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Electronic Information for the Humanities

Mark Stover
Issue Editor

University of Illinois
Graduate School of Library and Information Science
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Electronic Information for the Humanities

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Introduction

**MARK STOVER**

There is a movement today that has no official leaders or published agenda. It could be called an underground movement, except that no one denies its existence. This movement brings together participants from many professions—librarians, computer scientists, teachers, scholars, business professionals, and practitioners from every vocation. The movement is strong and unbending, but there are many who recoil from its grasp. It began with a dream, and it may end in a nightmare, but it will not stop until its goals are realized. The movement does not have a name, but here it will be referred to as “electronic information.”

Electronic information refers to practically anything in machine-readable form. This includes online and optical text-based files like bibliographic databases and full-text reference works, as well as computer-simulated audio and images. Technically, it could also refer to many videotape products, but these are generally excluded from the category of electronic information. While machine-readable information exists on various media, such as floppy diskettes, optical disks, or large magnetic fixed disks, it is almost always accessible from a personal computer.

Humanists have regularly received “bad press” from the conventional wisdom of electronic information. Humanists, it is said, are resistant to the idea of using computers for research. Humanists are a traditional group, and they will never allow their disciplines to be taken over by technological freaks who could not distinguish Homer from Homer Simpson. Humanists, pure and simple, will not
allow the tangible texts that are the foundation of their research to be converted into ephemeral bits and bytes. It just will not happen.

But it has happened. While a few isolated and celebrated computer projects in the humanities developed during the 1960s and 1970s, it was not until the early 1980s (with the advent first of the personal computer and then CD-ROM) that many humanists began to see for the first time the incredible capabilities of electronic information. They too joined the movement, and some of them even became its most vocal proponents. Today, humanities computing is a growing and respected organism within the larger body of electronic information. The new Center for Electronic Texts in the Humanities, established by Rutgers and Princeton Universities and led by Susan Hockey, is symptomatic of the spread of enthusiasm among humanists concerning things electronic. It should prove to be a powerful force for electronic information in the broader humanities community.

This issue of *Library Trends* is devoted to a discussion of the ways in which humanities scholars and librarians are working together (or not working together) in the electronic information movement. The scope of the issue includes all of the traditional disciplines in the humanities. There is, of course, some disagreement among scholars about exactly which disciplines fall into this category. For example, one of the essays focuses on history, even though some historians consider themselves to be social scientists rather than humanists. The reader is asked to be tolerant of the editor's decisions regarding which disciplines were (or were not) included.

Electronic information, for the purposes of this issue, refers primarily to textual information but does not categorically exclude images or sound. Indeed, although most humanists look to "the text" as their chief source of research, many humanities databases (especially of the hypermedia variety) also include images and sound as both primary source materials and as secondary background information. Some might even ask questions like, Why are words considered more important than nonwords? Can the text of a historical document be placed into machine-readable form without image reproductions of pictures that orginally appeared alongside the text and still retain its validity for research? Are musical scores "text"? These questions will not be answered definitively in this issue of *Library Trends*, but the research and library communities must ultimately deal with them.

Almost all of the electronic tools discussed here are presently being used or could conceivably be used within a library environment. This excludes some kinds of "courseware," although, of course, many curriculum-based materials could potentially be used by or within libraries. And the nature of electronic publishing would anticipate remote or networked access to many electronic texts, thereby blurring
the distinctions that used to be so easy to make—i.e., whether or not a product is used within a library context. In any event, the focus of most of the articles is on both the electronic information itself and on the library’s role in providing access to the information.

Many observers (and participants as well) believe that the fundamental responsibility of librarians lies in the area of collection development. What librarians choose to purchase for their collections has long-lasting ramifications. It could even be argued that all other facets of librarianship revolve around collection building. The reference interview is conducted under the assumption that useful materials exist in the core collection. Cataloging and classification occur only after the materials are purchased and are generally restricted to local holdings. In the first article of this issue, Edward Shreeves discusses some of the challenges that face those who would include electronic information in the collection development equation. He offers valuable insights especially in regard to the librarian-scholar relationship.

Mara Saule draws on her background of bibliographic instruction to discuss various user education issues vis-à-vis electronic information. Her article sets forth problems (and solutions) which arise when librarians seek to educate humanists in the fine art of database searching.

The literature of the humanities seems to many to be a prime candidate for conversion to hypertext and hypermedia. Erwin Welsch, in his nearly exhaustive article on hypertext and the humanities, separates the promise from the reality in a critical look at what hypermedia may and may not bring to humanists and librarians.

One of the more interesting ways that electronic information is conveyed is through the electronic journal. Michael Stoller brings together a sampling of electronic serial publications in the humanities, provides descriptions and critiques of these “e-journals,” and shares with the reader his ideas for providing access and preservation for these materials.

The next six articles are based in the various disciplines of the humanities. Matthew Gilmore and Donald Case present a sobering, yet hopeful, analysis of the ways in which historians use information technology. Mark Stover writes about religious studies, concentrating on the subdiscipline of biblical studies. Anita Lowry discusses English and American literature with a focus on the most widely distributed electronic text in this field, Shakespeare. Beatrice Oshika and Sylvia Krausse survey the unique realm of linguistic and language research. On the “arts” side of the humanities, Marcia Reed writes about electronic resources in art history, and Mary Kay Duggan discusses
musicology. In the final article of this issue, James Sweetland makes predictions concerning the future of humanities computing.

It is not without anxiety that most humanists and librarians enter the brave new world of electronic information. The nightmare scenario mentioned earlier was not hyperbole; electronic texts have the potential to wreak havoc on the scholarly world if preservation and standardization (not to mention bibliographic control) issues are not forcefully confronted. Nightmares can be avoided, and dreams can come true but only if a diverse group of professionals with common goals are willing to work together in harmony.
Between the Visionaries and the Luddites: Collection Development and Electronic Resources in the Humanities

Edward Shreeves

Abstract
The incorporation of electronic resources in the humanities into the traditional practice of collection development presents challenges that have pragmatic, technical, fiscal, and cultural dimensions. Many of the selection criteria valid for print resources have analogues in the electronic realm, while others are unique to the new medium. Among the most significant challenges will be understanding and responding effectively to the way computer-aided research in the humanities changes scholarship and scholarly communication. The substantial differences among humanist scholars in their readiness to participate in the evolving new world will require considerable attention from collection development librarians.

Introduction
The process of building a collection takes place within a cultural and social context from which it derives its values and assumptions. For selectors in the humanities, a part of that context has been formed by a system of scholarly communication and a literature that has developed over decades, if not centuries. As noted by many, that system is now suffering from severe strain on a number of fronts and is undergoing radical transformation. The emergence of machine-readable texts, of computer-based networks, and of all the attendant technological apparatus, has provided the means to alter radically scholarly communication and scholarly method in the humanities. Many librarians are eager to move toward this new future but are...
unsure how to proceed. Both their eagerness and uncertainty have valid roots. A computer-based system of scholarly communication offers the hope of an escape from the insoluble morass of economic, space, and access problems of the last few years. There are even more reasons for uncertainty. The technology itself is in a state of constant flux with little probability for stability. The glimpses of the future, which now and then emerge from the mists, demand that libraries reconceive the ways they fulfill their missions or even redefine the mission itself. The price for this emerging system—both infrastructure and information—is likely to be very high at a time when many institutions are suffering their worst fiscal problems in years. Finally, changes in the social and cultural context in which scholarship occurs are taking place much more slowly than changes in technology. This article will consider some of the implications of these factors for collection development.

THE ISSUES

As machine-readable texts (of a kind that might interest scholars in the humanities) began to grow in numbers in the 1970s, there was considerable skepticism—to the extent there was any concern at all—about the library's role in collecting and making these texts available. Some librarians, recognizing the research potential of these resources, argued that selection of research materials should not be limited by format (indeed, this argument was traditionally used for other nonbook resources), and that a computer file was simply another information package which libraries should collect. Like video recordings and microform, it had special features that differentiated it from print resources, but it was still an information source that supported teaching and research. In many ways this position, however enlightened and progressive, leaves unanswered a number of important questions and understandably did not foresee the world of networked resources that is haphazardly, but luxuriantly, growing today.

A concomitant argument deals with the issue of funding. In essence, this argument held that, while electronic resources were unquestionably useful, libraries should demand additional support to pay for them and not redirect dollars from already undersupported print resource funds. If librarians made a strong enough case to funding sources the argument ran, and local demand for these absent materials grew, the library would succeed in getting "new" monies to pay for these new and expensive formats. Although experience suggests that this tactic has rarely borne fruit, it is still heard in many quarters. It is tempting to assert that this argument, in fact, is not only fruitless, but perhaps dangerous, because it proffers an
excuse for inaction. As long as funding sources fail to provide the extra cash libraries need, there is no reason to look for ways to fund this new activity from existing resources. Taking the cost of electronic information from current resources is not a pleasant prospect, but it may be the only strategy available for many. A counter argument claims that such reallocation of existing resources gives funding sources a pretext for ignoring these new needs. This prospect leaves everyone at an impasse, and the potential beneficiaries—the humanists who need information resources—are the losers. It also puts the library at risk of abdicating its role as the organizer and provider of information for its clientele.

**The Scholarly Record**

In one way it makes sense to approach electronic texts in the humanities like their print counterparts. Books and journals are acquired to support teaching and research. To the extent that electronic texts justify the expenditure of resources, analogous selection criteria are valid. But many of the basic principles and practices of collection development assume the acquisition of an object—paper and ink or media carrying audio or visual information—which typically becomes a permanent part of the collection. A major function of the collection development librarian is to serve as a gatekeeper, identifying that portion of the published universe which a given library chooses to acquire. Selectors routinely perform this responsibility under a number of constraints. These include the availability of funds, the programmatic emphasis of the institution supported, the universe of publications and its accessibility, the number and skills of processing staff, and space availability. An effective bibliographer or selector should be familiar with the subject matter, including trends in research and publishing, knowledgeable about the strengths and interests of faculty and students, well informed about the book trade, and able to manage a budget. This bibliographer is judged, over the long term at least, by the collection he or she built—the aggregate result of specific, title-by-title, decisions made about which books (journals, microfilms, videos, etc.) to bring into the collection, and which to leave out. While many electronic texts can be purchased and acquired like their print counterparts, others, available through networks or through licensing arrangements, do not become a part of the library’s collection of information resources.

The theoretical and practical models developed for the processes of collection management have all shared this fundamental assumption—that the selector was exploiting limited resources to acquire that subset of the published universe most useful in the local
setting. Cooperation with other libraries collecting similar materials, with the avowed intent of avoiding unnecessary duplication and maximizing budgets, has received increasing attention, but the focus has always been the local collection. Present in the background has been the assumption that the cumulative resources of libraries and other repositories of textual information define what becomes the scholarly record. While the definition of what constitutes that record has been expanding in recent years to the point that virtually no source of information is outside the pale, libraries and archives, in the act of selection, effectively limit what enters the record. As Ross Atkinson (1990) points out, "[t]he definition of the record...has always been one of the library's primary social and epistemological functions" (p. 356).

Preservation is another concern. Various dangers to the physical integrity of collections pose risks to the intellectual integrity of the record and are a major reason preservation has received so much attention from collection management librarians. Collection development librarians have tacitly assumed that the information represented in the various media typically acquired by libraries would remain unchangeable and permanent. Atkinson (1990) explores the implications of a system of scholarly communication in which most information, textual and otherwise, being distributed electronically, is no longer immutable in the way print and other media are. He urges that libraries must continue to play a role in the definition and maintenance of the scholarly record. The method he suggests—to move “a carefully selected assembly of graphic utterances from the environment into a library database”—may not be the most efficient or desirable means to achieve the desired goal, but it does attempt to respond to the problem of record definition and preservation (p. 356).

The proliferation of discussion groups or lists on Internet and its affiliates raises some interesting questions for the collection development librarian. In the process of record definition and gatekeeping discussed earlier, there was little attempt to collect, except very selectively, the communications among scholars that took place prior to publication of finished products in peer-reviewed journals and books. The existence of these discussion groups, and the fact that the interchanges appear as text and are sometimes archived and searchable, has led some to wonder what role libraries should play in mediating access to them and preserving their contents. It is the invisible college made visible. Douglas Greenberg, in a paper delivered at the Symposium on Scholarly Communication held at the University of Iowa in November 1991, argues that “this is high-tech cocktail party conversation at a very high level and across very
great distances. Not all communication among scholars is scholarly communication.” Greenberg's point is that only peer-reviewed scholarship, of which the networks presently offer little, represents real scholarly communication, and by implication, that electronic conversations among scholars, however interesting, do not form a significant part of the record and should not be a primary concern of librarians.

**Electronic Texts or Electronic Publishing?**

In discussing electronic texts in the humanities, it is necessary to draw some important distinctions, although these distinctions are not always equally relevant. Much of the interest in electronic texts among humanists so far has focused on those texts which make up the various canons of different fields. In some cases, like the *Thesaurus Linguae Graecae (TLG)*, this canon includes all known surviving texts in a particular field or subfield. In others, the body of texts is selective, though extensive, and the aim may eventually be to achieve some level of comprehensiveness. The *ARTFL* database of French literature and the Cetedoc patristic texts available from Brepols exemplify this kind of collection. In addition, there are many other projects of varying size and complexity and thousands of individual texts around the world which have been created to serve the immediate needs of a specific researcher or research project. In most cases the creator of these texts did not initially plan for electronic distribution of the actual text by way of networks or other means. The aim was typically the study of the particular text in question, the desire to produce a concordance, or some similar purpose. Scholars who note the unfulfilled promise of computer-aided hermeneutics (see below) are thinking of this kind of text.

By contrast, much recent attention on electronic texts, especially among librarians, has focused on the potential of a network-based system of scholarly communication as a replacement for the expensive and cumbersome world of paper and print publishing. In this brave new world, for which the article by Rogers and Hurt (1990) provides one model, the National Research and Educational Network (NREN) or its equivalent becomes a high-capacity pathway for distribution of scholarly information of all kinds under some combination of academic, governmental, and corporate sponsorship. Many view with eagerness the opportunity offered by such a system to wrest control of the scholarly publication from commercial sources. At the same time, it seems to hold out the only chance for libraries to escape from the endless rounds of cost increases which always overmatch budgets.
Under the scenario envisioned earlier, the system would allow for the dissemination of any "text"—e.g., a full-blown scholarly edition of the Greek poet Theocritus, an article-length critical study of his *Idylls*, a monograph about ancient pastoral poetry, or a hypertext commentary on particular poems. This kind of system would of course provide the same facilities for scholarly information in the sciences and social sciences as well. In fact, the economics of publishing in scientific and technical fields make such a system all the more attractive for that literature. The implications of such a future for collection development are profound. It could fundamentally alter the basic assumptions under which bibliographers and selectors have worked since libraries began to build collections.

To date, however, this system is still inchoate, and most electronic information in the humanities has been of a much more specific kind. As befits a collection of fields in which the text provides the essential object of study, most computer-based resources have been either bibliographic or what might be called canonical. A bibliographer can apply the selection criteria typically used in the selection of printed texts to these electronic counterparts. Many new issues arise, but some of the fundamental questions are still valid.

A crucial question, which has validity in both the electronic and print realms, has to do with the quality and authenticity of the text being judged. For printed resources, especially when dealing with often-studied texts, there are a number of ways to discriminate among texts of varying merit. Through reviews, consultation with faculty and subject expertise, the selector analyzes the reputation of the editor; the value of added material, such as an introduction, notes, and critical apparatus; the prestige of the publisher or series in which the text appears; and the care and accuracy with which the text is established. In addition, the work is considered in the context of a long tradition of published scholarship. Most electronic texts of the kind discussed here have, as source texts, printed editions which can be judged on these same grounds. It is not always clear what the source text is for a given electronic analogue, but most electronic texts are based upon an identifiable print counterpart. Their quality, then, may be judged, in part at least, on the merits of the original text. Depending on circumstances, it may be desirable to have a text in electronic format even if it is based on an inferior or flawed source, but the quality of source text matters.

Several electronic publishing projects illustrate different aspects of this issue. The *Thesaurus Linguae Graecae* has generally sought to base its texts on the best available scholarly edition of the work in question. The texts in Chadwyck-Healey’s *English Poetry Full-Text*
Database are derived from the latest edition published in the author's lifetime. In the case of the ancient Greek texts of the TLG, this approach was obviously not an option. But the English Poetry Full-Text Database, which avoids copyright issues by its chronological limitations and its choice of texts, may be providing less than ideal texts in those cases where a modern editor has published a version based on all the available evidence.

**Migne Versus Cetedoc**

The recent announcement of the imminent publication in electronic form of Migne's *Patrologia Latina* and of Cetedoc's texts in the *Corpus Christianorum* series provides a case study of issues that arise in selecting electronic texts in the humanities. These questions concern practitioners in the field as much as librarians, as some sharp debate on various electronic discussion groups (the *Humanist* and *Medieval Text—Philology, Codicology, and Technology* etc.) illustrates. The text of Migne's *Patrologia Latina* is being issued by Chadwyck-Healey, which is beginning to take an aggressive role in developing and marketing electronic resources of interest to humanists. The publication of Migne (as this collection of texts is widely known) was a major event in nineteenth-century patristic scholarship. Migne collected and printed what were purportedly the best available editions of the writings of the Latin fathers from the third through the thirteenth century. In light of the centrality of the church during this period of western European history, this collection became a standard source for medievalists in all disciplines. While many works contained in Migne's corpus have seen modern editions in the twentieth century, for a large number of authors and texts, the Migne edition is the only widely available source. Even when a new text has been edited and published, many scholars, for a variety of reasons, still cite his text.

At the same time, Brepols, a major Belgian publisher of patristics, has announced the publication of a CD-ROM entitled the *Cetedoc Library of Christian Latin Texts*. This collection will contain all the texts issued in the printed series *Corpus Christianorum, Series Latina*, and *Continuatio Medievalis*, more than 250 volumes, along with the works of Augustine, Jerome, and Gregory the Great. The printed series, intended eventually to replace and supplement Migne, presents up-to-date texts carefully edited to the highest standards.

The debate engendered by the announcement of these two publishing projects focused on a variety of issues including cost, the quality of the texts, searching capabilities, and tagging. It is perhaps notable that the greatest passion was reserved for issues of pricing since the Chadwyck-Healey product sells for around $45,000.
(the cost varying according to certain options), and many participants in the discussion found this to be unthinkably expensive. Much of the indignation seemed to be directed rather abstractly at the size of the sum—perhaps a year's salary for many humanists. It looks egregiously expensive in comparison with the very low costs of some electronic texts which have been produced by individual scholars or as a part of publicly funded projects. For example, the CD-ROM from the TLG containing all Greek literature is currently priced at $750 for institutions. In the case of Migne, the publisher has borne all the costs of keyboarding, proofreading, and tagging, as well as the costs of production and marketing, licensing a search engine, and maintaining the requisite corporate infrastructure. Public or privately donated funds have covered the costs for most of these activities for the developers of the TLG. The Cetedoc CD-ROM, on the other hand, is based on the machine-readable texts used in the production of the printed volumes which Brepols produces. In reacting to these issues, Timothy Reuter (1991a), pointing out the differences in the way the two products were developed, suggests that electronic texts will only become more affordable as the industry develops, but this will not happen “until a few of our institutions have shelled out megabucks for the earliest products.” Bob Kraft (1991), another discussant, urges Chadwyck-Healey to take the product “back to the drawing board” and considered “calling for a boycott of the product by the libraries that are being threatened by this offer.” Notable here—beyond an admirable concern for library budgets—is the tacit assumption that libraries will be the agencies acquiring these texts.

Many attacked the quality and accuracy of Migne’s texts and noted that the Cetedoc editions were typically the most recent, and usually the best, texts available for the works in question. Defending the Migne product, others pointed out the value of having in electronic format a collection of texts which had been a standard source since its publication and still provided the only edition of many texts. Michael Sperberg-McQueen (1991) urged that “Chadwyck-Healey will do more for patristics, as well as all the other fields where PL [Patrologia Latina] is used, by reproducing Migne than by waiting another fifty years for better editions.” Another discussant (Gaylord, 1991) worries that his librarian will buy the Chadwyck-Healey product because it is known as a standard work in medieval studies, and will not realize that scholars “who know what they are doing” are using more modern critical editions like those published in the Corpus Christianorum. This lack of confidence in librarians’ understanding of the importance of textual authenticity is perhaps as worrisome
as the assumption that libraries will be the provider of such information.

