

# The Library of the Future: The Impact of Computer Technology on Traditional Library Services

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*30 November 2000*

*For*  
*CT 551: Technology and Society (Fall 2000)*  
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## Introduction

This paper will examine the impact of computer technology on traditional library services. For ease of analysis, I have grouped library services into five categories. Libraries provide:

1. Access
2. Content
3. Preservation
4. Mediation
5. Physical Space

## Part 1 – Access

Libraries provide access to quality content. More will be said on content in Part 2-Content; but with regard to access, it is helpful to think of two sub-divisions: physical access and intellectual access (librarians speak of having physical and intellectual “control” of a collection).

### Access – Physical Control – Cost

At the most basic level, libraries provide access by first acquiring content and then making it available for use. To do so, material is most often purchased (though it can also be received through donation or other method). This first step is a crucial one, for very few individuals could amass personal collections to match those of even the most modest academic library of today. The cost would simply be prohibitive. Storage space would also be a serious concern, though not for a digital collection (space will be addressed in Part 5-Physical Space.) By distributing costs over many users, libraries are able to supply to any given individual user many times the value of her/his own financial contribution.

The same principle holds true for digital content as much as for print content. An individual library can subscribe to online databases that cost many thousands of dollars, passing on full access to each user for a tiny fraction of that cost. The Thomas College Library, for instance, subscribes to several InfoTrac databases and provides all of its users with 24x7 access via the Web. With the aggregation of libraries into consortia, the effect is multiplied. At the time of this writing, over a dozen full-text periodical and e-text databases are being provided to the students, faculty, and staff of Thomas College for next to nothing in cost. The college library does not pay anything for this access; and users contribute only indirectly through their federal and state tax dollars, which are the ultimate funding source for the Maine Database Project<sup>[1]</sup>.

A word about micro-payments. It is increasingly possible for individual users to pay for only the information they actually need from a database without having to pay the enormous cost of accessing the entire database. The potential of the micro-payment model is great. Users who only print or download a few paragraphs from a few articles may thus be better served. Heavy users of online content, especially those requiring entire works for substantive or contextual reasons, would probably be better served through library subscription databases.

Located between micro- and macro-payment models are services like CARL UnCover<sup>[2]</sup>. UnCover charges users not for portions of articles, not for total database access, but for individual whole articles. This model works well if a user wishes to read only one or two articles cited in a textbook. The user begins with a title or author search and the resultant abstract is compared to other citation information (journal title, date, volume number). Once verified, the full text of the article itself can be accessed upon payment by credit card. If a user is not looking for a specific article, on the other hand, but is instead conducting a subject search, then the cost of irrelevant articles – or, for that matter, even of relevant articles – may soon surpass what the user’s contribution to a library subscription database would have been. Note, for instance, that the article “Digital Archiving” by Deanna Marcum (College & Research Libraries News, 1 October 2000) costs \$10.00 plus a \$5.25 copyright fee<sup>[3]</sup>: It would not take long for such charges to become prohibitive to a serious scholarly researcher.

### Access – Physical Control – Equipment

Libraries not only purchase content, they also make that content available for use. Using content presupposes that one can locate it reasonably easily (the subject of the next section, Intellectual Control). Using content also means that one can view it reasonably easily. With printed material, all one needs is one’s own eyes ... and perhaps a pair of spectacles (supplied by the user). Many libraries offer additional visual aids: for instance, public libraries serving older clientele often supply various types of portable and stationary magnifiers.

For many decades now, libraries have included an ever-changing array of non-print content: filmstrips, film, slides, transparencies, microfilm, audiotapes, videotapes, LP records, compact disks. To allow access to this content, libraries have also supplied an ever-changing array of mechanical and electronic devices: projectors (filmstrip, film, slide, overhead, opaque, microfilm) and players (audiotape, videotape, LP record, compact disk), as well as portable screens and easels.

As an aside, it is interesting to note that libraries have always supplied not only content-access devices, but also content-producing devices: typewriters, whiteboards, Polaroid cameras, video cameras<sup>[4]</sup>. Libraries have now added software CD-ROMs and laptop computers to this list.

Today, content comes packaged in digital form. As mentioned earlier, libraries supply users with paid subscriptions to online databases. To “read” this content, users need “viewers”: i.e., computers. Though many people today own their own computers, many others do not. For users in both categories (for the convenience of the first and the necessity of the second) the library supplies public computers. Further, for the display of digital content to an audience, the library loans LCD projectors.

With the coming of e-books, libraries may once again be adding to their holdings not only a new format (electronic texts) but also new access devices (laptop computers and proprietary e-book or e-media reader/players). Examples of proprietary e-text readers include netLibrary’s eBook Reader software<sup>[5]</sup> and the Gemstar eBook Reader hardware<sup>[6]</sup> device from RCA<sup>[7]</sup>.

### Access – Intellectual Control

In addition to physical access, libraries provide intellectual access to (or control of) content. Finding aids – such as lists, bibliographies, and subject guides – and catalogs are examples of intellectual control over content.

#### Access – Intellectual Control – Finding Aids

As soon as a content collection reaches any appreciable size, simple browsing no longer suffices as the sole means of finding information. Lists and simple bibliographies of various kinds are developed to help users locate items of interest. These lists are especially helpful if those items are dispersed throughout the collection. For instance, a list of recently acquired books may be generated each month for a user's benefit. Lists may be bibliographies (providing full citations) or simple author-title-call number tabulations.

Annotated bibliographies and subject guides provide increasingly useful intellectual access to content. The first adds analytical commentary to the straight bibliography, while the second is more a research guide. Subject guides show how select library holdings fit into a particular field of study. For instance, a subject guide may explain the difference between public and private companies and describe how to locate financial data on each type of company.

In the digital realm, library Web pages may offer lists of links to quality online resources, similar to lists of print items and simple bibliographies. Further, libraries may offer online subject guides. See, for example, Kirstein Business Branch's "Bibliographies & Guides to Our Collections" page and "Selected Business Websites by Subject" page[\[8\]](#).

#### Access – Intellectual Control – Catalog

Without doubt, the best-known manifestation of a library's intellectual control over its collection is its catalog. Early catalogs were simple handwritten lists. Then followed catalogs in the form of printed pamphlets and books. Finally, the catalog attained its archetypal form, the card catalog. Catalogs provide various points of access, including author, illustrator, editor, title, series, subject, and keyword (through cross-referencing), any one of which may exist in multiple forms and as multiple entries. A great deal of painstaking effort went into the maintenance of card catalogs, with individual books requiring as many as several dozen separate cards each.

