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From the Editor

Jennifer A. Younger

It has been my great pleasure to serve as the editor of *Library Resources & Technical Services*. Following in the footsteps of my distinguished predecessors who established *LRTS* as a research journal, I have had many opportunities to contribute to the growth of our profession. I leave with feelings of accomplishment and regret and shall miss all of you—authors, readers, and my editorial and production colleagues.

LRTS continues as a strong research journal as well as one with significant interests in innovative and unique developments in the field. In 1997 and again in 1999, the Jesse H. Shera Award for Distinguished Published Research, given by the American Library Association Library Research Round Table, was awarded to a *LRTS* author. The interests of *LRTS* members have been well served by the broad scope of published papers, including papers exploring patterns of interlibrary loan, the ethics of offshore data production, mutilation of art books, patron understanding of subject headings, and objectives of the catalog. We have all benefitted from their clear study, articulation, and reflections on important issues and our own subsequent understanding and use of their research and reports in improving services and operations in our own libraries.

From time to time, I heard people say that the journal is boring to read. This is not an unusual observation about a research journal with a diverse readership, nor should it be feared so long as the papers are of excellent quality. In a May 1996 *College & Research Libraries* editorial (vol. 57, no. 3), Gloriana St. Clair writes of hearing similar criticisms, but she notes that letters to the editor are at complete odds with this sentiment. During the last four years, *LRTS* has published articles in collection management, acquisitions, cataloging and classification, preservation and reformatting, and serials, and it should come as no surprise to learn that there are papers of greater or lesser interest to individual readers. For every suggestion on what not to publish, there would be a balancing commendation from a reader who found an article on the same topic of special interest or assistance.

LRTS exists in an environment quite different than that of even four years ago. This new environment is characterized by, among other things, fewer submissions and greater competition. The number of manuscripts submitted has declined from the 293 reported by former editor Richard Smiraglia between 1991 and 1996 to 142 during the following four years of my term. Although I am pleased to report there has no accompanying decline in the quality of the articles in the journal, the lower numbers bear reporting. There are both new journals and journals with expanded scope vying for papers. Some papers are posted on the Web and never enter into the journal publishing stream. Journal editorial policies do not necessarily heed Eugene Garfield's advice that acknowledged Web posting need not inhibit subsequent publication in a journal, as the journal adds value in editorial review, indexing, and archiving. Thus some papers are lost to the journals. While the process of publishing will no doubt change significantly, the need to disseminate reliable and high quality information is unlikely to diminish, and the role of journals and editors, however their work is accomplished, will increase in significance.

LRTS has a presence on the Web (www.ala.org/alcts/lrts). The table of contents is posted for current and past volumes, as are indexes for recent volumes. Instructions for authors and book reviewers are readily available as is subscription information.

Every journal is a collective effort. I have been fortunate to work with editorial boards who were committed to excellence and gave generously of their time in refereeing papers. David Thomas, manuscript editor, learned the fine points of editing a research journal from Richard Smiraglia and served as the manuscript editor for all four years. His careful attention to clarity of expression and presentation of data ensured the readability characteristic of *LRTS*. Gregory Leazer and Margaret Rohdy were outstanding book review editors who selected diverse, timely, and significant books and recruited knowledgeable reviewers. At Notre Dame, Melodie Eiteljorge, senior administrative assistant, logged manuscripts and handled correspondence in a timely and efficient manner. The ALCTS officers and staff provided steady support for *LRTS* and smooth processing of invoices and payments. At ALA, Kevin Heubusch, Angela Hanshaw, and their predecessors, Christine Squires Taylor and Gwen Ihnat, formed the most cooperative and helpful production team any editor could possibly wish for, and I am deeply grateful for their work.

I wish every success to John Budd, who succeeds me as editor, and look forward to reading *LRTS* in the future.

Selecting for Storage

Local Problems, Local Responses, and an Emerging Common Challenge

Dan Hazen

Off-site storage has become increasingly common as academic libraries run out of space and the political and financial costs of central campus construction soar out of reach. As it splits collections and denies browsability, storage is commonly regarded as a necessary evil for which there are no obvious alternatives. How we select what we store is therefore central in ensuring results that disrupt students, scholars, and collections as little as possible. After reviewing the purposes of off-site storage, I consider the conditions necessary for viable storage arrangements and suggest how these basic conditions have evolved over time. I then explore criteria that can be employed in selecting materials for storage as well as the interplay between these criteria, the mechanics of storage operations, and the pressures associated with storage goals. I close by suggesting some of the larger challenges whose solutions may be informed by our struggles with storage.

Off-site storage has become increasingly common as academic libraries run out of space and the political and financial costs of central campus construction soar out of reach (Association of Research Libraries 1990; Chepesiuk 1999; Kennedy and Stockton 1991; O'Connor 1994; Young 1999). Storage splits collections, denies browsability, and is commonly regarded as a necessary evil for which there are no obvious alternatives. How we select what we store is therefore central in ensuring results that disrupt students, scholars, and collections as little as possible. Grappling with storage as a local phenomenon can also highlight some of the challenges it shares with cooperative programs to create shared or distributed collections. More imaginative ways to describe and manage all of our holdings can emerge as a result.

Why Store?

First and foremost, we store books when our libraries run out of space. Lack of space is a condition normally determined as much by economics and politics as by absolute physical limitations. Building new libraries is far more expensive than warehousing little-used materials in remote storage: some projections put off-site construction and operating costs at less than 10% of those for central facilities (Cooper 1989; Powell 1998; Yale 1996; Young 1997). Unoccupied space that could accommodate enlarged libraries, or any other new construction, is often at a premium in campus centers. Promises that bookstacks will shrink as digital collections replace print holdings have not yet borne fruit. In the meantime, remote storage provides a compelling solution.

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While space constraints are the most common cause for storage, at least three other considerations enter into the mix. The first is the need to rationalize the physical distribution of library collections. Two scenarios are particularly common. Space limitations have often resulted in collections in which topically related materials are split between different sections of the stacks. In some older libraries, the scatter is even worse as a result of multiple classification schemes. (Many of these libraries developed idiosyncratic local classifications in their early years, eventually switching over to the Library of Congress system but without then recataloging their older holdings.) Full shelves make it difficult to shift books around, and users are expected to move instead. A second problem emerges when the evolution of research interests, book collections, and library buildings leaves high-use materials far from entry points to the stacks, with little-used collections more readily at hand. The efficiencies possible by moving heavily used books close to library patrons can, once again, be difficult to achieve when the stacks are full.

Preservation is another consideration in storage decisions. Off-site housing can provide secure, environmentally favorable conditions for materials that would be at risk in open stacks. Deteriorated items, books or newspapers with inherently fragile paper, and materials susceptible to vandalism or theft can thus be relocated to remote facilities from which they can be recalled for controlled use. Most storage facilities can accommodate a broad range of imperiled holdings.

Finally, remote storage can provide a lever for certain kinds of cooperative programs. Two examples may suggest both the possibilities and their limitations. The Center for Research Libraries has appointed a Foreign Official Gazettes Task Force to formalize CRL's effort to absorb hardcopy backfiles of foreign official gazettes, heretofore collected extensively by perhaps a half-dozen North American libraries, in order to create master sets (Center for Research Libraries 2000). These publications are voluminous, normally printed on poor quality paper, and used only occasionally. They are also essential research resources for which a single, well-managed collection of record may suffice. Cooperative reliance on remote storage at CRL's Chicago headquarters will at once ensure the availability of the materials, rationalize access, produce savings for participating institutions, and strengthen CRL's institutional presence.

Other attempts to make the leap from a cooperative storage facility that stores any and all volumes sent by individual libraries to a facility with a unified collections policy that imposes specific criteria for materials to be stored have proven more problematic. Some consortial storage facilities, for instance, will accept but one copy of any work (Northern Regional Library Facility 2000). Save in a few specific circumstances, duplicates are either returned or discarded. The effects can be difficult, and not just because participants' volume counts might suffer. Local collection integrity is challenged by this kind of approach. Scarce or unusual materials sent to storage for security reasons, or materials acquired by gift or donation, can all be important to retain for the local collection regardless of whether the title is already held within a certain group of libraries. Insisting that a storage facility can only house nonduplicative materials of last resort can, paradoxically, undermine the potential of remote storage as a tool for cooperation.

Making Off-site Storage Work

Whatever the reasons for remote storage, its success depends heavily on how well its proponents address several philosophical, psychological, and operational concerns. Technological change has permitted ever more satisfactory arrangements over time, though our solutions are still far from ideal. The operational issues requiring attention include: bibliographic control; inventory control and physical access; political support; financial support; and the adequacy of the storage facility itself.

The possibilities of bibliographic control, and also user expectations concerning bibliographic access, have expanded with time. Early storage facilities, such as the Midwest Inter-Library Center (the predecessor of the Center for Research Libraries) or the New England Deposit Library, were created in an era of catalog cards and manual files. Book catalogs, printed lists, and general statements of collecting policy—proclamations of CRL's commitment to foreign dissertations, for instance—were the only access tools. The limitations of this approach, in turn, affected the nature of storage decisions. In our experiences at Harvard, it proved more satisfactory to relocate categories of materials or entire classification segments (some newspaper backfiles and certain classification segments from Harvard's holdings to the New England Deposit Library, for instance) than to move a selection of unrelated pieces.

Online catalogs, and more recently the gradual implementation of meaningful serial holdings statements, have transformed both possibilities and expectations. Storage decisions by now almost invariably focus on materials with complete online records. Processing efficiencies for preparing, transferring, and ultimately for retrieving for patron use are thus possible for the library, while users are still able to identify the materials that they need. Fully adequate bibliographic access remains a weak point in some remote storage operations, but the improvements have nonetheless been dramatic.

A second area of concern involves inventory control and user access (Bellanti 1992). Early storage facilities in many ways simply replicated the central libraries that they supple-

mented. Whether the stacks were open or restricted, materials were shelved in call number order because that was the only way to arrange and then retrieve them. Computer-assisted methods for inventory control have since enabled more efficient arrangements. Current storage is built around barcoded materials that are packed in cartons sized for books of specific dimensions and then housed in quasi-industrial structures. These systems save space and facilitate retrieval. Physical browsing, however, becomes impossible.

Libraries, as they have coped with limited space in existing buildings, have typically adhered to a fairly predictable sequence of palliatives. Parts of the central collections may in the first place be hived off to form independent units. Holdings in music or fine arts, for instance, may thus be relocated to separate quarters, usually amid proclamations of increased efficiency for both specialized users and the mass of library patrons who work with the general collections. This coordinated decentralization took place, and continues, at many large research libraries, including Yale and the New York Public Library. Compact shelving, to house more efficiently parts of a library's classified collections, is often the next step. Frazzled users and damaged books are more common as a result of this step than we like to admit, though at least the materials remain onsite.

The next tier of decisions often focuses on relocating little-used materials off-site. Closed-stack, classified collections are one possibility, exemplified by Vanderbilt University's "Library Annex," though most such arrangements were implemented when sophisticated methods for inventory control (barcodes and the like) were not available. Some storage facilities, e.g., the Northern Regional Library Facility in California and the New England Depository Library, provide reading rooms as well. Size-based shelving in book warehouses completely dissociates book locations from users, leaving computer-based tracking systems as the only means to re-establish the connection.

The best bibliographic control and the most sophisticated storage arrangements mean little unless users can readily obtain the materials they want. Efficient delivery services are therefore essential. Most libraries with storage facilities now promise turnarounds within one working day. Some are considering more frequent shuttle runs, as well as the use of Ariel or other document delivery software to service requests for specific articles and other small pieces.

Requirements concerning delivery locations can raise additional complications. Most online catalogs allow users to request stored materials without coming to a circulation desk. But, with some notable exceptions at institutions that routinely offer office deliveries of library materials, the books usually need to be retrieved at the library itself. In some multiunit library systems, moreover, each unit may retain formal rights of ownership and control over the materials it has deposited, and require users to pick up or use the holdings within its facility. A profusion of service points can persist, even though requested items are all coming from a single location.

A third critical condition for successful off-site storage encompasses political and administrative support. Users resist off-site storage because it limits browsability. Librarians typically counter that onshelf collections are already fragmented and incomplete: inhouse holdings are split among the main stacks; the reference room; the current periodicals area; and so on. Moreover, an invisible and often substantial portion of the collection is at any moment checked out, on reserve, in preservation queues, or otherwise not on the shelves. Such correct but not necessarily helpful clarifications aside, access and browsability clearly become more difficult when materials are moved off site. The degradation is especially palpable in libraries whose strength and appeal include extensive holdings of little-used materials.

Effective financial and operational support are essential to the success of off-site facilities. Service must be quick and reliable, and appropriately staffed to make such service a reality. Staffing support is needed as well for units that prepare books and bibliographic records for transfer. Service guarantees must typically come from the highest levels of the university administration, as well as the library. Even when remote storage is a fiscal and operational imperative, implementation will only work when the tradeoffs are openly acknowledged and when there is a clear-cut, ongoing institutional commitment for support.

Finally, the success of off-site storage depends on the storage facility itself. Arrangements for remote housing have evolved from makeshift shelves in unappealing and environmentally inappropriate basements or attics, to rented warehouse space, and most recently to specially constructed modular structures featuring state-of-the-art security systems and environmental controls. Here, as in other areas associated with remote storage, standards and expectations have risen together. Quarters that might once have passed muster are no longer acceptable.

Criteria for Selecting for Storage

Once off-site storage has been embraced or mandated, both the political process to secure user acceptance and the logistics of relocation require decisions concerning general selection criteria and specific transfer procedures. Users must be convinced that the decisions will be as sensible as possible. They must likewise know that mistakes can be corrected. Librarians of course share these goals, even as they are keenly aware of the overflowing shelves. The way that the process typically plays out suggests a number of general observations.

Libraries usually begin to move materials only when their buildings are full. "Full" in some cases implies a comfortable shelving load with as much as 15 to 25% free space to accommodate collection growth, minor stack shifts, and empty shelves for users to spread out books. More often, and dramatically, it can reflect an emergency situation in which books are piled on windowsills, floors, and in special staging areas. Such conditions can be compelling in making the case for storage to reluctant library users.

Starting to store when the library is full implies that one volume must be relocated for every volume added to the stacks. This usually leads to arrangements to divide current receipts between materials for the stacks and for storage. Selectors typically make the decisions, though it is also possible to display all incoming materials so that users can identify any items that they find particularly important. New receipts are "unknown" to the existing collection, and choices made upon receipt allow these items to be directed off site through a single decision and processing sequence. Storing large numbers of current materials may not, however, be an optimal approach in terms of research priorities and needs.

The criteria for relocating materials that are already in the stacks tend to be more contentious, and the processes correspondingly more complex. Longtime users know the books in the areas of the stacks they consult most frequently and often become visually attached to these concrete manifestations of the collections. Materials whose existence has never been registered except through the online catalog don't usually stir the same level of allegiance or arouse the same kind of anxiety when they are housed remotely. Ideal selection priorities will enable and also reflect a simple, expedient, reversible, and cost-effective process that takes into account considerations of collection integrity and of security and preservation. Six criteria commonly used in determining which materials to transfer to off-site storage merit discussion.

Decision-Making Simplicity

Storage decisions reflect the relationship between transfer candidates and bibliographic control, at times with unintended consequences. Contemporary library systems and practice mandate machine-readable bibliographic records for all stored items. New receipts, ordinarily processed entirely online, are obvious candidates. Research libraries that have fully converted their card catalogs can freely draw from retrospective holdings as well, because all these materials are also represented online. But some libraries have made only piecemeal progress with RECON. Their machine-readable records might thus reflect specific projects to improve access to particularly important parts of the collection. Virtually all libraries by now rely on automated circulation, and items charged out without full online records are normally processed fully upon their return.

Records for older materials that are considered important, plus those for items that have actually been used, are thus the first to appear in electronic form. Under these circumstances, storage decisions will be based on a universe comprised of recent receipts, high-profile holdings, and high-use parts of the collection. The dusty volumes that no one wants will remain untouched. The rhetoric of storage typically speaks of moving research materials that exhibit low use. In collections not yet fully converted, this use criterion is easily turned upside down.

Shelf space and decision-making time are typically the commodities in shortest supply as transfer processes are put into place. Serials, multivolume sets, and fat books are attractive storage candidates: one decision can free lots of shelf space; it is easier to change the shelving location on a single record than to adjust many; and the impact in the stacks is visible and dramatic. The unintended consequence, however, can be an inhouse collection increasingly biased toward thin books and pamphlets. Moving long runs of unindexed serials can also be particularly grave in terms of diminished user access.

The simplest sort of storage decision is simply to move an entire classification segment or category of materials. As research agendas become broader and the supporting resources more encompassing, this kind of "clearcutting" is less and less likely to work. When it does, it can be extremely effective.

Expediency and User Involvement

Goodwill and efficiency are alike served by storage decisions that are easily borne by both users and the library staff. Certain constituencies may in some cases want to review all storage recommendations. Other groups might be more comfortable with decisions made within the library. A balanced approach is essential in order to demonstrate that no collections are exempt from storage. But it is also important to minimize antagonism and disruption.

Reversibility

Users require general assurances, and also concrete procedures, to bring back permanently materials that have been transferred off site. Repeatedly retrieving materials from storage incurs real costs, so many libraries also utilize automatic procedures to identify heavily used off-site items that might be returned to the stacks. Circulation counters, for instance, can generate reports of materials reaching a predetermined threshold of charges. Some rare or vulnerable items may need to remain off site, regardless of their level of use.

Cost Effectiveness

Storage decisions should privilege materials that are easy to identify and process, and that will generate significant free space. Such categories as duplicates of little-used materials, superseded editions, some translations into some foreign languages, and the accession lists of other libraries can represent some of these areas. Considerations of cost-effectiveness should inform the entire storage cycle, both in overall terms and for specific operations including selection, processing, and storage and retrieval.

