of the OCLC, speaking at the “Online World Conference” in Chicago in October 1999, very aptly defined such a model as “an end user library within the library environment at large.”¹ The library environment writ large includes a wide variety of spaces within which the results of collection building are housed.

In an important paper, “The Cultural Legacy of the ‘Modern Library’ for the Future,” Francis Miksa of the University of Texas at Austin raises several interesting questions regarding library spaces that might well be contained within London’s “library environment at large.”² Miksa asks whether a return to the “private space” library of the past may be under way. And if so, what will be the effect on our large public space libraries?

Miksa suggests that the great personal libraries of the past gave way to the giant modern library—the “public space” library of the present—as the volume of publishing outpaced the ability of the individual’s personal library to keep stride. The advent of the computer has made it possible, he suggests, for individuals to again build
“private space” libraries within the vast realms of computer memory and the Internet, where there is room to spare. This will enable libraries, he says, “to shape such collections and their access mechanisms precisely for the needs of the individual or the cohesive group of individuals who require them.”

The MyLibrary service of the North Carolina State University (NCSU) Libraries is an excellent example of how an academic library can make this type of personalized feature available to the campus scholar.3 Its website points out that MyLibrary “integrates principles of librarianship (collection, organization, dissemination, and evaluation) with globally networked computing resources creating a dynamic, customer-driven front-end to any library’s set of materials.” The result is a customizable HTML page where “local and remote sets of data, information, and knowledge” are gathered for the scholar.4

Any campus library user may create an account on the NCSU system, select an area of primary academic interest, and customize the prospective MyLibrary contents from a choice of hotlinks. This system is distinguished by the multiple paths along which content can be sought by the user, or delivered to the user, based on the customized design of MyLibrary—augmented by “reactive/human mediated interactive assistance” from designated reference librarians and collection managers. The choice of personal links, quick searches, current awareness, and interactive personal assistance services represent elements of a highly personalized, relational research library tool.

Work on a knowledge system at the University of California at Santa Barbara also shows promise of elevating this type of customized collection building and retrieval to rather remarkable levels. The Alexandria Digital Earth Prototype project (ADEPT) will enable faculty members working in the field of geography to create digital library collections tailored to their teaching and research requirements. This ambitious project looks far beyond the present capabilities of the MyLibrary approach towards a new knowledge system.5

An ADEPT program will reach out across the body of geographical information as it exists in digital form—data sets, textual materials, aerial photographs, and computer simulation models—and assemble these into “information landscapes” that will help an investigator solve specific problems. “Iscapes,” the project calls such assemblages of content and software, gathered from digital libraries and information servers around the globe. Software to provide specialized access and
interface for the program is under development at the California Digital Library.

It is anticipated that individual personalized libraries can be constructed on demand to develop answers to what the project calls an “iscape query.” The project will rely principally on the Alexandria Digital Library at Santa Barbara, “a digital collection now approaching 1.5 terabytes’ worth of digital maps, remote-sensing images, and aerial photographs of the State of California.” The experimentation with iscapes in geography courses will be followed by introducing the iscape concept into courses in anthropology, biology, research studies, arts, and humanities.

Among the most interesting commercially driven, relational information developments presently under way is the CrossRef reference-linking consortium. This nonprofit organization of over ninety major scholarly publishers is linking Web-based electronic journals and other Web-based content by means of the Digital Object Identifier (DOI) standard.

GraceAnne DeCandido has provided an instructive definition of the DOI in a paper for the Public Library Association: “The DOI is a unique persistent identifier of intellectual property in the digital environment.” Because the DOI is “persistent” (remaining with a digital information object throughout that object’s lifetime), it is possible for publishers to mark a particular digital object—book, article, map, image—so that it can be linked across a body of digital literature or its access controlled or managed by its owner.

A scholar browsing an article in a journal that cites an article in another journal is able to link immediately from one to the other if they have been marked with a DOI. A powerful relational tool can utilize the DOI to correlate the intellectual content of a work with its digital and physical manifestations. “CrossRef aims to become nothing less than the complete reference-linking backbone for all scholarly literature available in electronic form,” Amy Brand, a spokesperson for the program, asserts. CrossRef expects to add encyclopedias, textbooks, conference proceedings, and other relevant literature to the nearly 6,000 journals currently included in the project.