Topics which received only some attention were tagging, searching interface, and networking capability. The Chadwyck-Healey products are among the first to be published using Standard Generalized Markup Language (SGML) compatible with the standards being promulgated by the Text Encoding Initiative (TEI). It is also being marketed as both a CD-ROM product and on magnetic tape and can be networked for multiple users in the same institution without additional cost. Several participants in the discussion spoke in glowing terms of the search engine for the Cetedoc product, but no one reported on the searching interface for Migne. Finally, one person noted that, whatever the quality of Migne's texts, what was more important was the accuracy with which Chadwyck-Healey had brought those texts into electronic form (Reuter, 1991b).

STANDARDS, SOFTWARE, AND CRITERIA

It is unusual to have a choice between two similar electronic resources like the Chadwyck-Healey and Cetedoc products. With the exception of Shakespeare and the Bible, there are relatively few duplicate texts to choose among. The Cetedoc-Migne debate is instructive because it mirrors, in part, questions that arise in any selection decision between two products that provide similar information, but also because it reflects concerns which could only arise in the online environment. Since others have discussed many of these issues and concerns, the following remarks will focus on some specific topics which seem to have serious implications for libraries attempting to collect electronic resources in the humanities.

In the humanities, particularly in those fields that focused on literature, history, religion, and similar areas where specific texts have great importance, bibliographers and selectors must know how to distinguish important texts from unimportant, authentic from unauthentic, scholarly from popular. Many electronic texts and text collections in the humanities, especially literary texts, are copies or versions of printed counterparts. Often the library already owns the published text which formed the basis of the electronic edition. The primary motive for acquiring the electronic version, as with the Migne and Cetedoc collections discussed earlier, is to provide users with the improved capacity offered by indexing and access software to access and analyze the text.

Several writers have pointed out that a major obstacle for the selector of electronic texts is the difficulty of defining the available universe. The usual selection tools (reviews in scholarly journals, national bibliographies, publishers' catalogs, etc.) do not cover such
resources effectively, nor is there a developed system of publication and distribution. Finding out about electronic texts requires attention to a number of specialized sources of information like the *Humanities Computing Yearbook*, *Computers and the Humanities*, and *Literary Linguistic Computing*. The selector should also be familiar with the work of a number of projects and centers with a special interest in humanities computing, many of which publish newsletters or sponsor electronic forums. Examples from the English-speaking world are the Center for Electronic Texts in the Humanities, the Georgetown Center for Text and Technology, and the Oxford Text Archive. There are also a number of active centers in Europe and in other parts of the world. Gaunt (1990) and Lowry (1990) describe some of these, and other, resources, but no one would claim that their coverage of humanities computing is yet either systematic or exhaustive. Scholars and librarians share this problem. One of the most common inquiries on the Humanist Discussion Group takes the form, Does anyone know of an electronic version of some literary or historical text? Within libraries it is collection development librarians, with their subject and language expertise, who are in the best position to keep current with this chaotic situation and make informed judgments about resources.

Lowry (1990) distinguishes between published electronic texts, defined as those intended for further distribution—and unpublished texts—those not intended for further distribution (p. 16). This distinction, in what has until recently been mostly a scholarly cottage industry, seems largely unnecessary. Many of the sources which now actively distribute their texts or corpora began as projects with limited aims and little or no thought of distribution. In part, it is the microcomputer revolution and the growth of cheap mass storage capacity, in part the growing audience of users that have made distribution feasible. What it means to publish an electronic text, in view of the ease of duplication and dissemination and the informality typical of the process, is not at all clear.

As mentioned, many of the criteria governing selection of printed materials—the intrinsic importance of the text, the care with which it was established, its pertinence to local needs, its relationship to the existing collection, its cost—retain validity in the online environment (Johnson, 1990, pp. 7-9). There are also characteristics unique to electronic texts to complicate the task of the selector. These include criteria related to markup or tagging, to access software, to equipment platforms, to standardization generally, and to incorporation within standard library practice.

One cause of the seemingly chaotic situation with regard to electronic texts stems from the difficulty of finding out what is
available and how to get it. Another results from inadequacies in the existing systems for encoding characters and marking up text. Two recent efforts, Unicode and the Text Encoding Initiative, have sought to address these problems, and their success or failure could have significant implications for the spread of electronic resources in the humanities.

The inadequacy of ASCII encoding schemes to represent all the world's languages is widely recognized. Many feel that, for humanities computing to reach its potential, it is essential to find a single solution to accommodate the multiplicity of character sets and scripts used around the world. The Unicode initiative has emerged as one attempt to meet this need. Unicode proposes a single encoding scheme for all currently spoken languages, including those in non-Roman scripts. Unicode proposes a 16-bit (compared with ASCII's 8-bit) coding scheme, with a capacity of 65,536 codes. Its developers hope that its adoption will make it simpler to write multilingual software and exchange information worldwide. It is no accident that a library consortium, the Research Libraries Group, is one of its many corporate sponsors. Libraries, especially large research libraries, seek to represent in their online catalogs bibliographic information about items in nearly every known language. The failure to date to represent East Asian vernacular scripts (among others) in existing catalogs reflects how far from the ideal are these tools (Elman, 1991). Unicode may not turn out to be the successful solution to the multiscript problem, but it does represent an encouraging move toward standardization and interchangeability. It remains to be seen if centrifugal market forces will inhibit or prevent the acceptance of a standardized basis for multilingual computing, whether Unicode or its surrogate.

In a sense, the Text Encoding Initiative seeks to do for the text what Unicode attempts for the character. TEI aims to produce what some have called a metalanguage—i.e., a coding scheme which will enable texts to be created in a standardized form transportable from one hardware and software platform to another without loss of information about structure and textual features. In an electronic text, many of the usual signs which communicate the structure and organization of the text are peculiar to the computer system under which the document was created—or in many cases completely absent. Based on SGML, the TEI has produced draft Guidelines (Sperberg-McQueen, 1990) with the intent to support data interchange and application-independent local processing and to offer guidance in text creation or capture (p. 1). Funding received from the National Endowment for the Humanities and the Commission of European Communities indicates the potential importance of the TEI for
humanities computing. Libraries have based their collections over the centuries on the fundamental, almost unexamined, assumption of the interchangeability of printed texts. If the TEI succeeds in meeting its goals, it could form the basis for a more coherent and orderly growth in the development and use of electronic texts.

One obvious feature which differentiates an electronic text from a printed one is the necessity for equipment and software. The need for equipment is analogous to the situation for a videorecording or microfiche, but there are greater complexities involved. In addition, the situation is more unfamiliar because, until recently, most selectors were not accustomed to factoring equipment considerations into their decision-making process. Electronic texts in themselves have limited utility. To manipulate these texts requires software that searches, displays, and otherwise manipulates the text in ways that serve users' needs. Some text files are only accessible through tailor-made software, while others may be used with a variety of packages. But whatever the interface, the utility of a given text file might depend more on the availability of Micro-OCP, FolioViews, or Wordcruncher software than on the quality of the text itself. The quality and accuracy of this software must receive greater attention from scholars and librarians. It is essential that it really do what it claims to do, but there are fewer analogies to the world of printed resources than in the judgment of electronic texts themselves. This dependence on unfamiliar equipment and access software imposes new requirements on both the selector and those who catalog and provide service for such resources.

VISIONARIES AND LUDDITES

Greenberg, at the Iowa Symposium on Scholarly Communication, described two extremes in the scholarly community, between which, by implication, fall the vast majority of working scholars in the humanities. The visionaries, like many librarians who have eagerly embraced technological solutions, "believe that the emerging technologies signal a radical change in every aspect of scholarly communication" and are impatient to get on with the transformation. At the other extreme, the Luddites are "unalterably wedded to print" and have no use for online catalogs much less online texts of Shakespeare. The visionaries need no convincing that the future of scholarly communication in the humanities lies with computer-based technology. The Luddites are probably immune from persuasion for the most part, but when they are influential senior professors, their opinion carries considerable weight. At the same conference, in another context, a presenter suggested that the only
solution to the barriers thrown up by Luddites, especially in positions of authority, was to bide time until they retire or die off.

One of the great obstacles facing the academic librarian eager to provide access to electronic texts, especially in some humanistic fields, is the hostility of the Luddites and the indifference of the silent majority in the middle. While a small and growing band of enthusiastic visionaries does exist, the numbers, if not the intensity of their interest, are small. As Erwin Welsch (in Bailey & Rooks, 1991) recently pointed out, a comparison of the number of participants in the Humanist Discussion Group (over 1,200), a well-established, international moderated list server for humanists, to the number subscribing to PACS-L (over 3,000), a list server mainly for librarians, illuminates the degree of difference between levels of librarian and faculty interest in electronic communication (p. 30).

Most scholars are neither visionaries nor Luddites and it is this large and largely indifferent group that must be convinced of the efficacy of technological solutions to the problems of scholarly communication. When confronted with the likelihood of seeing fewer books and journals in order to pay for sometimes very expensive electronic resources, faculty in this group understandably balk. They urge that libraries should not be experimenting with new electronic gadgetry when they are having so much trouble responding to the existing demand for print. This line of reasoning is especially resonant when libraries are gutting subscription lists and acquiring fewer and fewer monographs.

Their resistance produces a quandary for the librarian. On the one hand, many have articulated a clear responsibility to lead the way in pointing to the benefits of broad access to electronic texts and helping the uninitiated find what they need and learn how to get it and use it. On the other hand, there is the risk of alienating the goodwill of strong library supporters by getting too far ahead of them, especially when they see human or material resources diverted to this end. Yet it would be irresponsible to ignore the potential which computer files have for the processes of scholarly communication and the analysis of text and image. Besides, there is the ever-present risk that other agencies may expropriate the role of libraries. If this is the case, librarians must continue to build alliances with those faculty who are users of electronic resources and work to convert the nonbelievers through education, demonstration, and experimentation.

One reason for the indifference of this silent majority is the absence of clear evidence of the benefits of a new technology based order. Faculty at most colleges and universities, at least in the United States, have eagerly embraced the microcomputer and some of its
associated software, chiefly word-processing systems, but few have ventured far beyond. Even though many scholars of language and literature study texts in ways that could benefit from computer-aided analysis, they have not exploited this potential for a variety of reasons. One has been the lack of easily available texts and of easily used and widely available software. Many are simply unaware of the kinds of questions that can be answered by electronic texts or are reluctant to spend the time required to learn how to pose such questions through the computer. Still, as Eric Dahlin (1991) points out, "humanities computing is one of the fastest growing fields of computing at present" (p. 4) and this rapid growth promises to speed the rate of acceptance of technological approaches to scholarly work in the future. But there remain many inhibiting factors.

Observers have often noted that the scholarly reward system—i.e., the tenure and promotion process—does not encourage the creation of humanistic databases, the development of software to manipulate them, or the publication of scholarly research based on electronic texts. At the same time, the market for such products in the humanities has so far been too weak to support the kind of commercial investment required to produce scholarly tools. At a "Computer Files Workshop" sponsored by the Research Libraries Group on January 11, 1991 in Chicago, Mark Olsen, assistant director of the Center for Information and Language Studies and the ARTFL project at the University of Chicago, maintained that there has not been a shift in perspective as a result of computer-based resources in the humanities as there has been in the social sciences with its computer-based use of quantitative information. He noted that the increase in the number of humanities databases does not seem to have produced a proportionate increase in the amount of research based on them. Faculty often report that, while their interest in creating and working with electronic information sources is keen, their mentors urge them to produce traditional scholarship for publication in mainstream journals if they want to be eligible for tenure. At present, most research based on electronic resources is published in marginal journals, which count less when tenure review time approaches. Certainly contributions to most online discussion groups and even to the few refereed electronic journals that do exist do not carry the prestige of an article appearing in a leading print journal.

Olsen and others have suggested that the problem is more than simply a matter of insufficient credit awarded to those working in the area of humanities computing. In an announcement of a session held at the 1991 Modern Language Association convention appears the summary of a paper to be given by Olsen which seems to develop
these themes. According to the summary (McCarty, 1991), Olsen argues that

the computer has not had significant influence on literary studies because old models remain dominant. He emphasizes that the primary benefits of the new tool come from asking new questions with it, but that first we must construct an appropriate model of computer-assisted research based on what the machine is particularly good for. He notes that there has been little interaction between critical theorizing and computer programming, to the detriment of both, and recommends concentrating on the specific theoretical and methodological issues.

Thomas N. Corns (1991) comes to a similar conclusion when he notes that "there is no substantial body of achievement in the field of computer-based literary criticism in English studies, and a discipline that has hardly begun can scarcely be a discipline in crisis" (p. 127). He supports this pessimistic conclusion by an analysis of papers published in the specialist journal Literary & Linguistic Computing (LLC) and several nonspecialist periodicals. Even in LLC (and its predecessors) the amount of computer-based literary analysis has been fairly small, and gotten smaller over time, while in a limited sample of four mainstream journals only one article (a computer-based analysis of prose style) appeared in the entire decade of the 1980s. Corns recalls that previous acknowledgments of the failure to produce significant results had found reason for optimism in future potential. In reaching his conclusion, Corns, like Olsen, blames the lack of results on deficiencies in the theoretical underpinnings of computer-aided analysis. Corns suggests that the concept of intertextuality can provide a useful theoretical base for computer-assisted work in which large databases of properly encoded historical texts help provide to students and scholars the intertext that would have been available to contemporary readers. It is certainly ironic that Corns's response to the problem of unrealized promise, however valid, is another appeal to the potential of the future. If librarians have a role in addressing this theoretical failure, it will be to act as facilitators providing scholars with the resources necessary to develop and test new theoretical models.

At the same time, there is evidence that technology can change the way scholars do their work. Theodore Brunner, director of the TLG, claims that this project provides "a prime example of how a humanities discipline has changed fundamentally for the better in consequence of the acceptance of technology" (Watkins, 1991, p. A24). Perhaps because the field is defined by a finite and relatively fixed set of texts, perhaps because it began before many other projects, perhaps because of the low cost of the CD-ROM version of the database, the TLG has made a significant impact on the kinds of questions scholars in classics can ask. But many of the problems
which the TLG was able to solve on the way to transforming research in classics are not as tractable for other areas of study.

CONCLUSION

The preceding paragraphs have sketched some of the issues which must concern the collection development librarian in determining the role of computer files in building collections as well as in making particular purchase decisions. While technical concerns and questions about standardization and interchangeability demand attention, the selector of electronic resources in the humanities must start with a knowledge of the subject matter, the methods and issues of the discipline, and the needs of the local program. This knowledge, equally important for selection in any format, is all the more necessary when selecting in an area marked by constant change and ambiguity in which personal knowledge and informal networks are often the best source of information. This is an argument for training the subject specialist in the requisite technical knowledge rather than seeking to educate the technologically adept in the appropriate subject disciplines.

The effects of electronic texts in the humanities are likely to be profound, and the strength of the impact will surely increase at a geometric rate in coming years. Many of the challenges facing librarians, and especially collection development librarians, will be technological and economic. But the greatest challenges will be social and cultural as selectors face the need to transform their own basic assumptions and to take a role in changing the ingrained views of faculty. It will be essential to make alliances with those visionaries already converted by the promise of computer-based models and work with them to demonstrate the validity of these models to an unconverted and uncaring majority.

REFERENCES


Reuter, T. (1991b). Further responses on Migne. *Humanist Discussion Group*, 5(324). (Electronic Discussion Group, e-mail: <humanist@brownvm.bitnet>)


Sperberg-McQueen, C. M. (1991). On Migne. *Humanist Discussion Group*, 5(0311). (Electronic Discussion Group, e-mail: <humanist@brownvm.bitnet>)


User Instruction Issues for Databases in the Humanities

MARA R. SAULE

ABSTRACT
In order to teach humanists how to search effectively the variety of information technologies available to them, librarians should reassess traditional instruction techniques. Teaching methods must be considered in view of the special characteristics inherent in humanities disciplines, humanities databases, and the humanist's own attitudes and learning styles. This article analyzes the attitudes that humanistic students and scholars typically display toward technology, and places those attitudes and behaviors in the context of the humanist's information needs and available information formats. A discussion of concepts, topics, and skills which should be taught to humanists for effective computerized literature searching is followed by a consideration of various instructional approaches.

INTRODUCTION
Until recently, bibliographic instruction for humanities scholars and students was fairly straightforward. Beginning students were shown how to use and interpret the library catalog and the major printed index in a particular humanities discipline, such as Historical Abstracts or The Modern Language Association (MLA) International Bibliography. Humanities scholars generally knew which sources served their specialty best, having set their own patterns of research in graduate school, and rarely asked for help or brought their advanced students to a librarian for library instruction. Researchers felt they were the best ones to teach the next generation of scholars about information sources and research methods in the humanities.
Since the growth of end-user computerized literature searching, scholars, students, and librarians alike have had to face the special challenges presented by electronic information sources. Issues of question analysis and selecting the appropriate databases for particular research questions, understanding command and search language protocols, interpreting search results, and finding cited materials are increasingly difficult to address as the number, scope, and types of databases grow and as the user population becomes larger and more dispersed.

New publishing and information technologies offer greater research possibilities across a spectrum of disciplines, with much of the greatest recent growth being in the humanities. Local, national, and international networked databases, databases created and shared by individual scholars, machine-readable texts, graphics and audio databases, and bibliographic databases—all in a variety of technological formats—converge to give the scholar and student a remarkable array of information on which to base study and research. The scholar's workstation, providing information beyond the library's walls, is now a reality for some. But, in order for researchers and students in the humanities to be able to use this confluence of technologies successfully, librarians need to design effective, creative, and attractive instructional programs—and overcome some of the instructional challenges inherent in dealing with humanists.

Librarians giving instruction must understand the unique characteristics of both humanistic research and of the humanist in order for instructional programs to be most effective. One would expect researchers and research methods in discrete disciplines to differ, just as the structure and information patterns of the disciplines differ. Assessing both individual and discipline-specific user characteristics is essential for designing effective instructional approaches. Linda Brew MacDonald (1991) outlines six questions that the instruction librarian should ask in order to determine learner characteristics for teaching electronic information sources: What is the educational level? What common background do learners have? Is there a preferred learning style? What are learners' attitudes toward automated sources? Are learners motivated? and, Can the instructor adopt the learner's perspective (pp. 32-34)? While an advanced educational level and background in humanities scholarship may be easily assessed and can provide a common base of understanding on which to build user instruction, humanists' cautious attitudes toward automation and their lack of substantive motivation for using technologically based sources directly affect which teaching methods will be successful.
THE DIFFERENCE IN THE HUMANITIES

The central difference between research in the humanities and research in other disciplines is the importance of the text and of the analysis of language in all aspects of humanistic scholarly and creative pursuits. Although individual humanities disciplines may be viewed as content areas not unlike scientific disciplines—such as art history or archaeology—the underlying unifying theme for humanists is that “the humanities have something to do with texts and their longevity” (Baron, 1985, p. 251). It is this reliance on the text that dictates many of the attitudes that humanists have about computers and alternate nonprint versions of texts and thus about the language used to search computerized databases.

In addition to serving disciplines in which the study of texts is preeminent, humanistic research may be defined as “a method of analysis, as a way of looking at a subject matter” (Baron, 1985, p. 251). This method generally involves a great deal of judgment and attention to nuance which excludes quantification and “logical clarity,” approaches not generally found in scientific research: “Humanistic knowledge is more open-ended, requiring complex philosophical and aesthetic judgments, and their disciplines are not normally organized in the hierarchical fashion of the sciences” (Atkinson & Walker, 1989, p. 24). The lack of hierarchical structure in the humanities appears to be directly opposed to the binary structure of computers and databases.

Humanities research also has interdisciplinary implications, even though many humanities scholars do not reach beyond sources in their own discipline. Margaret Stieg (1981) discovered that historians tend to follow established research patterns and that their knowledge of a wide range of sources is limited (p. 551). Nonetheless, a research question in literary history of ten may include concerns closely related to political history, economics, philosophy, and potentially the entire range of humanities disciplines from musicology to archaeology.