Despite the rhapsodizing of a few prominent social critics (c.f. Baker and Stoll[\[9\]](#)), card catalogs were gladly overthrown by librarians in favor of their electronic equivalents. At first, homegrown flat file databases replicated the card catalog. Soon, relational databases merged catalog and circulation features into one unified system. In-house systems expanded to Web-based systems. Once online, it was but a short step for libraries to merge their holdings into electronic union catalogs. Maine Info Net[\[10\]](#), which Thomas College has recently joined, is an example. A consortium of more than two dozen libraries, Maine Info Net will eventually provide access not only to union catalog data but also to the circulation, ILL, acquisition, serials, booking, and reserve data of all participants.

#### Access – Intellectual Control – Metadata

Card catalogs provided information about books in a collection; the cards were not the books themselves. They were information about information: known in today's digital dialect as "metadata." Card catalog metadata followed a strict protocol, namely, the Anglo-American Cataloging Rules (AACR). When later migrated to electronic catalogs, the metadata underwent a further iteration to become Machine-Readable Cataloging (MARC). MARC records, when compliant with the ISO standard Z39.50, are cross-platform

compatible; that is, they can be read by any catalog software. Today, even this is not enough, as cataloging metadata (and all other electronic metadata, for that matter) must increasingly conform to ever-converging worldwide standards. It now appears that the final comprehensive standard will be some form of the Standard Generalized Markup Language (SGML), perhaps the eXtensible Markup Language (XML). XML allows for any number of specialized metadata schemas, called Document Type Definitions (DTDs). Several DTD subsets have already been developed for various disciplines. Though no DTD has yet been finalized for cataloging metadata, demonstration MARC-to-XML conversion programs have been developed (see, for example, the MARC/XML and XML/MARC converters on the Logos site[11]) and a standard bibliographic DTD is emerging. An important part of this DTD is the Dublin Core, a simple set of metadata elements that can be applied to all types of digital library materials. Currently, these metadata elements are most often used in HTML documents, in the <HEAD> section. Appropriately enough, <META> tags define the Web page in terms of Dublin Core elements. An extremely simplified example follows (see also the source code of the document you are now reading):

```
<META NAME="DC.creator" CONTENT="Stephen LaRochelle">
<META NAME="DC.title" CONTENT="Digital Libraries">
<META NAME="DC.title.subtitle" CONTENT="The Impact of Computer Technology on Traditional Library Services">
<META NAME="DC.publisher" CONTENT="Thomas College">
<META NAME="DC.date" CONTENT="30 November 2000">
<META NAME="DC.form" SCHEME="IMT" CONTENT="text/html">
<META NAME="DC.language" SCHEME="ISO639" CONTENT="en">
<META NAME="DC.identifier" SCHEME="URL" CONTENT="http://www.thomas.edu/larochelle/ct551/paper2.htm">
<META NAME="DC.subject" SCHEME="LC" CONTENT="Digital libraries">
<META NAME="DC.subject" SCHEME="LC" CONTENT="MARC formats">
<META NAME="DC.subject" SCHEME="LC" CONTENT="XML (Document markup language)">
```

The evolution of MARC records into XML records will mark an important step in the convergence of libraries and the Web for two reasons. First, XML will address the longstanding problem of digital archiving (see Part 3-Preservation). Second, librarians will be able to extend their professional knowledge of cataloging and classification to include Internet resources. Not only will there be bibliographic records – information about books – but there will also be “Webliographic” records – information about Web sites. In other words, some sort of meaningful cataloging of the Web can begin to take place.

#### Access – Intellectual Control – Metadata – Search Engines

Before the Internet had grown very large, before it had even acquired graphical browsers, intellectual control was needed. Lists of sites proliferated, then lists of lists, and finally query programs to search the lists of lists[12]. Soon after the arrival of the World Wide Web, the Yahoo! directory appeared. Founders Jerry Yang and David Filo simply grouped their favorite sites into rough categories and the world’s most popular portal was born. As the number of Web sites – and the number of directory entries – grew, Yahoo! quickly showed signs of strain: broad category headings like “computers” and “cool stuff” no longer were descriptive enough to be useful. Librarians were hired to re-work the site’s classification scheme (first onboard was “Ontological Yahoo!” Srinija Srinivasan, hired within a year of the company’s founding[13]). Other directory sites, in an effort to avoid having to re-invent the wheel, applied Library of Congress classification rules when creating directories of Web sites (see, for example, Scout Report’s Signpost site[14]).

Human-compiled directories were soon outpaced by the Web’s phenomenal growth. Automated search engines were developed to help fill the void. Search engine indexes are created by “spiders” (recursive programs that “crawl” the Web, following link to link, collecting keywords and other data from each page visited). Users query the search engine’s index with keywords and the resulting “hits” are generally listed with the most relevant first (though newcomer Google lists results in order of popularity, based upon how many pages link to each hit[15]; Lycos ranks its hits by frequency and location of keywords[16]). Even

search engines cannot keep pace with the Web's torrid growth. Studies have shown that the no search engine indexes more than 16% of the estimated number of publicly available Web pages[17]&[18]. In an effort to address this shortcoming, meta-search engines like MetaCrawler allow users to conduct searches across several engines at once[19].

From the simple author and title entries in early paper catalogs, the number of access points – the points by which a user can call up content – has increased steadily. Card catalogs offered subject access points similar to those offered by online directories like Yahoo! Once catalogs became electronic, keyword searching became feasible; but this was keyword searching only of the bibliographic record, not of the item itself. Finally, with fulltext online databases and increased computing power, keyword searching is possible for entire content collections. With the Web expected to grow to over 1 trillion pages by 2005[20], however, keyword searching alone may not suffice for much longer. Even now, serious researchers cannot rely on search engines alone to efficiently locate the content they require. What is needed is a search engine similar to an electronic catalog, an engine that will not search the entire content of the Web but only descriptive metadata about Web sites. Web catalogs will not replace keyword search engines. Rather, the two will complement each other.

## Part 2 – Content

Traditionally, the library has been a kind of content warehouse. The physicality of the library's holdings makes an impression upon the mind. Even a small library, to one sufficiently aware of the massive amount of knowledge contained in just a few rows of books, can arouse a sense of awe. To many, the library is only a storehouse of books – or of other physical forms of information – and nothing more. To them, it naturally follows that with the advent of online periodical databases, e-books, the Web, and other electronic information sources, the library is doomed to extinction. How can a library with no physical content exist? If the library is purely digital, is it even a library at all? There seems no need for buildings or furniture or any of the trappings of traditional libraries. Is there even a need for librarians? After all, users can now access content directly on their own personal computers.

To answer these questions, let us take a closer look at the types of content libraries collect and for what purpose they collect it.