By utilizing these new linking systems, the digital research library of the future can be designed according to the demands of the user, its shape shifting as the user requires. But a great deal of content remains to be converted from its physical representation into digital
format, even as many publishing sectors create new information in digital form. It is important to recognize that commercial Web-based vendors, like libraries and other nonprofit agencies, are adding massive amounts of content to the surging cybersea, as well as seeking additional means to link the information objects that reside there.

**Commercial Web-Based Relational Services**

Information e-commerce vendors on the Web are providing services that some have suggested represent a fuller range of relational services than libraries presently provide. Commercial entities frequently and obligingly supply Web customers with personalized, protean “my space” digital services. For a fee, or to encourage e-commerce, the Web is scanned by a vendor according to a profile established for the individual. A constantly rebuilding “my space” is then provided to the customer by the vendor, who reaps additional commercial benefit as the rebuilding continues. Baseball games are updated inning-by-inning, or play-by-play, on the Web. A click on “Reload” delivers fresh content just as quickly as news or text or media is modified. Advertising is rebuilt just as quickly. Commercial messages are re-displayed to a prospective customer with every update of the site, with routinely rebuilding banner ads, and through streaming entreaties to the customer to try out a new service.

Amazon.com has been cited as an e-commerce model that libraries should emulate to improve their services. A modest current awareness tool only, Amazon.com gives the appearance of being more personalized and extensive than in fact it is. Amazon.com is basically an object-distributing business, and is good at what it does. But it is not an information service—except as a purveyor of simplistic publishing, bibliographic, and purchasing data, and as the provider of several interesting relational services based on buyers’ habits as revealed through implanted “cookies” on their computers.

These relational Amazon.com services suggest the prospective useful linking of scholars based on their common interest in a topic, or their use of a common informational site, in the global relational research library.

Another e-commercial area of service provides a different example of how libraries can extend their relational responses to the user. This
service lies in the field of family history. Two of the most popular, successful, and innovative commercial services in the family history field are Ancestry.com and Genealogy.com. These services have constructed extensive digital data banks quite rapidly thanks to the volunteer and commercial energy that is converting both print and non-print records into digital format and loading them into storage. Imagine all the genealogists in the world pouring their family history records into the Internet. These services already gather, store, relate, and deliver content of all sorts at an astonishing volume.

An inquiry regarding a distant family member, for example, can produce a page-set of pertinent data from a number of sources. These may include data available at Internet family sites, in articles listed in a “periodical source index,” and from other commercial family history Internet-based locations. These services also include family message boards for chatting or posting inquiries and a formidable list of additional Web-accessible or printed tools. Relevant sources such as census records, cemetery records, court records, military records, immigration records, ship lists, vital statistics, maps, and similar sources are included. Increasingly, the full-text content is displayed, including digital images of the original documents. The assembly of this information on a single website, linked to dozens of other sites only a click away, is made possible by the metadata that collocates the content of this relational tool. A great deal of local history may need to be rewritten based on new facts that are coming to light through this process. The ripeness of data available from many sources and the linking capabilities available to the user permit the assembly of a family tree, a knowledge tree, as human ingenuity chooses.

Commercial websites can be modified, and styles and features changed, much more easily than can the full informational expanse of research libraries. But it is the case that research libraries—in their digital aspects—are assuming many of the characteristics of the type of commercial relational services described above. The use of metadata systems such as the Digital Object Identifiers standard is potentially applicable to any information-bearing object that exists or is represented in cyberspace.

Over time, research libraries will increasingly become more relational throughout their full intelligence scope, given the nature of the technological, social, and fiscal pressures that are generating change, and given the rapidly evolving relational technology. It will certainly
benefit the library user or knowledge seeker if there can be a swifter construction of relational research libraries and a more rapid deposit of digital content into the information commons. The Internet already offers a vast bazaar of the best and the worst products and services that modern culture has to offer. It can become much more.

**Shared Construction of the Relational Research Library**

If the resource-sharing spirit of past years can be incorporated more deeply into contemporary shared-selection practices, adding new partners in the process, libraries can be constructed to satisfy a patron’s particularized needs on a more distributed and extended basis. Shared collection building can be a mechanism whereby traditional collections and the newer digital content services—including commercial collections and services—can join in expanding this emerging relational library, an internationally linked “mother” research library of the twenty-first century.