Collection Integrity

Research libraries have built their collections through expensive, carefully planned efforts that have extended over decades and in some cases centuries. Their holdings are deliberate creations of mutually reinforcing materials, not just haphazard accumulations of books and journals. The depth that distinguishes these research collections is reflected most immediately, albeit imperfectly, by the materials in the stacks. Multiple classification systems, separate shelving locations, materials not on the shelf at a given moment, and other imperfections of course limit how much of any collection can actually be apprehended at any one time. Removing materials for remote storage exacerbates the problem.

When criteria of costs and benefits prevail exclusively, little-used items are those most likely to be relocated. The process thus tends to remove precisely the sorts of materials that give research library collections their character. Off-site storage can easily result in onsite holdings that offer only minimally more than the core collections in much smaller libraries.

Possible solutions include measures to leave some distinctive materials in the stacks, even if they have not been used. For some literature collections, for instance, at least one work by every author might be retained. A few narrow topical segments might likewise be left intact, as well as occasional (noncirculating) examples of rare or classic works that students, in particular, might otherwise never encounter. New approaches to bibliographic control, as described below, may allow more imaginative solutions.

Security and Preservation

Contemporary storage facilities are secure. They also provide near-ideal environments for books. They therefore enable libraries to preserve materials at risk due to high value, susceptibility to theft or vandalism, scarcity, or poor physical condition. Most repositories own materials that should not be shelved in open stacks, and off-site storage provides an obvious solution.

Practical Approaches to Selecting for Storage

Off-site storage is often difficult for both librarians and library users. Reduced access to library holdings is always unsettling, even discounting users' sometimes-romanticized visions of current arrangements (Palladino 1999). The mechanics of moving materials can leave everyone suspicious that his or her areas of interest are being unfairly targeted. Political awareness, communication, and consensus building are crucial.

Off-site storage has to be understood and accepted on two levels. The university and library administration need to explain and justify the general concept of remote storage, usually by demonstrating the hard facts of exhausted library space and limited capital budgets. But explaining storage as an unavoidable though abstract solution is only a first step. Focused meetings with departments and faculty members are also essential to build consensus around the specific criteria that will inform transfer decisions. The choices will normally be based on local patterns of use and on research trends within each discipline and field. They must also reflect the concrete research interests of individual professors and students. Agreements can sometimes be reached through discussion alone. In other cases it may be useful to share and evaluate sample lists of transfer candidates. And sometimes it is most productive to walk the stacks with one or two faculty members, discussing the specific items and categories of materials that are immediately at hand. Whatever the approach, faculty involvement is essential.

Explanations, communication, and attention to process are needed to prepare the way for remote storage. Making nuts and bolts storage decisions requires at least as much effort. The simplest choices focus on categories of materials. Hardcopy newspaper backfiles, materials housed on-site in limited access "cages" (for instance for semi-rare materials, or for items susceptible to vandalism or theft), children's books, and folio volumes are just some of the possibilities. Very few classified collection segments can be relocated in their entirety, no matter how esoteric they seem or how little they are used. Such sweeping decisions almost invariably provoke questions associated with whatever use the materials do receive and with the need to maintain some in-stacks representation of all library holdings. Sooner or later, item-level selection almost always becomes essential.

In some cases intermediate decisions can also be possible. When a library owns long runs of several news magazines from a particular country, for instance, it might be possible to keep one set in the stacks and to move other backfiles to storage, often with a cut-off date to keep all issues from the past five or ten years on the shelves. Users seeking to compare accounts of a particular process or event can orient themselves by consulting the title remaining in

the stacks, and then recall complementary volumes as needed. When good indexes are available, some scholarly journals can also be considered for storage. Some materials that have been reformatted as microform editions or digital products can likewise be plausible transfer candidates, though usability, demand, and functionality must all be weighed.

Item-level selection for storage is typically a two-stage process. Potential transfer candidates are first identified on the basis of recorded use and the tentative choices are then ratified either by bibliographers or users, or both. The initial phase usually consists of a broad sweep through some part of the collection to identify materials that have little recorded circulation. The threshold will vary between institutions, partly as a function of local decisions about the amount of space to be cleared. Specific approaches will be informed by the feasibility of working from computer-generated lists, or relying on teams sent into the stacks to inspect the volumes themselves. Libraries with well-established automated circulation systems often can generate lists of items that have not been charged out over a period as long as several decades. Libraries without good online circulation information, however, may need to assess use by consulting the date due stamps in the back of each book.

Variants are possible as well: for example, sophisticated computer algorithms that go beyond the single criterion of past circulation to weigh differential use patterns among separate classification segments (a surrogate for academic fields), and such additional features as whether a particular work is a translation or an additional edition, and its language and publication date (Silverstein and Shieber 1996). At least in theory, the result is a weighted, rank order list that predicts whether a given book is likely to circulate in the future. Such models can be costly to devise and validate, and the lists themselves tend to be more expensive to prepare than straightforward tallies of past circulation.

No matter how the candidates for transfer are initially identified, a successful process requires subsequent review by a bibliographer and perhaps by faculty members as well. Apart from possible errors due to coding mistakes, machine-generated lists may include non-circulating, reference-like works that have been housed in the stacks. Bare bones lists of items that have not circulated also fail to convey the broader context of the surrounding collection, which typically informs transfer decisions as well.

When low circulation items have been flyered or otherwise marked in the stacks (one common technique is to apply pressure-sensitive colored dots to the spines of transfer candidates), both librarians and users can be invited to remove the markers from materials that they want to keep on site. Even in list-based storage selection exercises, decisions are usually most effective when the materials are also inspected in the stacks. Stack reviews also can reveal other storage candidates—for instance materials needing preservation attention, duplicates that are no longer in demand, or superseded editions—that may not be apparent from circulation lists alone.

The most common approach to storage decisions begins with preselection based on circulation. Uncritically accepting use as the primary criterion for storage, however, can easily compromise collection integrity. Some of the most difficult professional judgments concerning transfers come in attempting to represent a collection's richness and depth without subverting the economistic logic that underlies the whole concept of off-site storage.

A final check on certain kinds of storage decisions typically comes from the staff members who process the transfers. Selection anomalies, for instance when a single volume in a multivolume set has been marked for relocation, can be returned for reconsideration. Processing staff can also keep track of items not found on the shelves in order to enable tracing activities and the determination that some pieces may need to be replaced or declared lost.

Remote Storage Writ Large: Problems, Palliatives, and the Link to Distributed Collections

More and more research libraries are grappling with the need for additional storage. Off-site facilities nonetheless remain a decidedly second-best alternative to the classified, inclusive, on-site, open-stack collections whose successful expansion has made off-site storage facilities necessary. The two major disadvantages of off-site storage respectively center on bibliographic and physical access.

Today's storage facilities house closed collections in arrangements that facilitate inventory control and minimize costs at the expense of browsing. In a nonbrowsing environment, books and journals can only be identified through the bibliographic records in local online catalogs. The bibliographic descriptions and retrieval tools must compensate for direct user access to the pieces and therefore must be well constructed. Four aspects merit special emphasis.

Bibliographic records should be complete with subject headings and classification. Minimal-level cataloging and other abbreviated records do not substitute for open access to materials shelved by subject. Further, online catalogs must be able to manipulate the wealth of coded and free-text information contained in full-level bibliographic records. Constructing sophisticated searches often remains difficult. Our catalogs should allow users to take quick and effective advantage of all the information built into full catalog records.

A third dimension considers bibliographic access to sources that aggregate many separate items within one phys-

ical or bibliographic unit. Serials, for instance, are at once attractive and problematic candidates for storage. Moving a serial can save lots of space, but without complete and ready bibliographic access via indexes or citation databases, effective intellectual access is almost impossible. Monographs published in series present similar problems. Easy access to the contents via effective representation of the contents online is essential.

We can by now represent detailed serial holdings in our online records. With appropriate initial processing, users should thus be able to verify a library's precise holdings of an off-site serial. Knowing what is inside these volumes, however, can be far more difficult. Printed indexes are an obvious resource, and many serials regularly produce their own cumulative indexes. External indexing services may also cover a specific journal, though it is important to confirm both time frame and completeness.

Where indexing does not exist, or even in addition to indexing, digital technologies may assist in creating information on the contents for inclusion in an online catalog. One approach is to scan page images of tables of contents for users to consult online, through a product somewhat analogous to the notebooks of photocopied tables of contents available in some institutions (see, e.g., Harvard Digital Library Initiative 2000 and Latin American Network Information Center 2000). Creating searchable text files of tables of contents, which could support queries based on author name, keywords, and the like, might be a (more expensive) next step. And full indexing could enable users to receive automatic bibliographic updates alerting them to articles falling within personalized subject profiles.

Finally, the example of digital representations of serial tables of contents can suggest other ways in which we can exploit electronic technology to improve access to stored library materials. Browsing often consists of quick riffles through a group of books. Most users can quickly assess the potential utility of a work by glancing at its table of contents, gauging the level and nature of the prose, and noting the presence of footnotes and the type font. The title page, the table of contents, and the introduction are perhaps the most revealing pages. Scanning a very few key pages from monographs destined for storage and then linking those digital images to catalog records might provide a partial surrogate for browsing. Users could at least get a peek at potentially useful materials, and on that basis decide whether to recall them from storage.

The second major disadvantage to off-site storage lies in the lack of direct physical access, which is an inevitable hurdle for users seeking materials housed off site. Stored books and journals must be recalled through a process that involves delay. In the best of circumstances, the delay is no more than a few hours although it can be one to three days in other instances. Further, there is sometimes a requirement to retrieve the piece from or consult it at a specific library unit. Multiple requests exacerbate these problems. Document delivery capabilities, e.g., Ariel and fax transmission of journal articles, minimize some of the inconvenience. Additional enhancements need to be worked out as well.

Conclusion

More and more libraries are running out of space and turning to off-site storage. These libraries face a multitude of political, philosophical, and practical challenges in selling the concept, selecting materials to move, and implementing their storage decisions. Browsability, bibliographic access, and physical access to collections all become problematic when materials are no longer at hand in the stacks.

These same challenges also arise for materials held (off-site) by other libraries. Here, even more emphatically than with local storage facilities, users must rely on bibliographic records and online catalogs to evaluate materials of potential interest. Physical access is mediated through interlibrary loan and document delivery. The solutions we devise for off-site storage are therefore pertinent to many of the hurdles that we associate with cooperative collection development and distributed research collections.

Both off-site storage and distributed collections are likely to be only grudgingly accepted until the issues of enhanced bibliographic records and systems, limited digitization of book contents as a partial surrogate for onsite browsing, and streamlined mechanisms for physical access are more directly confronted. When the issue of access to remote materials is cast in terms of our national and international library system, rather than as a purely local matter of storage and retrieval, the need to improve access across the board also comes into sharper relief. Off-site storage, which affects us one library at a time, requires rigorous local responses. The very similar problems of remote resources pose a challenge for us all.

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Remote Storage in Research Libraries

A Microhistory

David Block

The storage of eye-readable information at a location removed from its parent institution has a history of more than two thousand years. Despite changes in the kinds of information that are stored and the technologies that enable their storage, the relationship between a reader's time and the distance of material from the reader is a constant challenge to information providers. Competing visions of service and economics, to which remote storage is one response, are timeless.

This short essay on the history of library storage is written at a time when the physical management of research collections relies increasingly on the use of remote facilities to house paper materials. In it, I cover two millennia, hardly pausing to document but pretending to identify a series of trends: the long-lived tension between recorded scholarship and physical space; tradeoffs between physical ownership, access, and physical space; and the changing solutions applied to these problems by many generations of librarians.

The story begins in antiquity. It is written that Socrates worried about the corrupting influence of books on learning (Plato 1955). In his age—the sixth century B.C.—knowledge traveled by word-of-mouth, and though scrolls and codices existed, Socrates was convinced that scholars would never use them. If only we had listened. The fixing of texts in papyrus, animal skins, or paper, embodied ideas, or in Negroponte's postmodern phrasing, turned them atomic (Negroponte 1995). Whatever the terminology, however, the newly embodied ideas in their physical form required space and thus began the quest for finite library space, now well into its second millennium.

Three centuries after Socrates's lament, the acquisitions rates at Alexandria, the world's first comprehensive research library, began to threaten its storage capacity. A document dating from 257 B.C. shows that the library received 434 papyrus scrolls in 33 days (Manguel 1996). And, yes, the Alexandrian Library developed a remote storage facility. Several sources cite a depository of 48,000 duplicate scrolls from the library housed in the Temple of Serapeum, located in the Egyptian quarter of the city (Millares Carlo 1993; Brundige n.d.). The hubris of a quest for acquiring universal knowledge has, from Alexandria forward, produced the nemesis of space crisis. At Alexandria, bibliographic overcrowding was "relieved" not by building but by the destruction of the scrolls and papyrii by the conquering Turkish emperor whose intent it was to rid the empire of Greek and Roman influences. The collapse of classic civilization, the loss of its recorded knowledge, and the continuing preservation of knowledge that in monastic retreat had only small numbers of scrolls, postponed the next age of monumental knowledge building in the West for a millennium.

Beginning with Gutenberg, five major landmarks in knowledge building are fixed in early modern Europe (see figure 1). Gutenberg's work in printing

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changed "publication" from high art to heavy industry. While printing itself followed a very conservative trajectory —using Gothic type faces and preserving manuscript layout, with margins for annotation, for instance—readers and librarians took a more radical view of what the technology implied. Newly literate men and women quickly grasped the advantages of printed books and often replaced manuscript copies of the same work in their collections (Lerner 1998). Apparently, university libraries practiced this same substitution and even sold the items they deaccessioned to make bindings for the newly printed books. Though paper cannot yet be recycled to silicon, the rest of this transition sounds very familiar in our era of shift from printed to digital storage.

Nicholas V, Pope from 1447 to 1455 and a liberal patron of the arts, unified several Vatican collections into a single repository during his papacy. This consolidation of resources, and subsequent assembly of comprehensive collections to foster research and statecraft found like-minded advocates. Philip II of Spain armed his Escorial residence with a huge, imperial library. Henry IV established the Bibliothèque Nationale in Paris and in England Mr. Bodley's library became a feature of Oxford University (Harris 1995). Agustín Millares Carlo points to the Ordonnance de Montpellier, where Frances I issued a decree intended to gather a copy of all works published in France at the Royal Library, as the first national deposit law. The Ordonnance also legislated an early approval plan by stipulating that a copy of every book imported to France be offered to the Royal Library for purchase (Millares Carlo 1993).

In the New World

Harvard University established its library in 1636 in support of teaching and set out to acquire all the books it could. As Harvard is still often the center of intellectual life, two centuries of collection development history in North America culminated in a debate between two Harvard administrators. So important was this debate that students of library history and of remote storage cite this as a seminal framing of the issues. Eliot (1902, 55), the university president, addressed the need for additional storage of library books with this proposal: "I am not proposing a crematorium for dead books, but only a receiving-tomb. Neither am I proposing that the bibliophile or the antiquarian should be absolutely deprived of his idols, but only that his access to them should made somewhat less convenient and attractive." Lane (1903, 11), the university librarian, took another view: "The point to be carefully considered is, how will the books thus set aside be treated; how will their segregation affect the interests of scholars; to what degree are they still to be accessible?"

Preserved on the pages of *Library Journal*, these statements set a tone that resonates a century later. The writers' views on the issue of handling expanding library collections led to very different proposed solutions. Eliot's logic and perhaps his position as the president of the pre-eminent university in the country led him to suggest the creation of four storage facilities to serve the entire United States while the library director's vision was less sweeping. Lane proposed a regional cooperative repository to be operated by Harvard, the Boston Athenaeum, the Massachusetts State Library, and other libraries in New England (Line 1980). As a historical footnote, this particular controversy eventually ended with Eliot's retirement in 1909 and the completion of Widener Library in 1915 with shelving capacity well beyond the extant collections. Nonetheless, the basic issues of the debate on storage facilities, which revolve around the economics versus service, a lack of agreement on what predicts use and on the proper locus of cooperation, remained and remain unresolved.

Although I cannot fully articulate it, it seems that there is or might be arelationship between the convergence and divergence of acquisitions rates and construction costs, similar conceptually to the supply and demand curves of classical economics, that drives the intensity of discourse and action on remote storage. Periods of great prosperity such as occurred in the 1920s and 1960s in this country and during the oil-boom in some regions of Latin America and the Middle East, make monumental construction relatively cheap. Hard economic times reduce the prospects for both construction and collections, but between prosperity and depression lie long periods when acquisitions outstrip available storage space. Many factors play into the equation, including the sending of books by countries usually in the

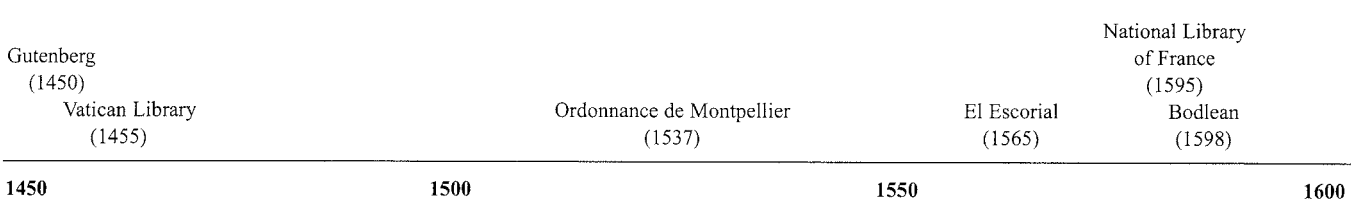

Figure 1. Steps on the Road to Bibliographic Overcrowding in Early Modern Europe

Third World in payment of dollars owed to the U.S., which in the 1960s added books by the hundreds of thousands to U.S. research libraries. This is where the First World has been since the 1970s and where it seems likely to remain for the foreseeable future.