### Content – Media

Despite their stereotypical image as book repositories, most libraries have been collecting non-print media for decades. Even a library as small and specialized as the Thomas College library contains (and lends) slides, filmstrips, microfilm, audio tapes, videotapes, LP records, music CDs, CD-ROMs – even matted and framed photographs[21]. Other libraries contain an even greater range of media. The assimilation of new media into a library collection is nothing new. Web content, however, is fundamentally different from these non-print media in that it does not physically reside in the library building. Users need not actually enter the physical library to use the virtual one. As mentioned earlier, though, somebody has to pay for and provide organized access to this online content. The library seems the obvious choice to take on this role, which is merely a logical extension of its existing mission.

### Content – Periodical Literature

Libraries subscribe to, collect, and provide access to magazines, journals, newspapers, and other periodical literature. Historically, this literature has been one of the most difficult to retain physical and intellectual control over. Many periodicals are printed on poor quality paper that deteriorates rapidly. The nearly infinite variety of formats adds to the difficulty of housing the material. Finally, complex indexing and retrieval



protocols needed to be created to allow intellectual access. Periodicals were the perfect subjects for conversion to electronic format. At first, only the indexes were computerized; but this was a great breakthrough in itself. Previously, only the most hardcore researchers would pursue a topic heading – with all its variants – through each and every annual volume of each and every set of indexes. Once online, entire index sets and even entire collections of index sets could be searched in a few seconds' time. Next came full text periodical databases on CD-ROM and magnetic tape, then full text proprietary databases available through telnet on dedicated systems (like Dialog), and finally online 24x7 Web based full text databases.

Surely, with so much material available online, there is no need for a library to deal in periodical literature any longer. Oh, that it were so. Besides paying for the databases, libraries play an editorial role. Librarians have the expertise to review and select from the many hundreds of databases available. In an academic institution, faculty and students do not generally have the time or inclination to undertake this task. It should be noted that databases and their vendors come and go, and those that persist change constantly, so that maintaining an online collection is not a matter of simply choosing a source and paying the subscription renewal fee year after year. In fact, of the half dozen[22] databases offered through the Thomas College library a little over a year ago, only two[23] remain. The others have been cancelled by the library[24] or discontinued by the publisher[25]. Most recently, the Maine Database Project has made freely available to all Maine libraries a collection of some 15+ databases[26]. Ironically, though no user ever need step foot inside a library building to use these databases, the databases would not be available to the user without the libraries.

Then, too, users need instruction in how to use this ever-changing cadre of databases. This training function will be touched upon in Part 4-Mediation.

Finally, there will always be a need to retain at least a few print periodical subscriptions. People like to sit and rifle through daily newspapers and general interest magazines. Though the entire Thomas College research collection of periodicals has now “gone online,” print subscriptions are still retained to several local daily and weekly newspapers[27] as well as to basic business publications such as Barron's and Business Week. Many of these publications have an online counterpart that is easier to use for research purposes; but users prefer the print item when simply whiling away the time or browsing to keep abreast of current events. Since digital counterparts do exist, however, the few remaining print subscriptions need not be archived. In most cases, for instance, the Thomas College library retains only one year, one month, one week, and in some cases only the current issue, of print periodicals. Public libraries, which have many more general interest readers and which often lend print periodicals to users, will of course continue to maintain more print periodical subscriptions than an academic library, whose mission is primarily research.

## Content – Books

It need hardly be stated that libraries generally supply content in the form of books. Today, books too are being transformed from print into e-text. As with periodical literature, academic libraries may well find that electronic books serve their research mission more efficiently than printed volumes do. Certainly e-texts are easier to maintain physical and intellectual control over. Currently, pricing is about the same for print and e-text versions of a work; but there are still many more titles available in print than online, so a wholesale adoption of e-texts has not yet taken place. As with periodicals, there will always be a need for some sort of printed book collection. Paper volumes are just too handy and portable to ever disappear completely. And though e-book viewing devices are improving all the time and though they will likely prove very useful for research purposes, it remains questionable whether they will ever adequately accommodate cover-to-cover reading. Once again, public libraries are likely to maintain larger printed book collections than academic libraries, where research often requires the use of only a portion of any given volume.

Even the academic library, however, will retain some subset of printed books. Large atlases spring to mind as

sources especially suited to the physical medium (though value-added online versions have their uses as well). Other ready reference resources, though duplicated online, may remain as well. In many cases information can be located faster in a book – for example, in a dictionary or an almanac – than online. Until computer equipment and Internet connections become much faster and electronic databases become easier to use, printed sources will still have their place.

With the preceding possible exceptions, the vast majority of content in the academic library will soon be electronic in format. As mentioned above, nearly the entire periodical collection of the Thomas College library has been replaced by online full-text databases. Something very similar is happening with reference books. In the latter case, many items are available for free on the Web: Dictionaries of all sorts[28], almanacs[29], encyclopedias[30], atlases[31], statistical sources[32], calendars[33], and countless other mainstays of the ready reference collection. More specialized reference sets – industry ratios, company profiles and histories, financial reports – are also available online, but for a fee[34]. Individual users could not hope to pay for access to these fee-based databases, so the cooperative purchasing power of the library once again comes in handy.

Most monograph books in the academic library will also become digital. Models are still being developed – and discarded – so it is hard to say exactly how an e-book library will work. Proprietary viewing devices such as the Gemstar eBook[35] are being pushed, for obvious reasons, by their respective manufacturers. The limitations of these devices suggest that other scenarios may emerge triumphant. For instance, millions of people already own PCs, laptops, and handheld computers. Why not make e-texts readable on any computing device?

Many thorny legal issues also come into play with electronic texts. When a library buys a copy of an e-book, can it make that copy available to only one user at a time (the traditional printed book model) or can it make that copy available to any number of users at the same time (the online periodical database model)? Which model wins out in the end will not necessarily be determined by convenience, for universal access is clearly the easier technological fix. The winner may instead be determined by copyright law, which seems now to lean in the direction of one-copy-one-reader. A working example of this more limited model can be found on the Thomas College homepage, where an account with netLibrary is maintained. netLibrary automatically “lends” e-books to users for a period of 4 hours. Texts can be read online on a Web browser or on proprietary reader software downloaded to a local PC. After 4 hours, the text expires. Despite the availability of e-texts, scholars may still want printed copies of texts: to mark up with notes or to transport to environments ill suited to electronic readers (dusty workrooms, sandy beaches, steamy jungles). In such cases, one-off copies of electronic texts can be printed and bound by high-speed machines like those offered by InstaBook[36].