How the humanities differ from the sciences and social sciences may affect how humanities scholars view technology. The centrality of the text, the analytical approach, and the interrelationships among the content areas all work against the humanist accepting technology into the research process.

ATTITUDES TOWARD TECHNOLOGY

Humanists, as scholars and teachers, are often characterized as unwilling to embrace new information sources and technologies. Many have theorized about the reasons that some humanists are skeptical regarding the computerization of information and texts. Scott D. Stebelman (1981) conjectures that the reason humanities users
view the computer as just "another inscrutable and potentially demeaning machine" is rooted in childhood and adolescent negative experiences with a variety of machines (p. 444). He also points out philosophical reservations that some humanists have about computer use: "Because the computer can do so many things that we cannot, such as process large amounts of data quickly and dispassionately, humanists fear that computers will become the psychological prototype for the new man or woman" (p. 445). Although Stebelman's observations may be overly psychoanalytical, many humanists do, indeed, view computers and computer-aided research differently than their counterparts in the sciences or social sciences.

In fact, B. J. Rahn (1987) explains that it takes humanists longer to learn computing skills "because they don't make certain kinds of automatic assumptions that pure scientists and social scientists do" (p. 59). Rahn also points out that humanists "lack the conceptual framework and language common to professionals in these other fields" (p. 59). Language and its clear use, which is so important to scholars in the humanities, is often "abused" by computer professionals in jargon-laden documentation and discussion:

> a humanist who interfaces with cybernetic processing is accessing a miniverse containing parameters of linguistic inelegance that possess the undeniable potential of arousing various negative responses ranging from a certain degree of suspicion to outright anger. (Crawford, 1986, p. 570)

Given the inscrutable terminology and diction of many computer manuals, it is no wonder that humanists are put off by the language used by members of the computer and information technology industry—including librarians.

Naomi S. Baron (1985) focuses on some of the specific concerns that humanists have about computers and technology. She outlines three essential fears that humanists display regarding computerized information sources. First, humanists are concerned about the elimination of nuance and judgment inherent in humanistic research that may come with over-reliance on electronic, mechanized analysis: "[W]ith the increased presence of computers in higher education, students may come to believe that there are no shades of grey worth worrying about in human affairs" (p. 259). Baron even implies that, because of the judgment and interpretation required in humanities disciplines, students may gravitate instead to courses and disciplines (such as chemistry) in which the logical approach to the discipline—"yes/no" binary logic—approximates the computer's own processing systems (p. 259).

Several theorists agree with Baron's (1985) second observation concerning the reasons that humanists are skeptical about
automation: that computers signal the potential end of the book, "that computers will violate our notion of the centrality of the text" (p. 260). This fear relates to the importance attributed to handwritten or printed texts in humanities disciplines. The manner in which humanists do their research often depends on the fortuitous discovery of connections between ideas and words found through browsing and "stumbling across" information (p. 259), whether it is by examining the card catalog, scanning titles of books in the stacks, or leafing through a book.

Marilyn Schmitt (1990) echoes this concern in addressing the negative ramifications of using intermediaries to search bibliographic and textual databases: "What will happen in this environment to the essential role of browsing, of wandering until you find what you are looking for, and, more important, what you did not expect to find" (p. A44)? Some humanities scholars feel that one cannot browse through a computer file with the same results as browsing through tangible cards or pages. Thus, they may think that computers will be counterproductive to successful research in the humanities. The "hit-or-miss techniques" used by humanists may be inefficient by librarians' standards of information retrieval but are nonetheless ingrained in established research patterns (Stern, 1985, p. 163).

Finally, Baron cites perhaps the greatest fear humanists have about the computer: the fear that it will render the humanities themselves irrelevant, and that we will all come to ask, Who needs the humanities (p. 259)? The corollary question, of course, is Who needs humanists? particularly humanists who do not use or exalt the computer? It is the humanist's own feeling of inadequacy in dealing with new technologies and new information publication and storage formats that is reflected in this deep concern. Baron implies that this concern is fed also by the prestige that science and the scientific method have been given by the public and by the larger scholarly community (Baron, 1985, p. 252). The perceived threat to the future of humanistic research and the rise in prestige of science can be traced to the modern valuing of technology over the humanities as an essential part of economic progress.

Other philosophical and practical issues also affect humanists' attitudes toward using computerized databases. One of the most often cited concerns is that of cost. Stebelman (1981), Mackesy (1982), Stern (1988), and Lehmann and Renfro (1991) all point out that humanists are put off by the idea of paying for information. Humanists often feel that association memberships should include access to databases, such as the MLA International Bibliography (Mackesy, 1982, p. 150).
Furthermore, humanists have lesser research money available to them through university or grant funding than their counterparts in other disciplines.

Humanists also resist being restricted to the location of a machine in order to do their research. Lehmann and Renfro (1991) found that connectivity, "getting the scholar to the resource with a minimum of effort on his or her part" (p. 411), was a key in overcoming humanists' negative attitudes toward technology. In addition to the need for technical assistance in using computers and networks, many humanists do not have the time or patience to invest in learning computerized literature searching.

Another interesting impediment to searching is discussed by Sandi Kirkham (1988). She observes that the lack of librarian-searchers in the humanities may exacerbate the humanist's reluctance to use computers (p. 98). Compared to the number of business, trade, and science librarians, there are fewer humanities librarians skilled in providing access to the range of information technologies now available in humanities disciplines. Furthermore, Kirkham indicates that some who go into humanities librarianship do so in order to get away from information technology (p. 98). Humanities librarians, then, and the researchers whom they serve, may work together to keep technology at a distance from humanities research. It is the responsibility of humanities librarians to learn about appropriate databases and technologies and, by overcoming their own fears, help their humanist patrons as well.

Although the attitudes, fears, and concerns that Baron and others ascribe to humanists may apply to many in humanities disciplines, these attitudes are becoming less pervasive as increasing numbers of scholars use word-processing programs to write their own books and articles, and as many humanists are using computer programs to analyze quantitative information (Stern, 1988, p. 162).

Concerns about the future of the text persist, however, and many humanists who are computer users still rely on manual methods for research and analysis. Stern (1988) observes that humanists even feel some sense of "satisfaction with comfortable and familiar, if haphazard and inadequate, research methods" (p. 163).

**Needs Versus Technology**

In many respects, humanists' information needs are not best fulfilled by information technology or even by librarians. Like the structure of humanities disciplines and humanistic research itself, the content, language, and methods of access used to search computerized databases differ significantly from those in the sciences.
Content

The basic differences between what computerized databases contain and what humanists need contribute to the humanist's skepticism about the effectiveness of computers for humanistic research. Stephen Lehmann and Patricia Renfro (1991) point out that "the most fundamental distinction between researchers and librarians is perhaps the emphasis on content by the one and on access by the other" (p. 410). Librarians are most interested in how information is organized and retrieved and thus see the inherent value of online systems; the humanist, on the other hand, "after checking for his or her own publications, looks for that seminal work published in Belgium in 1937 and wonders what the use is of a system that does not include it" (Lehmann & Renfro, 1991, p. 410). Database content concerns center on the number of suitable subject files, the general lack of primary sources either cited or provided online, and the reliance of bibliographic databases on current journal literature rather than retrospective journals and monographic coverage. Stebelman (1981), Mackesy (1982), Stern (1988), Atkinson and Walker (1989), and Lehmann and Renfro (1991) all have pointed out the discrepancies between what is available online and what is needed by humanists for their research.

Although the number of humanities databases is growing—in full-text, bibliographic, and data formats—many scholars are unfamiliar with the range available and are unaccustomed to using any sources other than the standard index in a field. For example, while literature scholars have available to them databases other than the *MLA International Bibliography* online, they have relied on the printed *MLA International Bibliography* nearly exclusively for their own research and, thus, often do not expand their online or printed sources to include *Arts and Humanities Citation Index* or *Humanities Index*.

Humanities scholars also need to find primary and book materials from which to work. Online sources rarely include citations to any primary sources, much less the often obscure and unstudied sources that a humanist might need. Related to the general lack of primary materials is the lack of references to monographic material, particularly retrospective material. Atkinson and Walker (1989) indicate that "humanistic scholarship has strong historical dimensions, such that books are at least as important as journal material, and retrospective coverage even more vital than currency" (p. 35). Lehmann and Renfro (1991), in studying the use of the RLIN database at the University of Pennsylvania, found that the availability of references to older monographic literature in the RLIN database greatly enhanced its usefulness to humanities researchers (p. 411).
In fact, both the RLIN and OCLC databases have special appeal for humanities researchers because they include citations to older materials, monographic items such as books and pamphlets, and primary sources that current bibliographic databases do not include.

One of the most basic characteristics of humanistic research is the need to use secondary and primary sources that reach back in time beyond what is commonly available on computerized systems. Humanists are much less concerned with currency than they are with retrospective research. While earlier scientific results may be superseded by current research, humanities research can stay vital for decades (Mackesy, 1982, p. 149). The lack of retrospective online information has changed little since 1982 when Eileen Mackesy observed that, "of the databases currently available, only Philosopher's Index has available online all the material that has also been published in printed form" (p. 149). Even though critical databases, such as the MLA International Bibliography, now have expanded their backfiles considerably, some humanists dismissed their usefulness early on at a time when those databases only covered a few recent years and are still skeptical about searching those databases again.

The lack of historical coverage in online databases will be eased over time as more retrospective literature is included in database files. Regardless of how far back databases eventually reach, however, the issues of full-text primary source availability might only be addressed by the increased building of personal textual databases by individuals and individual institutions. As Lehmann and Renfro discovered, database content is the single most significant determinant of database use—surpassing connectivity, user-friendliness, and cost.

**Language and Access**

The differences between how humanists use language and how computers retrieve words and citations create significant conflicts for humanities scholars. Mackesy (1982) observes that "computer searching...forces scholars who work with ideas and concepts to define their language carefully in a way in which they are not accustomed" (p. 150). The ambiguous language used in article titles, language which is sometimes "cute and meaningless" (Mackesy, 1982, p. 150), causes particular problems for searching bibliographic online files in which little information beyond the title is provided.

Furthermore, humanities articles can be difficult to abstract since they often discuss a range of time periods, historical and literary figures, named persons, trends, and topics—all of which can be referred to by a variety of acceptable terminology that may or may not appear in the title or abstract (Stern, 1988, p. 162). Stebelmann
(1981) gives the example of the literature scholar trying to research character development in the Victorian novel: the searcher may need to enter into the computer the names of all major characters in all Victorian novels and indicate the Victorian period using both the term "Victorian" as well as a range of years. Stern (1988) points out that germane dates are not always discussed in articles and that imprecise terminology is often used (e.g., "medieval," "19th-century," "early modern") (p. 162).

It is not surprising that many humanists feel that scanning the printed MLA International Bibliography may, in fact, be easier than trying to outsmart the computer's terminology. While the use of controlled vocabulary can alleviate some of these confusions, inexact humanistic language and discipline structures prevent controlled vocabulary searching from being entirely accurate.

Stebelmann (1981) neatly summarizes the three major issues surrounding the vocabulary used in humanistic research: "[T]he vocabulary is softer and less easy to control or predict than in other disciplines; relevant research is often subsumed under broader or narrower concepts than the user anticipated; language limiting is nonexistent in a key data base, as is effective period limiting in others..." (p. 449). In other words, the language of humanities scholarship comes in direct conflict with the language and search structure of computerized databases.

**WHAT TO TEACH HUMANISTS**

Given the nature and structure of humanities scholarship, attitudes of humanists toward technology, and the information needs of humanists, what should librarians attempt to teach humanists about computerized literature searching in order to make their research more efficient?

**Establishing Need**

Before librarians can teach anyone anything, they must establish a need for instruction in the potential searcher, particularly in humanities scholars who may not see the value of changing their teaching or research patterns to include computerized databases. This is, of course, part of the essential marketing mission of instruction librarians. The common use of demonstrations, newsletters, library signage, and word of mouth can all work to attract humanities scholars and students to computerized literature searching. Educating humanists about which databases are available in their field, including special attention to type of material contained in the databases and range of years covered, can help to overcome some of the concerns about database content that humanists express. Special attention
should be given to databases which both undergraduate and graduate students might use effectively for their own papers. In this way, the researcher too can learn how database searching improves the quality and quantity of research.

**Concepts and Skills**

Once humanists have found a research need for using information technology, librarians must decide what to teach humanities scholars and students. On the one hand, the humanist could be taught only searching skills that are based on an analysis of a system's particular functions. The searcher can be taught which keys to press in a specific system to achieve a desired result. Or, librarians could teach concepts—the general principles of database construction, selection, searching, and evaluation of results. Giving scholars this conceptual framework provides the basis for understanding any database or any computerized information retrieval system. Teaching concepts such as information structure and research strategy will help humanities users to overcome fears about technology use and to approach new retrieval systems with confidence and curiosity.

Librarians, and computer system educators in general, are recognizing the importance of teaching concepts over skills. Nancy Ide (1987) refers to teaching concepts as the "Holistic View" of computer instruction, which she defines as:

> the Holistic View is most concerned that the knowledge, concepts, and skills taught in computers and the humanities courses provide adequate understanding of the formal methods underlying computer implementation, as well as substantial foundation for the acquisition of new knowledge and skills that may be relevant to the field in the years to come. (p. 211)

The "Expert Users View," on the other hand, seeks "to familiarize students with existing tools and provide sufficient skills to enable them to automate phases of fundamentally traditional humanities research" (p. 211). Ide feels that too many humanities computing courses focus on the Expert Users View rather than the Holistic View (p. 211). Both approaches are important, and users should have the option of getting the broad view of computing in the humanities in addition to practical search training.

**Key Concepts**

In order to understand how automated information retrieval systems work, humanists need to understand several key concepts in database structure and search software design. To address the humanist's unique concerns for history and context, the librarian should share an overview of the history of computing with searchers.
Tannenbaum and Rahn (1984) explain why this understanding of history is so important:

[Humanists] should...know something of the history of the computer—which is really intellectual history—so that they can appreciate the significance of its invention in the development of Western civilization and be able to assess, in part at least, the enormous cultural impact of the computer on society as well as gain some vision of the computer's implications for the future. (p. 19)

Thus, the humanist can place computing in a historical context and set the philosophical basis for learning more about computer use.

The practical concepts that humanist searchers, like other searchers, need to understand begin with what is meant by the term database, particularly as it applies to their disciplines. Elements that should be specially addressed include the range and variety of databases available to them, the subject areas and types of materials covered, ranges of dates covered, relationship of the computerized database to any print counterparts, and research situations in which the databases are appropriate (Lippincott, 1987, pp. 186-87).

A searcher also needs to understand how a database is constructed and how it might parallel a familiar printed source. The basic unit of a database—whether it is the bibliographic record or the text of a poem—should be explained carefully. Record structure, including the concept of fields, should be the focus of general database orientation. It is particularly important to explain to humanists the differences in searching full-text, data, and bibliographic databases.

**Search Strategy**

Humanist researchers should be encouraged to construct a careful search strategy. Since some searchers may be skeptical of the computer's ability to help in their scholarly work, attention to a search plan that is likely to get satisfactory results is critical in the early learning stages.

At the heart of a good search plan is thorough analysis of the research question. No matter how antithetical to the novice humanist searcher the idea of "thinking" like a computer might be, the librarian should lead the scholar in identifying key terms and relationships in the research question, and in listing synonyms or related words for these key terms. Attention to different ways of expressing historical or literary time periods, movements, and concepts will help the search be more relevant. The concept of controlled vocabulary and the use of database thesauri may be introduced to facilitate searching.

In addition to analyzing the research question, the searcher must group common elements of the research question into sets and be able to manipulate those sets effectively using Boolean operators. Although set theory and Boolean logic is not necessarily easy to
understand, humanists will expect computer logic to be straightforward. Crawford (1986) observes that “a humanist, no matter how uninformed, is likely to believe that the logical operations involved in reading a bibliographic database should appear simple, resembling those required for reading a card catalog” (p. 571). The current proliferation of machine-readable texts, such as the ARTFL (American and French Research on the Treasury of the French Language) and Thesaurus Linguae Graecae, places special demands on the ability to navigate through large amounts of text using Boolean and free-text searching.

The final element of search strategy construction is database selection. The librarian should spend ample time teaching the humanist how to match the research need with the appropriate databases. Databases, such as RLIN and OCLC, provide the retrospective coverage of monographic and other publication formats that humanists need. Public access to these systems should be made available to researchers; special instructional materials should address the unique characteristics of these search systems. Since humanities disciplines—and thus many humanities research questions—are interconnected, multiframe searching should be explained. In fact, Atkinson and Walker (1989) discovered that, for humanities searchers, one system and one database does not lead to the most effective search results (p. 29). Unfortunately, humanists often are unwilling to search databases with which they are unfamiliar.

Middlebury College librarians recently experimented with the WILSONDISC demonstration CD-ROM disk to teach cross-database searching and thus teach a broader view of the research process. The WILSONDISC demonstration disk contains six months of sixteen different databases. Working with librarians, tutors in the college writing center searched one subject through several of the databases on the demo disk to show students writing research papers the interconnectedness of databases and to give them an understanding of the interdisciplinary nature of some areas of study (MacDonald, 1991, p. 15). This same multiframe, cross-database searching approach can be used with more advanced humanities students and with humanities scholars using advanced research databases such as Arts and Humanities Citation Index, MLA International Bibliography, PsycLIT, and Historical Abstracts.

Searching Skills

Of course, a successful search is based not just on the searcher’s conceptual understanding of information retrieval systems. Once the humanist has a solid foundation in database concepts and strategy, he or she needs to be shown the technical skills of searching. The
commands to begin searching, to execute a search, to combine and truncate terms, to view and print results, and to get help differ with each system and thus must be addressed on a system by system basis. Lippincott (1987) lists the specific features that a searcher should be shown for each system: logging on and off the system, including system security; keyboard mechanics; and input and output procedures (p. 189).

Teaching the technical aspects of searching necessarily must include telecommunications issues. In addition to remote access to local catalogs and databases, a variety of bibliographic and full-text databases for humanists are now available through Internet and other national and international networks. Lehmann and Renfro (1991) discovered that issues of connectivity, including the understanding of network connections and the use of hardware and software, were second only to database content concerns as impediments to effective searching (p. 411). Librarians can help the technologically hesitant humanist to learn how to make connections from his or her office, classroom, or from wherever the information need is felt.

In addition to system-specific and technical searching skills, humanists also have expressed a desire to learn other types of computing skills, such as the use of computer graphics and statistical packages (Estabrook & Hunter, 1987, p. 69). There has been much discussion outside of the library literature about the specific computing skills and knowledge of applications software that humanists might need. Denley (1990) outlines four kinds of teaching that fall within the purview of those involved in humanities computing: word-processing skills; basic computing skills; discipline-specific computing skills; and discipline-specific computing skills with the help of a computer (use of computer-aided instruction, expert systems) (p. 19). Further specific skills that the humanist researcher should learn include relational database analysis, modeling and simulation, data acquisition, process control, and computer-aided instruction (Tannenbaum, 1987, p. 221).

As humanists become involved in creating and managing their own databases of citations or text, many may want to learn the principles of programming and the applications of computers to disciplines outside the humanities. Tannenbaum (1987) cites four fundamental reasons for teaching humanists how to program:

a) to understand the potentials and limitations of software; b) to make simple modifications to programs to meet their special needs; c) to communicate effectively with a professional programmer working with them on a project in their discipline; and d) to evaluate software for possible use in their discipline. (p. 218)
While most librarians are not qualified to teach specific programming skills or applications software, they should be aware of the humanities-specific resources available to scholars if they should choose to learn more about computer programming and applications software.

**How to Teach Humanists**

Ideally, a librarian faced with instructing humanist researchers or students in computerized literature searching, would have the inspiration, time, and resources to teach motivated learners concepts as well as skills, technical access to systems as well as some programming and applications software. Learners would be exposed to the range of information technologies available in the humanities disciplines and would emerge from the course familiar with bibliographic as well as data files and full-text databases. Unfortunately, humanists generally are not willing to invest such time and effort into learning computer searching skills, nor does the library generally have the time or resources to provide in-depth instruction.