Remote Storage in Modern Years

The second time line fixes six events in the last fifty years of remote storage (figure 2). The New England Depository, which opened in the unlikely year of 1942, conformed to Lane's vision from forty years before: a cooperative, regional facility. A similar approach took shape at the Midwest Inter-Library Center (MILC), which began in 1949 and subsequently in 1965 became the Center for Research Libraries, with storage shared originally by thirteen research libraries in Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Ohio, and Wisconsin (Center for Research Libraries 2000). The British Library Lending Division (1973) illustrates another vision with the assembly of a collection in a single location intended as a nation-wide lending resource.

By the 1980s, many research library collections had surpassed the capacities built to hold them a mere two decades before. Some of the shortfall was met with new construction, at the University of North Carolina, Boston College, the University of Texas at El Paso, and Queens College, for example. However, the building of these library facilities proved exceptional. The preferred solution became high-density storage units located at some remove from the institutions they served. The Harvard Depository pioneered the construction of specifically designed library storage facilities. In the early 1980s, the Northern California Regional Facility and a similar facility begun four years later in Los Angeles served as models in which state appropriations purchased existing space and new furnishings for the holdings of several University of California libraries. The University of Michigan bought and retrofitted a former manufacturing plant, which functions now as the Buhr Shelving Facility for collection storage. Collectively, they illustrate the diverse storage solutions applied in the last several decades in the United States.

Research on Storing Books and Journals

The late 1970s and 1980s also produced a wave of storage research published in the library literature. The Association of Research Libraries compiled SPEC kits on the topic in 1977 and 1990 that serve as good benchmarks. O'Connor (1994) summarizes much of the periodical and monographic literature. Given the number of different solutions shown on the time line, it should come as no surprise that the authors of these studies do not agree on the most effective solution to bibliographic overcrowding.

Two major positions order the debate. There is first a Metcalf School reflecting the views of longtime New York Public and renowned Harvard librarian Keyes Metcalf. Reified in the many editions of his *Planning Academic and Research Library Buildings*, supporters of the Metcalf School espouse the virtues of a regional, cooperative scheme. Proponents stress that remote storage is best viewed as part of a program that reduces interlibrary duplication and fosters cooperative collection development. Swain (1978) describes the planning of the Northern California facility and Buckland's (1990) proposal of a "last copy" scheme with transparent ownership as the purpose of cooperative storage both develop facets of Metcalf's approach.

The Fussler School represents the views of Fussler (1969), a highly respected figure in library history who postulated that the cost of housing a large collection would be lower if some of it is in compact storage, a premise that follows the economic approach championed by Harvard President Eliot. Although his conclusions and analysis are directly contradicted by Harrar (1962), Fussler's approach holds sway in current library practice. An interesting corollary was developed by Cooper and Gorman, who each ask where the compact storage should be. Cooper (1989) compared storage alternatives and concluded that, with the exception of never-circulating material, greatest savings

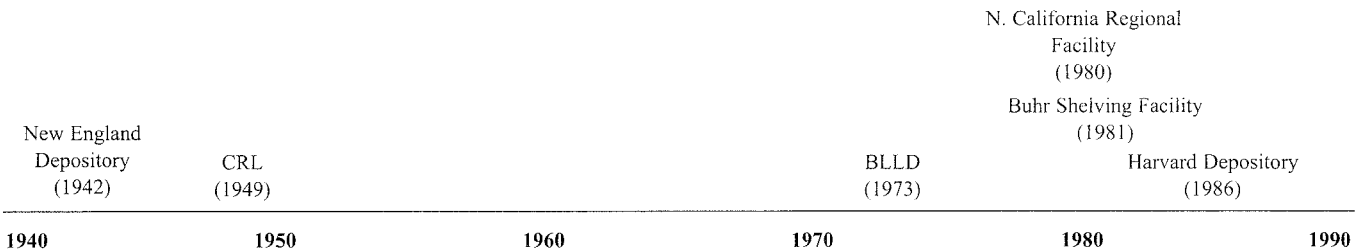

Figure 2. Major Events in the Modern History of Remote Storage

occur when compact storage is open stack and on-campus. Although he wrote two years earlier, Gorman (1987) likewise stressed that moveable on-site compact storage is optimal, principally because selection will never produce a noncirculating collection.

Despite the variety of solutions to space shortages proposed in the 1980s literature, the practice in the 1990s clearly favors the approach illustrated by the Harvard Depository. In 1986 Harvard completed a high-density, modular facility built on land sufficient to hold multiple modules, of which there are three modules currently existing at the Southborough site. Its design, well described on its Web site (Harvard Depository 1999), features climate control, sodium vapor lighting, high bay adjustable shelving, and an inventory tracking system.

The documentation for these new facilities and the thinking that produced them is generally not in the commercially published and indexed library literature, but rather available on the World Wide Web. Searches on Internet search engines that combine terms such as "remote storage," "library materials," and "high density," summon a broad array of library documents, institutional trustee minutes and press releases. These descriptions include a number of interesting facts. Remote storage is likely to occur on any and every campus. In what is surely an unusual case, Williams College has six science libraries and three off-site depositories holding back runs of science journals. Book storage appears in unexpected physical locations. Rice University, for example, has a depository under its football stadium in space shared with the University's Marching Owl Band. And an ever-larger percentage of library collections are housed in remote storage. Colorado State reports that 500,000 (33%) of its 1.5 million volumes are in storage, which is double the percentage of the Harvard University Library collections in storage. In addition to the wealth of specific information on the existence, locations, and relative capacity of these facilities, these texts show an important, public facet of current off-site storage in discussions of how remote storage facilities are described by those who design and manage them.

Still, a Lack of Enthusiasm for Remote Storage

The rationale for storage facilities is uniformly economic necessity. Given current costs and budgetary realities, off-site, high-density storage seems the only viable alternative to a mass deaccessioning of books and journals. But this is clearly a painful choice and one unhappily made. In an interview in *The Chronicle of Higher Education*, Mosher reflects on the difficulties that remote storage caused him as a Medieval Studies doctoral student. Now the library director at the University of Pennsylvania, Mosher sees off-campus storage as a necessity, stating that (Young 1998, A27): "All our libraries are full. Something had to be done."

A reluctance to undertake remote storage in the first place finds reflection in public justification. Some of us cite the addition of public space, "seats" in the argot, as a virtuous byproduct of removing materials; gone is the argument once made that a smaller collection is an easier-to-use collection. The importance of environmental upgrades finds expression from the details of "very-flat" construction and temperature and relative humidity statistics to less technical assertions that the facilities will simply prolong the life of books. And, of course, off-site storage is much cheaper; Yale calculates it as one-tenth as expensive as traditional, on-campus, open-stacks facilities. But these assertions lack the enthusiasm so evident in the description of other contemporary initiatives, such as networked electronic resources.

Conceptual and political problems, inherent in remote storage, also emerge from the public documents. Variations on the theme of "if you can take them off campus, why keep them at all," haunt our writing. Ohio addresses this dilemma with the statement that its depositories contain "permanently held but little used library materials." Texas is more forceful, describing its off-campus storage as "a facility for planned remote storage of permanent, *important* [my italics], but little used library materials."

What will go into storage vexes us as well. The mantra, "little-used materials," is both incomplete and misleading. Proponents of the Fussler School argue that "little" should be as close to "non" as possible, but philosophy and internal politics often lead to caveats promising "flexibility in returning material to campus," quoting the Yale documents. Library users, especially faculty members, raise the crucial issue of how removal of material will affect research. Some of the public documents mention an active faculty involvement in the actual selection of materials, before they are transferred. However, the imperatives of a massive move limit faculty involvement to consultation at the planning stage; for example, Cornell is currently transferring 2,000 volumes a day, making faculty involvement difficult.

Operational Assumptions

Librarians have not resolved all the issues that off-site storage raises, but they have come to share a series of basic assumptions on how the new facilities will operate. One prerequisite for including an item in high-density storage is to have it represented in a library's bibliographic database. Not to do so is to consign it to oblivion, but providing an electronic bibliographic surrogate enables readers to browse holdings virtually at a computer screen. It also offers the potential of enhancing access through electronic wizardry

such as linking bibliographic records for these materials to electronic representations of their tables of contents. Librarians also agree on a rapid delivery of materials from storage as essential for establishing remote facilities. Twenty-four hours to two or three days appear in the new facilities descriptions, and several documents mention transmission of articles by fax or Ariel.

Ironically, these developments potentially alter the relationship between distance and access and threaten to overturn the intent of placing materials thought to be little-needed in the less desirable physical location. However, the combination of bibliographic representation of every item in remote storage in online databases (which occurs at a time in large research libraries when significant segments of centrally-housed collections are not yet shown in such databases) with the provision of delivery services that place materials in readers' hands more quickly than the current system of open stacks and self service may provide better access to materials than was possible before. Materials stored remotely may become more accessible and more used, a danger signaled by Gorman (1987), although it is very difficult to argue against promoting greater use of any library materials.

Surprisingly, current research and position papers gloss over two major issues. The first is a lack of agreement on a set of best practices for off-site storage. Not only is the research from the 1980s highly contradictory, but working groups such as the ad hoc storage consortium in the New York metropolitan area have produced widely-divergent analyses and recommendations for action (Final report of the working group 1996; Young 1999). Neither do researchers offer meaningful guidance on the complex issue of selection of materials for storage, although the use of circulation data is generally regarded at least as an initial element in examining and determining what materials should be stored. Second, authors leave unfilled our expectation of analysis of the role of new technologies and how they would affect the facilities of today. Despite the growing presence of JSTOR, a program conceived with space savings at its heart (Bowen 1996), public documents that describe remote storage make digital technology conspicuous as a strategy only through its absence. For now, library planners imply that paper collections will continue to grow substantially and that more of them will reside at remote locations.

Conclusion

I turn readers' attentions to the work of Jorge Luis Borges, an Argentine writer whose involvement in the literary world of authors, book lovers, and readers led to an understanding of libraries. Writing of an infinite "Library of Babel," Borges describes two types of intruders. The first are inquisitors who are always on the alert for material that offends orthodox sensibilities. But a danger at least as great was seen in another group. "Other men, inversely, thought that the primary task was to eliminate useless works. They would invade the hexagons [Borges' library shelves], exhibiting credentials which were not always false, skim through a volume with annoyance, and then condemn entire bookshelves to destruction." (Borges 1962, 84–85).

In 1999, the year of Borges's centennial, librarians clearly recognize space as a resource as precious as capital and staff yet the commodification of space is not a development of the Information Age. In fact, the inability of library facilities to keep pace with the simultaneous acquisition and preservation of information has challenged our professional ancestors for centuries, and remote storage has been used to house collections for more than 2,000 years. The essence of the Eliot-Lane debate on where and how materials are stored will continue unresolved as long as eye-readable media remain important information carriers. While only incipient in the debate, the role of digital technology in information storage and retrieval promises to change the landscape significantly. How long buildings will remain the principal repository of information is no trivial question. Librarians do not wish to fall behind the technological curve, to be cast in the role of Borges's second class of intruders, nor to be seen as poor stewards of the public's property and cultural heritage. If history offers any guidance here, it is that economy and service exist in competition. Low-cost real estate and high-density shelving will be economical only to the degree that they enable the delivery of information to those who use it.

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Prelude to a Digital Music Library at the Pennsylvania State University

Networking Audio for Academic Library Users

Amanda Maple and Tona Henderson

The three significant factors in planning and implementing a digital music initiative are infrastructure, collections, and human resources, with a fourth factor, funding, affecting all decisions. By examining these issues it is possible to describe the Penn State experience in the initial stages of creating a digital music library and offer suggestions and experiences that may assist others in planning, developing, and evaluating a similar service. The benefits of digitizing the music collection include increased access and the potential for enhanced preservation. At Pennsylvania State University, collection decisions have been based on course-related needs.

Music audio materials (compact discs, long-playing records, and cassette tapes) are used by music faculty and students daily throughout the academic year for classroom teaching, study, and research. Students are assigned to listen to and study dozens of specific music works every semester to meet course objectives in music, and these recordings are traditionally placed on course reserve in the library by music faculty. Students must come to the library to listen one at a time to recordings housed physically in the library. Faculty must come to the library to borrow each recording they need to use in the classroom, and immediately return the recordings to the library so their students can study them. Additionally, faculty are limited to using classrooms equipped with playback equipment for sound recordings.

Providing access to these assigned music works over the Internet enables faculty to use the music during classroom teaching from any classroom with a computer and an Internet connection, and also to use the assigned music while working with students individually or in small groups in their offices. Students can study the assigned music from computer labs, dormitory rooms, and homes off campus, or at computers in the library. Most importantly, students and faculty are not limited to listening during regular library hours. Providing audio music information over computer networks also makes possible distance education courses in music that until now have been impractical.

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Building a Digital Music Library

Our use of the term "digital music library" implies networked access to a digital music audio collection, with or without related visual images and text-based information, developed for and accessible to a defined user community from all desired end-user locations. While there are many issues involved with the creation of a digital music library, three emerge as both critical and comprehensive: infrastructure, collections, and staffing. Pervasive within all three categories is the question of funding. In this report we focus on these issues, using the format of a general discussion followed in each case by a description of our experience at Penn State University.

By examining these issues, we can describe the Penn State experience in the initial stages (the "prelude") of creating a digital music library and offer suggestions and experiences to assist others in planning, developing, and evaluating a similar service. Within the context of this examination, it is also possible to imagine new applications and future directions, thus balancing the practicality of today's implementation with the promise of tomorrow's potential.

A review of the literature, both print and Web-based, uncovered no published reports of similar projects other than Indiana University's VARIATIONS project (Dunn and Mayer 1999), though informal discussions with music librarians at several institutions indicated that similar projects are underway across the country.

Infrastructure

At a minimum, the technological infrastructure of an online music library consists of servers, clients, network hardware and software, and some type of audio player. Client-server machines communicate with each other in a very specific way based on a query-answer model. Clients query while servers answer. In any networked environment, two or more computers are linked via wires (coaxial, fiber, and so forth) or wireless (that is, antennae) connections while a specialized operating system coordinates the communications between all the computers on the network. Network connectivity is desirable if distributed access is a goal. For an online music library, it is essential that all client machines contain an audio-player software package, sound card, and speakers or headphones.

In addition to the minimum required digital infrastructure, additional hardware and software are required to actually create digital materials from recordings and scores. These devices and associated software are most often considered specialized peripherals and vary widely in cost depending on a variety of factors. Conversion projects are rarely easy and digital music libraries are associated with a number of traditional problems, such as learning curves for operating scanners and encoders, conversion error, and equipment failure.

Inputs and outputs of the digital music library require storage and delivery capacities that often exceed previous experiences in digitizing print collections. A typical four-minute music audio track equates without compression to about 40 megabytes of data. Although newer computers routinely sport 1 to 3 gigabytes in disk storage, these capacities can be quickly consumed by even a small digitization project. Symphonies are typically 30 to 60 minutes long, and operas can be several hours long. File size, end-user computer processing capability, and network speed all affect the speed of data delivery. Inadequate delivery speed can result in long download time and breaks in audio delivery.

There are many questions to be answered at the outset of a networked digital audio project, including network size and available local technical support. The question of whether to compress files, and if so, what techniques to use is directly related to the quality of audio desired and delivery speed requirements. Most music audio files are large, requiring significant storage space and download time, and the use of compression techniques is highly desirable if not necessary. Answers to these questions help determine decisions about hardware and software.

The questions of who will be able to access the music and whether users will be able to download any of the music files are primarily driven by copyright issues. If the music audio being considered for digital networking is protected by copyright, then restricting access to the audio files is usually a requirement. Options include filtering by IP address, using proxy servers, requiring password access, and restricting by physical location of the network (to a single room in the library, for example, or a single building or campus). Copyright protection sometimes has the practical effect of not allowing downloading if there is not technology in place to disallow further forwarding or use of the music from the downloaded file. Some streaming technologies enable the delivery of networked audio while preventing end-user downloading capability, but may not provide CD-quality audio.

Rapid innovation in digital audio technology and competition in the market offers planners many options for proprietary software, but requires care and attention to questions about the longevity of any particular program or file format. Planning for the digital music library must include access to the appropriate audio player on all end-user computers. At present, proprietary systems for the creation and playback of digital audio files are in competition for the market and their players in some cases do not play file formats created by another proprietor's capture software. Though in the future it is possible that proprietary players will play each other's file formats, for now planners

must choose one system and make it accessible to end-users either by physically loading it on each end-user's computer or by providing instructions to end-users to do this themselves. A decision must also be made about who pays for the player: the end-user or the audio provider. Most proprietary systems offer downscaled versions of their players for free.

Local Infrastructure Problems and Solutions

The Digital Music Library at Penn State was implemented in 1998 using RealNetworks streaming technology, server, and production software. Choosing among proprietary software brings the risk of creating a collection that will some day be unusable without expensive migration efforts. We considered several factors, including the software's current popularity and the ability of the campus to host it. Penn State's Library Computing Services maintains the server and provides storage space with regular backups for the audio files. The Digital Music Library home page explains that users need a sound card and RealPlayer software, and instructs them to download the RealPlayer (a free version is available) from the RealNetworks Web site. Only institutional IP addresses can access the audio files, and the audio is streamed in real time; end-users cannot download the audio files. Users access the audio files from computers on campus connected to the server via the campus local area network (LAN) and from computers off campus via modem and dial-in connections.

Network audio quality is directly related to the network connection's bandwidth, or amount of data capable of being sent through the network connection in a given time: the higher the bandwidth, the better the audio. The campus network has a higher bandwidth than off-campus modem connections. Therefore, two choices of audio files are offered for each selection of music: a file captured for transfer over an ISDN (integrated services digital network) connection with an approximate bandwidth capability of 112 Kbps (kilobits per second), and a file captured for transfer through a modem capable of handling approximately 28.8 Kbps or higher. This dual capture process doubles staff production time but offers high quality audio for on-campus use while providing the convenience of admittedly lower-quality off-campus access when needed. Informal feedback from users indicates that they use and now expect to have both types of access.