### Content – Books – Acquire-on-Demand

In the past, libraries built collections largely on a “just in case” model. Material was selected and acquired prior to a specific need and placed on a shelf awaiting use. Today, even the purchase of online periodical databases works this way. There is no guarantee that just because a library has content, users will use it. That said, one should also note that in the past libraries often had what amounted to captive audiences. Users had nowhere else to go and so would use the content in their library’s collection, whether or not it really suited the need. Once libraries started sharing content through interlibrary loan, users could, in effect, direct acquisition (albeit actual possession was only temporary). This is a “just in time” model.

Today, with massive online bookstores and overnight delivery, libraries can not only borrow on demand but also purchase on demand. (Note that library patrons have always demanded the purchase of some specific content, but the acquisition process was so belabored that nothing like real-time fulfillment could exist.) Mediation, more on which in Part 4, must come into play if for no other reason than to prevent a single user

from depleting the entire library budget in one mad spending spree. Would purchased-on-demand content be returned to the library after use? (Probably.) If so, what would such an ad hoc collection look like? (Pretty good overall, with some waste.) Mediation could help eliminate waste: for example, duplicate copies and poor quality publications. For librarians, such a scenario is an ideal one; but it would require proactive and committed users. Unfortunately, most users are unwilling or unable to play such an active role.

Content acquired on demand need not be in print form. Electronic texts could be purchased on demand as well. A library could purchase an e-book and store it on local servers or, more likely, on the supplier's server, allowing access to the user from any Internet accessible computer. Perhaps the library could purchase only short-term access to an e-book on behalf of a user in need. In such a case, the library's collection would become virtual in more ways than one: Not only would the texts in the collection be online and so not have any physical presence, but also the makeup of the collection would change constantly. The e-books actually possessed by the library would be different from one moment to the next, as access to some items expired and access to other items began. This model may seem exceedingly strange to our notions of the massive, fixed collections of traditional libraries. In fact, though, such notions were only ever held by non-librarians, for the professionals who manage print collections are reminded daily of the shifting nature of their content. Books are borrowed, lost, stolen, or withdrawn and so become unavailable. New books are purchased; out-of-print items are donated. At no time is the collection fixed. Acquisition on demand – with temporary possession – occurs today; only in slow motion.

#### Content – Books – Print-on-Demand

Yet another variation of acquisition-on-demand is print-on-demand. In this model, content may be stored by the library on its own or its vendor's server and printed on demand by a device such as the InstaBook printer/binder[37]. This model would not apply to short works, like periodical articles, which can simply be printed on conventional printers. Instead it addresses those longer works – like popular novels in public libraries and, alas, the all too few non-fiction works in academic libraries – which demand cover-to-cover reading. E-book reading devices have already been mentioned, but also already mentioned was the need for printed books as well. Though print-on-demand equipment is still expensive, libraries working together in consortia could cooperatively purchase such devices and begin offering print-on-demand service any day now. What to do with the one-off printed copy? The item may be added to a small print collection of popular items in anticipation of further demand or the item may simply be recycled. Today, print-on-demand companies are able to sell books comparably priced with their mass printed counterparts and still make a profit. If library consortia printed their own books, the cost per book would be much lower. As technology improves, the cost will drop lower still, until multiple, disposable, printed-on-demand books become a reality.

#### Content – Special Collections

Aside from content that is easily accessible (including everything mentioned up to this point), libraries also provide limited access to special collections. Special collections include – among other things – rare books, manuscripts, and archival material. Often uncommon, sometimes fragile, and occasionally absolutely unique, special collections have in the past suffered from very limited use. Not only must a user physically visit the holding library, but she/he also must usually acquire special permission to view the material. Libraries do republished a tiny fraction of these special holdings, but only the most important or the most popular. With the advent of the Web, libraries may now digitize great portions of these special collections and make them available to scholars worldwide. In this way, the integrity of the original artifact will remain intact while the content of the item enjoys maximum exposure. In this way, too, libraries will not only exist as facilitators of access to electronic content but also as suppliers of the electronic content itself. Current online examples include the Maine Folklife Center[38] at the University of Maine at Orono and American Memory[39] at the Library of Congress. Thomas College, too, is in the process of digitizing portions of its archives for



broadcast over the Web[\[40\]](#).

## Content – Reserve Material

Finally, the content category of reserve material must be mentioned. While reserve material can consist of many of the different formats already mentioned, the issues raised are unique. Take, for example, the case of a magazine article assigned to the reserve desk for one semester. The article may be read by many students, students who then do not need to purchase the article themselves. Even though this practice deprives publishers and authors of income, traditional “fair use” doctrine allows for such limited use without penalty. On the other hand, if the same article were placed on reserve for the same course for more than one semester, there would exist a clear violation of copyright law.

Today, with affordable and easy-to-use optical character recognition (OCR) scanners, faculty themselves can post magazine articles directly to publicly available Web pages. This practice is a clear violation of copyright law. First, fair use guidelines are overstepped (the material is accessible to more people than are in the class). Second, even if all fair use guidelines were followed (the material could be password protected or placed on an intranet or extranet), it is not all clear that the fair use doctrine applies to online material.

The Conference on Fair Use (CONFU)[\[41\]](#) – a group composed of publishing and library representatives – met for four years but was not able to agree on a single guideline. Publishers are pushing hard for the elimination of any fair use of their content on the Internet. Even with traditional fair use of print items there is little controlling law. Instead, libraries rely on “guidelines” – commonly accepted practices (accepted by libraries and publishers) – to keep their practices legal. Online, there are certainly no laws sanctioning fair use. There are no guidelines either. The only thing remotely resembling a safe harbor for libraries in this area is the so-called “notice and take-down clause”[\[42\]](#) of the Digital Millennium Copyright Act (DMCA)[\[43\]](#).

In essence, the clause requires that a library register an agent with the Copyright Office (part of the Library of Congress)[\[44\]](#), post that contact’s name prominently on the library Web site[\[45\]](#), and take down any offending material once notified by the copyright holder. If a library meets all of these preconditions it should be immune from lawsuit. This is not the same thing as fair use. Instead, the clause simply protects the library from immediate suit without prior notification. Continued use of copyrighted material after notification from the copyright holder would open up the library to suit. The presumption has shifted from an understood right of use under limited conditions to right of use only after permission is granted.

In the absence of any clear guidelines – or even of murky guidelines, for that matter – some libraries continue to apply traditional fair use tests to online reserve material. Boiled down to their essentials, these guidelines hold that reserve material should not consist of a whole work (or any overly-substantial part thereof), should be directly relevant to the class, should be used only by current class members, should be used only for the time necessary (and in no case for more than one semester).

Material in the public domain can be posted at will, as can any material for which appropriate permission has been granted by the copyright holder. Services such as the Copyright Clearance Center[\[46\]](#) exist to aid in the often-convoluted process of acquiring and managing copyright permissions.