Anita Kay Lowry (1990), however, has designed and taught what may be the ideal course for humanities students at Columbia University’s Graduate School of Arts and Sciences: “Research in the Humanities: A Practicum on Resources and Methods.” The course is comprised of eight two-hour sessions and taught in a small group seminar. The eight sessions cover: (1) introduction to library and archival research; (2) reference tools and services; (3) introduction to computerized databases for bibliographic research; (4) searching computerized bibliographic databases; (5) organizing scholarly information; (6) scholarly communication and publishing; (7) machine-readable texts, part 1; and (8) machine-readable texts, part 2 (p. 27). This dynamic course for graduate students allows Lowry to teach both skills and concepts in addition to discipline-specific databases and computing applications.

Most libraries, however, cannot offer such extensive instruction. Instead, the same one-hour bibliographic instruction session available to scholars and students in all disciplines often must suffice for humanists as well. While standard library instruction techniques can be used with humanists successfully, there are, however, several teaching approaches that work particularly well with humanist learners and address specifically the attitudes and behaviors that humanists often display.
Cost

Several librarians have pointed out that the most immediate obstacle to the use of computerized databases by humanists is that of cost. Both Stebelman (1981, p. 448) and Krausse and Etchingham (1986, p. 92) found that subsidizing literature searching for the humanist greatly facilitated database use. Overcoming the humanist's opposition to service and searching charges opens the way both philosophically and practically for the humanist to be able to search without financial burdens.

The Personal Approach

Once concerns about cost are addressed, the skepticism that humanists display about technology assisted research can be eased most effectively by using personal one-on-one approaches to showing technology to researchers. Librarians at the University of Rhode Island's Computer Access Service (URICA) found that humanists used their librarian-mediated search service much less than scientists. In order to attract more humanists to URICA, librarians made telephone calls to faculty who were visible library users, interlibrary loan service users, and bibliographic instruction users. The calling campaign was "instantly successful" and humanists increased significantly their use of the URICA system (Krausse & Etchingham, 1986, p. 92).

Demonstrations

Stebelman (1981) also highlights the need for personal and persistent marketing techniques to attract humanists to computerized database searching and to instructional sessions. Providing demonstrations of database contents and capabilities at the humanist's own department or office is the most effective means to educate humanists on the potential use of computerized databases to their teaching and research:

I cannot overstate the importance of actual on-line demonstration to humanities users; they are more resistant than most groups...; they often know very little about computers; and because they know so little about computers, they will not benefit much from posters or brochures that talk abstractly about an activity that they cannot even begin to visualize. Seeing is believing, and unless they see for themselves, few will believe.

(p. 449)

Demonstrations given in department lounges and other familiar and comfortable settings allow the humanist to see and learn database searching without being threatened by a strange environment.

Demonstrations and instruction can also happen effectively and in a nonthreatening manner at the point of need, most specifically at the reference desk. Librarians staffing the general or departmental reference desk should be sensitized to the special concerns of humanist
library users and searchers. The special relationships that individual librarians have established with individual humanities faculty can be used to enhance receptivity to computerized database searching.

**Formal Sessions**

In addition to informal demonstrations, the librarian may have the opportunity to provide formal laboratory instruction to humanists. Tannenbaum and Rahn (1984) found that team-teaching works well with humanist learners, particularly when "a computer scientist who has extensive experience in humanities and social science applications [is] paired with a humanist who has considerable professional experience using computers" (p. 22). Furthermore, they discovered that women instructors help to break down traditional stereotypes of women and humanists as being nontechnical and offer excellent role models for hesitant students (p. 23).

Any formal class in database searching should provide ample opportunity for "carefully planned, thoroughly tested, and fully documented laboratory exercises" (Tannenbaum & Rahn, 1984, p. 19). It is important, then, for the librarian to design exercises that will address the specific research interests of the humanist and, if possible, the individual researchers in the class (Stebelman, 1981, p. 449). The librarian should do all that he or she can to ensure that the laboratory experience will be successful by planning out sample searches and exercises beforehand. If the humanist's initial searching experience is unsuccessful or frustrating, he or she will likely not return to the computer soon.

**Language**

Because humanists are put off by the jargon used in computer manuals and by computer professionals, it is important to stay away from unnecessary technical terminology. Rahn (1987) explains that "one must devise pedagogical strategies and employ language appropriate to humanists in order to enable them to build on already acquired intellectual frameworks and learning techniques that are familiar to people who work in the humanities" (p. 59). Librarians themselves, therefore, must become familiar with the structure and language of humanistic study, in addition to being familiar with humanities databases and searching techniques.

The techniques used to teach humanists do not vary much from those used to teach scholars and students in other disciplines. It is the approach to the humanist, however, that needs to be judged carefully. In all cases, a personal, tailor-made approach will pave the way for successful interactions with the computer and the librarian.
CONCLUSION

In many respects, the odds are against librarians trying to teach humanistic scholars and students how to use computerized databases. Historically, humanists have been skeptical about the value of computers in their research and have been hesitant to try new research techniques. The very structure of humanities disciplines is not conducive to computerization. But humanists can and do learn computing skills. In fact, humanities disciplines, like most areas of study, are becoming increasingly computer dependent. Machine-readable primary texts, locally constructed databases, and national networks are changing the way scholars do research and communicate with each other.

Librarians play a key role in helping humanities scholars to overcome their preconceptions about computers and to navigate through the wide array of new information technologies available to them. Librarians also have a central role in system development, particularly in designing the user interface and participating in system standardization. Librarians and scholars alike, however, are “shooting at the proverbial moving target”:

electronic systems will engage scholars and librarians in a dynamic of change, where both sides interact in a back and forth of stimulation and adaptation. New technologies will spur on new research methodologies, and these, in turn, will guide new technological developments. It is important that technology in the scholarly environment be understood as a part of this dynamic process and not as a Darwinian, adapt-or-die imperative. (Lehmann & Renfro, 1991, p. 413)

Librarians, therefore, must be flexible and open-minded so that they can instill those same characteristics in humanities users.

With careful planning, the librarian can assess which instructional approaches to use in view of humanists’ special attitudes and concerns. The value of planning and setting educational objectives early on will help ensure successful instructional sessions (Carlson, 1988, p. 53). It is the users’ needs that must always drive librarians’ educational efforts. In the case of humanities users, the imperative to understand individual and discipline specific attitudes and behaviors is clear. By recognizing and addressing creatively the unique needs of humanists, librarians can help humanities scholarship progress.

REFERENCES


Hypertext, Hypermedia, and the Humanities

Erwin K. Welsch

ABSTRACT

Hypertext/hypermedia systems in the humanities have evolved significantly in the last decade and particularly since 1985. The writings of humanist scholars are important in understanding the use of this comparatively new medium for information access and use. Hypertext/hypermedia applications in the humanities show significant promise for the future but may also present libraries with special problems. This article provides historical background on hypertext/hypermedia; focuses on their use in the humanities; describes humanities projects that illustrate trends and techniques; discusses libraries' roles in hypertext/hypermedia humanities computing; and concludes with a description of challenges and opportunities as librarians implement such systems.

DEFINITION AND BASICS OF HYPERTEXT AND HYPERMEDIA SYSTEMS

The precise origin of hypertext is not entirely clear. Ted Nelson (1987) claims that he coined the word about 1967 (p. 0/2); Kahn (1990, p. 80) traces it to a conference presentation by Nelson in 1965. But Van Dam (1988) notes that he was also working with the concept in 1967 and traces it back to Douglas Engelbart in the 1950s. Engelbart is said to have reported on his Stanford research on workstations for browsing text at a conference in 1968 (p. 164). Nelson also acknowledges Engelbart's contribution as inventor of electronic text systems. Nevertheless, it is Nelson himself, particularly in his "Project Xanadu" (dating from 1960), who has drawn most attention to issues
of a shared pool of information that can be accessed nonlinearly, and Nelson was a prominent and fervent advocate of hypertext for several decades before it achieved wider popularity.

Nelson's (1987) definition of hypertext as nonsequential writing—"text that branches and allows choices to be made, [and] is best read at an interactive screen" (p. 0/2) serves us well. Hypertext systems can include sequential text but their real strength lies in allowing users to move through text by selecting from a series of links among information nodes, rather than forcing a linear approach that provides little opportunity for individual variations in thinking or, for that matter, writing. Bevilacqua (1989a, p. 159) defines hypertext as nonsequential text in which users can link associated information and hypermedia as linking various document formats. Shneiderman (1989) describes it as part of "a large body of information organized into numerous fragments, [in which] the fragments relate to each other, and, the user needs only a small fraction at any time" (p. 115). A more technical definition (Rada, 1989) would be of a "Textbase + a semantic net + tools for creating and browsing this combination of text and semantic net" (p. 164). Atkinson, developer of Hypercard, called it: "A software erector set" (quoted in Harris & Cady, 1988, p. 33), a description that some now apply to hypertext in general.

Contemporary definitions blur the concept by including the word "multimedia." Since the 1980s, various innovative equipment, reflecting the dynamism of this still relatively new field, have compelled a reshaping of the original hypertext definition to include nontext resources. Nelson (1989) has enhanced his original definition to include "text, graphics, audio and video [that] can now come alive in unified, responding, explorable new works that present facts and ideas: hypermedia" (p. 3) (known also by such other terms as "interactive-multimedia"). Although expansion of the term is not without complications (e.g., possible incompatibility of systems based on different media, Nelson (1987, p. 0/3) believes that it offers the advantages of openness and pluralism of information. Gaines and Vickers (1988, p. 4) warn that terms such as "hypermedia systems" may lose their meaning if overused before they are well defined. Others (Bevilacqua, 1989a) suggest that these terms will gradually replace "hypertext," since, "in a digital world, sound, text and images are all represented by the same binary signals and microcomputers are evolving to take advantage of these new capabilities" (p. 158) even as some (Heid, 1991) see it as "the victory of sound bites and flashy visuals over the printed word" (p. 225).

This expansion of the scope of hypertext may lead to an expansion of our ideas on what constitutes "reading and writing"—to include access to and use of graphics, sound, moving images, and other
formats. Nelson's augmented definition refers to "reader-controlled links" (quoted in Bolter, 1991, p. 105)—users should be able to create an individualized system by including their own links and nodes—which implies that such systems should allow users to gather segments from varying contexts and formats, by freely moving among them, and to store them for later re-use. "Hypertext" and "hypermedia" both refer to systems that "support manipulation of and access to structured information," but such terms as "hypermedia" highlight the multiformatted aspects of modern information systems (Irish & Trigg, 1989, p. 192). The idea of what constitutes a "book" could undergo a transformation to include an electronic product containing text and images through which the "sender" can transform the plot into a multimedia production by moving among various story elements without relying upon a linear movement. This can now take place on a home television screen, rather than a microcomputer, which confirms Bailey's (1990) prediction, that "new computing technologies will quickly evolve and converge, creating hybrid computing systems from the cross-fertilization of previously discrete products and research areas" (p. 30).

To simplify further discussion in this part, the term "hypersystems," will be adopted to refer to all systems of this general type. The result of the implementation of hypersystems would be a seamless computing environment where the user, at will, could assemble and link materials from different storage media and from different sources to create individualized knowledge bases (or "ideabase"). (Beck & Spicer, 1988, p. 23)

**Development of Hypertext/Hypermedia**

It is only in recent years, since 1985, as Carlson (1989, p. 59), Harpold (1990), Scacchi (1989, p. 183) and others note, that there has been an explosion of interest in the development of hypersystems. Publication of Bush's (1945) "As We May Think," commonly regarded as the foundation for the development of such systems, stimulated few immediate responses. As Harpold (1990) documents, very few writers elaborated on Bush in the period 1945-1975, interest picked up in 1975-1985, and the literature on information systems of this general type has exploded since 1985. Moreover, the literature no longer focuses exclusively on technical issues but also addresses such concerns as the "epistemological, philosophical and sociological consequences of hypertext" and "the consequences of this new form of literature as a new literary form" (Harpold, 1990).
HUMANITIES AND HYPERTEXT/HYPERMEDIA OR HYPSYSTEMS

Background

Although there were a few early and successful humanities hypertext efforts, it was not until the late 1980s that the subject became a part of the humanities computing vocabulary. Publications about humanities computing illustrate this trend. For example, a guide to the use of computers for humanists published at the start of the 1980s was entirely text oriented and focused on developing word indexes and stylistic analysis (Hockey, 1980) and manuals on computers in humanistic studies (Tannenbaum, 1988; Kren & Christakes, 1987) did not include the topic. Most of the proceedings of humanities computing conferences in the 1980s lacked references to hypertext concepts: the International Conferences on Computing in the Humanities in 1977 and 1982 (Lusignan & North, 1977; Bailey, 1982) concentrated on textual, linguistic, and stylistic analysis and computer assisted instruction; the 1986 Toronto conference on "Computers and the Humanities" focused on using computers for text analysis, databases, and similar topics (Centre for Computing in the Humanities, 1986); and an international conference on Computers in the Humanities and the Social Sciences held at Cologne in 1988 (Best et al., 1991) showed that hypertext concepts had not yet penetrated the disciplines deeply; papers presented made no mention of hypersystem concepts.

The first volume of the essential Humanities Computing Yearbook 1988 (Lancashire & McCarty, 1988) included few hypertext projects or applications in the humanities although publication in itself demonstrated growing interest in the application of computers to humanistic issues. A comprehensive survey of the literature of multimedia (Chen, 1989b) includes citations to applications in the humanities but few in comparison to those on the technology itself or to applications in science and engineering.

The comparative paucity of previous information makes two 1987 conferences stand out. "HyperText '87," a multidisciplinary conference at the University of North Carolina (Hypertext '87, 1987), included path-breaking papers on hypertext and creative writing, on nonlinear thinking, and hypertext's use in specific information applications of appeal to humanists. Coming shortly after the introduction of HyperCard, these applications also seemed completely feasible. The "Annual Conference on Writing for the Computer Industry," while it focused on writing and documentation, also included hypertext and other electronic techniques. Although intended primarily for the technical community, as in Herrstrom and Massey's (1988) concept of creating documentation for system end-users, such applications as
the use of hypertext to teach writing within object-oriented hypermedia environments were widely applicable to the humanities as well. Rapid publication of the proceedings of the conference (Barrett, 1988) helped to make hypersystem ideas more widely known in the humanities.

Hypersystems quickly became part of humanistic computing after 1987. The *Humanities Computing Yearbook 1989-90* (Lancashire, 1991), in contrast to the 1988 volume which had evaluated various hypersystems in just a few pages—with many citations to articles written outside the humanities at that—included numerous index references to hypersystems and other specific products or applications in the humanities. At the 1988 Modern Language Association Convention, just two sessions dealt with hypertext/hypermedia (Doland, 1989, p. 6), but within two years it was possible to say that "the conference circuit is now liberally sprinkled with hypertext sessions..." (Baird, 1989, p. 1). Launching of the periodical *Hypermedia* in 1989, with an introduction by Nelson (1989) himself, also acted as a stimulus and signified, through its publication in England, that the technology had become truly an international phenomenon.

Later publications served as guides to the applications of hypersystems in the humanities and were important in the change process. This second volume edited by Barrett (1989) included the application of humanities concepts, mainly derived from literature, within the context of technical writing and the synthesis of the three roles of writing, management, and engineering. Increasingly, general texts such as Nielsen (1990), a thorough and comprehensive summary of research and design issues with a fifty page bibliography supplementing his earlier work (Nielsen, 1989), Jonassen (1989, 1990) for the educational community, and general reviews of the state of the art (e.g., McAleese & Green, 1991) also became available. Similarly, the new *Hypertext/Hypermedia Handbook* (Berk & Devlin, 1991) will include chapters on the use of hypersystems in a variety of humanistic settings.

Books with a focus on the use of hypersystems specific to individual humanities disciplines, increasingly for an international audience clearly captivated by the potential of the new technology, are becoming available (Ambron & Hooper, 1988, 1990; Gloor & Streitz, 1990; Delany & Landow, 1991) as well as others in which hypersystems are prominently represented (Miall, 1990a). These activities are echoed in recently scheduled conferences: Oxford University in May 1991 on "Hypermedia and the Humanities" (Hypermedia, 1991) which, perhaps as a sign of how fast the medium has progressed, included a contribution on "The LEGO-kit Approach to Hypermedia"; a second, "The Social Creation of Knowledge: Multimedia and
Information Technologies in the University" also scheduled for May 1991 (Social, 1991) showed the continuing leadership of institutions in the Northeast in this area; and a third held in Norway in October 1991 on pictorial arts, including hypermedia in museums, that noted the potential of multimedia for enhancing analysis (Hofland, 1991). These books and conferences are important indicators of the future of hypertext/hypermedia and provide both the theoretical and practical underpinnings for the application of hypersystems.

**Hypertext's Appeal**

The increase in humanistic interest in this new technology may be attributed to its intellectual appeal as well as to technological developments that have enhanced its potential for less technically skilled users. Promoters of hypermedia attracted attention by appealing to information needs and current interests in the humanities. Some made heady promises indeed: "A hypertext system could automate much of the work, allowing the scholar to have flexible access to vast amounts of data stored on optical media" (Crane, 1987, p. 54). Hypermedia techniques offered the capability to allow rapid access to large quantities of information through the creation of explicit links that enhance access—an "enabling device rather than directive environment, offering unusually high levels of learner control," and they have the potential to alter the roles of teachers and learners (Marchionini, 1988a, p. 9). They offered easy nonlinear access to integrated information that could be responsive to a variety of skill levels and unrestricted or free access to information from many different perspectives (Duchastel, 1990, p. 222). Appeals were also made from an aesthetic standpoint: "[L]ike poetry, prose, mime, theatre, sculpture, painting, dance, or music, this technology empowers and constrains creators and users in unique ways" (Marchionini, 1988b, p. 7).

Promises were not the only stimulus. Evidence emerged from cognitive psychology that "individuals 'learn' by augmenting, combining, and rearranging a collection of cognitive maps, many of which are overlapping and most of which are interconnected through a complex network of associations" (Carlson, 1990b, p. 18). Since two individuals would have dissimilar associations and would view information differently, flexible information systems—what hypertext promises—would model learning processes. Hypertext, through its principles of building information nodes and interrelating them through connectors or links, offers a way of imitating these individualized learning behaviors (Jonassen, 1988, p. 13). In addition, it was believed that less experienced readers remain locked into the sequence of the printed text while experienced readers develop a more
complex linking of information or "text web" (Carlson, 1990b, p. 18) which hypertext emulates. Multiple options permit users to determine which paths to follow and how to find and use information (Jonassen, 1986, p. 270). Findings of other studies (Stone, 1982) also show that hypertext systems could appeal to humanists' inclinations toward individual study and their serendipitous interaction with materials through browsing. Such reasoning from the scholarly world supported the claims of hypertext enthusiasts for using nodes and links in presenting information.

Another idea about hypertext—that echoed Nelson's Project Xanadu and his great world of information and shared documents—was that it would enhance cooperation and collaboration and mimic what were perceived to be Japanese competitive organizational strengths. Hypertext could enhance interaction through idea webs, an objective endorsed in such concepts as quality circles in which communication is an important part of the process as opposed to the solitary activity of reading books (Carlson, 1990b, p. 28).

There were other significant technical developments as well. Although the interactive videodisk is not inherently a hypermedia product (Howlett, 1986, p. 40), it can display images frame by frame and incorporate two separate sound tracks. It attracted early attention for humanistic teaching, as in vivid images of a mythical town in Mexico (Gale, 1983), and to teach languages (Schneider & Bennion, 1982). Descriptions of other uses quickly appeared and, as a recent note on methods of transferring 500,000 slides to videodisks showed (Brown, 1989), it is still an attractive technology. The introduction of a videodisk connected to a microcomputer or digital video interactive technology made its possibilities even more attractive (Morris, 1987) since images stored on a videodisk could then be accessed randomly and incorporated with text or other technologies.