When the Digital Music Library was first implemented, public computers in the University Libraries were not equipped with sound cards and audio players. Thus, users were unable to listen to the audio files inside the library buildings. Not all computer labs on campus provided the necessary hardware and software, and Digital Music Library staff personally researched which computer labs provided computers with sound cards and audio players and mounted this information on the home page. Because LAN upgrades around campus and computer purchases for faculty are often the responsibility of individual colleges or departments, some faculty experienced access problems associated with inadequate end-user processing speed. These problems have been resolved with installation in the library of public computers equipped for audio access and upgrading of the campus LAN. We also know, however, that as we plan new services, we will have to inform those who are responsible for computer equipment in computer labs and colleges of baseline hardware and software requirements.

Instructors who assigned use of the Digital Music Library found themselves fielding questions in class about problems accessing the audio files. Providing a feedback form and a problem-report form from each page of the Web site has allowed instructors to refer all questions and problems to these forms, which are sent directly to the music librarian. Access problems and questions generally relate to IP filtering, remote authentication, improper installation of the player software, and inability to download the audio files.

Collections

Library collections are the basis on which library services are provided and are the second issue discussed in creating a digital music library. The benefits of digitizing the music collection include increased access and the potential for enhanced preservation. Academic music libraries often address the special needs of their fragile and hard-to-replace recording collections through restrictive access measures such as special circulation procedures, limited physical access in listening rooms, and denial of interlibrary lending. However, in spite of the value of these measures for collection preservation, questions arise about their effect on the use of the collection. Conversion to digital format, while problematic, minimizes damage from physical use while simultaneously improving access. With a virtual format, there is no scratching or breaking of the materials in the traditional sense. And, as an added bonus, appropriate network connections and computing resources enable multiple simultaneous uses of a single resource as well as remote access, allowing users to study the music even when they are unable to make a trip to the library or when the library is closed.

As for information in any format, copyright is a primary consideration in the selection of recorded music for digitization. Providing access to a digital copy of copyrighted music audio in the context of an electronic course reserves service can be in compliance with copyright law. The Music Library Association (1999) "supports the creation and transmission

of digital audio file copies of copyrighted recordings of musical works for course reserves purposes" as long as access is: "through library-controlled equipment"; restricted to campus networks or authenticated remote users; provided only to music being taught in the course and only for the duration of the course; and the copies are made from legally acquired original sound sources. Other aspects of digitizing music, such as enhancing access to music audio outside of the electronic reserves context through hyperlinks embedded in the library's online catalog, are not covered by this statement. Designers of digital music libraries should address within their individual institutions whether to invoke exemption under fair use when providing such enhanced access in an educational setting.

Though digitization offers the promise of long-term preservation of audio, that promise has not yet been realized. As Smith (1999, 4) notes, "much is gained by digitizing, but permanence and authenticity, at this juncture of technological development, are not among those gains." Magnetic tape is an inherently unstable medium of storage, and proprietary software and hardware necessary to read digital information can become obsolete, requiring regular migration of digital information from medium to medium and consequent potential loss of data. However, as mentioned above, short-term protection of sound recordings is achieved through digitization by lessening the need for multiple users to handle the original sound sources.

Local enhancements that add value to the original sound source further improve the usability of the collection. By incorporating supplemental materials, the digital music library emerges as something more than a one-to-one transcription of audio. These supplemental materials might take the form of composer biographies, critical analysis of the music, discussions of music theory, or information accompanying the original sound sources (such as liner notes). Taking it one step further, associated materials can be synchronized at playback; for example, the "pages" of a scanned score can be "turned" automatically in synchronization with the audio. Complementary materials correlated in this way can enhance the learning experience by providing a combined visual and auditory experience. For example, at Penn State a professor has used the Digital Music Library while teaching an introduction to the study of music for first-year students to demonstrate notational and performance practice issues in baroque music. Sample pages from different editions of a work of baroque music were scanned and made accessible along with the audio to demonstrate in the professor's lecture differences between the notation in the score and notes the performers actually play in this improvisatory style, as well as different editors' approaches to editions of the same music.

Retrieval of music in the library's collection can also be enhanced by linking from the online catalog's bibliographic descriptions directly to the digitized audio. A consequence of such enhanced access might well be increased use of the collection by students and faculty. Dunn and Mayer (1999, 17) report heavy use of Indiana University's digital music library, VARIATIONS. Their statistics show that, "when given a choice, students are using VARIATIONS rather than traditional materials" and "are listening to far more sound recording titles than they did using traditional formats."

Local Collection Problems and Solutions

At Penn State, selection decisions have been based on course-related needs. This has been an appropriate focus because it meets the most important need as expressed by music faculty and students. Also, we found digitizing the music assigned in music courses has taken up all of the staff time available to date for this project and we have no capacity at this time to go beyond course-related needs. Our efforts to comply with copyright law include the use of streaming technology in which download capabilities are disabled; IP filtering and remote authentication through a secure server; providing access to music assigned in courses only for the duration of the course during the semester it is taught; and digitizing only items the library has purchased and added to the collection. Future collection projects could include digitization of special collections such as those on 78-rpm records and oral histories on cassette tape, and exploring the potential for collaboration with collegiate faculty in the development of distance learning courses in music. If available in the future and affordable for libraries, online commercial sound recordings legally available for networking would obviate both conversion and copyright issues.

Staffing

People involved with the creation and availability of a digital music library include not just music librarians and staff but also computer technical support personnel, other public service staff, senior administrators, collegiate faculty, and students. In general, these staffing and attendant issues can be organized along the lines of the inputs and outputs of a digitization project.

Digitization of library music materials is time-consuming and thus expensive. Training music staff to operate specialized peripherals requires additional time and access to specialists who have the requisite expertise to conduct the training. Technical support from library support units (such as computer teams) can involve lengthier response times for assistance because of inexperience or lack of familiarity with the equipment involved, thus presenting another training

need. Senior library administrators often provide outset funding and organizational support for digital music initiatives. As such, their role as one of the human inputs in a digital music initiative is crucial. Finally, since conversion and creation projects are expensive and time-consuming, selection of these projects is often based on faculty input. It is not possible or desirable to digitize for the sake of digitization. Faculty input insures a relevance and value to the project not present in mass conversions.

Once digital music materials are converted, their availability and use becomes a responsibility of reference staff in reference interactions at the desk, via e-mail or telephone, and in general as well as music locations. While many librarians and staff are familiar with the basics of a Web browser, identifying materials and troubleshooting retrieval of digital music collections involves an additional level of expertise. As the output point of contact for a digital music project, the reference desk staff must know about all the issues involved with retrieval including network infrastructure, variations in access methods, sound cards and audio players, and local cataloging conventions and points of access. While technostress emerged several years ago as a byproduct of increasing automation activities within the library, music librarians and staff appreciate the additional dimensions of technostress created by the addition of digitized sound.

Staffing Problems and Solutions at Pennsylvania State University

Audio capture has been accomplished to date with a single personal computer equipped with RealNetworks production software and a sound card connected physically to audio source devices (CD player, turntable, cassette player, and DAT player) and networked for transfer of files. The project director trains staff to: capture audio at different encoding levels; name the audio files according to local filenaming procedures; create text files that RealAudio uses to point from HTML hyperlinks to the audio files on the RealServer; and create Web access to the audio files using HTML. Funding from research and special project grants from the Dean of the University Libraries has staffed the project in its initial stages. When time allows, staff are also trained to scan scores and create synchronized audiovisual files that allow users to read the digitized scores while listening to the music. Staff maintain a database that tracks items digitized, their filenames, course numbers and titles, and semester used. Required qualifications for staff include a strong music background and knowledge of HTML and Web page design. Technical support is provided by Library Computing Services.

At Penn State, staffing levels are a primary concern. The university is a complex organization pursuing an electronic agenda that includes projects and initiatives on several fronts. Coordinating a digital music project with other university or library initiatives requires significant time and frequently influences decisions of the music librarian on this project as well as in general collection development. We have learned that incorporating an organizationwide view of the present and future networking capacity and capacity for digitization is important for fully leveraging the computing infrastructure into music library priorities and activities.

Reception of this service by faculty and students has been extremely positive, and the potential for enhancing learning and developing new distance learning initiatives motivates us to explore ways to reallocate permanent staff hours to this project in lieu of future grant funding. This project is in its infancy and we are still learning how much staff time is required to keep up with digitizing the assigned music for courses in each semester. Impending improvements in technology will almost certainly reduce the staff time now needed for capture and synchronization although implementing new technological developments is a time commitment for project planners.

Conclusion

As more classrooms are equipped with computer and projection equipment, the potential for collaborating with collegiate faculty to enhance teaching and learning in the classroom is significant for music courses and other courses in the arts and humanities in which audio is becoming increasingly important (for example, history, language, communications, and integrative arts). As more institutions implement music digitization projects, the potential exists for consortial digital music collections that could be the basis for collaborative distance learning courses with faculty from different institutions. The potential also exists for sharing the work of digitization among institutions, though this would require working out differences in platforms, file formats, delivery mechanisms, and copyright issues.

Enthusiastic response and increasing demand for this new service from faculty and students indicate that Penn State's beginning effort to create a digital music library has been worth the investment. We are fortunate to have strong interest in and support for the project from our Library Computing Services, who make available the server, storage space, and excellent technical support. At Penn State, the university and library administrations are both highly supportive of exploring ways to use technology to enhance learning, and a technological infrastructure was already in place that contributed to a successful outcome.

We learned through this initiative that creation and maintenance of a digital music library is time-intensive on an ongoing basis and requires either external funding or reallo-

cation of existing human resources within the institution (in our case, both) to make sustained service possible. It demands top-notch technical support and a project manager interested in learning the details of capturing and making accessible the audio files, working within an institution that values such work and therefore makes it possible for the project manager to devote time to the work. We learned to involve permanent staff as early as possible in the process of creation of the new service rather than to rely heavily on part-time workers. We also learned to separate the work of capturing from creation of HTML for access, as the two activities can be done by different people with different skills at different times.

It was a surprise to us that many students love the off-campus access and use the service at all hours of the day and (especially) night. With increasing demand for this service, we consider the possibility that in the future digital music libraries in academic institutions might provide networked access to music audio from a variety of sources, including in-house capture, consortial projects among institutions, and networked files purchased or licensed from commercial vendors.

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Academic Library Web Sites as a Source of Interlibrary Loan Lending Information

A Survey of Four- and Five-Year Colleges and Universities

Michael Coffta and David M. Schoen

We surveyed library Web sites of four- and five-year colleges and universities to determine the extent to which interlibrary loan (ILL) information is provided to users not affiliated with the institution, specifically ILL staff at other colleges trying to find lending policies, contact information, and holdings.

The Web has penetrated academia to such an extent that we are now surprised when a college lacks a Web site. Many institutions now consider their Web sites to be a major means of communicating with constituencies in and out of the institution. This is also true for academic libraries whose Web sites are an effective way to provide remote services and electronic database access. The majority of academic libraries have Web sites, which usually emphasize the services available to faculty and students and offer descriptions about the libraries.

Library Web sites provide information to visitors not affiliated with the college. Colleagues at other libraries seek information on library programs, services, and policies, and with its availability of information, the Web has become a preferred means of obtaining that information. In the area of ILL, librarians have traditionally consulted a variety of sources to find the lending policies and procedures of other libraries, including such tools as the Name-Address Directory (NAD) on the OCLC Online Computer Library Center, the *Interlibrary Loan Policies Directory* (Morris 1999), or policy directories specific to a particular consortium. Our goal in this survey is to determine how useful library Web sites are as a source of ILL policy, contact, and holdings information.

This issue is important for two reasons. The use and acceptance of the Web as a multifaceted source of institutional information is rapidly changing how people in different institutions communicate. Academic libraries are expanding their Web sites to carry information that was available only in print five years ago. Second, while librarians currently use a variety of printed and online tools to ascertain ILL policies and procedures, the Web offers potential convenience and accessibility worth investigating. ILL staff can call the lending institutions to determine lending policies, but this can be time consuming and disruptive for both parties. Certainly the use of OCLC's NAD is common, but not all libraries use OCLC, nor is OCLC access always readily available to an ILL staff member—

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when an ILL librarian is on the reference desk, for example. Printed directories, such as Morris (1999), are an option, but some libraries do not have entries in this directory, and not all libraries have this source either. Library consortia often have ILL policy directories, but this information is not readily available to those outside the consortium. Library acquisition, cataloging, and collection development departments have developed informational Web sites to assist in their work, and such sites might be useful in support of ILL activities.

Literature Review

Surveys of library Web sites in the literature primarily fall into two categories: articles in which technical aspects of Web design are examined, and articles in which the content of sites is analyzed. With regard to technical aspects, King (1998) surveyed the library Web sites of libraries in the Association of Research Libraries and focused on design issues, such as the use of backgrounds and document headers. Stover and Zink (1996) examined the physical layout of library Web sites and found that they did not adhere to fundamental design guidelines. Cohen and Still (1999) compared the content of library Web sites at research universities and two-year colleges. They identified the core elements common to the sites studied, such as contact information, descriptions of services, and links to search engines. More recently, Agingu (2000) studied the content of library Web sites at historically black colleges and universities to determine their usefulness as tools for disseminating information about the library and for providing services to its primary users on campus.

Many of these authors mentioned content that related to ILL, but they tended to focus on ILL as a service to the institutions' patrons. We determined that no previous research exists on ILL content from the perspective of ILL staff from another institution.

Research Questions

The purpose of the survey was to learn how useful library Web sites might be to ILL staff from other institutions looking for ILL information. We defined three categories of content that represent the kinds of information that library staff from borrowing libraries would find relevant. They are:

1. ILL Policies and Procedures: Is it possible to determine charges, loan types, loan lengths, etc.?
2. Contact Information: Can Web users find contact names, phone numbers, fax numbers, e-mail addresses, and postal addresses?
3. Book and Journal Holdings: Is it possible to determine whether a library owns a book or journal?

Method

During June and July 1999, we surveyed 300 college and university Web sites. We randomly selected the sample from a list of institutions of higher education from the 15th edition of *American Universities and Colleges* (American Council on Education 1997), a comprehensive directory of more than 1,900 American institutions offering bachelor's degrees or higher, which lists colleges and universities alphabetically. The sample was limited to American colleges whose highest degree offered is a bachelor's or master's degree. After we excluded law schools, medical schools, and doctorate-granting institutions from the population, 1,584 institutions remained. We selected every sixth college or university from this list.

We focused on bachelor's- and master's-granting institutions for the following reasons. First, these institutions are the most numerous institution of higher education in the United States. Second, most bachelor's- and master's-granting institutions have a main library, while doctorate-granting institutions have multiple libraries on campus. A study of these doctorate-granting institutions would require a different method from the one we employed.

Once we obtained the sample, we checked the Web for the existence of a site for the college. If no Web site could be found, the college was discarded from the sample and replaced by another institution. Fewer than 20 colleges were removed from the sample for this reason. We did not, however, remove a college from the sample if there was a college Web site but no *library* Web site. We were interested in determining how likely it was that a visitor would find a library Web site if the college, in fact, had a Web site. It is possible that a college might not have a Web site, but that the library maintains a site with a commercial Internet service provider or otherwise separate from the institution. We did not think this was likely to be a significant number and did not go in search of such Web sites.

From the list of institutions with sites, we then looked for library Web sites. Some colleges had more than one library. When presented with more than one library to choose from, we chose the main library. When presented with more than one choice at a site, we selected the Web site of the library whose collection appeared to represent the general collections. We did not select libraries whose collections represented a specific discipline or format, such as music, chemistry, law, or media. Because we were surveying non-doctorate-granting institutions, most of which had small to moderate-sized enrollments, this rarely presented a problem. The median enrollment of the sample was 2,188 students.

Ease of Finding Library Web Sites

We examined how easy it is to find library Web sites. In order for library Web sites to be worth consulting for ILL information, these sites must be fairly easy to locate. The first route we considered when trying to reach another library's Web site was to go to the college's page and find a link to its library. The URLs for many college Web sites are intuitive; for example, the URL for Neumann College's Web site is www.neumann.edu. While these instances are common, ILL staff cannot rely completely on the presence of straightforward URL addresses. Fortunately, there are several college Web site directories on the Internet, including Allaboutcolleges.com and Yahoo!'s college directory. These direct users to the main Web page of a college, so finding the library Web page always involves a second step. There are library directories, such as Vanderbilt University's Lib-Web-Cats (http://staffweb.library.vanderbilt.edu/Breeding/libwebcats.html), which take the user directly to the library's Web site, thus eliminating that second step when access is via the college Web site. In general, we did not find it difficult to locate college Web sites using these various directories.

Once at the college or university Web site, we found that 240 (80%) of the institutions had library Web sites. We examined these institutional Web sites to find whether and how the library Web sites were linked to the main or home page of the college. Not every college had a link from its main page to the library. Of the 240 colleges with library Web sites, 151 (62.9%) had a link from the main page to the library Web site. The remaining 89 (37.1%) did not have this direct link to the library but did have a link from a category on the institutional main page, usually "academics" or variations thereof, to the library Web site. We concluded that college Web sites were easy to find and subsequent navigation to their respective library Web sites was also straightforward.

Another phenomenon we observed is what we shall refer to as the "omnipresent series of links" on many Web sites. This refers to a sidebar, extra frame, etc., which appears on every page within that Web site. The intention is to ease navigation and provide a consistent avenue to important pages on the site. We discovered that of the 240 colleges with library Web sites, 85 (35%) had such links on their sites. Of the 85 colleges with this feature on their Web site, 38 (44.7%) placed a link to the library Web site in this group of links.

ILL Policies and Procedures

Many library Web sites contain information on borrowing materials from other libraries for campus students and faculty. Such policies include basic information such as eligibility, renewals, and late fees. These are certainly of great value to campus users, but ILL staff from other libraries are concerned with finding policies and procedures regarding lending and borrowing between libraries. They want to know what materials the library will lend, what the library's renewal policy is, and whether there are charges for lending.

In our sample of 240 library Web sites, only 8 library Web sites (3.3%) contained ILL policy and procedure information relevant to ILL staff in other libraries. Six of these libraries included this information amidst their policies for their students and faculty, while two had a separate page devoted to lending policies.