## Part 3 – Preservation

Besides acquiring and providing access to content, libraries often are entrusted with the duty of preserving content as well. Large institutions, especially, fulfill their responsibilities as “libraries of last resort” by retaining content long discarded by smaller libraries with less space. Even small libraries, however, must preserve some content: that which is unique to their collections. The Thomas College library, for instance,

preserves archival content relating to the institution, content that exists nowhere else.

### Preservation – Conservation

Before proceeding further, a distinction needs to be made between preservation and conservation. Preservation refers to the capture of information contained in a decayed item. A fragile newspaper, for instance, may be microfilmed or photocopied onto acid-free paper. Conservation, on the other hand, refers to the retention of the artifact itself. The Northeast Document Conservation Center (NEDCC)[\[47\]](#) in Amherst, Massachusetts, conserves fragile and decayed paper artifacts by neutralizing acidic paper, reconstructing torn pages, filling in holes, rebinding dismembered books with inert glues, and more. Their goal is to save the content container itself.

Historians, librarians, and others argue over which material should be preserved and which conserved. Conservation, by its very nature, involves painstaking professional work at considerable cost. Preservation is almost always more expedient, but it also often destroys the original object in the process of content migration. For example, the handling required to microfilm fragile newspapers causes them to disintegrate. Literary fetishist Nicholson Baker has written, in the New Yorker magazine, several long screeds against libraries and librarians. In his mind, preservation is conservation. Every newspaper and every book – even every catalog card – must be conserved for the benefit of future generations. He himself has spent tens of thousands of dollars purchasing discarded newspaper collections. Never mind that these purchases will turn literally to dust within his lifetime.

Most professionals agree, however, that only truly significant historical documents warrant conservation: Thomas Jefferson's original rough draft of the Declaration of Independence[\[48\]](#), for example, or Action Comics No. 1[\[49\]](#) (in which Superman made his first appearance and a copy of which recently sold for \$125,000[\[50\]](#)). For the rest, preservation of the information contained in the item is sufficient.

### Preservation – Digital Archiving

Not only must the content contained in decaying print be preserved, so too must the content in decaying or obsolete digital media. As with print, one may retain the content of older digital media by conserving each medium (magnetic tapes, punch cards, etc.) along with the equipment needed to process them. This would be a daunting task. The other option is to migrate the information from one medium to another. This is the preferred method, though it does present problems of its own. One especially difficult problem has been the lack of standards for electronic data. Microsoft Word 2000 (running on today's PCs) cannot read memos created with Write software (running on circa 1984 Macintoshes). During periods of rapid growth and innovation in the computer industry, one format quickly gives way to another – and yet another – with hardly a glance backward. Today, however, after having experienced problems reading old NASA telemetry[\[51\]](#) and East German records[\[52\]](#), we have come to understand that we need electronic data standards.

### Preservation – Standards

As the result of several important factors – preservation of data not least among them – standards for electronic data are being developed and adopted. For text, Unicode (or if you speak English, ASCII, which is contained within Unicode[\[53\]](#)) or the more flexible XML (which incorporates Unicode[\[54\]](#)) seem to be today's leading contenders.

### Part 4 – Mediation

Mediation refers to those services librarians supply beyond being caretakers of content collections. Mediation

often interposes the librarian between the user and the content.

### Mediation – Selection

Users of a collection may delegate to a librarian the authority not only to acquire but also to select material. In this case, the librarian exercises an editorial role, acting as a filter between the user and all possible content. Only content deemed relevant and of sufficient quality by the librarian is admitted into the collection. Databases require the same selectivity, for not all databases are of the same high quality. Someone has to review all of the choices and make recommendations to users. Then, too, as the Web grows to 1 billion – then to 1 trillion – pages, users require more and more help in sifting through the digital haystack to find that golden needle. One way librarians can help is by synthesizing lists of links to quality online information sites.

Mediation could include access services, but libraries have existed in the past (and still do today, in some rare cases) with access and no mediation. Traditionally, librarians were not involved in selection and certainly did not provide reference or instructional service. They were, first and foremost, keepers of books. In public libraries today, patrons may request – and trustees may select – some material. In academic libraries today, students may request – and faculty may select – some material. By and large, however, librarians now do most content selection.

### Mediation – Reference

Librarians also supply reference service. Librarians help users figure out what kind of information they need and help them interpret the information once it is located. Reference librarians suggest starting points for research projects and point out the strengths or shortcomings of various sources.

With a greater amount of information available now than ever before, reference services are needed now more than ever before. Finding lines of fruitful exploration becomes more difficult as the Web grows. Users need help assessing the validity of content found on the Web. They also need help figuring out how best to capture the information they find and how to cite sources correctly.

With the increase in the need for reference services have also come methods for extending the availability of that service. FAQs and online guides steer beginners in the right direction. HTML forms allow users to submit questions after hours or from remote locations. The Thomas College library currently offers online reference service: Students and faculty can ask questions, order books, request ILLs, and much more [\[55\]](#).

### Mediation – Instruction

Another form of mediation is instruction. The main goal of library instruction is to promote information literacy. In an odd way, librarians are in a constant fight to render themselves superfluous by creating self-sufficient information consumers out of their users. To this end, librarians take every opportunity to try to teach users how to do their own research. During reference work, for example, users are not merely shown where to find key information, they are also taught how to find that information themselves so that the next time they have a similar need they will not require a librarian's assistance. Structured instruction, not necessarily tied to specific research projects, also takes place in the library and in the classroom.

Information literacy today must include a component of computer literacy. To locate the information they need, users must know how to navigate online databases and download files. They need to know how search engines work and how to figure out who is sponsoring any given information Web site. All of this instruction the library supplies as a natural outgrowth of its traditional mission to promote information literacy.

The American Library Association has adopted a forceful and detailed statement on information literacy[56], while the Association of College and Research Libraries (ACRL) has adopted specific information competency standards for higher education[57]. An especially fine example of an online tutorial dealing with information literacy in an academic setting can be found at the Cal Poly site[58].

## Mediation – Knowbots

For routine information gathering tasks, software programs called “knowbots” can be used. These programs scour the Web, searching for content specified by the user. This content may be returned as an e-mail attachment or gathered together on a Web site that the user must visit. While knowbots do what they do (routine, recursive retrieval) increasingly well, they do not supply the kind of specialized reference service that only a trained information professional can supply.