An accretive process is already building this entity whether we intentionally plan to do so or not. It is building at this very moment, albeit rather willy-nilly, as digital additions from thousands of sources pour into the rich, rebuilding digital sea.

David Seuss of Northern Light once asserted that his firm was probably manipulating the largest body of knowledge in the history of the world. In addition to what it is able to supply via the Web, Northern Light provides a pay-per-document service based on its holdings of over 25 million individual full-text documents in a Special Collections program it offers—another ancillary source of digitally provided information.

The opening of the Internet Archive in October 2001, with 10 billion web pages dating back to 1996, represents an enormous addition to the Web, but how these snapshots of web pages through several generations of change will contribute to scholarship remains to be seen. The physical contents of our research libraries, in fact, continue to constitute a far, far greater amount of scholarly substance than that presently available on the Web.

The quality of this rapidly growing Web-based library will improve as our libraries, commercial firms, scientific bodies, government agencies, volunteer organizations, and individuals contribute higher quality,
standards-based, value-added information to it. Library information-management organizations have been building collections through collaborative selection and consortial purchasing of library materials and electronic services for some time. A number of cooperative models exist through which libraries collaborate to enrich the building and rebuilding of this information sea that is proximate to every intellectual shore. New content is being contributed through such programs as the Academic Image Exchange and the Making of America project, through numerous cooperative digitization projects, and through the encoding of local archival finding aids and the subsequent addition of archival content to the Web. The Library of Congress’s American Memory program has been a successful model, helping stimulate many of these initiatives. In fact, the full extent of the LC’s leadership in the establishment of digital library programs has never been adequately acknowledged.

JSTOR has proven how shared collection building can work successfully in developing digital access to retrospective journal contents. Project Muse has offered another model for providing access to current journal literature. The proffering of digital books offers a completely new venue for shared collection-building opportunities. EarthWeb’s ITKnowledge service represented still another model whereby the constantly changing, constantly updated contents of some 5,000 physically published, key computer books were made digitally available on the database simultaneous-user model, but a market could not be developed rapidly enough to sustain such a narrowly niched business. Ebrary is introducing yet another model: look at a book for free, pay for download or print.

The Questia enterprise has been another aggressively constructed and promoted business vehicle for marketing e-book content directly to consumers rather than through a library or other middleman. However, its business plan never seemed viable, and it is likely that the warehouse of digital books that it has been building will be marketed by someone else in some other manner. Libraries should never have been concerned that Questia was going to usurp their role. In fact, any time an effective content-delivery system is created that will assist the information seeker, libraries should be the first to support such an extension or improvement of their own systems. Systems building on systems—hypersystems—provide the strongest means by which access can be magnified for the content seeker.
Electronic Book Sharing

The growing availability of electronic or digital books offers a different target of opportunity for libraries and publishers to cooperate in producing and providing access to these texts. (There are e-books and e-books. This chapter refers to an e-book service provided online through libraries, not e-books published to be sold directly to individual readers.) NetLibrary has been a good example of a business model for the successful distribution of digital books online, and especially for providing scholarly access to them. The contracts that netLibrary has established with reputable scholarly publishers, its arrangements with book jobbers to market its titles, a sensible business arrangement with libraries, and good technical features point towards a strong emerging model in e-commerce. Despite the financial problems that netLibrary has faced in maintaining market viability during the recent economic downturn in dot.coms and the information technology industry, it continues to offer the best example of how e-book commerce can thrive in a library setting. With its sale to the OCLC and the immediate resumption of its services, there should be every expectation that the size and scope of this venture will grow over time.

Either for an individual institution, or for a consortium of any size, there is the possibility for a vital service based on the netLibrary model. Libraries are going to have to consider carefully how such online services can be established to function on a cooperative collection-building or shared-selection basis in a consortial arrangement. A physical book and an electronic book live under different physical laws. A title available through the netLibrary e-book service can be delivered immediately, anywhere, at any time—unless another library patron is browsing the title or has it checked out for a longer period of time. Access to the title and its contents can be established immediately from an entry for the title in the online public access catalog or other digital finding aid.