Contact Information

A common reason to visit any organization's Web site is to find contact information for people. We found that 128 (53.3%) library Web sites offered the name of a person in the ILL department, although a telephone number or e-mail address of that person was not always provided. Overall, 131 (54.6%) of libraries provided an e-mail address of a person identified with ILL or a generic departmental e-mail address, in some cases without a person's name explicitly stated. Department or staff telephone numbers were provided by 129 (53.8%). We counted only those e-mail addresses and telephone numbers that were associated with ILL activities. We recognize that library addresses and telephone numbers can provide access to ILL departments but we were looking for a direct listing. Also, telephone numbers without area codes were not counted as valid telephone numbers. Likewise, extensions with no readily available three-digit prefix were not counted as valid telephone numbers. If we could find both the area code and the three-digit prefix anywhere on the library Web site, we did indeed count it as a complete telephone number, although its components were separated. We were surprised at how much time we had to spend hunting for area codes and three-digit prefixes.

We were less strict with fax numbers and postal addresses. We could not assume that every library's ILL department had its own fax machine. Therefore, we counted any library that provided a library fax number with an area code, even if the number was not explicitly associated with ILL and assumed that a fax sent to a general library number would be delivered to the ILL department. The same principle should apply to postal addresses. We did not insist that a postal address be associated with ILL, but counted as valid those library Web sites that contained a complete postal address anywhere on the site. Undoubtedly, an envelope marked "Attn: ILL department" delivered to a general library address will be sent to that department. We found that 68 (28.3%) of library Web sites provided a fax number and 100 (41.7%) provided their full postal address.

Ariel (an electronic ILL document delivery tool offered by the Research Libraries Group) addresses were virtually nonexistent, although we cannot determine how meaningful this is because we do not know how many of these libraries use Ariel.

Access to Book and Journal Holdings

We found that 180 (75.0%) library Web sites had links to online catalogs. We only counted online catalogs that were readily available to remote users. If the online catalog was protected by a password and the library Web site did not offer that password, we did not count it.

ILL librarians look for two types of information in online catalogs: book holdings and periodical holdings. Online catalogs contain complete book holdings that include title and volume holdings. Most books are single volumes or multiple volumes issued together, but in any case, the general practice among libraries is to add book volumes to the record on arrival. Regarding periodicals, 165 (68.8%) of the 180 library Web sites with online catalogs provided searchable periodical titles and holdings either in the online catalog or in a periodical list posted on a Web page separate from the online catalog. The majority of libraries listed periodical title and volume holdings in the online catalog. In addition, we found that 37 (15.4%) of libraries with Web sites provided a page that listed periodical titles owned by the library. Twenty-four (10.0%) of the libraries offered periodical holdings both in the online catalog and in a separate list on a Web page.

Discussion and Recommendations

Overall, the demonstrated usefulness of library Web sites as sources of ILL information is variable with the most usefulness seen in response to information on library book and periodical holdings. Eighty percent of libraries in this study had Web sites and 75% of the Web sites had direct links to the library's online catalog. Thus, book holdings information was easy to locate and readily available. Approximately two-thirds of the time (68.8%), periodical holdings were also available.

However, the library Web sites were surprisingly deficient regarding the amount of contact information that was available for the ILL department. Less than half of the library Web sites offered postal addresses anywhere on their sites. Other research indicates that this not just a deficiency of four- and five-year college library Web sites. Cohen and Still (1999) found that only 46% of two-year colleges and 53% of Ph.D.-granting institutions provided postal addresses on the library main Web page. We were able to find complete phone numbers, with area codes, only about half of the time. Fax numbers were rare. Plus, we often had to sift through an entire Web site to find contact information. Names of ILL staff were only provided about half of the time, a deficiency that seems easy to correct and should be a priority for ILL departments. Although the assumption that local users will readily travel to the library or communicate via e-mail, it also seems reasonable to assume that contact information for phone and address would be useful to on-campus library patrons as well.

On the question of finding ILL lending policies and procedures on the Web sites of four- and five-year college libraries, there is not much information available. Merely 3.3% of these libraries provide policy information on what the library will lend or not lend to external borrowers. While the absence of complete contact information might be a matter of oversight, the absence of ILL lending information makes it clear that the intended audience is the primary local clientele. ILL librarians are not designing Web sites for outside users.

We found in our sample that library Web sites of four- and five-year colleges and universities are not good sources of ILL policy, procedure, and contact information, but might be worth visiting for book and periodical holdings. ILL workflows are unlikely to change to include searching library Web sites.

The following recommendations are designed to increase the potential usefulness of library Web sites for ILL policy and contact information. Libraries should post the following lending policy information on their Web sites:

- The materials a library is willing to lend, and under what circumstances. For example, a library should indicate whether it will lend bound periodicals or microfilm. A library should indicate whether lending is contingent upon consortium membership. A library should indicate whether it will lend theses.
- The services the library will supply if the library will not lend a certain medium of material. For example, libraries should indicate whether they will photocopy articles from microfilm if they will not lend the microfilm itself.
- Any charges associated with the service.

With the addition of consistent contact, holdings, and lending policy information on library Web sites, we believe that library Web sites could easily become a viable place for ILL staff to find ILL information. Such a development is needed given the rapid increase in the use of Web-based information not only by library users but also by library staff. While the usual resources are clearly needed and used, a Web site has the potential to expand access at low cost. This is an easy matter to accomplish. ILL staff needs to inform

library Web masters of information to link to or post. Our survey did not extend to doctorate-granting institution libraries and it is unknown to what extent ILL policy and contact information is included on their Web sites.

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Security and Access to CD-ROMs Accompanying Books

Data and Recommendations

Katherine H. Weimer, Laura Lillard, Wendi Arant, and David Mitchell

The holdings of the Texas A&M University Libraries contain approximately 1,800 CD-ROMs that accompany books. Most are computer programming manuals or materials about the Internet. Given the increasing publication and acquisition of books with accompanying CD-ROMs, we saw a need to review the libraries' policy of separating CD-ROMs from their books and securing them behind a service desk. We believed that CD-ROMs shelved in the open stacks with their books would circulate more than when the CD-ROMs were housed separately. Further, we believed that books and their accompanying CD-ROMs, if lost or stolen, would be easily replaced. Data were gathered on the circulation rates of these materials when they were separated, the loss rates in the open stacks when they were shelved together, and the availability of replacements. Based upon the data gathered as well as other considerations, we recommend that for items with accompanying CD-ROMs, the CD-ROM should reside with its book, with no additional security beyond the book's sensitized strip.

The development of new technologies has contributed to the proliferation of media used for the dissemination of information. For many years, libraries have collected books with accompanying maps, cassettes or paper supplements. The mid-1980s saw the emergence of books with accompanying floppy disks. In just the past few years, there has been a deluge of books with accompanying CD-ROMs, particularly on technical subjects such as computing and the Internet. The prevalence of these accompanying materials amplifies the age-old dichotomy of collection goals: how to both provide convenient access to the collection, while at the same time securing and preserving the collection.

We conducted this study at the Texas A&M University Libraries, exploring two basic alternatives for housing CD-ROMs that accompany books: on the open shelves with the items they accompany; or in a restricted location, separate from the items they accompany. Other matters were raised as well. We wondered what impact separating the accompanying material might have on the circulation of each item, whether separation affects the loss rate, and the factors that might adversely affect convenient access to these materials for patrons.

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Definitions

The *Anglo-American Cataloguing Rules*, 2d ed. (1998) defines accompanying material as "material issued with, and intended to be used with, the item being catalogued" (615). Olson (1988) elaborates: "a complementary part of a work, physically separate from the predominant part of the work and frequently in a different medium, such as a sound disc in a pocket inside a book cover, an answer book accompanying a textbook, a libretto accompanying a sound disc, or a teacher's guide and script accompanying a videorecording" (1).

Libraries state their purpose in a mission statement that in a university library usually includes collections support for curriculum and research. More specific goals and objectives for developing the collections are usually found in a collections management policy that includes considerations of access and preservation. Driessen and Smyth (1995) explain that a library whose goals include convenient access to the collection would logically follow with an objective that accompanying material would always be kept packaged together with its primary parts. On the other hand, they point out that a library that places great importance on preserving the collection would have goals that emphasize security, and objectives such as a secured environment for accompanying materials. A middle-ground approach might call for a library to provide easy access to most materials, but restrict access for selected materials to provide increased security. The middle ground is what many libraries choose to do with accompanying CD-ROMs. The book or serial is shelved in the stacks while the accompanying disk or CD-ROM is placed in a secure location, most often behind a service desk. Sometimes the book and accompanying disk or CD-ROM are shelved together in this secure location.

Literature Review

The literature on the circulation, access, and housing of accompanying materials, particularly accompanying disks and CD-ROMs, is sparse. Weihs (1991) addressed the treatment of nonbook materials, such as maps, prints, slides, and cassettes. She recommended that these materials be interfiled in the main library shelves. Most often in large academic libraries, however, these nonprint materials were housed in a separate location. As librarians began collecting computer software, either as accompanying material or primary resource, they developed policies to address how these materials would be housed, served, and circulated. In 1986, the Association of Research Libraries (ARL) examined the extent that microcomputer software, as a primary media, was acquired and circulated (ARL 1986). At that time, 28 (38%) responding ARL libraries circulated microcomputer software to library users. A smaller number, 20 (27%), had special circulation policies or limitations on circulation of software acquired for public use, most often restricting use to in-house, although the remaining 53 (72%) responded "not applicable" to the question.

Only a handful of authors address the topic of software as accompanying material. Anderson et al. (1990) examined the topic of accompanying floppy disks at the Colorado State University (CSU) libraries. Their primary concerns for the disks were access, preservation, and protection from theft. CSU libraries ultimately chose to shelve the printed material in the open stacks and put the accompanying disk material in a reserve area. The same procedures were to be used for other formats with accompanying disks. Similarly, Hutto (1994) discussed the procedures devised at Pennsylvania State University Libraries to handle paper serials with floppy disks. After determining the accompanying disk is a component piece of the serial, both items were cataloged and shelved together in the stacks. This procedure mirrored their method of handling monographs with accompanying disks. Errickson (1997) offered advantages and disadvantages of various methods of securing and providing access to disks and CD-ROMs, including the options of keeping the book and disk or CD-ROM together in the stacks, or keeping material at a circulation desk. Seaman and Carter (1997) discussed the decisions made at the University of Colorado Library to separate accompanying media from books. The book and its accompanying material had different circulation periods. Subsequently, in an effort to simplify processing, access, and preservation of the materials, a committee reexamined the policy, and decided that all accompanying disks and CDs would be kept with the parent book or serial, with one cataloging record for both.

While discussion of this topic in the printed literature is fairly limited, numerous electronic discussions have taken place regarding security, access, circulation, physical processing, and cataloging of accompanying floppy disks and CD-ROMs. One popular electronic list in the cataloging community, AUTOCAT, has messages in its archives on these topics dating from February 1992 through 2000, with requests for input on accompanying disks or CD-ROMs regularly posted a few times each year. Broyles (1994), Johnson (1996), and Feig (1998), along with numerous others, requested input from AUTOCAT readers on policies dealing with security, access, and physical processing of books with accompanying disks or CD-ROMs. Each request garnered a number of responses that included keeping the materials in the open stacks, more secure policies where the disk or CD-ROM was kept at a service desk, various technologies used to secure the materials, and reasons for and changes in the policies over time. The responses echoed many of the advantages and disadvantages enumerated by Errickson (1997).

The common theme observed in these AUTOCAT messages was that individual libraries were devising policies that

fit their particular circumstances. Materials security, staff time, budgetary restraints, and space shortages at service desks were factors in policy decisions. We observed that policies appeared to be based primarily on staff or patron opinion, or minor incidental evidence. No respondents mentioned conducting any formal studies in their library to measure the effectiveness of their policies. Comments regarding the efficacy of the decisions were general.

We noted the amount of electronic discussion on accompanying CD-ROMs, the lack of articles offering solutions, and the escalating number of books coming into the library with accompanying CD-ROMs. We saw a need for a study focused on material use and loss rate, specifically for CD-ROMs that accompany books, in order to determine the right course of action for our library.

In summary, previous authors describe several models currently or previously used in libraries for housing CD-ROMs accompanying books. These print and online discussions reveal a continuing concern with how well these methods serve the purposes of access and preservation, yet no one has conducted studies that can be used to make more informed choices and decisions on housing CD-ROMs accompanying books. We decided to compare the effects of housing accompanying CD-ROMs on the open shelves with the items to which they belong, with the effects of housing them in a restricted access location separated from the items they accompany. We did this to gather data in support of decision making on how these materials should be housed and circulated.

Housing and Circulation Policies at Texas A&M University Libraries

Librarians at the Texas A&M University Libraries historically processed items with accompanying material in various ways. Decisions were based first on the seriality of the primary piece (i.e., whether the item was a serial or a monograph) and then the format of the accompanying material (map, video and audiocassettes, disk, CD-ROMs). These distinctions resulted in many specialized procedures. Maps on paper were among the first kinds of accompanying material. In the past, they were separated from the books and housed with the map collection, while the book was shelved in the general collection. This practice ceased more than twenty years ago, and the maps are now placed in pockets and shelved with the book. When floppy disks began to appear, it seemed a natural extension to keep floppy disks that accompany a book with the book. Preservation concerns, however, called for making a backup copy of the disk for placement in the book. The original floppy disk was then archived in the Education and Media Services department (EdMS). Currently, however, there are no back-up floppy disks and all accompanying maps, microfiche, and floppy disks remain in the books in the open stacks.

New formats of accompanying nonprint materials have appeared in the last ten years, including CD-ROMs, videos, and music CDs, all of which are separated from the monograph they accompany. The accompanying CD-ROMs, videos, and music CDs are housed in the EdMS, which collects and provides service for multimedia materials for the entire library. The small number of nonprint materials such as disks, CD-ROMs, music CDs, and microfiche that accompany serials were generally handled on a title-by-title basis. In most cases, the accompanying pieces stayed with the serial and were bound with the volume.

All of these practices developed and changed over time. Consequently, the location and circulation of accompanying nonprint materials were not always convenient to the patrons, and some problems emerged. Despite the varying procedures in place, staff and patrons were satisfied that materials were processed in a timely fashion. Some staff expressed concerns about the procedural inconsistencies and the absence of an overall guiding principle for housing accompanying nonprint materials. The biggest problem was circulation.

Patron concerns focused primarily on circulation policies related to the separated CD-ROMs. At the beginning of this study, all CD-ROMs had a two-week circulation period regardless of the patron's normal circulation privileges. This meant that graduate students and faculty who were allowed to check out a book for up to four months were limited to two weeks for any CD-ROM, including the CD-ROMs that accompanied a four-month circulated book. Furthermore, the EdMS location in the adjacent Library Annex building—and its shorter hours of operation than the main stacks—created inconveniences for patrons at check out and return. Last, there was a circulation policy that left the CD-ROMs inaccessible when a book was checked out but its CD-ROM was not. Patrons were required to check out the book prior to checking out its accompanying CD-ROM. Patrons could and did check out the book independently and without checking out the CD-ROM. The circulation policy, however, required checking out the book first, which meant that the accompanying CD-ROM could not be checked out independently and was thus inaccessible to other patrons.

Statement of the Problem and Research Questions

Three specific problems brought accompanying CD-ROMs to the attention of the library's collections committee: space limitations in EdMS, preparation for a new integrated library system, and patron inconvenience. The space problems

resulted from the high numbers of accompanying CD-ROMs separated from the books and housed in the EdMS closed stacks, which also houses videos and other multimedia primary materials. The 1,800 accompanying CD-ROMs took up much-needed space. At the same time, the library was planning for a new integrated library system, which prompted review of processes in order to minimize migration problems. Finally and most significantly, library patrons were greatly inconvenienced when the books and accompanying materials were housed in different buildings and were governed by different circulation periods and other limitations. A fourth problem was security of these materials. The risk that CD-ROMs kept in the stacks with the book without additional security measures would be stolen or lost was presumed to exist although it had not been measured. Two issues were raised but not included in this study. We did not address the problems of maintaining operational software access to the content disks and CD-ROMs, nor did we investigate the circulation and loss rates of print materials accompanying serials.

The research questions were constructed to address circulation, loss and replacement rates for the books and accompanying CD-ROMs. They were:

1. Is there a difference in the circulation rate between a book shelved in open stacks and its separated CD-ROM housed in EdMS?
2. What is the loss rate of CD-ROMs housed in the open stacks with their books?
3. How easily can lost CD-ROMs be replaced?
4. What is the loss rate for accompanying materials of other formats that are housed in open stacks with their primary text?

Method

Two hypotheses underlie all four research questions addressed in this study. With regard to the circulation rates of books and accompanying CD-ROMs, we believed that CD-ROMs shelved in the open stacks with the books would circulate more than those CD-ROMs housed separately in the EdMS. Second, although we could not predict the loss rate of accompanying CD-ROMs housed in the open stacks with the books or for accompanying materials of other formats, we believed that lost CD-ROMs or the books they accompanied could be easily replaced.

To address the first question, we drew a sample of 54 book titles published in 1997 for which the accompanying CD-ROMs were housed in EdMS. Books from 1997 were selected because they had been in the collection at least one year at the time the samples were collected and were thus old enough to have had some time to circulate. These 54 titles were the total number of books and CD-ROMs, published in 1997, that could be located in the library collections at the time of the study (i.e., not lost or missing). Titles with a lost piece, whether the book or its CD-ROM, were omitted because they would affect circulation rates.

The circulation statistics were collected in two steps. First, we combined three search parameters—publication date of 1997, the code for the monograph format bibliographic records, and the keyword "CD-ROMs"—and we pulled a subset of bibliographic and circulation records. Then we reviewed all records manually to identify the titles in the sample and count the number of times the book and accompanying CD-ROMs circulated. We then compared the circulation count for the books with the circulation count for the accompanying CD-ROMs shelved separately in the EdMS to determine whether the circulation patterns were different.