## Part 5 – Physical Space

Perhaps the single biggest reason so many technology pundits today predict the immanent demise of the library is that, with texts online, there is no longer any apparent need for library buildings. Ipso facto, there is no need for libraries. This line of reasoning is flawed on several levels. First of all, mistaking library buildings for libraries themselves is mistaking the container for what it contains. As stated in the preceding sections, the services – the added value, if you will – traditionally supplied by libraries will still be needed in the digital world. Just because patrons sit at home or in their dorm rooms and see only a computer screen does not mean that librarians have somehow vanished. Just because something cannot be seen does not mean it does not exist. Of course, even if librarians continue to play a role in the digital world, that in itself does not prove a continuing need for library buildings. So then, are library buildings doomed? (No, they are not doomed.)

### Physical Space – Study/Reading (Individual)

Library buildings themselves encompass unique features, aside from their content collections, which will probably assure their survival – albeit in an altered form. The first libraries often did not lend material to a user. Instead they provided space for reading within the building itself. From such beginnings arise the otherwise inexplicable names of some institutions today: for example, the Lithgow Library and Reading Room[59] in Augusta, Maine. Throughout the whole history of libraries, and across the wide variety of all library types, the reading room has remained an integral part of the library’s mission. Even during the slower times of yore, users enjoyed the quiet areas set aside for reading and contemplation. On a college campus today, the library is often the only place where a student can find respite from near-constant aural stimulation. Public libraries, too, offer citizens a sanctuary from the hurly-burly of life. Some people require quiet isolation to think. This quietude the library supplies even amidst a rowdy campus or a crowded city. Anyone who has nodded off while reading a book in the courtyard of Boston Public Library’s McKim Building knows that library buildings do not just warehouse books. There simply is no digital counterpart.

### Physical Space – Books & E-books

As previously stated, printed texts will not disappear completely; and while printed texts exist, so must there be someplace to store them. With the unprecedented explosion in printed material over the past decade[60], it may even be that library buildings will have to expand before they contract. At any rate, lending collections of popular material (be they books, CDs, DVDs, or what have you) and browsing collections of newspapers and magazines will require display space and storage space and reading space. Then, too, some portion of today’s reference materials will continue to be available in print. This material will require space also.

Archival material, rare books, and other collections will continue to require space.

There will always be people who cannot afford or who do not otherwise have access to information access devices. Here once again, the library will continue to fulfill its role as democratic institution, bringing equal access to all. Of course, not only the disadvantaged will avail themselves of the library's public access workstations. Even those who own their own equipment will find it convenient to stop by the library on their way to class or work.

### Physical Space – Group/Social (Communal)

Besides providing quiet areas for serious study, libraries have also paradoxically offered common areas for socialization. College libraries offer conference rooms for group study or risk-free courting. Public libraries offer meeting rooms for civic groups or reading clubs. Group activities have become so important to modern library service that it would be unthinkable for any new construction to ignore the inclusion of such spaces. In fact, group spaces often feature prominently in new construction (see, for example, the Olin Science Center[\[61\]](#) at Colby College and the Valley Library[\[62\]](#) at Oregon State University). Users of content can interact online, of course, through chat rooms or e-mail discussion groups. These are fine methods of enabling group dynamics among remote users, but as long as we continue to inhabit physical bodies there will always remain some need to meet and interact “in person.” Meeting spaces need not be called “libraries;” but why not continue to call them that, since spaces with those names already exist. Further, why not continue to combine other features together with these meeting spaces: on-site content collections, devices to access remote content collections, professional reference and instruction services, and all of the other useful services the library has traditionally included.

Increasingly, the library has incorporated into its design classrooms which take advantage of the proximity of content, the environment of serious contemplation, and the availability of professional reference librarians. On the college campus, as content has moved online, these classrooms have mutated into something closely resembling computer labs.

Over time, furthermore, the library and the traditional stand-alone computer lab are also likely to merge. On the Thomas College campus, computer lab attendants are often asked how to use online reference sources. Unfortunately, they do not have the expertise to answer such questions. On the flip side, library staff members are asked questions about computer equipment which they are ill prepared to answer. In time these two groups will be first cross-trained and then eventually merged into a single information services staff, for information literacy no longer involves only print literacy but also computer literacy as well.

### Physical Space – Bookstore Model

Another vision of the library of the future is that of increased coexisting compartmentalization. Quiet study areas will coexist in the same building with group conference rooms. Printed texts – even special collections material – will coexist side by side with Internet-connected computer terminals. In addition, the library will continue to grow, continue to add more services, continue to alter its appearance. Cultural events – readings, signings, concerts, movies – are likely to proliferate in the public library as it increasingly becomes a central civic space. The public and academic library both may take their cue from successful bookstore chains and add food services and music in certain parts of the building. More comfortable furniture will be used. Book stacks will be lowered and aisles widened, not only to increase accessibility for the handicapped but also to lighten up the general atmosphere of the place. Book covers will be left on books and books will be displayed face out for a more attractive and colorful appearance. New books and magazines will be in easy reach for browsing, while archival content will be relegated to online databases. Data ports will be installed throughout the building so that users who bring in their own laptops can plug into library databases from any



individual carrel or group study room. The library may even form partnerships with bookstores and database vendors to sell content on-site. For instance, the library may offer free on-site access to online databases while selling off-site licenses for a minimal fee. It may offer a single copy of a printed reference work for general use and sell additional copies to those who want their own copies. Hours will be increased to accommodate the perpetual activity of today's 24x7 society.

## Conclusion

Though the immanent demise of the library has been much anticipated by technologists, libraries and librarians are likely to play an increasingly central role in content management. The skills that professional librarians have been developing for centuries are precisely the skills needed today to efficiently access and manipulate electronic information. The five categories of traditional library service – access, content, preservation, mediation, physical space – will endure of necessity. They will adapt to fit new media, new study habits, new economic realities. The fundamental mission of libraries – information literacy – will continue to become increasingly urgent. The more that information multiples and disseminates, the more libraries will be needed to organize and make sense of it all.

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[1] "Access made available with support from the Maine State Library, the University of Maine System Libraries, and the Maine Technical College System Libraries."

Acknowledgement on "Electronic Databases for the State of Maine." University of Maine Library System. 2000.

URL: <http://libraries.maine.edu/mainedatabases/>

[2] "Welcome to UnCover Web: A Current Awareness and Document Delivery Service." UnCover Company. 17 May 2000.

URL: <http://uncweb.carl.org/>

[3] "Full Article Record for 'Digital Archiving'." Uncover Company. 20 November 2000.

URL: <http://www.thomas.edu/larochelle/ct551/paper2uncover.htm>

[4] Though not directly relevant to the current discussion, it is nevertheless interesting to note that some libraries do not stop at lending content, content readers, and content producing devices. See, for example, the Tool Lending Library of – where else! – Berkeley, California.