During the 1980s, several institutions and research laboratories supported basic research into hypertext, among them the "NoteCards Project" at the Xerox Palo Alto Research Center (Trigg & Irish, 1987; Halasz, 1987); the commercially available "Guide" from OWL International, derived from a system initially developed at the University of Kent (Beck & Spicer, 1988); and "HyperTies" from Ben Shneiderman for a DOS environment, which has been in development, initially with the name "TIES," at the University of Maryland since 1983 (Shneiderman, 1987; Shneiderman & Kearsley, 1989). Despite many excellent features, these failed to win a wide user audience among humanists. Even systems, such as "Notes" developed at Carnegie-Mellon University (Neuwirth et al., 1987) and "WE" at the University of North Carolina (Smith et al., 1987) intended for humanist needs, or to focus on basic cognitive issues, did not seem immediately attractive.
In comparison, HyperCard became quickly and widely known among humanists after its introduction early in 1987. Its availability, ease of learning, backing by a major computer manufacturer, and capabilities for nonlinear progressions to nodes that could include images and sound, stimulated its applications in humanities areas. Within a year, HyperCard was being called "a milestone in educational computing" (Camp & Cogan, 1988) and humanists, as well as librarians, began to develop applications (Baird, 1988; Bevilacqua, 1989b; Ertel, 1989). Combining HyperCard with emerging CD-ROM and videodisk technologies was a natural progression into hypersystems.

The appeal of hypermedia systems based on HyperCard may actually be related to the way computing applications in the humanities have developed. Other than for some shared programming languages such as SNOBOL (Butler, 1985), a proliferation of diverse systems lacking compatibility dominated the field. There was little in the humanistic computing environment comparable to MARC standards for the library community. Volumes on humanities computing in the 1980s more typically described individualized applications than interchangeable tools and capabilities. HyperCard offered ease of use and compatibility which enabled humanists to share stacks, programs, and techniques with colleagues elsewhere throughout the world. Its international availability and comparative ease of manipulation broadened the hypersystem user base.

**Institutional Activities**

During the 1980s, several institutions developed hypertext systems specifically for the humanities. Dartmouth College, under contract from Apple Computer, tested an early version of HyperCard and showed its applicability to a variety of humanistic uses—e.g., its "Mnemosyne Project," in which the videodisk of the National Gallery of Art was enhanced by a HyperCard front end that made it possible to access the 1,645 paintings and prints as well as information about individual artists and works (Beck & Spicer, 1988, p. 24; Lancashire, 1991, p. 15). As an added incentive to other humanistic projects, the report of the Dartmouth project emphasized HyperCard's ease of learning in comparison to other hypertext programming languages.

Under the auspices of the Institute for Research in Information and Scholarship (IRIS), Brown University's "Intermedia Project" also emerged as a prominent hypersystem application with implications for the humanities (Ess, 1990). Intermedia, which originated in the 1960s on a mainframe computer accessible from other university sites (Van Dam, 1988), made possible the linking of visual and textual resources with windowing and multiple simultaneous document
capabilities. It was originally intended to "show what that operating environment should be like" (Kahn, 1990, p. 81) in providing object-oriented, direct manipulation, and linking of information nodes. Intermedia deals with two difficult problems in instruction—"the connectivity of materials and the visualization of concepts and ideas" (Beeman, 1987, p. 71) and provides a consistent user interface with links between specific points as well as among documents. It was applied first to the teaching of an English literature survey course (described later) and a plant cell biology course (Beeman, 1987, p. 71; Lancashire & McCarty, 1988, pp. 361-62).

**Examples of Hypersystem Applications in the Humanities**

Listing all active or proposed humanities projects that employ hypertext/hypermedia techniques is beyond the scope of this survey (e.g., Lancashire & McCarty, 1988 and Lancashire, 1991 offer excellent lists and descriptions) and some fields in which advances were made, such as religious studies (DeRose, 1991), were excluded due to lack of space. The present survey reviews selected fields, suggests the diversity of humanistic approaches, and provides a context for subsequent discussion of these projects within library services. It employs somewhat arbitrary categorizations.

*Art and Archaeology.* As Martlew (1990) noted, "archaeology is a very visual subject [in which] lecturers often use the image as an aide memoire, rather than consulting notes" (p. 43). Therefore systems that efficiently incorporate images with texts and search them effectively seem ideal for art and archaeology applications. Scholars in these disciplines are unlike scholars in fields that depend on a corpus of texts; they rely more on the ability to establish connections among images (Harward, 1988, p. 16). Without the ability to access two art works simultaneously, difficult in such cases as the Parthenon's dispersed sculptures for example, an "authentic" comparison is impossible. Hypermedia makes it possible to access separate images randomly, examine them simultaneously, and even combine them in comparative ways that would be impossible even using the physical objects themselves. Hypersystems might thus supplant or supplement large, difficult to manage slide accumulations derived from multiple sources.

The National Gallery of Art application (see earlier discussion) makes use of videodisk technology with a HyperCard front end that includes access by period and genre with interactive searching capabilities by painting or artist. Other related applications include an "interactive encyclopedia system" (Shneiderman et al., 1989, p. 172),
tested in an art museum, which, although not entirely a success, demonstrated that "computers can contribute to an exhibit by offering an engaging, interactive, and personal experience" (p. 181). Schneiderman et al. also note, in a caution that librarians should take account of, that designing for museum patrons is difficult because user characteristics vary significantly (p. 182). The popularity of an application at the Getty Museum in California demonstrates that technology can be almost as appealing as art, and a University of Wisconsin-Madison project uses software called ARTSearch to directly link computer data to visual images of textiles stored on a videodisk (Femenias & Mansfield, 1986a, 1986b).

Other projects demonstrating international appeal include an interactive project in Dublin (Hastings, 1986); an Italian government videodisk on that country's art, archaeology, and cultural history—termed the "national photographic archive" (Bartolozzi & Chen, 1987); and Project Emperor I, which combines art, history, and archaeology in examining, through a multimedia Macintosh application, clay statues located in a tomb in China (Chen et al., 1988; Chen 1989a). Several, for example Project Perseus described later, have combined images with extensive textual data and function as tools of scholars in several disciplines simultaneously. The description of Project Emperor notes, in a comment applicable to all such developments, that hypermedia might first be thought of as an educational device, but its ability to access images located at a distance melds that function with research (p. 11).

There is also a blending of disciplines. Project Athena, which originated at MIT, was a large-scale attempt to explore computer use, but the techniques employed were used at the University Museum of the University of Pennsylvania as part of the curriculum of the Department of Classical Studies (Romano, 1989; Davis, 1988; Hodges et al., 1989, p. 79). As part of a course, students used Project Athena's techniques and data to experiment with the development of an ancient city.

There are also attempts to explore basic artistic levels for use in teaching. For example, a videodisk with a HyperCard front end deriving from Josef Alber's Interaction of Color (Phelan, 1988; Whiteley & Roberts, 1990), promises to revolutionize color theory in the same way his book did when first published. Other efforts are being made to use hypersystem techniques in art education (Dyer & Milner, 1990).

On another level, archaeologists note the dichotomy between archaeological technology and the use of printed formats to disseminate information: "Changing information technologies have reshaped the ways archaeologists collect and analyze data" (Smith,
The resolution of this dialectic may lead to significant changes in information dispersion in art and archaeology that will have meaningful implications for libraries trying to develop collections and provide information.

Classics. Perhaps the leading example in this field is the "Perseus Project" (Crane & Mylonas, 1991), which originated at Harvard University as a text base derived from scholarly sources that made available in one place approximately 10 percent of all surviving classical texts. It was intended to be an educational device in which students could develop their own skills independently and build complex intellectual models of their own (Crane & Mylonas, 1988, p. 27) but one in which the instructor could exercise control over content and sequence. It can be used to teach courses in Western civilization, archaeology, and related fields such as philosophy and political science that use ancient Greek texts as sources. In its hypersystem implementation using HyperCard on a Macintosh linked to videodisk and CD-ROM, Project Perseus (Crane & Mylonas, 1988, pp. 25-26; Harward, 1988) allows a reader of a Greek play in either Greek or English to locate "references in other texts, see visual representations, and relevant place names on a map, look up Greek words in a dictionary, and read the encyclopedia entry." The user can access line outlines of buildings or, from the videodisk, photographs of archaeological sites. Its derivation from reliable scholarly texts combined with visual materials contributes to its strength (Harward, 1988, pp. 18-19). A reviewer (Hughes, 1988) although not entirely satisfied, noted that it helps "bridge the gap between disciplines for students, as well as for teachers and researchers, and [enables] users to view the classical world as a whole" (pp. 1-2). It is a product that relates directly to the scholarly needs of those interested in the classics since it is textually based yet provides a means of accessing related information that enriches the understanding of those using it.

History. Historians have long been attracted to computer programs that promised to mimic actual historical events. As early as 1968, the famous French historian Le Roy Ladurie had predicted that "tomorrow's historian will have to be able to programme a computer in order to survive" (quoted in Woods, 1982, p. 229). For the most part, however, historians have found available programs to be either inflexible or insufficiently comprehensive to meet scholarly needs.

The "Project Jefferson" interface, developed in 1987/1988 at the University of Southern California, was intended to be "an innovative teaching library" (Chignell & Lacy, 1988, p. 43); to access online
and other sources through the use of a "resource icon [that] directly invokes the online access program and establishes connection with the remote system" (Kinnell, 1988, p. 35); to serve as a model of computer-based instruction using a standard interface applicable to other disciplines; and to encourage students to acquire writing skills using ethical issues arising from study of the U.S. Constitution (Kinnell, 1989, p. 34; Chignell, 1988, p. 12). Although largely intended to teach writing and research skills, the approach that it took, a variant of the Macintosh "Desktop" metaphor, was to include linkage between, for example, an encyclopedia entry and bibliographic citation together with a mechanism for saving personal materials and creating additional links. Project Jefferson also provided a self-pacing device that made it possible for students to establish their own sequence of learning. It was also notable as one of the few projects to be a combined effort that included librarians along with scholars and technologists.

In England, the BBC's interactive videodisk "Domesday Project," named after a survey of the country carried out in 1086, was intended to be a replication covering contemporary England. It included text, maps, and graphical images. A user could interact with the images stored on two laser disks through the use of a "tracker-ball" that operated an on-screen pointer. Overall, despite some caveats, the Domesday Project was a success. In the opinion of two reviewers, interactive video was an "interesting, stimulating and novel way of learning and absorbing information," even though the reviewers were not convinced that it would actually make learning easier (Noble & Hargreaves, 1987, p. 245).

*Culture 1.0*, a HyperCard product that claims to provide information on all aspects of Western civilization from its origins to contemporary times, stands out as an example of the challenges involved in creating historical projects. It uses scanned images, the capability of HyperCard to produce musical notes, and clever linking and orientation devices to lead the user through diverse information. But a comparison with even basic reference works found in most libraries by this writer (Welsch, 1989) or by another librarian otherwise favorably disposed toward *Culture 1.0* (Heise, 1991), showed that it covered most historical topics superficially and, a key element for historians, failed to include full citation to materials making it impossible to derive information about source origins.

There are other commercial products, particularly games involving combat in past wars. Scholastic Software's "Point of View" is intended for a high school audience and is open ended since it provides capabilities for teachers to add visual materials from videodisks or audio materials from other sources. Although not
technically a HyperCard application, it uses the point-and-click features of that program, enabling students to move easily among segments. But one review noted problems with the documentation—particularly the lack of full citations to the materials—which would annoy teachers, as well as some technical glitches which would trouble users (Markowitz, 1990).

For historians, with their emphasis on the use of soundly based texts whose origins are known, hypertext/hypermedia efforts have been only partially successful. Even though the discipline, with its frequent need to refer to external information, should be ideal for such applications, neither the journal *History and Computing* nor other sources suggest that this has been a productive applications area. Part of the problem is reliability. Unlike Project Perseus, which originated from scholarly sources, the use of incomplete or inaccurate sources would, despite the ease of use described for such products as *Culture 1.0*, make such efforts unsuitable for historical research or teaching. Just as libraries do not buy books because they have attractive bindings, alluring ways of maneuvering through stacks which lack content do not make products suitable either.

**Language and Literature.** There have been several ingenious hypertext/hypermedia applications in this discipline. It would be theoretically tempting, as a leading humanist computer user noted (Slatin, 1990, p. 124), to view hypertext as a postmodernist effort to replace the modernist emphasis on objects and order with another on processes and chaos as the foundations of reality, but applications are probably more prosaic in origin. Another prominent scholar stressed the importance of hypertext systems for literary studies because they can emphasize relationships and connections among texts that might otherwise be physically isolated and can alter the way that we perceive, understand, and experience texts (Landow, 1989a, p. 174), have the capacity to be anti-hierarchical and can lead to the disappearance of the boundaries between reader and text (pp. 185-86).

Brown University has hosted an ambitious effort to use hypertext/hypermedia in literature as part of its Intermedia Project. In the 1970s, there had been experiments with use of a full-text retrieval program called FRESS, developed by Andries Van Dam, for poetry courses at Brown. In one, an experimental course built around William Blake's "The Sick Rose," students were made aware of a surrounding body of text and encouraged to participate in the shaping of the material as well as being able to refer to related materials by simple command macros relayed to a mainframe computer (Catano, 1979). Describing that course in a work published almost a decade before hypertext
had become common, Catano (1979) of Brown found hypertext analogous to poetry since "individual poets constantly develop their meanings...by referring to that total body of poetic material of which the particular poems comprise a small segment" (p. 269).

In many respects, this project contained the essence of later work using hypertext in literature—multiple windowing; enjoyment of literature as well as development of critical abilities; student flexibility; movement "outward" from a bare text—random access to related texts and, in hypermedia systems, other materials as well; and the concept of a poem or other text as part of a "web of interconnected materials...[in which] each student could use the strands of the web to 'pull' other selected materials into the three remaining windows" (Catano, 1979, p. 270). Instead of the computer taking over or doing the instructor's job, it enhanced personal creativity, classroom dialogue, and poetry reading (Catano, 1979, p. 275).

In the 1980s another application, Context32, was developed as part of the Intermedia Project for use in English literature survey courses (Landow, 1987; Kahn, 1990, p. 82 and following; Lancashire, 1991, pp. 445-47). For example, a part of "The Dickens Web," a collection of about 2.5 million bytes of documents relating to the author and specifically to Great Expectations, was extracted for use in a complex but flexible mixed media assemblage. The object was to link literature to its contextual surroundings in historical and biographical data and, as the name of the project suggests, to provide the context for a literary work. More than a thousand information nodes interlinked by the same number of links include "overviews, biographical timelines, brief biographies, short essays about literary works...as well as graphical illustrations, all of it browsable by students" (Duchastel, 1990, p. 221). Observation (Beeman, 1987, p. 75) of the project in action suggested that the professor came into a less didactic relationship with the students, and that the students had more significant flexibility in determining the course sequence. But, as more than one source noted (Lancashire, 1991, p. 446), copyright has been a restricting factor in deciding which texts to include.

A project to illuminate Shakespeare's dramas at Stanford University took a different approach derived from a faculty member's frustration in talking about something that was not there—the "real experience of theater: communal, sensual, hallucinatory, fleeting as a dream" while studying the plays of the most prominent English playwright (Friedlander, 1988, p. 26; Friedlander, 1991). As Context32 at Brown had sought to put texts into their literary background, the issue of framework was significant since, regardless of the richness of the texts, they were being studied outside of an acting context.
that would add to their understanding. The result was "The TheaterGame" which uses a HyperCard front-end on a workstation with a two-screen monitor, a videodisk player, and a video monitor. In a sense, the project encourages students to explore and create their own Elizabethan theater in the same way that Project Athena (see earlier discussion) encouraged students to create an ancient city. As did students in other projects, those at Stanford could maintain an electronic notebook of text or images for later presentation as a multimedia essay. The system's flexibility augmented learning.

The use of hypermedia for literary study has not been confined to universities. Robert Campbell (1989) used John Steinbeck's *The Grapes of Wrath* in a public school environment. Using hypertext links on a Beta test version of HyperCard integrated with a videodisk machine, students were able to find illustrations from sources such as posters, videotapes, audiotapes, and books that related to the text. Two other instructors (Harris & Cady, 1988) used HyperCard in a secondary school to develop a tool for enhancing Poe's short story "The Masque of the Red Death." Although an early implementation of HyperCard, the teachers thoughtfully included a "tracking device" that made it possible to evaluate student progress and activities. Another proposal was for developing model stackware for use of HyperCard to embellish the poem by Edna St. Vincent Millay, "Justice Denied in Massachusetts" (Vandergrift, 1988). Since the poem alludes to the trial of Sacco and Vanzetti, reinforcing the text with illustrations and other information was a natural enhancement for schools. Recent publication of a manual intended for pre-college students (Franklin, 1990b) is likely to reinforce this trend. Augmenting textual materials with contextual materials is important as schools continue to address the question of how they will use computers as part of current curricula, but their use may also evolve into cultural or "hyper-environments" for learning (Cumming & Sinclair, 1991, p. 325). If this trend does spread and establish itself, students will have altogether different learning expectations of their institutions and libraries than those of previous generations.

Even before the advent of HyperCard, interactive videodisks were being used for teaching languages in the United States and abroad (Branvold et al., 1986; Fletcher, 1987). With point-and-click random access hypertext systems that enable a student to progress at individualized speeds and to hear a native speaker pronounce a word as it is clicked—e.g., a Cantonese pronunciation guide on HyperCard (Leung, 1989); another for Hanzi characters (Bantz, 1990, pp. 36-37)—the system is even more appealing. Access to external multimedia sources suggests that teachers have "just crossed over into a new generation in the creation of language-learning materials, one that
might be called the Age of Hypermedia” (Underwood, 1988, p. 13). The addition of hypermedia, in Underwood’s (1988) case a Spanish language course derived from a British soap opera, makes it possible to increase student involvement and engage the student actively in the learning process (p. 17). In addition, there have been attempts to use hypertext techniques to enhance access to dictionaries. The new Oxford English Dictionary has been the focus of several researchers (Raymond & Tompa, 1987) who developed prototypes for access, but one pair found it a good example of a text that was initially developed with little thought for computerized access (Watters & Shepherd, 1991, p. 60) and therefore presents special problems.

Finally, a more complex idea about interactive creative writing and hypertext has emerged and interacted with conceptions of technical writing and online documentation (Harris & Cady, 1988; Yankelovich et al., 1991; Bolter, 1985; Bolter & Joyce, 1987; Bolter, 1991; Moulthrop, in press, cited in Harpold, 1990). It is based on the idea that a true hypertext system allows for true human interaction with the resources: since hypertext systems closely model human idea processing by creating a network of nodes (modules) and links (webs), they allow for “three-dimensional navigation through a body of information” (Carlson, 1988, p. 95) and thereby enhance both creative writing and system documentation (Carlson, 1988; Slatin, 1988; Brockmann et al., 1989). Through interaction with hypertext systems, the user can, usually through the creation of “notebooks,” extract information and create individualized links to the system to enhance learning. As Irish and Trigg note (1989, p. 192), this concept incorporates two streams from computer science—hypermedia and “computer supported cooperative work.”

In the literary realm, hypersystems could foster collaborative creative writing. Multiple authors on a college campus (Slatin, 1988) could create a hypertext, since authors could add to any section at any time, a literary process that somewhat parallels the emphasis of some twentieth-century poets on nonlinearity. A complex form of hypertext within a literary context used a system for interactive fiction called Storyspace™ which follows a pattern suggested by short stories of the Argentinian author Jorge Luis Borges (Bolter & Joyce, 1987). His Ficciones consists of a series of short pieces of information without much of a plot (Bolter & Joyce, 1987, pp. 45-46), a characteristic inherently similar to hypertext applications. Hypertext relates to other aspects of postmodernist writing and to literary and semiological theory that have profoundly affected current literary research (Landow & Delany, 1991, p. 4). Yet other writers contend that hypertext may remain problematical as a literary device. Miall (1990b), although generally supportive of computer use, makes a key
point when he notes that "the central experience of literary studies cannot in itself be facilitated by the computer" since reading relates not only to intellectual demands made on the reader but also to the emotional responses to the materials presented in the text (p. 52).

Music. Two successful commercial productions using HyperCard as a front-end on Mozart's "The Magic Flute" and on the string quartet (Dunn, 1990; Eckhardt, 1991) have been widely accepted, and one, Beethoven's Ninth Symphony (Weiman, 1990), received the 1990 prize as MacWorld's commercial "SuperStack" of the year. They make it possible to examine musical works in depth and combine graphics with text and sound (Lancashire, 1991, p. 191). For opera, it would be similar to reading a synchronized libretto and commentary simultaneously with the opera. As commercial products, some works faced harsh criticisms such as "sloppy audio edits in some examples, typos, obscured text...[and] confusion when you try to start up" (Dunn, 1990, p. 267), but generally they have been useful in providing historical background and functioning as tutorials for beginners. A number of libraries have installed them to the delight of their users.