To address the second question, we drew a sample that consisted of 337 books with accompanying CD-ROMs published from 1995 to 1999. This sample was generated to test the change in procedure. The accompanying CD-ROMs were shelved with their books in the open stacks, and had no security beyond the security strip in the book. The newer books with accompanying CD-ROMs were purchased and cataloged in November 1998 and were shelved from day one in the open stacks with their CD-ROM. The majority of the sample consisted of books and separated accompanying CD-ROMs reintegrated for the study and shelved in the open stacks as well. These books were pulled from the shelves, reprocessed with their CD-ROMs, and shelved in the open stacks in November and December 1998. The sample included all books and accompanying CD-ROMs that were on the shelf, or returned during the early part of the study, and for which both pieces were present. Titles with missing pieces were omitted from the sample. These data were used to project a baseline loss rate for the CD-ROMs housed in open stacks. After six months in the open stacks, an inventory was made of these materials and the loss rate was calculated. Shelves and reshelving areas were searched three times during May 1999 to ensure that items in process were counted.

While the books were being collected for the study, the procedures for creating item records in the online system were modified for better tracking of circulation data. The practice was to create one item record for books with accompanying materials and record a two or more piece-count in the system. Each item record correlates to one circulation record in the system. However, it was difficult to accurately circulate, discharge, and inventory multiple physical pieces when the information had to be recorded on a single item record. The procedure was changed and applied retrospectively to all books and accompanying CD-ROMs in this sample. Unique item records were created for each of the pieces.

This sample of 337 books was used again to address the third research question. We initially consulted Global Books in Print (GBIP) to determine whether the missing CD-ROMs from the second sample could be replaced. This source did not provide details on whether accompanying CD-ROMs could be purchased separately from the book nor did it clearly indicate the presence of an accompanying CD-ROM. We determined this information would not suffice and did not use any information from GBIP in determining ease of replacement. Instead, we telephoned all 64 publishers of the lost materials to inquire about the availability of the lost items. The publishers were asked whether the book with CD-ROM was still in print, whether the CD-ROM could be purchased for replacement independently, or whether a new edition was available. Only 27 (42%) of the 64 publishers provided information. In the other cases, we either could not reach a person or when we did, the person did not have the information. Despite follow-up phone calls, we were unsuccessful in obtaining responses from all publishers.

The fourth research question required another sample. Materials in this sample were selected based upon two criteria: publication dates of 1995–99 for correspondence with the publication range of titles in sample two, and the presence of accompanying materials other than floppy disks or CD-ROMs because floppy disks and CD-ROMS were handled differently from other format accompanying materials at the time. Data from this sample were used to establish a benchmark for the loss rate of accompanying materials in other formats, such as maps, fiche, or cassettes that were housed with their books on the open stacks. The total number of materials with accompanying fiche and cassettes was so small they were excluded from the sample, which then consisted of 71 books with accompanying maps published from 1995 to 1999. Again, we checked the shelves in May 1999. Due to the small size of the sample and the low circulation, we were able to obtain all data very quickly.

Results

Results regarding the first question are shown in table 1. The circulation rates in figure 1 show that the books in this sample circulated on average 2.5 times, whereas separated CD-ROMs circulated on average 0.5 times. Circulation records also indicated that 40 of the 54 CD-ROMs (70%) had not circulated at all, and only two CD-ROMs circulated more than twice. In contrast, only 8 of the 54 books (15%) had not circulated once, and four books circulated five times or more.

The inconveniences associated with different building locations for the book and its separated CD-ROM, the shorter hours during which CD-ROMs could be checked

Table 1. Circulation of Books and CD-ROMs Shelved Separately

Topic	No. of Items	Total CD-ROM Circulation	Total Book Circulation
Computing	44	22	110
Noncomputing	10	1	4
Total	54	33	114

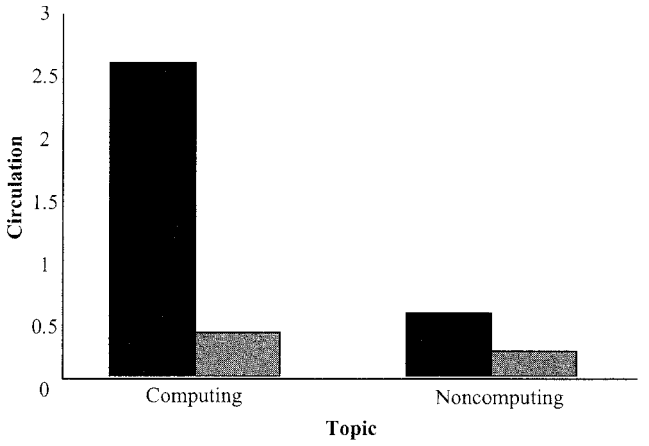

Figure 1. Average Circulation of Books and CD-ROMs Shelved Separately

out, and the circulation policy requiring that the book be checked out prior to checkout of a CD-ROM all appear to have had a negative effect on the patron's pursuit of checking out CD-ROMs. It could be that the accompanying CD-ROMs shelved separately were not checked out because the patrons did not see the need to do so, but we did not explore the reasons for noncheckout with the patrons.

For further analysis, the sample was sorted into two groups by topic, using the classification number for group determination: computing and noncomputing. There were 44 titles on computing topics, and 10 titles on noncomputing topics. The data revealed that both the books and the CD-ROMs on computing were approximately five times more likely to circulate than the books or CD-ROMs on other topics.

We found that CD-ROMs in the open stacks with their books had a loss rate of approximately 10%. Additionally, 11% of the books with CD-ROMs were missing for a total CD-ROM loss of 21%. The remaining 79% of the sample were either intact on the shelf, or shown in the catalog as checked out.

Circulation staff identified a problem early in the study, which may have affected the loss rate of the CD-ROMs missing from the books. A large number of books with CD-ROMs did not come from the publisher with any container

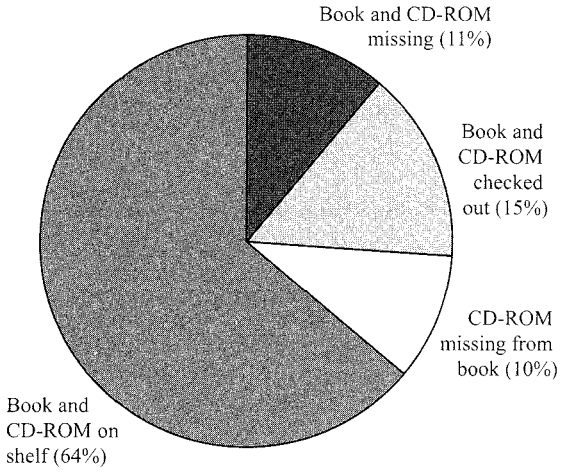

Figure 2. Status of Books and CD-ROMs Shelved Together

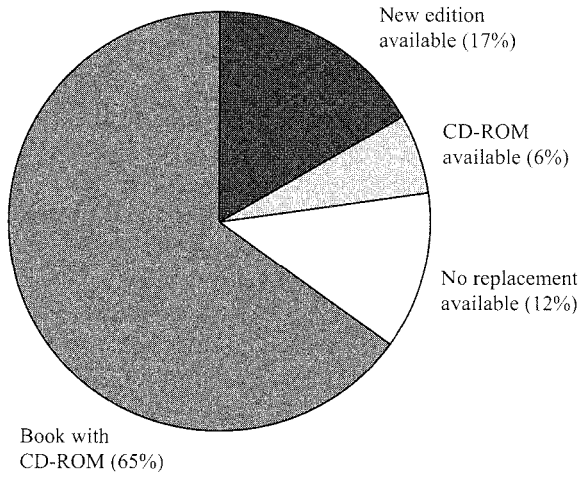

Figure 3. Replacement Potential for Missing CD-ROMs

or pockets for the CD-ROM. At the time they were processed, staff attached self-adhesive pockets onto the inside back cover of the books. During the period of data collection, while checking in returned books and accompanying CD-ROMs from circulation, the circulation staff noted that these pockets did not close completely, and a few CD-ROMs were gone. We took preventive action, pulling books and CD-ROMs already processed from the shelves and replacing the inadequate pockets with more secure pockets. We recorded the number of missing CD-ROMs and included this number in the total loss rate for sample 2.

We did not attempt to explore reasons why CD-ROMs were missing, despite knowing that a primary reason for separate shelving was to reduce opportunities for theft. All libraries struggle with the issue of missing, lost, or stolen materials. This sample revealed that the problem is not solely attributable to the format of the material. Security for all materials should be addressed.

With regard to the third research question, we found that some replacements were available (see figure 3). Of the 64 publishers contacted, 29 (42%) responses were received. Among these 29 publishers, the majority required purchase of the complete title (book and CD-ROM together). Only a few publishers allowed the purchase of the CD-ROM alone; in 6% of the cases the replacement CD-ROMs were available without the purchase of the book. Some new editions or versions were also available. For 12% of the titles there was no replacement available, because the title was out-of-print and there was no new edition planned.

With fewer than half of the publishers responding, we can report only on 131 (39%) of the books and accompanying CD-ROMs out of the total sample number of 337. We had earlier consulted GBIP to determine whether the titles were in print, but even though our data are partial, we judged the GBIP data insufficient information for determining the presence of an accompanying CD-ROM or its availability with or separately from the book.

Microsoft Press published many of the items in the overall study and therefore some of the CD-ROMs needing replacement. Cataloging staff noted that many of the titles on these CD-ROMs were generic in nature and duplicated titles of accompanying CD-ROMs in books with different titles on the same or similar subjects. Also, many books do not mention the specific title of the accompanying CD-ROM on their covers or introductory chapters, and the CD-ROM titles are often different from the book that they accompany. These discoveries led to a change in practice. Catalogers began adding the CD-ROM title to the bibliographic record and writing the barcode number on the CD-ROM itself.

The sample to answer the fourth research question showed that accompanying maps located in the open stacks with their book had an extremely small loss rate (see figure 4). Only one item's accompanying map was missing from the 71 books in this sample. This is noticeably less than the loss of books with accompanying CD-ROMs in the open stacks described above. However, the circulation rates of the books with maps, checked out just over one time per title, is also lower than the books in sample one, which circulated on average 2.5 times each.

Discussion and Recommendations

We began the study with hypotheses on the circulation of accompanying CD-ROMs shelved in the books on the open stacks and whether lost items could easily be replaced. The

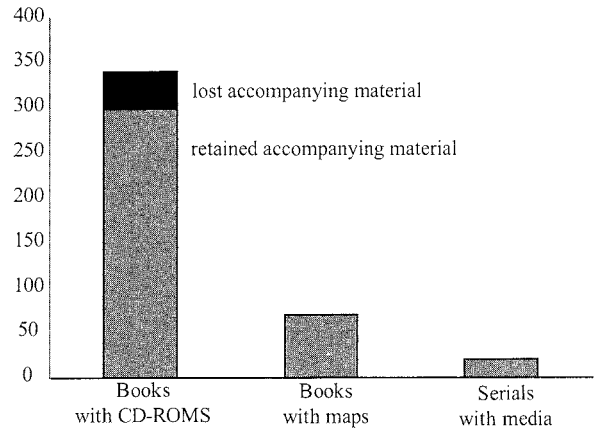

Figure 4. Loss Rate by Format

circulation rates for books and CD-ROMs shelved separately showed that the accompanying CD-ROMs shelved separately from the books circulated many fewer times than did the books. Second, although we could not predict the loss rate of accompanying CD-ROMs housed in the open stacks with the books or for accompanying materials of other formats, we believed that lost CD-ROMs or the books they accompanied could be easily replaced. We found easy replacement to be possible for 115 (88%) of the missing CD-ROMs.

In considering whether to keep books and accompanying CD-ROMs together in the open stacks, we used our findings to address questions and provide guidance for our recommendations on local internal processing. Driessen and Smyth (1995) included a number of these questions regarding the processing of accompanying CD-ROMs and other types of materials. They asked whether the additional time and effort spent handling CD-ROMS separately adds value to the item, makes the item more usable for the patron, or makes it less likely to be stolen or damaged.

Although not the only factor in ascertaining value, for these materials, we equated value with use of the materials and used the circulation data as the measure of use. The circulation data as shown in table 1 confirmed that accompanying CD-ROMs shelved separately circulated fewer times than the books. We concluded that the additional time and effort spent processing to separate the CD-ROMs did not add value as measured by circulation.

With regard to making the item more usable, we were unable to substantiate any conclusion. We recorded only the circulation of items shelved separately and did not examine patrons' actual use of the item. However, it seems reasonable to assume that a complete item is potentially more useful to a patron than is an incomplete item. When shelved in the EdMS, there were neither onsite facilities nor adequate staffing for use of the accompanying CD-ROM. If onsite computers were provided, it might be reasoned that separate housing adds to the usefulness.

Many of the accompanying CD-ROMs in the library's collection are tutorials or manuals for software applications while a smaller number contain other scholarly data such as radio broadcasts, musical selections, or spoken words. Presumably all these enhance the content of the book. While we did not examine the significance of the content beyond the obvious decision to retain the CD-ROMs, the circulation data show that the CD-ROMs were more often in the hands of the user when the CD-ROMs were shelved with the book they accompany.

Accompanying CD-ROMs stored separately were decidedly less likely to be lost or stolen. As seen in the AUTOCAT messages, many libraries secure their CD-ROMs behind a service desk or in a secure container, or affix a sensitized strip to the CD-ROM itself. Our library has a magnetic security system. We affix a security strip to the book but not to the accompanying CD-ROM. The loss rate of 21% of books or accompanying CD-ROMs from the regular collection shows this is not a perfect system, although the majority of lost CD-ROMs (88%) can be readily replaced in an original or revised version. We can only speculate, however, that the loss of CD-ROMs should not be a concern that mandates separate shelving, because when the CD-ROMs are shelved separately, they seldom circulate.

Our findings were factored into the discussions where we considered a broad range of issues, including shelving space and overall costs, and were useful in formulating our recommendations on where to house accompanying CD-ROMs. We have now concluded that accompanying material should reside with its print parent with appropriate exceptions made for specific accompanying materials considered at great risk for loss. This recommendation highlights convenient patron access to the materials and simplification of the cataloging processes as shown in table 2. While different from how some libraries manage their accompanying CD-ROMs, the recommendations support the Texas A&M University Libraries collection philosophy, which emphasizes access to be of fundamental importance to its mission.

These findings will be used in the future as well. The libraries are currently undergoing a renovation that will create a more secure reading room environment. In addition to our knowledge of at-risk art books, we now have more information on other at-risk items, such as books and CD-ROMs on computing and Internet topics, which might be housed in this room.

Conclusion

In a world of constantly changing technologies, the CD-ROM format will surely not continue to be the dominant

Table 2. Pre-1999 and Revised Procedures for Items with Accompanying Materials

Primary Format with Accompanying Material	Location	Pre-1999 Procedure	Revised Procedure
Book with CD-ROM	Stacks	Separate and send CD-ROM to EdMS	Keep CD-ROM in book
Book with Floppy Disk	Stacks	Copy disk, send original to EdMS, keep backup copy in book	Keep original floppy in book, no backup disk made
Book with Music CD	Stacks	Separate and send CD to EdMS	Keep CD in book
Book with Map, Fiche, Cassette, etc.	Stacks	Keep together	Same
Book with Floppy Disk or CD-ROM	West (Branch)	Keep together at West, at Reserves desk	Same
Periodical with Floppy Disk or CD-ROM	CPD	Keep together on CPD shelf, bind with volume	Same
Circulating Serial with Floppy Disk or CD-ROM	Stacks	Keep together	Same

format for accompanying material in the future. In this study, we presented circulation and loss data on this portion of the general collection and provided useful guidance in policy development. Future studies are needed to evaluate the importance of the content and longevity of accompanying materials in all formats. A better understanding of all library materials will assist in decision making for selection, preservation, and use of the collection.

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The Wood Shelving Dilemma

Ann Massmann

Wood shelving puts library materials at risk of damage because wood has an acidic nature and contains other chemical components. Although the best solution is not to use wood at all, many libraries find themselves in a dilemma where wood shelving is already in use or the alternative of steel shelving is not aesthetically acceptable. Finding appropriate solutions for minimizing harm is possible and needed, though a complex series of factors are involved. In addition to sealants or paint, a number of simple yet preservationally sound liners are now available for use on shelves. In this article I present some of the latest preservation information on the subject, in conjunction with one library's solution for mitigating damage from extensive wood shelving.

Wood. So beautiful, so traditional, so damaging to library materials. Yet libraries continue to use wood shelving and ironically sometimes choose to house their most valuable collections on this less-than-ideal shelving material. This is not surprising, as word of the hazards of wood is often still not widespread enough in the library community to counterbalance the aesthetics of the material.

Authors in Preservation Literature Warn of Dangers

Authors of preservation literature in the library, archives, and museum fields have consistently warned against the use of wood shelving as a long-term option for several decades (Miles 1986; Northern States 2000a; Ogden 1986, 1999b; Ritzenthaler 1983, 1993; SOLINET 2000; Tétreault 1994). But in the library profession in general, the hazards of using wood for shelving are mentioned only very briefly in a few of the books on library planning (Brown, 1995; Leighton 1986, 1999), and in others not at all (Brown 1989; Freifeld 1991; Sannwald 1997; Thompson 1989). The authors that have mentioned the concerns often continue to leave wood shelving as an acceptable, even common option for libraries. Of course, one of the most widespread sources of information for shelving choices continues to be library supplier catalogs, all of which offer extensive selections of wood and wood composite shelving, with no mention of the dangers inherent in this material. As library preservation officer positions and preservation workshops begin to be more widespread, however, an awareness of shelving issues is growing. Regional preservation services such as that of OCLC's AMIGOS in the Southwest and SOLINET in the Southeast, as well as the Northeast Document Conservation Center (NEDCC), the Conservation Center for Art and Historic Artifacts (CCAHA) in Philadelphia, and the Upper Midwest Conservation Center are particularly active in education (Abbey Newsletter 1999).