"Tool Lending Library." Berkeley Public Library. 25 January 2000.

URL: <http://www.infopeople.org/bpl/tool/>

[5] "The netLibrary eBook Reader." netLibrary. 2000.

URL: [http://www.netlibrary.com/nl\\_ebook\\_reader.asp](http://www.netlibrary.com/nl_ebook_reader.asp)

[6] "About eBook Readers." eBook. Gemstar-TV Guide International. 2000.

URL: <http://www.softbook.com/ebookrdrs/index.asp>

[7] Gemstar-TV Guide International recently bought out NuvoMedia (maker of the Rocket eBook) and Softbook Press (maker of the Softbook Reader). Both e-book technologies were merged and immediately licensed to Thomson Multimedia, manufacturer and marketer of RCA and GE brand home electronics. Changes are fast and furious in this nascent industry.

"About eBook." eBook. Gemstar-TV Guide International. 2000.

URL: <http://www.softbook.com/about/index.asp>

[8] "Bibliographies & Guides to Our Collections." Boston Public Library. 21 May 1999.

URL: <http://www.bpl.org/WWW/KBB/guides.htm>

"Selected Business Websites by Subject." Boston Public Library. 16 May 2000.

URL: <http://www.bpl.org/WWW/KBB/websites/websites.htm>

[9] See the following writings of Nicholson Baker and Clifford Stoll:

Baker, Nicholson. "Books as Furniture." New Yorker. 12 June 1995. Pages 84-92.

Baker, Nicholson. "Deadline." New Yorker. 24 July 2000. Pages 42-61.

Baker, Nicholson. "Discards." New Yorker. 4 April 1994. Pages 64-86.

Baker, Nicholson. "The Author vs. the Library." New Yorker. 14 October 1996. Pages 50-62.

Stoll, Clifford. "The Connected Library." In High Tech Heretic. New York, NY: Doubleday, 1999. Pages 155-164.

Stoll, Clifford. "Chapter Eleven, Wherein the Author Considers the Future of the Library, the Myth of Free Information, and a Novel Way to Heat Bathwater." In Silicon Snake Oil: Second Thoughts on the Information Highway. New York, NY: Doubleday, 1995. Pages 173-214.

[10] "Maine Info Net." Maine Info Net. Maine State Library. 2000.

URL: <http://ursus2.ursus.maine.edu/>

[11] "MARC Record Resources: MARC to XML to MARC Converter." Logos Research Systems. Converters copyrighted: 22 June 1998. Last updated: 21 June 2000.

URL: <http://www.logos.com/marc/>

[12] The early text-based Internet used the Gopher protocol of hierarchical menus. These menus – GopherSpace – could be searched with tools named Veronica and Jughead (Archie was, and still is, a tool for searching FTP sites). See "Gopher Root" for one of the last remaining vestiges of GopherSpace.

"Gopher Root." University of Minnesota. 21 July 1998.

URL: <gopher://gopher.micro.umn.edu/>

[13] "The 'Net 50.'" Newsweek. 25 December 1995.

URL: <http://search.epnet.com/direct.asp?AN=9512217546&db=afh&>

[14] "Signpost." Internet Scout Project. University of Wisconsin. 2000.

URL: <http://www.signpost.org/signpost/index.html>

[15] "PageRank Explained." Google. 2000.

URL: <http://www.google.com/technology/index.html>

[16] "Search Engine Features for Web Masters." Search Engine Watch. 2000.

URL: <http://searchenginewatch.com/webmasters/features.html>

"How Search Engines Rank Web Pages." Search Engine Watch. 2000.

URL: <http://searchenginewatch.com/webmasters/rank.html>

[17] There may be as many inaccessible Web pages as publicly available ones. Institutional intranets and extranets, for example, contain many pages inaccessible to the general public.

[18] Lawrence, Steve. "Accessibility of Information on the Web." Nature. 8 July 1990.

URL: <http://www.wwwmetrics.com/>

[19] Engines searched by MetaCrawler include: About, AltaVista, DirectHit, Excite, FindWhat, Google, GoTo, Infoseek, Internet Keywords, Kanoodle, LookSmart, Lycos, Sprinks, Thunderstone, and WebCrawler.

"MetaCrawler Fact Sheet." MetaCrawler. 2000.

URL: <http://www.metacrawler.com/press/facts.html>

"Engines to Use." MetaCrawler. 2000.

URL: [http://www.metacrawler.com/index\\_power.html](http://www.metacrawler.com/index_power.html)

[20] Wiggins, Richard W. "Coping with the Trillion Page Web." netConnect. Fall 2000. Pages 26-28.

[21] Currently, a dozen prints from the library's Antanas Sutkus collection are on loan to various offices throughout Thomas College. For more information on the Sutkus collection at Thomas and on the artist himself, see the [Antanus Sutkus Web site](#).

"Antanas Sutkus at Thomas College." Thomas College. 2000.

URL: <http://www.thomas.edu/library/sutkus/>

[22] General BusinessFile ASAP, Expanded Academic ASAP, Electric Library, Britannica Online, CheckPoint, Westlaw.

[23] CheckPoint, Westlaw.

[24] General BusinessFile ASAP, Expanded Academic ASAP, Electric Library.

[25] Encyclopedia Britannica is now available online for free.

"Britannica." [Encyclopedia Britannica](#). 2000.

URL: <http://www.britannica.com/>

[26] Academic Search Elite, Business Source Elite, Corporate ResourceNet, CRN Knight Ridder, ERIC, Health Source Plus, Clinical Reference Systems, USP DI Volume II-Advice for the Patient, MAS FullTEXT Ultra, MasterFILE Premier, Middle Search Plus, Primary Search, EBSCO Animals, Funk & Wagnall's New World Encyclopedia, Newspaper Source, BIOSIS Previews, Zoological Record, netLibrary.

"Databases." Thomas College. 2000.

URL: <http://www.thomas.edu/library/databases/>

[27] [Morning Sentinel](#) (Waterville), [Kennebec Business Monthly](#) (Augusta), [Daily News](#) (Bangor), [Maine Times](#) (Bangor), [Maine Sunday Telegram](#) (Portland), [Mainebiz](#) (Portland), [Christian Science Monitor](#) (Boston), [Wall Street Journal](#) (New York).

[28] "Dictionary and Glossary List." [OneLook Dictionaries](#). Study Technologies. 2000.

URL: <http://www.onelook.com/browse.shtml>

[29] "Almanac Resources." [Internet Public Library](#). University of Michigan. 2000.

URL: <http://www.ipl.org/ref/RR/static/ref05.00.00.html>

[30] "Encyclopedia Resources." [Internet Public Library](#). University of Michigan. 2000.