Among noncommercial applications, faculty members at the University of Delaware have combined videodisks with computer technology using IBM's "Info-Window," for music education (Peterson, 1991). Other developmental projects include "HyperBach," which combines themes with information about the works (Drone, 1988). The ability of multimedia systems, using HyperCard front ends, to capture sounds together with images and text and access them either sequentially or at random, makes these systems ideal for music uses and broader applications as well.

A combination of available technology, the desire to improve student access to information, the appeal of hypertext features in responding to pedagogic theories and demands, and some parallels between trends in the humanities and hypersystems, have all been influential in the adoption of hypersystems within the humanities. In addition, innovative conferences, increasingly meaningful publications, and ingenious applications have helped drive the hypersystem movement forward. What was invisible at the start of the decade—and even half way through it—had by its end become apparent. Although phrases such as "new technologies for the 1990s" may be trite, as Janet H. Murray (1991) noted while discussing the use of computers for linguistic analysis, "hypertext and hypermedia, theoretical for decades, are on the verge of becoming commonplace" and, together with interactive video and other techniques, the result will be "methods that promise to be different in kind rather than degree" (p. 1).
LIBRARIES AND HYPERSYSTEMS: BACKGROUND

Largely through the introduction of HyperCard, hypersystems became appealing for library educational needs in the late 1980s as a means of:

1. using attractive technology to motivate students to learn basic library skills (D'Elia, 1989, p. 21);
2. substituting technology for inadequate staff in providing information (p. 22); and
3. serving as a technological variant of library guides in helping a user navigate a library (Ertel & Oros, 1989, p. 47).

These principles, even though drawn from experiences in a school and special library, are broadly applicable. As a result of exposure (Byles, 1988; Smith, 1988; Bevilacqua 1989a; McClelland, 1989; Franklin, 1988, 1990a) and appeal, various libraries initially began producing library tours, particularly directed at undergraduate students, that frequently used HyperCard's basic elements mixed with unsophisticated graphics. Others, including the tour of Boston for the Library and Information Technology Conference held there (Bevilacqua, 1989b) and a tour of Glasgow (Baird, 1988), had the merit of being carefully defined, of using HyperCard's talent for including smaller bits of information on discrete cards—an advantage since HyperCard's original metaphor was 3 inch by 5 inch cards in a stack—and incorporating informative graphics. Libraries have moved on from these basics to using applications that link Macintosh technology to other resources (Wilhite & Dearie, 1990), that have generic applications (Welsch & Loomis, 1990), or imaginatively employ hypertext's flexibility for access to a variety of materials.

To conclude that hypertext concepts have been immediately accepted by the library community would be inaccurate. Recent comments include the suggestion that "hypertext developers have too much dazzled the present early generation of users with the flash & sizzle..." and that "hypertext tends to be confusing" (McAleese & Green, 1991). As we look back at some of those early HyperCard efforts with flashing buttons, we can share some concerns about misapplied technology. But doubts notwithstanding, any technology that is open-ended, that is attractive to newcomers and experienced users alike, and that can offer access to digitized texts as well as images, seems likely to have staying power.

LIBRARIES, HUMANITIES, AND HYPERSYSTEMS

Issues concerning the inclusion of hypersystems for the humanities within a library context seem less clear than the use of HyperCard for library tours or other functions. Prevailing orthodoxy
about the irrevocable imminence of technology and of the significance of hypersystems may not, or may not yet, apply within a library humanistic context. Although descriptions of individual projects and enterprises can be appealing and technical and other aspects of hypersystems may seem to make them inexorably necessary in libraries, there are challenges innate to the use of hypertext/hypermedia for the study of humanistic subjects that need to be addressed if such systems are to be successfully employed, including: (1) financing and implementation; (2) information validation; (3) humanist attitudes toward computing; and (4) related issues.

Financing and Implementation

A basic truth for any library in the 1990s is lack of funds for financing new projects, especially including hypermedia: "Going broke in interactive multimedia can mean," as Jim Heid (1991) wrote quite simply, "going broke" (p. 232). Promises that: "In another five years, schools will be able to purchase devices with greater capabilities than large research computers had five years ago" (Dede, 1987, p. 20) may not apply to multimedia workstations. Descriptions of some of the hypersystems mentioned earlier and other published accounts (Gaines & Vickers, 1988, pp. 3-4) suggest that the equipment needed to access these in libraries would typically include microcomputers with added internal random access memory (RAM), large high-quality monitors, speakers (or more typically headphones to reduce noise), videodisk players, a mouse or pointing device, graphics display screens, keyboards for text input, and CD-ROM players, together with appropriate software. Promises that: "The cost of computing equipment will continue to decline dramatically" (Weber, 1990, p. 3) in many respects would not apply to hypersystems. Large-screen monitors in the 27 inch and larger size that effectively display hypermedia applications have not yet reached the mass-market levels that would force costs down. As an information professional who holds a joint library and computing center appointment noted (Halbert, 1990), the implementation of "multimedia requires a quantum leap in hardware beyond the typical personal computer of the 1980s...and has troubling implications for libraries, which have frankly not yet caught up with the computing media developed in the eighties" (p. 7). When library costs are projected for the 10 or 100 workstations that might be needed, the equipment for large-scale hypermedia implementation may remain beyond the reach of all but the best financed libraries or those generously supplied with equipment, usually for experimental and not operational programs, by the computer manufacturers themselves.
Questions have been raised about even high-quality products that should alert librarians to potential problems. In discussing the BBC's Domesday Book project, the reviewers, although little doubting that English libraries should have it, raised valid points about implementation within a library context applicable to similar products in other situations. They found it difficult to categorize—"Is it a computer, is it a piece of A/V equipment, is it a reference tool?" (Noble & Hargreaves, 1987, p. 241)—which will mean that budgeting and allocation procedures will be complex. They also cautioned libraries about the need to consider such mundane questions as adequate electrical outlets, headphones to avoid noise, easy access to a reader service station to provide assistance, staff training, problems with the product itself, and other difficulties in placing it within a library context.

Nor is the issue of software resolved. The 1991 announcement that the Apple-IBM partnership would result in a new scripting language for hypermedia (Gore, 1991) should shake the confidence of any librarian who had believed that the software issue had been settled and that reliance on HyperCard or its clones would be sufficient for the future. Although this product is described as working on both computing platforms, that may be an issue, as other firms enter a fast-moving game, that is fluid as well. As Wagschal (1985) noted several years ago when discussing interactive technologies even before hypersystem approaches became common, the whirlwind pace of development, the sense of bewilderment that many librarians feel when confronting these technologies, and the choices and dilemmas that they face, will make the librarian's task increasingly difficult.

Evaluation

A profession that prides itself on the provision of accurate and timely information may find the implementation of hypersystems in the humanities to be complicated by lack of outside criteria satisfactory for validating use within a library context. Some commercial hypersystem products have been fully reviewed in standard reviewing media; libraries have used these judgments to successfully install them as part of user services. But most humanities efforts are noncommercial projects outside the usual purview of reviewing media and unfamiliar to librarians. Early in the development of hypertext systems, Catano (1979) illuminated the problem of validation by remarking of his project that: "We were aware of the need to obtain less subjective reactions as well" (p. 274). Although he showed a film of the project during a Modern Languages Association Conference session and collected empirical data based on statistical data (which showed that student averages
rose and that instructors' time was more efficiently used with the advent of hypertext), his efforts may have been the exception. Currently, few descriptions evaluate the effectiveness of non-commercial hypersystems in the humanities; accounts that cross the line between description and boosterism in the enthusiast press may be more common than we like to believe; articles by corporate representatives or by system originators seem questionable guides to implementation decisions. The moral aspects of the "cohabitation of universities with major marketers" and resolving inherent conflicts between groups that sell and those that teach ("Wooing of the Humanities," 1986) is particularly acute in this area because of equipment costs. As Raskin (1987) noted (in an article worth reading in detail): "The literature on Hypertext is generally effusive and non-critical" (p. 325). Lacking a comprehensive scientific evaluation system, libraries may have difficulty determining which hypersystems are appropriate for their clientele. Evaluation will be a vital element in the implementation process.

Reviews of commercial products that illuminate their weaknesses, such as those for *Culture 1.0* and the music products discussed earlier, confirm that stringent principles need to be applied before libraries embrace any system incautiously. The few reviews of noncommercial products that exist, such as of the Perseus Project (Hughes, 1988, pp. 2-4), suggest that even this highly regarded project, which this writer viewed favorably after use, also needs attentive care in implementation. Reviewers of the Domesday Project noted that there were conceptual and movement problems, some as simple as difficulties caused by users being unclear as to the distinction between "turning" and "moving" (Noble & Hargreaves, 1987, p. 244). Emerging, rather than established, technologies are unsuitable in library environments since, as Ted Haehler, a developer of HyperCard, noted: "A library gives a piece of software the ultimate torture test" (quoted in Ertel & Oros, 1989, p. 45). Shearer's (1988, pp. 417-18) reminder, that validation and information proofing, although they may seem "trivial," are necessary steps, seem especially relevant to the hypersystem context. The comparative dearth of electronic information resources in the humanities, linked to the appeal of hypersystems, may easily lead to enthusiasms that are expensive to support. Critical and comprehensive evaluation is mandatory before libraries adopt hypersystems products or even accept them as gifts.

*Humanist Attitudes Toward Technology and Hypersystems*

Attitudes of humanists toward technology in general, and perhaps toward hypertext/hypermedia in particular, may affect library success in implementing such systems. Previously, over-optimistic predictions
have helped engender humanist caution about technology. To paraphrase music professor David Crawford (1986, p. 569), there was euphoria during the 1960s as humanist scholars heard of computers that could translate, compose symphonies, and perform other extraordinarily difficult and, in fact, largely still undone tasks. As even an experienced hypersystem advocate conceded, scholars, particularly but not exclusively in the humanities, still use microcomputers predominantly for word processing (Yankelovich, 1991, p. 133) or in some instances for manipulating electronic versions of printed materials. As has been noted in a number of sources (Denley, 1990, p. 13), use of computers in the humanities is a new phenomenon. Therefore, scholars may not support what they do not know or, worse yet, what they suspect. In addition, they either question or resist suggestions (Heid, 1991, p. 232) that educators need to prepare for a future dominated by students who have been exposed to years of "non-linear, TV-based education." They are also concerned about the "insular" and "monolithic" nature of hypersystems (Meyrowitz, 1989, p. 107) that would cause them to abandon current systems. Although hypersystems, whose multimedia displays can overwhelm the senses, could reawaken the exhilaration, a reality is that many—perhaps most—humanists will not support library purchases of equipment for hypersystems if they are to the detriment of traditional purchasing. Finding the political combination that can convince humanists that libraries should acquire expensive hypersystems may be difficult.

Most humanities continue to rely on bodies of texts or sequences of information that generate both system and resource needs unique to those disciplines. Since researchers have not validated assumptions that all materials are suitable for hypertext/hypermedia system applications, questions may arise about the suitability of applying such techniques to Dickens or other Victorian authors, because reading a computer screen is up to 30 percent slower (Slatin, 1990, p. 129 citing Shneiderman). Those texts organized in small "chunks" that deal with one topic, such as some encyclopedias (Beekman & Beekman, 1991) or other reference works, or with one theme, are most suitable (Kearsley, 1988, p. 21). Systems such as Context32 or Perseus rely on extensive print sources and were developed largely as student aids to supplement text sources, not supplant them. Carlson (1990a) also suggests that, since "hypertext transforms the implicit knowledge structure of text into an explicit one," not all sources are suitable (p. 115). In addition, other humanities skills, particularly those that are not immediately apparent or confirmable, such as heightening sensitivity, developing critical thinking, and cultivating
appropriate responses to ethical situations, may be neglected (Steig, 1987, p. 39).

Related Issues

Although hypersystems that relate a work of art to other sources or act as a tool to reconstruct the ancient world are valuable, they may not achieve their fullest evolutionary potential until they mature as active tools for information distribution. That maturation would have conditions and implications. Some scholars believe that hypersystem "publications" would need to carry the same weight as traditional print works in the academic promotion and tenure process in the humanities (Crane, 1990b). Without scholarly accreditation for that time-consuming work, as noted in the works of George Landow (Crane, 1987, p. 52), and even though groups such as archaeologists may be conscious of the capabilities of hypersystems to enhance information distribution capabilities, fulfilling the technology's potential may be delayed because the current tenure system allows little incentive for experimentation. If this barrier is breached and scholarly publications that are, in themselves, hypersystem applications begin to appear, the implications for libraries will be far-reaching and complex. Even before libraries have fully confronted other issues of information in electronic formats, they may need to address acquisition and preservation questions that are far-reaching and different in degree because of extensive and expensive equipment and software requirements.

Finally, libraries need to recognize copyright barriers to hypersystems in the humanities. Comparatively few system designers (Context32 at Brown University being a notable exception) mention the inclusion of copyrighted texts. With most humanistic texts protected by copyright laws, as inclusion of the issue in an important forthcoming book (Haynes, 1991) suggests, its importance as a limiting factor in hypermedia implementation may be substantial. Investing in expensive library equipment and then being required to pay substantial prices for information in hypermedia formats, or being unable to acquire materials in sufficient quantity to justify expenditures, are thoughtful issues for library implementation.

Conclusions

Humanists have made significant strides in the theory and use of hypersystems. Their writings constitute, for libraries contemplating the implementation of information systems of any kind and for librarians dealing with the humanities and other fields, important bodies of fundamental knowledge that address serious information
issues. The rules for hypersystem linkages that such authors as Landow (1989b) have evolved for literary linkages contain general principles applicable to all situations. Experiments and systems over the past decade, and particularly since 1985, have demonstrated the application of hypersystem concepts to a variety of humanistic subjects and situations and their potential for operation elsewhere. Librarians who ignore these writings and developments do so at their intellectual peril for these hypertext/hypermedia systems signify potentially important trends for the future. The concepts are fundamental; the conceivable applications boundless.

In many respects libraries are logical settings for humanistic hypersystems. They house extensive information collections on the humanities and facilities for online searching and similar text-related activities and therefore should also include these new products (Franklin, 1988). Users could rationally expect that libraries would also contain humanistic hypersystems. Continuing to separate information by type rather than by discipline seems unresponsive to current information trends and prospects for the future. Suggestions that hypermedia systems are inherently too expensive could be countered by reminders that libraries intrinsically possess resources that are beyond the means of any but very few individuals (Halbert, 1990, p. 7).

Yet libraries must also temper admiration for hypersystem achievements and potentials with realities and be cognizant that theory and application do not always coincide. Although perhaps logical, implementation of hypersystems would cause libraries to be confronted with a series of problems that are difficult to resolve—costs, adequate evaluation, training for staff and patrons, educating humanists unfamiliar with hypersystems, training and employing technical staff, and balancing equipment costs against books during a period when publication continues unabated and the humanities remain firmly text-oriented disciplines. Less obvious are problems that implementation of untested technologies within demanding library environments could cause in user and staff stress while the human interface evolves to satisfactory standards (McKnight et al., 1989).

Libraries must also be aware of and address the position of hypersystems within humanities information needs. Recent symposia that addressed those requirements unfortunately demonstrated a lack of awareness of their use that may not be unrelated to age (Lougee et al., 1990). *Humanists at Work* (University Library, 1989), an informative examination of how humanists find their information sources, included little mention, other than negative remarks from a sociologist intending to be provocative, of the use of computerized
resources of any kind and none of hypersystems. Another symposium (Batt & Martell, 1991) specifically related humanities and libraries within a technical context but dealt with text not hypersystem issues, which are scarcely mentioned. Even the *Humanities Computing Yearbook* (Lancashire, 1991) shows that, although hypersystems have become increasingly important in the last decade, text systems still dominate; hypertext occupies a relatively small percentage of its pages. The first volume (Hockey & Ide, 1991) of the new series "Research in Humanities Computing," also focused on text even though some articles (Brunet, 1991) incorporate hypersystem concepts within broader elements of study. Although hypersystems have staying power, libraries must also ask whether they are sufficiently important to a local clientele to justify cost and other factors.

Beliefs that books, particularly in the humanities, are "historical artifacts" soon to be replaced by easily affordable and accessible hardware and software are "fantasies," whether in a hypersystem or other computer framework, as Schuman (1990) accurately noted (p. 35). Yet librarians sometimes seem to believe, in part due to hypersystem advocates, that the electronic library is here. In an article frequently cited by hypertext critics, Jef Raskin (1987) suggested that too much was being made of hypertext and accused Ted Nelson of writing "with a messianic verve characteristic of visionaries" but producing little but experimental projects that remained largely unfinished (p. 325). Just as over-enthusiastic writings about the computer three decades ago were unwarranted, libraries must now temper hypersystem ardor with reality. Yet titles such as "Breaking the Tyranny of Text" (Vandergrift, 1988), albeit misleading since it actually proposes that libraries use the technology to "enhance the understanding and enjoyment of literary works" (p. 31) and not eliminate them, seem to represent a common frame of mind. While hypersystems have immense potential, to believe that they will supplant printed materials instead of enhance them or place them into context would be unwarranted and inimical to the current work patterns of most humanists. Although hypersystems have demonstrated their validity in numerous commercial and noncommercial efforts, for many humanists the humanities are not bits of information but linear systems—books, periodicals, scores—that are likely to remain unprecedented sources for humanistic information for the foreseeable future. The writings of proselytizers who want the public, schools, and/or libraries to adopt one system or the other, and their sometimes extravagant claims for the educational or research capabilities of any system need to be carefully validated, a process difficult with the current state of many humanities projects, before libraries open the Pandora's box of hypersystems.
As libraries contemplate the implementation of humanistic hypertext/hypermedia systems, they will need to consider questions that range from philosophical issues related to the nature of computing for the humanities to the concrete question of finding funds to purchase expensive equipment. As the issue continues to evolve in the thoughtful writings of humanist scholars that may assist libraries in planning for another new information age that effectively employs the wonders of hypersystems, a maxim (quoted in Wyatt, 1988) from T.S. Eliot that: "Between the idea And the reality...Falls the Shadow" (p. 79) may be a viable guide in seeking to resolve these questions.

REFERENCES


The wooing of the humanities: A marriage of inconvenience. (1986). *SCOPE, 4*(September/October), 1, 47.


Electronic Journals in the Humanities: A Survey and Critique

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ABSTRACT
In recent years, as use of national computer networks has expanded, certain list server groups have begun to emerge as electronic journals. This article provides an overview of the electronic journal as a phenomenon in scholarly communication within the humanities—a description of the journals that are currently available, a broad examination of the issues they raise for libraries, and some possible responses to those issues.

INTRODUCTION
In 1665, when the learned gentlemen of London’s Royal Society began publication of the Philosophical Transactions, they assigned their new journal the extraordinary subtitle: “Giving some accompt of the present undertakings, studies, and labours of the ingenious in many considerable parts of the world.” Few modern periodicals would lay claim to such scope, but the essential function of the scholarly journal has not otherwise wandered very far in these last 300 years. It is still about communication.

In recent years, as increasing numbers of scholars have found their way onto the principal academic computer networks, Bitnet and Internet, electronic communication has begun to take its place among the established methods by which scholars communicate. Inevitably, much of that communication has been one-to-one over electronic mail. But the list server capacities of academic mainframe computers, and sometimes just the patient hard work of a few scholar/hackers, have offered the additional ability to communicate in groups.
Some such groups have remained relatively informal message-posting media like electronic bulletin boards or newsgroups. Others have formulated specific topical discussions as electronic seminars and conferences. Some have become electronic newsletters serving particular organizations or groups. But, within the past two years, a few of these list server operations have taken on a new formality, appearing at relatively predictable intervals, numbering and dating their issues, forming boards of editors, and refereeing the articles and reviews submitted by contributors. As such, a category of communication has emerged that can justifiably be termed the electronic journal.

This article is intended as an overview of the electronic journal as a phenomenon in scholarly communication within the humanities—a description of the journals that are currently available, a broad examination of the issues they raise for libraries, and some possible responses to those issues. Inevitably, in trying to do so much, the article will do too little. Doubtless some titles will be missed, and some issues that may occur to others will not have occurred to this author. But the fundamental purpose here is to provide a broad context for discussion of the electronic journal, and, with luck, the gaps left by this author will only serve as an incentive for others to continue the discussion.