Selections from e-books can be downloaded or printed quickly under standard fair-use policies. Resheling the title is instantaneous, and maintenance, preservation, and security are such that a title should almost never be unavailable. Multiple copies can always be acquired to meet high demand. Titles available through these means will easily fit among the numerous other resources that are building in the digital information commons. And imagine! A book published in
Paris or Rio or Austin can be simultaneously available at locations around the world. Interlibrary borrowing of print-based objects could become increasingly a service of secondary resort, as it should be.

**An International Digital Information Commons**

Thus, in many places and programs, it is evident that a new sort of research library for the global community is being developed. That library is extensively relational in nature, constructed on a distributed basis by many participants, and takes advantage of the physical and digital objects that are being added to the global community’s private, public, and commercial intelligence spaces. It should employ new economic models that leverage the financial resources of libraries and provide appropriate financial rewards for publishers and authors. Shared collection building, on a distributed, relational, and global basis, is becoming the model from which to construct the digital research library.

In an excellent paper on the ARL’s Global Resources Program—whose principal stated goals are to improve access to international research resources, especially through cooperative structures and new technologies, and to help libraries contain costs—Deborah Jakubs comments: “We are already functioning in an interdependent system of access to information, but we have not yet called it by its true name, or developed it in a rational way.”

It should not be inferred from this discussion of linking information via digitally based connections that the physical collection has been forgotten. A major feature of this evolving information commons continues to be the growing physical library, with access to its holdings, and enhancements to those holdings, made possible through the linkages and relationships that information technology and knowledge systems are providing. For all that is available on the Internet, this store of superior content far exceeds that available in digital format. The challenge that should most excite librarians is the prospective melding of the physical and the digital, and the creation of a mechanism for fusing these modes of storage and delivery into the fuller bionic library that still lies ahead. This furthers that ongoing pollination of things art and things science towards a new flowering in humankind’s reflections on the mind, our earth, and the universe.
A cross-pollination of the physical and digital in our library and Internet collections is the goal, and a shared construction of both will bring a more rapid genesis of the great information commons and relational library growing around us.

Several papers prepared for the Center for Research Libraries (CRL) conference, “Creating New Strategies for Cooperative Collection Development,” held at Aberdeen Woods in Georgia in November 1999, include interesting suggestions for collection-building practices based on variations of “shared selection” or “cooperative” collection-development practices. There are many indications that international shared collection building is a concept rising in many minds. Neither governmental borders nor natural features of the geographical world should restrain cooperation and resource sharing from enlarging library collections or the digital information flow.

Anna H. Perrault, at the same CRL conference, provided several interesting suggestions concerning the need for collecting foreign printed publications on a cooperative international basis. She makes the point: “With the concept of an international information commons, there is the idea that whatever resources exist are available for the shared use of all. Is it possible that the Internet is engendering a mind set that makes the concept of an information commons more acceptable?”

As an increasing portion of our research collections becomes a part of the evolving, digitally based relational research library, the more effective that global resource will be. Libraries can purposely help shape that commonly shared library’s development. They must recognize the need for partnering among libraries, government, and the private sector—through the establishment of new forms of collaboration and resource sharing, through the application of metadata in a more organized fashion, and by the introduction of supportive global public policies. Learners can then find their way to a newly imagined universe of knowledge encompassing the globe.

“Over the years it has become almost a cliché to urge people to ‘think globally, act locally,’” comment Milton Wolf and Marjorie Bloss in an Aberdeen paper. “Could we possibly add a parenthetical addendum to ‘act locally (with global intent)?’” they ask.

Peter Lyman of the University of California at Berkeley suggests that the opportunities that a global system offers have just not yet been recognized by the scholarly community: “At the turn of the twenty-first
century, scholarly publishing is evolving into a global system of scholarly communication on the Web, including a spectacular array of multimedia texts based on visualization and real-time network communication . . . . It is striking that neither universities nor learned societies are prepared to sustain this work or to recognize it as a strategic opportunity to break the monopoly power of commercial publishers.”

A relational global library, building and rebuilding in a limitless digital sea, interoperable, constructed interdependently, offering customizably definable content to meet the learning and knowledge needs of individuals—that is what information cartographers are charting in this new century.

As Wolf and Bloss conclude: “After all, whether you realize it or not, we are building one library. And all of you are its bibliographers!” And so we are.

NOTES
3. Available at http://my.lib.ncsu.edu/.