URL: <http://www.ipl.org/ref/RR/static/ref32.00.00.html>

[31] "Map & Atlas Resources." [Internet Public Library](#). University of Michigan. 2000.

URL: <http://www.ipl.org/ref/RR/static/ref42.50.00.html>

[32] "Statistics Data Sources." [Statistics.Com](#). Resampling Stats, Inc. 2000.

URL: <http://www.statistics.com/>

[33] "Calendar Resources." [Internet Public Library](#). University of Michigan. 2000.

URL: <http://www.ipl.org/ref/RR/static/ref20.00.00.html>

[34] Commercial databases which supply company and industry information include (but are not limited to): ABI/Inform, Business Dateline, Dow-Jones Interactive, Dunn & Bradstreet Industry Norms, EBSCO Business Search Elite, Hoover's Online, InfoTrac General BusinessFile ASAP, InvesText, Predicast PROMPT, Standard & Poor's Advantage.

[35] "About eBook." [eBook](#). Gemstar-TV Guide International. 2000.

URL: <http://www.softbook.com/about/index.asp>

[36] "InstaBook Maker." InstaBook Corporation. 9 November 2000.

URL: <http://www.instabook-corporation.com/index.html>

[37] "InstaBook Maker." InstaBook Corporation. 9 November 2000.

URL: <http://www.instabook-corporation.com/index.html>

[38] "Photographs." [Maine Folklife Center](#). University of Maine at Orono. 16 October 2000.

URL: <http://www.umaine.edu/folklife/photographs.htm>

[39] "American Memory." Library of Congress. 15 November 2000.

URL: <http://memory.loc.gov/ammem/ammemhome.html>

[40] As of the time of this writing, archival materials are just being digitized and are not yet available on the Web. Another portion of the library's special collections, however, is available online: the Antanas Sutkus photograph collection. For more information on the Sutkus collection at Thomas College and on the artist himself, see the [Antanus Sutkus Web site](#).

"Antanas Sutkus at Thomas College." Thomas College. 2000.

URL: <http://www.thomas.edu/library/sutkus/>

[41] "CONFU: The Conference on Fair Use." U.S. Patent and Trademark Office. 24 November 1998.

URL: <http://www.uspto.gov/web/offices/dcom/olia/confu/>

[42] See Section 512(c)(2)-(3) and Section 512(g)(2)-(3) of 17 U.S.C.A.

"Title 17--Copyrights. Chapter 5--Copyright Infringement and Remedies." United States Code Annotated. Approved 22 September 2000.

[43] "H.R. 2281: Digital Millennium Copyright Act." Government Printing Office.

URL: [http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=105\\_cong\\_bills&docid=f:h2281enr.txt.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=105_cong_bills&docid=f:h2281enr.txt.pdf)

[44] "Designation by Service Provider of Agent for Notification of Claims of Infringement." U.S. Copyright Office. 12 May 1999.

URL: <http://lcweb.loc.gov/copyright/onlinesp/>

[45] See, for example, the notice on Thomas College's library Web page.

"Marriner Library." Thomas College. November 2000.

URL: <http://www.thomas.edu/library/>

"Copyright Complaints." Thomas College. 2000.

URL: <http://www.thomas.edu/copyright.htm>

[46] "Welcome to Copyright.Com." Copyright Clearance Center. 2000.

URL: <http://www.copyright.com/>

[47] "Services." Northeast Document Conservation Center. 13 June 2000.

URL: <http://www.nedcc.org/services.htm>

[48] Jefferson, Thomas. "Original Rough Draft of the Declaration of Independence." American Memory. Library of Congress. 5 May 2000.

URL: <http://lcweb.loc.gov/exhibits/treasures/images/uc004215.jpg>

[49] Gelatt, Dorothy. "Action Comics No. 1 [Photo Courtesy Sotheby's]." Maine Antique Digest. August 1995.

URL: <http://www.maineantiquedigest.com/images/com8953.jpg>

[50] Gelatt, Dorothy. "Sotheby's \$2 Million Comic Book Bash." Maine Antique Digest. August 1995.

URL: <http://www.maineantiquedigest.com/articles/comic895.htm>

[51] Stoll, Clifford. Silicon Snake Oil. New York, NY: Doubleday, 1995. Page 180.

[52] Arms, William Y. "Digital Archeology in Germany." In Digital Libraries. Cambridge, MA: MIT Press, p. 262.

[53] Nixon, Dorothy. "ASCII and Unicode." Computer Science 95 and 100: Introduction to Programming (Java). Queens College. Spring 2000.

URL: <http://www.cs.qc.edu/~nixon/cs95/asciiUnicode.html>

[54] "Unicode in XML and Other Markup Languages." World Wide Web Consortium (W3C) & Unicode, Inc. 23 June 2000.

URL: <http://www.unicode.org/unicode/reports/tr20/index.html>

[55] "Marriner Library." Thomas College. November 2000.  
URL: <http://www.thomas.edu/library/>

"Ask the Library [Intranet]." Thomas College. 2000.  
URL: <http://www.thomas.edu/intranet/libreq-enter.asp>

"Ask the Library [Extranet]." Thomas College. 2000.  
URL: <http://www.thomas.edu/extranet/>

[56] "American Library Association Presidential Committee on Information Literacy." American Library Association. 10 January 1989.  
URL: <http://www.thomas.edu/library/libweb/libinfolit.htm>

[57] "Information Literacy." Association of College and Research Libraries. 13 July 2000.  
URL: <http://www.ala.org/acrl/infolit.html>

[58] "Information Competence." Cal Poly State University. 12 March 1999.  
URL: <http://www.lib.calpoly.edu/infocomp/modules/index.html>

[59] I worked at Lithgow Library for 2 years, before coming to Thomas College. Its reading room has been voted one of the most beautiful interior spaces in Maine. Follow the link below to view interior and exterior photographs of the library.

"Lithgow Reading Room [Photograph]." Lithgow Library and Reading Room. 2000.  
URL: <http://www.ci.augusta.me.us/service/community/lithgow/>

[60] Over 6.25 million titles were produced during the 1990's.

"Annual Book Title Production." International Publishers Association. 27 June 2000.  
URL: [http://www.ipa-uae.org/statistics/annual\\_book\\_prod.html](http://www.ipa-uae.org/statistics/annual_book_prod.html)

[61] "F.W. Olin Science Center." Colby College. 2000.  
URL: <http://www.colby.edu/tour/olin.shtml>

[62] "Artist's Rendering of One of 33 Group Study Rooms." Oregon State University. 17 June 1999.  
URL: <http://www.orst.edu/dept/library/vallib/grostu.htm>