Probably the most extensive and up-to-date source on wood and steel shelving issues is Ogden (1999b). This leaflet is from the enormously helpful *Preservation of Library & Archival Materials: A Manual*, recently revised and now available online (Ogden 1999a). The Conservation Online Library (CoOL) (2000) offers further information on this and many other topics relating to the

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care of library collections, and includes links to resources by NEDCC, SOLINET, the Abbey Newsletter, and the Western Association for Art Conservation (WAAC), as well as a search engine that allows users to search by topic.

The Problems with Wood Shelving

Wood shelving is problematic because the woods and adhesives used in its construction emit harmful acids and chemicals. Oak is one of the worst offenders, containing large amounts of acetic acid (Miles 1986; Craddock 1992). Wood composites (plywood, masonite, etc.) usually contain formaldehydes, aldehydes, or potentially damaging acids (Ogden 1999b), though authors in the museum conservation field have reported on several wood composites that might be less damaging if used correctly (Mibach 1994; Northern States 2000b). Unsealed bare wood can be particularly harmful, but so can the coatings used to seal wood as they can also emit harmful chemicals. These acids and chemicals "off-gas" into the surroundings, where they are absorbed by books and papers, speeding the deterioration processes. Other library materials—especially audio tapes, video tapes, and photographs—can be damaged when off-gassed chemicals interact with those materials' own chemical composition. Certain metals, as found in plaques and mementos, are also highly reactive to the corrosive effects of these acids.

Closed wooden cabinets and drawer units (such as map cases or microfilm cabinets) are especially dangerous as they enclose and concentrate the emitted gases from the wood. Thus the use of wood for exhibition cases in museums, libraries, and archives has long been a concern. Various preservation information has been produced over the years regarding proper materials for exhibit cases (Craddock 1992). Most recently this includes a new NISO standard, Z39.79-2000 (NISO Forthcoming).

In addition to dangers from off-gassing, there is the possibility of pitch, resin, peroxides, and acids leaching out from the wood and coming into direct contact with the materials stored there (Ritzenthaler 1993). Numerous insects are attracted to wood and might settle in cracks and crevices of cabinets and shelves and move on to the library materials (Kesse 1999). Further, depending on the finish, wood can be highly abrasive to books as they slide across its surface. For these reasons, it is strongly recommended not to use wood shelving or other wood storage equipment to store library materials with long-term value.

Steel Shelving

Steel shelving is recommended instead of wood. Steel shelving should be finished with a powder-coating—similar to that used for today's high-end patio furniture (Georgia 1997; Ogden 1999b; Ritzenthaler 1993). A baked enamel coating had previously been recommended, but it is now known that an improperly baked-on finish can allow formaldehyde and other volatile substances to leach through (Ogden 1999b). Baked enamel is no longer recommended unless the finish is tested to confirm that it has been correctly applied. Ogden (1999b) offers instructions on how to test steel shelving with the solvent methyl ethyl ketone and a cotton swab. If a wood-look is deemed necessary, then a combination of steel shelving with wood end units or exterior partitions can be purchased or constructed. Shelves in wood cases or cabinets can be removed, for instance, and replaced with steel shelving units inside to provide a partial solution.

National standards for steel library shelving point toward other disadvantages of wood. Among its requirements, ANSI/NISO Z39.73 1994 specifies that steel library shelving be able to bear prescribed loads without sagging or swaying, endure normal use and cleaning for at least thirty years without signs of wear, and not pose a hazard to books or people (Brown 1995). The correct forms of steel shelving can easily meet these requirements, while few if any wood shelving units can.

Given the many reasons for not using wood shelving, a dilemma in some libraries is how to deal with built-in or other wood shelving that is already installed and not likely to be replaced for reasons of expense or aesthetics. In other libraries, aesthetic concerns often continue to override preservation concerns when purchasing new shelving or storage furniture. Given these situations, librarians can make choices to protect their materials stored on wood better.

A Wood Shelving Case Study

The University of New Mexico's Zimmerman Library presents a good case study of the issues and dilemmas involved in protecting collections against wood shelving. Three of the library's collection locations were in the historic and architecturally significant West Wing, which featured large quantities of built-in, unsealed wood shelving units that had been installed during a renovation in the early 1970s. These three locations were: the Anderson Reading Room, with 245 shelves housing the special collection reference books; the Willard Special Events Room, with 48 shelves housing a locked limited edition collection; and the West Wing, with 48 shelves housing a circulating book collection. As a newer librarian and archivist at Zimmerman Library, and one of several persons concerned about the unprotected wood, I set out to find a solution to care for our books better.

When wood shelving is used for storing library materials, the main concern is to get a barrier between the wood and the materials in contact with it. Ideally, the wood should

be sealed on all sides, surrounding the materials with a sealant or coating that is not in itself harmful to library materials. Though two-component epoxies, latex, and other paints have been suggested as less harmful than oil-based paints or certain varnishes (Miles 1986; Ogden 1986 and 1999b; Ritzenthaler 1993), moisture-borne polyurethane sealants were most highly recommended in the past by the preservation community (Mibach 1994; Miles 1986; Ogden 1986 and 1999b).

It was in this regard that I began, with the intention of finding the "correct" polyurethane for our wood shelving. Unfortunately, I found that the specific use and formulation considerations of polyurethane for library-shelving purposes did not provide a straightforward solution. In the end, I found that sealants proved to be enormously problematic and unworkable for our situation.

The use of sealants is essentially accompanied by three problems. First, many formulations of polyurethane sealant, including moisture-borne polyurethanes, are now known to contain formaldehyde. Yet because the production specifications for polyurethanes are inconsistent, even the same brand's formulation can change rapidly according to manufacturer desires, and there are no lists of acceptable polyurethanes to help simplify the selection process. For this reason, any polyurethane should be tested before use to ensure that its formulation will not damage the library materials it is intended to protect. Ogden (1999b) provides instructions for testing sealants as well as the wood itself. Testing is time consuming but if not conducted precisely as specified, the results may prove unreliable. In addition, some of the highest quality polyurethanes cost more than $60 per gallon, making multiple testings a costly proposition where funding is limited.

The recommended alternative is close consultation with a conservator who can conduct or who has recently conducted such tests and can help make accurate recommendations of safe polyurethanes. When I undertook this project, conservator Pamela Hatchfield of the Museum of Fine Arts in Boston recommended the Camger clear finish 1-146-40 waterborne polyurethane glaze, and the Sterling, Clark, and Lurton "Aqua Coat" epoxy. Though our physical plant's supplier offered lower-cost replacement brand products as equivalents to the recommended products, the intended replacement brand name sealants did not in fact have equivalent compositions when previously tested by Hatchfield. This illustrates why it is essential not to accept at face value any sealants offered as equivalent solutions without proper testing (Hatchfield 1997).

Second, the logistics of applying the sealant is problematic because it requires moving books, patrons, and staff if the area is currently in use. In addition to the displacement from the area while the shelves are being sealed, some sealants can require two to three coats, and all sealants require a period for the finish to cure after application. Three to four weeks is generally recommended by preservation specialists as a curing and off-gassing period (Ogden 1999b).

Third, in many cases the coatings have only a temporary effect in sealing the wood, lasting an unspecified number of years, before needing to be reapplied. We considered this a fatal flaw.

The Second Solution

Although in a perfect world a polyurethane would have been the best solution, it was because of imperfect reality that I looked for other remedies to our situation. In addition to the use of sealants, I found that there are a number of barrier or liner materials that can be used to separate the wood from library materials. For older wood that has had time to off-gas the most harmful of its acids and chemicals, a liner can be an acceptable solution in place of using sealants. For newer wood, a liner can (and in many cases should) be used in addition to a sealant coating.

An appropriate liner should provide a physical barrier between the wood and the library material while not further damaging the materials themselves. One of the simpler materials often recommended is polyester film (Mylar D or Melinex 516), 5 mil or heavier, held down with double-sided tape (3M #415). Mylar and tape are available from most archival and preservation suppliers. Liners can also be made from 100% ragboard or acid-free/lignin-free/alkaline-buffered board from archival suppliers. Ragboard, however, has not been shown to provide a sufficient barrier by itself and should be used in tandem with another material (Ogden 1999b).

Other possibilities for liners include glass, Plexiglass, or MicroChamber folder paper (containing activated charcoal and alkaline buffers). These last two materials both absorb gases, and so will need to be changed over a period of time. Mibach (1994) also has reported on an adhesive coated polyester sheet, Flexmark P M 150C, to seal wood composites such as Gatorboard and Masonite.

An important consideration in selecting a liner is how well the material forms a vapor barrier, blocking corrosive gasses from migrating. A multilayered, laminated foil product, MarvelSeal 360 (a nylon-aluminum-polyethylene laminate) or MarvelSeal 470 (a polypropylene-aluminum-polyethylene laminate) is recommended most often today for the purpose of providing a strong vapor barrier (Bachmann 1992; Burke 1992; Ogden 1999b). It can be used to line wood shelves or display cabinets, and has recently become available in rolls from University Products and Gaylord, as well as from its manufacturer, the Ludlow Corporation. Another acceptable high barrier film is Alcar, a PCTFE (polychlorotrifluorethylene) (Ogden 1999b). These and numerous other materials are

listed in the appendix of the NISO standard on exhibiting library and archival materials (NISO Forthcoming).

From among these choices of liners, we eventually selected two types for our library, keeping in mind that aesthetics were vitally important, that we had a large number of shelves to cover, and that the wood shelving, though unsealed, had already had many years to off-gas its worst acids. For the Anderson Reading Room and the Willard Special Events Room, we chose to lay glass on top of each wood shelf. We chose this as an aesthetic, durable, and chemically stable barrier that would form an acceptable vapor barrier for this older wood. Other advantages to the glass were that it could be cleaned as needed, and the ease with which books could move across it. (The unsealed, rough wood shelving had been very abrasive to the bottom of books in the high-use reading room collection.) Because the glass only covers the surface on top of which the books are resting, we also use book ends to prevent the books from leaning against either end of the shelving, and we endeavor to keep the books several inches from the back of the shelving.

The glass we selected was clear-float, 3/16-inch thick, with simple seamed edges, unpolished and unoiled. An oil similar to motor oil is often used along the edges of the glass to give it a deeper color, but unoiled glass is preferable. For 293 shelves, varying from 14 to 43 inches long, we paid just under $2,000 in 1998. We considered this worth the price for finding what promises to be a long-lasting and durable barrier to the wood. And for the large number of shelves to be lined, the labor-saving use of the glass company—which cut, seamed, and installed each sheet of glass—was well worth the price.

We selected a different barrier, however, for the shelving in our open, circulating West Wing Collection. The head of the Circulation Department was concerned that a glass shelf might slip off and injure a patron in this open, unsupervised area. Although soft plastic circles were available from the glass dealer that could be placed under the corners of the glass to prevent this, it was enough of a concern that we chose a different barrier for these shelves. Here we used mat board wrapped in Mylar D polyester. We selected mat board instead of Mylar alone for aesthetic reasons. Because many of the shelves were not completely full of books and the area needs to look its best, we chose a brown mat board that matched the color of the shelves. The board was cut to size with the grain running perpendicular to the long edge of the board to prevent the ends of less-than-full shelves from curling up. These mat boards were then wrapped in Mylar D, which was creased along both long edges and fastened underneath with double-sided tape. More of this tape was used directly on each shelf to prevent the liner from slipping off the shelving.

While some compromise was made for aesthetic reasons (i.e., not using MarvelSeal or similar material), the advantages of this barrier include a smooth, nonabrasive, cleanable surface for books to move across. As the Mylar becomes scratched, new Mylar can replace it. Also, the cutting and encapsulating process can be done in-house by students and staff as time permits, saving labor costs. For this project's 48 shelves, we used: mat board ordered through a local art supply store, which cost approximately $90; one roll of archival polyester, 4 mil thick, 40" x 100", from an archival supply company, which cost $133; and several rolls of double-face tape at $5 each. The total cost was $233.

An especially important advantage to both the Mylar and the glass liners was that their installation caused minimal disruption to patrons, staff, and collections compared to a project to seal those same shelves.

Conclusions

Wood shelving puts library materials at risk of damage because wood has an acidic nature and contains other chemical components. Finding appropriate solutions for minimizing harm is possible and needed. Though a complex and sometimes baffling series of factors are involved, solutions are in fact available when wood shelving is already present in an area or the alternative of steel shelving is not acceptable. In addition to sealants or paint, a number of simple, yet preservationally sound liners are now available. The liner options have various advantages and disadvantages depending on the nature and use of the shelving and the available budget and staffing of the library. By presenting the latest preservation information and my own library's solutions relating to the nature and consequences of using wood shelving, I hope that others with similar wood shelving dilemmas will be able to find practical solutions to protect library materials from the dangers posed by wood.

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Book Reviews

Margaret Rohdy, Editor

The ABCs of XML: The Librarian's Guide to the eXtensible Markup Language. By Norman Desmarais. Houston, Tex.: New Technology Pr., 2000. 206p. $28 (ISBN 0-9675942-0-0). LC00-8051.

As libraries develop digital collections and make use of digital publications, librarians need to understand the underlying technologies that support those resources. The eXtensible Markup Language (XML) has received attention as a method to revolutionize electronic data interchange, data organization, and information retrieval. In *The ABCs of XML*, Norman Desmarais explains this complex technology and many of its possible uses within libraries. Although this book is not a how-to manual or a reference work, it fills an important need by presenting a concise survey of the technical aspects of XML and of the issues libraries will face in processing, managing, and using XML-based documents and resources. Desmarais's book can serve as a starting point for thinking about XML and thus would be valuable for librarians and students first approaching the topic.

Like many other writers on XML, Desmarais concentrates on the technical structure and underpinnings of the language by describing the logical and physical structures of an XML document. The largest section of *The ABCs of XML* is concerned with technical understanding of how XML is structured. The first four chapters—almost ninety pages—are devoted to detailed technical descriptions of the relationships among XML, SGML (Standard Generalized Markup Language), and HTML (Hypertext Markup Language); the XML document structure; the display of XML documents; and the creation of links among XML documents and document fragments. Desmarais's descriptions are very clear and will appeal most to readers who want to understand the structure of an XML document. For example, he explains why the declarations at the head of an XML or SGML document are not gibberish, but are a key to understanding the entire document. His discussions of Document Type Definitions (DTDs), linking and pointing, and entity references show the potential of XML to deal with multiple character sets and multiple data types such as digital video and audio. However, readers may have a hard time imagining how a complex XML document, with all the features Desmarais describes, would look. An appendix with a more complex example, as well as an example of a DTD, would have been useful. His discussion (100ff.) of the Resource Description Framework (RDF) is brief, vague, and out-of-character for what is otherwise a detailed work. Desmarais also discusses areas of XML that are under development and expansion—like the eXtensible Style Language (XSL), which will be used to tell software how to display a document, and XLink, Xpoint, and Xpath, which will handle linking among XML documents. His understanding of these complex developments enables him to point out problems that can occur with unnecessarily complex schemes for display and linking. When Desmarais writes that "an XML link isn't exactly simple" (65), the reader understands why.

The remaining approximately sixty pages of text include discussions of processing XML, storing and managing XML documents, using XML for Electronic Data Interchange (EDI) and e-commerce, and sources of help with content, application, and schema development. This portion of the book is slightly less technically detailed than the first chapters but provides useful insights into how librarians and technology managers will work with XML. It will appeal to readers wanting to know what XML documents will accomplish and how people will manage and work with them. The bibliography includes many of the established publications on XML as well as Web sites cited in the text, although many of the sites are those of companies working on XML product development and thus not helpful sources for additional information about XML *per se*. Readers wanting to create XML documents and systems will need to turn to some of the resources listed, or others like them. The glossary includes the major concepts and technical terms mentioned in the book; the definitions are brief but very helpful for keeping track of this jargon-intensive field. Throughout the book, especially in Chapter 8, "Getting Started," Desmarais provides guidance about software for viewing, producing, and managing XML.

Unlike most writers on XML, Desmarais knows the library audience and focuses his discussions and explanations on the concerns of libraries and librarians. He uses the MARC (MAchine-Readable Cataloging) record structure and cataloging concepts to explain XML. For instance, he employs the concept of "statement of responsibility" to explain groups of elements and container elements (18). Using library concepts helps make a potentially vague topic more concrete

and approachable. Drawing on his understanding of the impact of adherence to standards—or the lack thereof—in libraries, Desmarais provides, especially in the chapter "XML and Its Potential for E-Commerce," great insight into the importance of establishing and adhering to standards to realize XML's full potential. His discussion of EDI is particularly thoughtful, reflecting his understanding of library acquisitions and fund management and the potential of XML for supporting EDI services. Although he understands the needs of libraries, Desmarais focuses almost exclusively on MARC and e-commerce applications. Four appendixes provide examples of SGML and XML used to store and generate MARC records, in particular to support the display of either Chinese characters or the transliterated text of a record. This emphasis tends to shift the reader's thinking away from other current uses of XML (with electronic books and journals, non-MARC metadata formats like the Encoded Archival Description, automated cataloging of electronic resources, etc.) and from developing new uses for XML beyond traditional library considerations. Few references are made to Appendixes 1–3, so perhaps they could have been shortened to make room for other materials. Although Desmarais mentions the development of other XML standards, such as the Chemical Markup Language, he does not discuss how these applications of XML will affect libraries and the work done in them. Desmarais also does not discuss how XML is likely to affect the library as an organization in nontechnical ways, such as workflow and funding.

Desmarais succeeds in explaining why we need to care about "the real goal of the [XML] markup: to clarify the document's underlying structure" (32), how this need differs from simply displaying text, and what advantages there are in using a powerful markup language. By focusing on the possible uses of XML within libraries, Desmarais avoids the vague assertions and abstractions that characterize many descriptions of XML and other markup languages. Although other good XML surveys exist, Desmarais's book is specifically oriented to libraries and will be most useful for readers wanting that perspective.—*Thomas P. Turner (tpt2@cornell.edu), Cornell University, Ithaca, New York*

Digital Libraries. By William Y. Arms. Digital Libraries and Electronic Publishing. Cambridge, Mass.: MIT Pr., 2000. 287p. $45 (ISBN 0-262-01880-8). LC99-14773.