Currently Available Electronic Journals

At the outset, it is useful to say something about the online formats from which electronic journals emerged and from which they are still not always easily distinguished. This is no simple matter. As with the term electronic journal, the labels applied to the various forms of online communication are borrowed from other modes of interaction, and the match is largely subjective. Terms like bulletin board, discussion group, conference, and seminar are not meant to be hard and fast definitions but only to evoke a sense of how these various list server operations intend to function. Nonetheless, being mindful of these limitations, it is possible to apply some categorical parameters to these media by talking about several factors—editorial mediation, subject coherence, and formality of presentation. At the outer limits are bulletin boards—open-ended posting systems where almost any message can appear and no real control is exercised. As one moves into the realm of the discussion group, conference, or seminar, editors exercise greater control over subjects and presentation, pushing their contributors toward more topical specificity and insisting on contributions that look more like essays or articles than bulletin board notes. The final product, of course, is the electronic journal. But precisely where the line is crossed is a subjective decision.
This article looks for predictability of appearance, enumeration of issues, formal boards of editors, and editorial policies. But a flexible approach is critical, as the electronic journal is a moving target and one that cannot properly be bound to analogies with other formats without losing appreciation for the unique contributions this electronic medium has to offer.

For the humanities librarian, the best tool for keeping abreast of emerging electronic communications is a subscription to the most comprehensive of the relevant online discussion groups, HUMANIST, which is currently managed by Elaine Brennan and Allen Renear on the Brown University brownvm mainframe. There is a guide to online communications called the Directory of Electronic Journals and Newsletters compiled by Michael Strangelove at the University of Ottawa. It is available in paper format from the Association of Research Libraries in Washington, D.C. or in ASCII format from a Comserve fileserver. In the latter case, an electronic mail message can be sent over Bitnet to <comserve@rpiecs> or via the Internet to <comserve@vm.rpi.edu>. The message should state:

SEND EJOURNAL1 SOURCES
SEND EJOURNAL2 SOURCES

But this area of electronic activity is developing so rapidly that no directory can really be current, even one like Strangeloves's that is to be updated on a routine basis. This means, of course, that the only certain method for bibliographic awareness of online communications is through the medium itself, but this is really no surprise.

For the purposes of this article, twelve electronic journals have been identified: Bryn Mawr Classical Review, Dargonzine, Ejournal, Erofile, Fineart Forum, Offline, Postmodern Culture, Public-Access Computer Systems Review, Psycoloquy, Quanta, SHAKSPER, and Textual Studies in Canada. Most of these titles are evolving, changing with each new issue. Any description will therefore reflect only a snapshot, the momentary characteristics each has exhibited within approximately the last six months. Recognizing this significant limitation, an attempt will be made here to describe briefly each journal's editorial practices, contents, mode of appearance, and method of subscription.

The Bryn Mawr Classical Review (BMCR), which existed in paper format beginning in November 1990, is a review journal in Greek and Latin Classics. Its electronic format lies at the edge of this article's criteria for an electronic journal because it is not planned to appear in discrete, numbered issues. Instead, reviews will be sent out to subscribers as they are received by BMCR, with only minimal editorial
intervention. Moreover, the editors plan to print some or all of these reviews from time to time in the journal's print version. As such, BMCR is not exclusively electronic, and some might also say it is not quite a journal. It has some of the qualities of a heavily moderated list, slightly more formal than HUMANIST. But the editors are soliciting articles and have published essays, while the format is distinctly journal-like to date, so the final decision on these issues can be deferred. It exhibits many of the difficulties in text presentation over an electronic mail network that is still basically unfriendly to diacritics, foreign fonts, and the like. Even footnotes, which were separately enumerated for each page in the paper journal, have become disoriented by the loss of that formatting element in the electronic version. But the editors are mindful of the difficulties and seem genuinely anxious to receive comments and work to improve the end product. For subscriptions to BMCR, send electronic mail to <mailserv@brynmawr> over Bitnet or to <mailserv@brynmawr.edu> via Internet. The message should read: "sub bmcr-l your-name", with your name given in the manner in which your e-mail account is registered.

Dargonazine, the heir of a previous electronic journal, FSFNet, is a fiction magazine printing stories written for the Dargon Project, a shared-world anthology centering on a medieval-style duchy called Dargon in the Kingdom of Baranur on the planet Makdiar. Fairly rigorous controls govern contributions, an author having first to read the entire opus of the project, master the characters, and be fully informed about plot lines under current development. But the casual reader can subscribe as a passive participant by sending electronic mail to <dafydd@white@duvm> over Bitnet or <dafydd@white@duvm.edu> on Internet.

Ejournal describes itself as a peer-reviewed academic periodical interested in issues surrounding creation, transmission, storage, interpretation, alteration, and replication of electronic texts in the humanities. It treats these issues in the broadest possible context, looking at the social, economic, and psychological implications as well as the purely literary and didactic consequences of the electronic format. It is predominantly a review journal, but issues usually contain at least one article. Its discussion presents a truly phenomenal combination of literary criticism and technological analysis, the science being virtually inseparable from the art. Subscriptions are by electronic mail to <listserv@albnyvm1> on Bitnet or <listserv@albnyvm1.edu> on Internet with a message reading simply "sub ejrn1 your-name". It is important to distinguish Ejournal from the electronic journals published under the same name.
by the American Medical Network and Information Companies of America on a range of medical and dental topics.

Erofile publishes book reviews in the fields of French and Italian studies, including literary criticism, cultural studies, film studies, pedagogy, and software. Like many electronic journals, it encourages and publishes responses to reviews, creating ongoing discussions. The preponderance of the material is literary in scope, though it remains to be seen whether historical and other topics will be treated as well. Thus far, articles have been in English, but the journal is considering distribution of reviews in French, although the ASCII standards failure to allow diacritics presents a problem the editors have not yet resolved. Subscription is by electronic mail to <erofile@ucsbuxa> on Bitnet or <erofile@ucsbuxa.ucsb.edu> on Internet, with a free-text message requesting membership in the list.

Fineart Forum is published on the first of each month by "Leonardo" for the International Society for Art, Science and Technology with support from the Macmillan Foundation, Hochscholl voor de Kunsten Utrecht, and the Visualization Laboratory at Texas A&M. Its purpose is dissemination of information regarding the use of computers in the fine arts, ranging from the role of computers in creating art to their use in its distribution and criticism. It has produced a spinoff, Leonardo Electronic News, which will appear on the fifteenth of each month and will contain items linked to the society, including book reviews and member news. It is unclear precisely what relationship these two publications will eventually develop, as their areas of concern overlap and both have the quality of a newsletter. But subscriptions to Fineart Forum are by electronic mail message to <fast@garnet.berkeley> on Bitnet or <fast@garnet.berkeley.edu> on Internet, with a message reading "sub fine-art your-email-address, first-name, last-name, postal-address".

Offline is the electronic, prepublication edition of Robert Krafts Offline column, which has appeared since 1984 in the Bulletin of the Council of Societies for the Study of Religion and in Religious Studies News. This electronic edition does not have an independent existence and so might not properly be called an electronic journal in its own right, as it appears on the HUMANIST discussion list mentioned earlier and on the IOUDAIOES list, which is reached on Bitnet at <yorkvml> and on Internet at <yorkvml.edu>. Offline was originally directed specifically at the interests of the Computer Assisted Research Group of the Society of Bible Literature, but Kraft, who has taken on an editorial team, has broadened its range to include the various uses of computers in the study of religion. The most recent issue of Offline can be obtained by sending electronic mail to <listserv@brownvml>, with the message "get offline 35 humanist".
Membership in either the HUMANIST or IOUDAIOIS list will ensure routine delivery of Offline.

Public-Access Computer Systems Review, usually called just PACS Review, was established in January 1990 as an electronic journal appearing three times a year as a service from the PACS-L computer conference and is concerned with the full scope of computer use in libraries. Subscription is not distinct from membership in the PACS-L network. PACS Review articles are simply stored individually as files on the PACS-L list server at the University of Houston. Members of PACS-L receive an annotated table of contents for each issue. They are then able to call up articles of interest by sending a command to the list server. As with Fineart Forum and Leonardo, PACS Review is closely bound to a newsletter, Public Access Computer Systems News, issues of which appear as messages on the PACS-L network. Subscription to PACS Review entails joining PACS-L by sending an electronic mail message to <listserv@uhupvm1> stating: “subscribe pac-l first-name last-name”. For those not wishing to join PACS-L, tables of contents for individual back issues of PACS Review can be obtained by sending an electronic mail message to the same list server, stating: “get contents prvlnx”, where “x” is the number of the desired issue.

Postmodern Culture (PMC) is an interdisciplinary journal of criticism in a wide range of topics falling under the general rubric of its title. With a distinguished board of editors, it is one of the most formal of the electronic journals currently available. In a manner similar to PACS Review, subscribers to Postmodern Culture do not automatically receive entire issues but only tables of contents and abstracts. Individual items or the entire issue can then be requested from the list server, though receipt of the entire issue requires a minimum of one-half megabyte of free disk space. Interestingly, PMC has begun encouraging subscriptions to an alternate disk or fiche version of the journal at a cost of $15 for individuals and $30 for institutions, apparently motivated by a desire to expand the title’s audience beyond those with electronic mail capacity. Subscription to the electronic version, which is free, requires an electronic mail message to <listserv@ncsuvn.bitnet> or <listserv@ncsuvn.ncsu.edu>, stating: “sub pmc-list your-first-name your-last-name”.

Psycoloquy is sponsored by the Science Directorate of the American Psychological Association and edited by Stevan Harnad at Princeton University and Perry London and Cary Cherniss at Rutgers. Like Postmodern Culture, it has the formal qualifications of a scholarly journal in greater measure than most of the other titles considered here. It appears several times each month with
announcements, reviews, and formal articles in the field of psychology broadly defined. Subscription to *Psycoloquy* is by an electronic mail message to <listserv@pucc.bitnet> or <listserv@pucc.edu>, with the message: “sub psyc first-name last-name.”

*Quanta* is the electronic equivalent of the “little mag,” a small, relatively informal literary journal of science fiction and fantasy. Appearing bi-monthly, it publishes articles, reviews, and short stories by a variety of amateur authors. In spite of its amateur hacker origins—its editor is an undergraduate in Pittsburgh—it has the formal appearance of a paper magazine, with volume and issue enumeration as well as dating on a clearly presented title page. It appears in two formats for possible printing purposes, ASCII and postscript, which must be specified in the subscription request. To subscribe, an electronic mail message is sent to either <quanta+requests-postscript@andrew.cmu.edu> or <quanta+requests-postscript@andrew.cmu.bitnet> for postscript format, <quanta+requests-ascii@andrew.cmu.bitnet> or <quanta+requests-ascii@andrew.cmu.edu> for ASCII format.

It should be noted that *Quanta* is only one of several recently emerged electronic journals devoted to amateur fiction. *InterText* publishes amateur writing in all genres of fiction and appears bi-monthly, alternating with *Quanta*. Subscription requests can be sent to <jsnell@ucsd.edu>. *Core* is devoted to publication of prose and poetry, subscriptions going to <rita@eff.org>. *The Guildsman* is an electronic magazine centered on role-playing games, amateur fantasy, and science fiction. Inquiries can be sent to <jimv@ucrmath.ucr.edu>. The informality of the electronic medium seems particularly well-suited to these amateur publications.

*SHAKSPER* is included here, though it is both less and much more than an electronic journal. This is an electronic conference and, like the annual Shakespeare Association of America meeting, it presents announcements, bulletins, scholarly papers, and formal exchange of ideas. In most respects, it resembles HUMANIST as a moderated list. But the effort to build this list into a nearly comprehensive mode of communication among Shakespeare scholars suggests that excluding it from any treatment of electronic journals would be to put excessive stress on the formal definitions of such journals and to miss the potential of the medium. The elements of *SHAKSPER* do not appear as discreet issues. Conference papers, articles, and theses submitted by members can be retrieved individually. Moreover, members have access to the *SHAKSPER* Quarto/Folio Textbase, a 17-megabyte file of all fifty-five authoritative quarto and folio texts of the Shakespeare plays. There
is also an international directory of Shakespearean institutions, organizations, libraries, and journals; a continually updated Directory of Conferences and Calls for Papers; an index of works in progress; and a bibliography of poems, novels, plays, and films inspired by Shakespeare. Contributions are published with little editorial intervention but are grouped topically whenever possible. Prospective members are asked to submit a brief autobiography to the editor, not in an effort to restrict membership but to facilitate shared expertise among list recipients. To subscribe, an electronic mail message should be sent to <listserv@utoronto.bitnet>, stating: “sub shaksper first-name last-name”.

*Textual Studies in Canada* focuses on the composition, reading, and definition of texts according to disciplinary and cultural assumptions within the Canadian context. This includes Canadian literature, popular culture, rhetoric, reading theory, translation, pedagogy, Canadian studies, feminism, and critical theory. It appears as an annual in the Fall and is the only electronic journal yet encountered that is not free. Annual subscriptions cost $7 for individuals and $10 for institutions. Subscription requests should be sent to W. F. Garrett-Petts by electronic mail at <petts@cariboo.bc.ca>.

**THE ISSUES**

This extraordinary collection of electronic publications and the many more that will doubtless emerge in the near future present librarians and scholars with an array of issues. Some of these issues are by nature philosophical—concerns about the impact of electronic distribution on the development and presentation of scholarship, about the manner in which readers can and should gain access to that scholarship, and about the role of libraries in assuring such access. Other issues are entirely practical and library oriented—if libraries are to make themselves intermediaries in access to these electronic journals, then what are the best methods for receiving them, distributing them to readers, and archiving them on behalf of future generations? Each of these concerns must be addressed by anyone involved in creating, distributing, and providing access to this new phenomenon.

*The Nature of the Medium*

Perhaps the most striking feature of the electronic journal, for those who are accustomed to its paper cousin, is the wide-ranging impact of the electronic medium upon the presentation of each journal’s “message.” Of course, the very definition used here to delineate electronic journals as a special category of electronic communication entails an anachronistic reference back to the paper
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format: appearance at predictable intervals, numbering and dating of issues, and editorial control of contributed materials. In fact, each of these qualities is fundamental in some way to anything one would wish to call a scholarly journal. Any scholar publishing an article or review wants to know that it will appear in a predictably timely manner. Accuracy of citation requires that journals approach the enumeration and dating of issues with a defined methodology. Finally, the very essence of modern scholarship has come to entail peer review of which the editorial boards of journals are a central feature. And most electronic journals have made real efforts to conform. One, *Quanta*, has even gone so far to make itself look like a paper journal as to provide dotted lines marked "cut here" at the start and finish of each release, assuming that readers or libraries will print the journal, cut away its "electronic" header information, and bind it like any other periodical. But the electronic medium has nonetheless had a profound affect on the production, distribution, physical appearance, and even the contents of these journals.

The simple presentation of material in any of these journals is the first element to experience the impact of the electronic medium. Of course some journals, like *Quanta*, adhere rigorously to the forms long established for paper periodicals: a carefully defined title page, list of editors, table of contents, and topically organized displays of reviews, articles, and fiction. *Bryn Mawr Classical Review* has even retained the footnote enumeration that was specifically designed to sit at the bottom of the page in its paper edition, with numbering starting over again with each page—a meaningless phenomenon for which the editors apologize. But others, like *Psycoloquy*, come in peculiar bits and pieces—a queries segment, an abstracts segment, each in a new mailing. But even more notable, mailings come that are not part of the "journal proper"—a brief discussion of copyright problems by one of the editors, an announcement of an award, a warning that publication will be delayed by a holiday. Because each of these gobbets of information does not entail putting ink to paper and postage to envelope, the journal becomes a free-flowing mode of communication. It comes into the reader's life sometimes in traditional, large, and comprehensive units, but just as often it appears in a serendipitous occasional manner, like a quick note dashed off by a friend. This particular informality is directly bound to the electronic format and gives the scholarship in these journals an intimacy that is all but impossible in print.

There is, however, one simple element of the electronic format that limits the impact these journals might have in the world of scholarship. While word processing software has possessed the capacity to paginate documents almost since its inception, the online
systems that distribute electronic journals are largely insensitive to that need. However mundane the concern might sound, precise citation of scholarship is all but impossible without pagination. To the best of this author's knowledge, no convention has emerged to specify how one would go about citing from an article published online. Authors in these journals do cite one another, but the citations have an informality that would not be considered sufficient by the broader scholarly community in most humanities fields. The natural solution might be for electronic journal editors to break their texts into discretely identified, pagelike units. But other, more genuinely electronic, solutions might be equally useful. In any case, until some readily apparent method for citing electronic articles emerges, these journals can have only a marginal impact on the world of scholarship.

The curious manner in which \textit{PACS Review} and \textit{Postmodern Culture} are distributed is equally a phenomenon of the electronic medium. By sending the subscriber only a table of contents and abstracts from which to choose the articles to be retrieved, these titles make the journal a sort of reader-designed product. The interactive capacity of the networks and the list servers are fundamental to this approach. Like \textit{Psycoloquy}'s gobbets of text, it would be a prohibitively costly method of distribution for paper journals. Here, it requires only the right software. There is a potential danger in this mode of distribution. By allowing preselection of texts, these journals eliminate much of the idle browsing of a broad collection of materials, a process that often yields fortuitous surprises in the research process. Whether the tables of contents suffice to retain this serendipity, only time will tell. But there can be little doubt the experiment could only take place in electronic form.

But perhaps the most significant impact of the electronic medium upon the physical presentation of journal text has hardly begun to emerge. This is, after all, electronic text. This means it is searchable with all the freedom and speed that has made other electronic information such a bonanza for many scholars. The tables of contents that accompany many of these journals are, at some level, anachronistic remnants of their paper ancestors. The ability to find that particular piece of analysis, that particular reference for which one hunts, is immeasurably increased by this simple fact. Of course the journals must be downloaded to a local system for these purposes, as electronic mail software is usually fairly wooden in this area. But that is a small concession. Moreover, beyond searchability lies the power of hypertext. This, of course, is more a vision than a reality on the mainframe systems that generate and manage these electronic journals. But there is every reason to think such capacity is not far off.
There can also be little doubt the electronic medium has an impact on the contents of these journals—the writing they attract and its relation to the reader. On the one hand, the freedom of the bulletin board is still evident—the personal queries, the announcements, the abstracts. Each, in this context, has a scholarly purpose, but there is an almost oral quality to them, an intimacy that was often present in nineteenth-century journals but is largely impossible in the formal products of twentieth-century publishing. On the other hand, the electronic medium has a tendency to insert itself into the contents of these journals as an issue. Perhaps this is a consequence of their experimental nature, of the medium’s centrality to what a journal like *Erofile, Fineart Forum,* or *Psycoloquy* is doing. But the medium as a concept tends to become a central topic, as authors writing in an electronic format ponder the impact of the computer on the presentation of their ideas. Certainly the knowledge that they are writing for a computer-literate audience on the network draws such discussions out of the electronic journal’s contributors. But the tendency of the medium to foster innovative presentation of ideas invariably becomes interwoven with the ideas themselves. On the negative side, this phenomenon fosters a great deal of trendy, often rather self-indulgent, analysis. But genuine creativity seems at least an equally frequent result.

The nature of the electronic medium, however, has profound and sometimes baffling implications for these journals’ relation to their audience. Fundamentally, as already noted, electronic journals emerge out of an array of online list server operations that have been oriented toward direct communication among scholars over the network. This means that subscriptions to the journals will, for the most part, come from persons already involved personally with online communication or interested in becoming personally involved. So the journals’ audiences are limited to individuals with ready access to computer networks. It also means that subscriptions to the journals will come largely from individuals who want to receive them personally rather than from institutions like libraries, whose purpose is to provide access to a large group of readers.