Monographs that deal with the Internet, the Web, or digital libraries are often outdated by the time of publication, but reviewing William Arms's book *Digital Libraries* with this idea in mind would be inappropriate. In the introduction to the chapter on economic and legal issues, Arms describes his approach: "The discussion reflects my own viewpoint, which will probably need revision over time. However, I hope the basic ideas will stand" (99). The basic ideas of this book, contained in a comprehensive historical survey, an assessment of the state-of-the-art, and more importantly, of the accompanying culture should indeed stand the test of time.

The objective of producing a comprehensive review is worthwhile. Arms accomplishes his purpose through personal knowledge and reflections that are based on interaction with well-known individuals and institutions in the digital library community. Arms states that the text reflects his "own experiences and biases" (x) and examples that he knows personally, augmented by information from other individuals, as shown in the list of names in the acknowledgments. The examples may reflect Arms's personal experiences, but his discussion also makes it clear that he has interacted with a variety of digital library projects, researchers, and practitioners.

An examination of the individual chapters within *Digital Libraries* confirms its breadth of coverage. With topics ranging from technological ("The Internet and the World Wide Web") to sociological ("People, Organizations and Change"), the discussion covers the multidimensional aspects of digital libraries. Arms correctly points out that "digital libraries bring together facets of many disciplines, and experts with different backgrounds and different approaches" (1). While there are undoubtedly technical issues associated with digital libraries, his discussion also covers economic, legal, social, and cultural issues. Arms also describes the diverse groups that influence development of digital libraries, including computer scientists, librarians, archivists, lawyers, economists, and publishers. He strikes a balance between praise and constructive criticism of these communities—an approach that is most refreshing. Undoubtedly, each community has much to offer in the development of digital libraries, but each group can also benefit from a broader and greater understanding of the other players. When describing librarians and computer science researchers, Arms states that "Until recently these two communities had disappointingly little interaction; even now it is commonplace to find a computer scientist who knows nothing of the basic tools of librarianship, or a librarian whose concepts of information retrieval are years out of date" (3).

In the chapter "User Interfaces and Usability," Arms reminds us that the library user must assess the effectiveness, utility, and ultimately the success of digital libraries. His discussion might have included more emphasis on educators and instructional designers as an additional community for consideration. While discussions of instruction are included, an explicit treatment of educators' interaction with digital libraries would reflect the

growing realization that pedagogical issues should constitute a part of digital library development, not an additional consideration after the fact.

Digital Libraries offers a useful glossary of terms, but it is not the ideal resource for those seeking detailed descriptions of specific topics. This is not surprising given Arms's goals and objectives. His text is an excellent primer for individuals who require an introductory survey or wish to examine digital libraries in a holistic manner. Even with this emphasis, and acknowledging the difficulties of combining breadth and depth, it might be useful for readers to have more references and a bibliography for further investigation of individual topics.

I was especially eager to review *Digital Libraries*, given my professional situation. My academic background includes engineering and economics, but I work in a research facility within an academic research library. My exposure to electronic publishing, scholarly communication, and intellectual property issues in the academic community arises from involvement with Project Muse since its inception. Even from the perspective of this diverse experience, I discovered new insights, facts, and understanding in this book. Arms inspires new perspectives on familiar ideas, whatever the reader's background.

He weaves an interesting story regarding digital libraries, with historical context, a view of the digital library landscape, and a blueprint for further research and implementation. Whether read for its narrative, architecture, or artistry, William Arms's *Digital Libraries* is noteworthy. Much like Michael Lesk's *Practical Digital Libraries: Books, Bytes, and Bucks* (1997), Arms's book should now be considered required reading for anyone interested in digital libraries.—*G. Sayeed Choudhury (sayeed@jhu.edu) Digital Knowledge Center, Milton S. Eisenhower Library, The Johns Hopkins University, Baltimore, Md.*

The Future of Classification. Ed. Rita Marcella and Arthur Maltby. Aldershot, England: Gower, 2000. 144p. £55; $99.95 (ISBN 0-566-07992-5). LC99-46030.

With the intention of describing a vibrant future for classification, Rita Marcella and Arthur Maltby have gathered ten chapters whose authors include classification theorists of long standing such as Eric Hunter and A. C. Foskett, established academics such as Lois Mai Chan and M. P. Satija, editors of major classification schemes, and writers who bring other perspectives, especially from theory and computing. Some of the authors stress the strong points of classification, others discuss somewhat radical potential uses, and still others document concrete recent progress and its logical trajectory. The tone varies from cautious to enthusiastic, but none of it is unrealistic and most of it is frank. Most of the authors are or have been library school faculty, and most are from the United Kingdom. The chapters are organized starting from basic principles, many of which will be a review for professionals, continuing to theoretical views that offer fresh perspectives, particularly on the value of browsing, and moving logically to classification as an online tool. Three major classification schemes—the Library of Congress Classification (LCC), the Dewey Decimal Classification (DDC), and the Universal Decimal Classification (UDC)—merit a chapter each, and the concluding chapter documents the literature of classification and serves as a starting point for following up the ideas in the book.

In the United Kingdom, *The Future of Classification* is likely to be marketed as a textbook, but as an instructor in a Canadian context, I would not use it for this purpose. The book is interesting reading for North American professional librarians of all specializations—not just catalogers—because it reminds and challenges us regarding a powerful library tool. Since Charles Cutter and others of his time introduced the dictionary catalog, we have spent less effort on classification. Still, we know that library users frequently use the catalog to find a likely call number and then go to the shelves to browse—an activity impossible without classification. We also know that Web search engines commonly include a quasi-hierarchical classification for assisting searchers in navigation. We may scoff at the nature of these classifications (finding "feral cat control" under "pets" under "hobbies", for instance), but the fact that even poorly constructed classifications are popular should indicate the potential of well-constructed classifications.

Lest we forget the power of classification, *The Future of Classification* gives us the basics in readable form and then goes on to create a conceptual framework filled with suggestions of concrete approaches. The following sampler of ideas from this collection will entice readers into spending some time thinking about the merits and potential of classification:

- Classification is an exploratory device that allows creativity and serendipity as our subject heading searching does not.
- Classification in electronic form allows us to browse virtual shelves and make links across these shelves so that they are no longer only linear.
- Classification can be used as a switching device to link different languages, whether they are natural languages (English, French, Spanish, Mandarin) or controlled vocabularies (subject headings and thesauri).
- The two major North American classifications, LCC and DDC, are now both available in electronic form and are being used to classify electronic resources.
- Boolean searching on classification is possible in an electronic

environment, especially with faceted classifications like UDC (and, increasingly, DDC) with each aspect of the topic represented by a particular part of the number.

- UDC and DDC are moving closer together so that in the future a library might consider using UDC for specialized parts of its collection and DDC for the rest. This link is especially interesting for North American librarians unfamiliar with UDC.
- Classification is an international tool, especially as we use it increasingly in our catalogs and other sites on the Web.
- Automation makes updating classification numbers easier, especially when they are used for "virtual" rather than shelf browsing. Reclassification may be a cost-effective project, even for shelving, if it means significantly improved access.
- Shelving and browsing make different demands on classification, and we can use them differently for these two purposes.
- Advances in automatic classification are an aid to catalogers in terms of workload—an especially welcome capability for classifying large numbers of electronic resources.

Throughout the ten chapters, themes occur in different contexts, weaving elegant squares for a well-designed quilt. The connections are not always conspicuous, but one comes away from *The Future of Classification* with a far deeper and more cohesive understanding of classification and its potential than one might expect of ten varied chapters from ten quite different authors.

Editors Marcella and Maltby encourage us to take this book seriously. They suggest that librarians need to regard classifications as part of their total system for information retrieval. The weaknesses of one aspect of the system can be balanced by the strengths of another part; however, this balance can only be achieved if librarians have a close understanding of each aspect. Classification is an area that we do not always stress in North America, yet it is a potent means of achieving our overall end: linking people and information.—*Hope A. Olson (hope.olson@ualberta.ca), School of Library & Information Studies, University of Alberta, Edmonton, Canada*

Gatekeepers of Knowledge: Journal Editors in the Sciences and the Social Sciences. By Stephen McGinty. Westport, Conn.: Bergin & Garvey, 1999. 160p. $55 (ISBN 0-89789-664-5). LC99-12703.

Journal publishing is receiving a great deal of attention, primarily because of the costs of journal subscriptions. Stephen McGinty addresses another element of the publishing process: editing. Specifically, he reports on the results of interviews with journal editors in the sciences and the social sciences. In part, his aim is to study the personal aspects of editing, such as how one becomes a journal editor, how the editors go about the business of editing, how the individual editors perceive their role in the scholarly community, and how they manage their workload. In addition to these personal details, he asks editors their perceptions about technology and journal publishing and the extent to which disciplinary cultures affect their work and their journals.

Despite the capabilities of technology, especially the Internet, to facilitate rapid transfer of information, many agree that there is still a need for some control over the dissemination of disciplinary information and that the role of the editor is likely to endure, regardless of the medium employed for publication. This topic is an important one, and this book is clear and well written. These strengths, however, are not sufficient to overcome some serious deficiencies.

McGinty reports that he interviewed thirty-five editors. He does not, however, tell the reader why he chose this number, or more importantly, why he selected these thirty-five individuals. Was this simply a convenient number, or were these the individuals who agreed to speak with him? The editors come from disciplines in the sciences and social sciences, but McGinty does not reveal which particular disciplines are included, except that fifteen are from the sciences and twenty are from the social sciences. With quotations from individual editors, McGinty mentions the discipline in which the editors work, but there is no simple table or narrative that shows the specific disciplines represented. There is no way to tell, and McGinty rightly does not present these editors' experiences and thoughts as representative of editors in general. He does attempt to place the editors' experiences into some conceptual frameworks, notably the gatekeeper model suggested by Kurt Lewin several decades ago. The model is sometimes imposed, though, and its application is repeated unnecessarily. Even with the attempts at applying conceptual frameworks, there is a sparse review of the considerable literature on editing; the bibliography is scant and not very helpful.

There are other shortcomings in this work. In the chapter on the impact of scholarly culture on editors and editing, McGinty writes of differences between editors in the sciences and the social sciences. For example, editors in the sciences are likely to have larger full-time staffs and larger budgets. He implies that the differences may be due to the different cultures of the sciences and the social sciences. He does not, however, address some other important differences between these cultures that may affect editorial operations. He does not examine frequency

of publication. It may be that journals in the sciences are published more frequently than those in the social sciences. He does not examine the numbers of submissions received by the editors. These factors may influence the sizes of editorial staffs. If a science journal is published weekly and receives a thousand submissions a year, that journal will require a larger staff and budget than a social science journal published quarterly with one hundred submissions per year.

These shortcomings, while serious, are not the most important. McGinty includes many quotations from his interviews with the editors. At times the editors' words are illuminating and provide insight into the workings of the journals. At other times, the statements are repetitive and intrusive. Many opinions and experiences could have been summarized so that the reader could better understand the challenges faced by the editors. Without the numerous quotations this book would have been even shorter—this is the most troubling aspect of all. McGinty's examination of journal editing could have been an interesting and informative article, but it has been unnecessarily expanded to justify publication as a high-priced book.—*John M. Budd (buddj@missouri.edu), School of Information Science and Learning Technologies, University of Missouri-Columbia*

Knowledge Discovery in Bibliographic Databases. Ed. Jian Qin and M. Jay Norton. Library Trends 48, no. 1 (Summer 1999). Champaign: University of Illinois at Urbana–Champaign, Graduate School of Library and Information Science, 1999. 281p. single copy, $18.50 (ISSN 0024-2594).

Knowledge discovery in databases (KDD) is one of those arcane information science topics that seem both mysterious and inviting to most librarians, bearing an aura of the future of librarianship. While being discussed in the major information science journals (e.g., Trybula 1997; Vickery 1997; Raghavan et al. 1998), it has not found its way into mainstream library science literature. If for no other reason then, the appearance of this issue of *Library Trends* is a welcome development, especially because of its focus on using KDD in bibliographic databases.

The papers comprising this book have been artfully assembled. The introduction and a useful overview of KDD are followed by an assessment of classification schemes, from the standpoint of knowledge discovery, as devices of knowledge representation. This link to bibliographic organizational practice yields in turn to two accounts of finding new knowledge by discovering connections, through common citations, between sets of articles in the biomedical and philosophical literatures. Next is a demonstration of using cocitation links to forge a pathway of relationships through the literatures of several subject areas from economics to astrophysics. There follow three articles on different aspects of discovering knowledge in word-occurrence patterns, another four on automated knowledge discovery using various kinds of document surrogates (search-engine templates, metadata headers, abstracts, MARC-encoded geospatial data), and a concluding essay on the significance of automated information retrieval for librarians. Each article takes on a distinct subtopic, complementing its neighbors and contributing to a largely satisfying whole.

At the same time, the collection suffers somewhat from not sufficiently tailoring its presentation to its primary audience. The authors are all well versed in the information science concepts underlying KDD, but unfortunately most working librarians lack such familiarity. Each article seems intended to introduce a particular aspect of KDD to the nonspecialist; only a few report new research. It is therefore doubly frustrating when bibliometric jargon and obscure statistical formulas are employed without explanation, as they frequently are in this volume. Such explanation would of course slow down a presentation and annoy information scientists, but by writing as if for *JASIS (Journal of the American Society for Information Science)*, most of the authors have squandered an excellent chance to educate the working librarian and drive home the relevance of their topics.

A recurring theme in this volume is KDD's function of revealing the broader intellectual context of a scholarly work by using computer-aided association techniques to uncover links between two apparently unrelated articles. This process can have dramatic results. For instance, Don Swanson and Neil Smalheiser present a classic example of bibliographic KDD: linking articles through common citations to produce a promising but unsuspected idea for treating migraine headaches. In the following chapter, Kenneth Cory recounts how humanities researchers adapted Swanson and Smalheiser's methods and discovered an undocumented intellectual link between Robert Frost and the Greek philosopher Carneades. Henry Small's 331-article path from economics to physics is a spectacular demonstration of both the power of bibliographic association and the interrelatedness of knowledge. Jian Qin's study of using bibliographic coupling (through common citations) to discover semantic patterns in the literature shows how frequency distributions of keywords can delineate "core" and "marginal" literatures in any subject, and identify interdisciplinary regions; Qin shows how analyzing the co-occurrence of words and phrases in various documents can also perform these functions.

Bibliographic KDD by its very nature depends on probabilistic techniques of text processing. It rests on the assumption that the frequency of certain words or the citation of certain documents provides a reliable clue to

the "aboutness" of a document. The need for such techniques is perhaps obvious when one is dealing with very large databases. This is particularly true when the data are relatively unstructured, as with full texts, abstracts, uncontrolled keywords, or even titles. Another recurring theme of this book, however, is the role of human judgment in KDD and the continuing need for human processing, whether at the front end, providing structured descriptions; at the back end, interpreting search results; or in the middle, normalizing text data to facilitate machine analysis. Swanson and Smalheiser, in describing the process of discovery in medical databases using the Arrowsmith program, emphasize the necessity of professional judgment at all three stages, especially in the analysis of results.

Several other papers promote a less promising mode of human input, having the authors of documents provide a structured surrogate of their work to facilitate database access. While the point is well taken that authors know better than anyone else what their works are about, it does not necessarily follow that they have any special expertise in the organization of knowledge or the larger intellectual context in which their works exist. Nor would the author—unless he or she is also a librarian—likely have a commitment to calling attention to the document only when it meets a searcher's expressed information need. While author-generated surrogates can add value to documents by providing additional data for "mining," they are no substitute for professional indexing or cataloging.

Although he does not address this point directly, Herbert White seems to recognize it at least by implication in his concluding essay. After briefly acknowledging the topic of the book, he discusses on a more general level the limitations of automated information access, the continuing and increasing need for trained information intermediaries (a.k.a. reference librarians), and the forces that prevent people and institutions from recognizing this need. Both his style and his arguments will be familiar to readers of his longtime *Library Journal* column. Though many readers of this volume may see White's contribution as jarringly out of place, it reinforces the recurring theme of human judgment and its role in providing meaning to the induced serendipity of machine-assisted data analysis, and in the process helps the reader make the connection between KDD and the work of librarianship.—*Gregory Wool (gwool@iastate.edu), Iowa State University Library, Ames*

Works Cited

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Trybula, Walter J. 1997. Data mining and knowledge discovery. *Annual Review of Information Science and Technology* 32: 197–229.

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Correction

A book review in the April 2000 issue of *LRTS* referred to the "now-defunct Getty Information Institute's 'Introduction to' series" (106). Though the Getty Information Institute closed in 1999, all of the volumes in its "Introduction to" series are still in print; an updated edition of *Introduction to Metadata* is available at www.getty.edu/gri/standard/intrometadata.

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Compiled November 1, 2000. These reviewers are those to whom manuscripts received in 2000 were sent.

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Index

Volume 44, 2000

Compiled by Edward Swanson

General Procedures Used in Compiling the Index

The following types of entries are included:

a. authors—of articles and reviews
b. titles—of articles
c. subjects—of articles and of books reviewed

Reviews are indexed by name of reviewer and by subject of the work reviewed, identified by "(*r*)". They are also listed by title under the heading "Books reviewed."

Entries are arranged word by word following the "file-as-spelled" principle. Numbers are arranged before alphabetical characters; acronyms without internal punctuation are arranged as words.

Subject headings are based on: *ASIS Thesaurus of Information Science and Librarianship,* edited by Jessia L. Milstead (Medford, N.J.: Published for the American Society for Information Science by Learned Information, Inc., 1994).

Paging of Volume 44:
Pages 1–56 = Number 1 (January)
Pages 57–108 = Number 2 (April)
Pages 109–172 = Number 3 (July)
Pages 173–224 = Number 4 (October)