This does not mean that electronic journals have not had an audience, that they are trees falling in empty forests. Editor’s remarks and reader comments in virtually every journal indicate that reception has been enthusiastic. But the situation described earlier makes two significant assumptions about the audience of an electronic journal—it assumes that the journal only needs to be accessible to individuals with online capacity, and it assumes that the only persons wishing access to a journal are those sufficiently interested to warrant a personal subscription and routine examination of the entire contents.
But both assumptions run contrary to the role journals have conventionally played in scholarly communication. No journal, scholarly or otherwise, would wish to limit its audience to those possessing a particular technological capacity any more complex and expensive than the ownership of a mailbox or the ability to walk into a library. However ubiquitous computer networks will be to future generations of scholars, any journal whose audience is limited to those participating personally in the networks is limited to a small subset of the current scholarly community, particularly for the humanities. Furthermore, most scholars actually subscribe to and routinely examine just a handful of journals, making only occasional use of others when citations or a colleague's suggestion leads them to an individual article. Few scholars would want to subscribe to every electronic journal that might ever be of interest to them, however infrequently. So the individual subscription structure that has predominated on the networks to date simply will not allow electronic journals to take a central place in the world of scholarly communication.

The natural conclusion, then, is that electronic journals must somehow make their way into libraries or some equivalent thereof, an institutional setting in which they can be accessed easily by those who cannot or do not wish to subscribe personally. Only in that setting can these electronic journals be made accessible to the entire scholarly community. But any approach to library access should recognize the uniqueness of the electronic medium, as discussed earlier, and every effort should be made to retain that medium's positive attributes. As electronic journals find a workable place among other modes of scholarly communication, they may inevitably lose some of the informality that has characterized their network origins. But taking their place "on the library shelf" should not in itself require that electronic journals become clones of their paper cousins.

Issues of Library Access

Any discussion of libraries providing access to electronic journals should be approached using the broadest possible meanings of the terms involved. In other words, the library should be understood here to mean some sort of institutional support that will almost inevitably involve significant participation by a university computer center or other systems specialists. The library should also be understood as potentially either that physical location at which access is joined or simply as the agent providing access to other remote locations. Moreover, providing access can mean collection—i.e. physically capturing the journal—a process that can be managed in various ways; it can also mean simply providing the technological
capacity for access—the equipment and the network connections. Computers offer wonderful and frustratingly complex ways of combining these two options, and the discussion here will try to consider as many of them as possible.

At the outset it will be assumed here that library access does involve an actual institutional subscription to an electronic journal and receipt of issues via the local mainframe computer. The alternative is for the library simply to offer information about these journals to its users and perhaps to provide the hardware and software necessary for individuals to establish and maintain their own subscriptions. But this does not fulfill all the requisites of access discussed earlier. Providing the machinery may address the need to reach an audience beyond those who are already active online. But it does not address the fact that many potential users of a journal have no desire to become active online, and many users will need only occasional access rather than a personal subscription.

So, functioning on the assumption that the library places an institutional subscription to an electronic journal, it must then decide what to do with the issues when they arrive and how to provide the patron with access to them. This article cannot address the technical support entailed in any of the available options but will only attempt to present the options themselves and the advantages and disadvantages they offer. In simple terms, those options are: first, to print the journal either directly from the online file or with the intermediate step of a download and manipulation by word processing software; second, to download the online file to an electronic medium, usually a diskette, manipulate the file with word processing software, and provide access through personal computers; third, to maintain the file on a mainframe computer and provide access through a local area network.

The first option, printing the journal, offers the library the comforting ability, once the printing is complete, of treating electronic journals just like any of their paper cousins—binding them, shelving them, and in every way possible turning them into something indistinguishable from the rest of the library's collection. This methodology unquestionably offers potential as an archiving methodology, but that facet of electronic journal management will be discussed separately later. Printing also offers the ability, if library policy allows, to circulate the journal like any other paper product. Since circulation has come to be regarded in American libraries as an essential feature of democratic access, this is certainly one way to enhance distribution of electronic journals. As a mode of presenting these journals to readers, however, the printing option has significant limitations.
From the standpoint of simple cost management, it means the library must absorb the cost of printing on top of the conventional expense of binding and other material processing. Admittedly, most electronic journal subscriptions are free. Only *Textual Studies in Canada* has thus far imposed a charge. But that seems likely to expand, so the cost of printing may not always be offset by gratis subscriptions. Moreover, if the journal is to be coherent in printed form, significant staff effort is necessary prior to conversion to paper. Printing an online file directly does not result in font and format that is presentable on paper. Consequently, the journal must either be downloaded to a mainframe file and manipulated with that system's editor or downloaded to a personal computer and word processed. Any library contemplating the paper approach must be prepared to absorb the cost of such staff involvement.

But there are other reasons to avoid the paper solution. As discussed earlier, the electronic medium has a significant impact on the nature of electronic journals. Their appearance, their structure, the very subjects they address are shaped in part by the online environment. Of course the full flavor of that environment cannot be conveyed to anyone who is not connected to a network like Bitnet or Internet, with the capacity to participate in the associated seminars and discussion groups. But, if removal of an electronic journal from the online environment alters its character, printing distorts it almost beyond recognition. The continuous flow of electronic text, the header information that identifies the journal's, and often the article's, provenance, even the hint of the electronic environment is lost. Admittedly, these are subtle, perhaps even superficial and aesthetic, concerns. But they have a significance that should be considered by anyone contemplating electronic journal access. These journals have been produced in the computer environment because it suited their purpose. Their removal from that environment in some sense can be seen as defeating that purpose.

The option of downloading an electronic journal to a diskette or other personal computer medium seems to offer most of the disadvantages of the paper option and few of the advantages. The most workable method might be to download to a hard disk, from which library users could read the journal and, if allowed, copy it to their own floppy disk. This eliminates the cost of printing and does maintain the file in an electronic format. But copying to floppy is no alternative for the user without a personal computer, so democracy of access is not assured, and the electronic format on a personal computer is largely an illusion—the file is still only a frozen copy of its online original, far removed from the network environment in which it originated. In addition, the library incurs the cost of
hardware maintenance in an area where such costs may not be necessary.

The third option is to capture the electronic journal on mainframe computer disk space and provide access through the local area network. This seems, on the whole, to provide the most advantageous approach, where the mainframe environment permits. As with the personal computer download, the user does have the capacity to copy the file to a diskette by dialing into the local network from a personal computer. If, like the library's OPAC, the journals are mounted in a mainframe file accessible without personal computer account, democratic access is guaranteed. Finally, mainframe storage means the journal is maintained in an electronic format in proximity to the online environment in which it originates. Admittedly, those who access the journals without a personal password cannot expand their experience of the online environment without securing such a password, though limited access to the broader environment might be developed employing a universal password. Though imperfect, mainframe storage thus offers the best opportunity for retaining and conveying the unique qualities of an electronic journal to the broadest possible audience.

The basic outlines of mainframe storage are relatively simple. The method described here has been in place for approximately three months at Columbia University and, though no statistical analysis has yet been done, seems on the whole to be working well. A notesfile is created on one of the university mainframes for each electronic journal. The subscription is placed with the list server, and issues received are stored in the notesfile. Users of the local area network can simply issue the command, "notes psycholoquy", for instance, and they receive an index of all available files received from that list server. This author, as chair of the humanities library serial committee, serves as caretaker of each electronic journal, a function which involves occasional purging of the file when the index becomes excessive. At present, only individuals with computer accounts can access the notesfiles, but accounts are available to all faculty, students, and librarians so the only real limitation is computer literacy. Access would be more effortless if the notesfiles were available at the top level of the local network, like the library's OPAC. But any institution deciding to approach electronic journal access at that top level needs to consider whether such high visibility is warranted by the needs and number of anticipated journal users.

No matter which option for electronic journal access is chosen—printing, personal computer download, or mainframe storage—a need exists for staff intervention in managing the resultant files. In some measure, this can be viewed as an alternative to the routine check-in
procedures necessary with paper journals, though for the printing and personal computer options the time involved is probably greater and in all cases the level of training needed exceeds that conventionally associated with serial check-in. For the printing option, a staff member must download the file, format it with word processing software, print out the results, and see to their binding. The personal computer option eliminates only the printing and binding phases. It should be noted that if the files are to be reformatted with a word processor, they will often need to be merged. An electronic journal issue is frequently too large for a single mailing and so is sent in several batches. If the issue is to be downloaded for printing or personal computer use, most libraries would want to merge these separate mailings, stripping off their electronic headers and putting them in the proper order. The volume of material to be managed is often considerable. An issue of *Psycoloquy*, for instance, may approach 100 KB or more.

Management of a mainframe-stored journal is less time-consuming for library staff, but the activities involved also require significant acquaintance with the materials being received and the technical procedures needed for their maintenance. It is the notesfile manager who must periodically delete older materials from the file lest it begin to require excessive disk storage space. In the case of journals, like *PACS Review* or *Postmodern Culture*, where automatic mailings include only tables of contents and abstracts, the notesfile manager is responsible for routinely submitting a request to the list server for delivery of the entire issue. Initially, as a library experiments with electronic journal management, the notesfile manager probably needs to be a professional librarian, but, with time, a lower-level staff member might be trained to perform the function. But, whether this person is managing a notesfile or handling printing or personal computer downloading, the tasks involved will not have the routine quality associated with conventional serial check-in.

However a library chooses to manage subscriptions to electronic journals, cataloging needs to be a part of the structure. Without bibliographic control, these journals can never be more than arcane tools available to those who are literate in the online list server experience or at least in the portions of that experience associated with their own field of interest. Even serendipity will not lead one to "stumble" across an electronic journal in all its online uniqueness if the library simply blends it into the paper journal collection or conceals it within personal computers or mainframe terminals. Several of the journals discussed earlier have already been cataloged by the Library of Congress: *Ejournal, Fineart Forum, PACS Review, Postmodern Culture, Psycoloquy, and Quanta*. The phrase,
"[Computer File]" is included in the 245 field, the publisher information is given with the listserv network address in the 265 MARC field, and the mode of access—e.g., "Electronic mail on Bitnet"—is specified in the 500 field.

Finally, on the access level, interlibrary loan must be considered as a potential method for ensuring reasonably universal availability of electronic journals. This seems, on its face, to be a preposterous notion. Electronic text, by its nature, does not seem "loanable." But bibliographic control will invariably result in requests by individuals who either do not realize the title they have discovered is a computer file or who harbor the hope that the host library will consider printing out that file's contents on their behalf. For libraries that approach local access by printing out the journals, of course, such requests would be easily met. For others, the level of service they are willing to provide over interlibrary loan will need to be determined, much as has been the case with CD-ROM products. In a world where online computer access is still not universally available to students and scholars, such determinations will have important implications for access to a scholarship in a format that is likely to become increasingly common.

Archival Responsibilities

In the humanities, access to current journal issues, electronic or not, has perhaps less long-term significance to researchers than access to the backfile. Humanities scholars continue to use one another's work long after that work is published, and the odds of a scholar needing the current issue of a journal to follow up a citation are actually rather slim. Consequently, management of electronic journal backfiles has at least as much significance as management of current receipts.

An exchange of views on the Humanist Discussion Group during the summer of 1991 illustrates the complexities encountered when considering the archiving of electronic journals. In response to a note by Ann Okerson who wrote of librarians' fears that the journals themselves may someday die and leave their mainframe backfiles to the mercy of local computer center staff, and referred to NASA's costly triennial back-up process for satellite data, Stevan Harnad, editor of *Psycoloquy*, wrote with an air of contempt, labeling the whole issue "trivial" (Humanist Discussion Group 5.0178, June 21, 1991). Richard Ristow wrote back in anger, outlining the nightmarish process of trying to do routine backups and suggesting that electronic journals, for want of a better medium, should be archived in paper, a material far better understood from a preservation standpoint than machine-readable files (Humanist Discussion Group 5.0207, July 1,
1991). John Unsworth suggested instead that microfiche be the logical archival medium, since computer files are easily dumped into fiche (Humanist Discussion Group 5.0210, July 4, 1991). Finally, Willard McCarty gave the inevitable response of an electronic text advocate, pointing out that the great glory of electronic communication is that it makes playful fleeting conversations affordable. He pointed out quite rightly that much of what appears online does not merit preservation, indeed that such preservation efforts fly in the face of the electronic communication’s very nature (Humanist Discussion Group 5.0216, July 7, 1991).

Indeed, the issue of archiving electronic journals may be less pressing than our librarian instincts tell us. As McCarty points out, the new medium is NEW. It may very well prove true that some electronic journals will not produce lasting scholarship but will continue to share the fundamentally ephemeral qualities of online discussion groups, seminars, and other list server operations. As discussed earlier, that informal element of electronic communication is much of what makes electronic journals special, and a reasonable argument can be made that much of what moves over the networks can be comfortably consigned to oblivion. But there are two arguments that come to mind in opposition to this cavalier attitude—one concerning electronic communication in general and one addressed specifically to electronic journals.

In the first case, it may be noted that electronic communication, although it is new, is increasingly replacing older forms of communication among scholars, forms that were often preserved. There have always been ways for scholars to communicate informally. Above all, many of them communicated through the mails. Anyone who has sifted through the correspondence files of a great scholar who thrived during the last 100 years knows those files invariably contain reams of informal exchanges with colleagues. Rough drafts of articles and book chapters will be there too, often with the comments of colleagues scratched in the margins. These forms of communication were cumbersome in comparison with the online miracle, but they existed and, of no small importance, were often preserved. It is only a guess, but someone wishing to know how Henri Pirenne formulated his theory of the ancient world’s demise or how Frederick Jackson Turner arrived at his view of the American frontier might find a wealth of information by examining the papers of these great scholars. Had they communicated online, however, current practices would almost certainly mean that such information would be long gone. So a note of caution is appropriate, even where the ephemera of the networks are concerned. A librarian who has ever stood behind a reference desk knows that researchers do not
always restrict their queries to formally published articles and books but often seek the ephemera just as eagerly.

With specific regard to electronic journals, however, a second argument is appropriate. However transient much online communication may be, the very notion of an electronic journal represents an effort to bring formal scholarship into the electronic medium. However much these new journals may share the informality of the networks in their format and even in their contents, their publication of reviews, articles, and new works of fiction represents a lasting contribution to scholarship. If they are not making such contributions, they have no business calling themselves journals and should instead retain the labels of the networks' less formal lists. But if they are indeed journals, then by definition their contents warrant preservation. In some measure, each library will have to approach the distinction of ephemera versus real journals on an ongoing basis, just as it must make occasional reviews of its paper journal collections to judge which titles may have drifted out of scope or failed to live up to their original promise. But preserve we must.

For those electronic journals that do warrant preservation, however, the archival efforts of the list servers themselves are not sufficient. As so many have noted, libraries have never been willing to rely on journals to archive themselves. When a periodical ceases, and most eventually do, its institutional support usually comes to an end with no dependable means of retaining backfiles. This is even more so with computer files, as their maintenance entails use of disk or tape space that is rarely in long supply at university and other computer centers. For the moment, backfiles of all the journals discussed earlier are available from their list servers. But no one would want to bet the same will be true in ten years or even in five. So libraries must ensure that archival efforts are undertaken, and they must probably confront the issue soon.

There is probably no perfect medium for archival preservation of electronic journal backfiles. Purely electronic retention, as already noted, is very expensive and would probably result in texts becoming unreadable, as hardware and software change. The alternatives are conversion to paper and production of microfiche. The latter is probably easier and cheaper to do on a large scale, and *Postmodern Culture* is already encouraging libraries to purchase the fiche backfiles it is generating. But librarians are generally less comfortable with microfiche as a preservation medium, as there are no universally accepted quality standards, whereas archival quality paper has a proven track record. The decision will not be an easy one.
Above all, one might hope the decision would not have to be made library by library. In this time of limited fiscal resources, it does seem appropriate that libraries undertake preservation of electronic journals on a cooperative basis. It may not be workable to integrate this effort with those aiming at preservation of electronic data and text files, since those materials do not lend themselves to format conversion as well as electronic journals. But it does seem useful that libraries make some effort to reduce their overall commitment to creating electronic journal backfiles, at least until the future significance of this new medium becomes clearer. Precisely when that day may come, of course, is a question for astrologers more than for librarians.

CONCLUSION

The electronic journal is a hybrid. It springs from an effort to merge the informality, speed, and relative cheapness of network communication with the durable scholarship of the print world. In some degree, it is a hopeless endeavor, because the two components are so very different and indeed contradictory. How does one inject durability into an electronic medium that is by nature transient or bring speed and cheapness to a print format that has become incurably cumbersome and expensive? The more the electronic product begins to look like its print cousins, the more it will lose the charms of its electronic birthplace; boards of editors, peer review, and formal pagination will invariably make these journals more expensive, slower, and a good bit stuffier. But, if electronic journals fail to achieve some of the formality of their print cousins, they will also fail to make a lasting contribution to scholarship.

The experiment nonetheless seems worth a try and well worth the support of librarians. In contemplating these new products, it is a useful exercise to peruse the rather amateurish book notices of the seventeenth-century Journal des Scavans and the very personal accounts by German scholars in the Reiseberichte of the nineteenth-century Archiv. Doing so, one cannot help but long for a time when scholars shared an intimate world, where most of the rules of evidence, text authentication, and ownership of ideas had yet to be formulated. That world, admittedly stripped of its more archaic qualities, is alive again on Bitnet and Internet. We may fret about how to provide our users with access to it or worry about how to preserve the things it creates. But the simple potential it offers—to keep a rather staid and cautious world of scholarship dynamic and vibrant—seems worth a sleepless night or two.
Historians, Books, Computers, and the Library

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ABSTRACT
PAST EXAMINATIONS OF THE interactions of librarianship with historical scholarship have noted problems that libraries face in serving historians. This article examines changes in the nature of historical work that have occurred over the last four decades including the advent of computers and electronic texts. The authors examine recent developments—such as electronic publishing, electronic mail, electronic journals, and hypertext databases—and suggest that some of these tools will be of limited use to historians, due to the nature of historical scholarship. While some historians may be reluctant to adopt computer technology, many of them already use computers in writing. Historians' personal computers will be a gateway for new forms of electronic information, as evidenced by the publication of various CD-ROM files of relevance to historians. Other publishing projects in the humanities also offer examples that historians can follow in the use of electronic text and images.

INTRODUCTION
Almost forty years ago, Jesse Shera (1953) published a book that contains points salient still today. The book is an extended essay on history, its origin, practice, and on the methods and research needs of the historian. Shera's goal was to provide the background to educate adequately the librarian whom he had found sadly lacking in understanding of the historical research process while working on
his historical publication *Foundations of the Public Library*. Shera's seminal book will be used as a starting point to indicate how much computer technology has and has not changed the practice of librarianship and history.

First, imagine the tools commonly used by historians in 1953, the year in which Shera published his book. Electric typewriters were just being developed. Xerography—a technology that has altered historical scholarship even more than the computer—was in its infancy. Bibliographic tools, such as the *National Union Catalog*, existed only on paper. In short, the tools of the historian were hardly different than they had been in decades past—largely paper, pencil, a good memory, and a lot of note taking. Moving ahead thirty-odd years, we find photocopiers in virtually every library and archive, computer-based word processing, and many catalogs and abstracting services—and, indeed, many publications themselves—available in machine-searchable/ readable form. Some of the particular tools extolled by Shera have been supplemented or replaced by electronic versions, in the sense that one might well choose to use OCLC, RLIN, or a local union catalog instead of a printed version of the *National Union Catalog*.

Has the writing of history changed? In substance, no. Shera's description of the discipline is as valid today as it was in 1953. Yet, in form and method, the discipline of history is changing in subtle ways due to the introduction of new technologies of storage, processing, and retrieval. Let us first consider how Shera described the field four decades ago.

Shera's book begins by indicating the position of history as a social science and as a "transitional point between the social sciences and humanities," a view perhaps more widely held today than it was at the time he published. The universal human interest in history gave rise to libraries; historians later pressed for the establishment of public libraries "in which they might find the books they needed to pursue their own studies" (Shera, 1953, p. 1). Similarly, Kevin Starr has pointed out in a speech at the 1990 Special Libraries Association conference, that, in the nineteenth century, librarians often were historians and historians had large personal libraries. The association of historians and libraries may be most noticeable in appointments to the position of Librarian of Congress, a post which historians Daniel Boorstin and James Billington have held in recent times.

Shera (1953) defines the task of the historian: "The historian is a general social scientist whose primary concern is with the past. In pursuit of this inquiry the historian may proceed as a political scientist, a sociologist, an economist, a psychologist....In short, the
The historian is the sociologist of the past" (pp. 2-3). Shera continues with an exposition on ways in which to classify history: purpose (descriptive, evaluative), subject (history of person, place, thing), method (narrative, psychological analysis, statistical analysis). He makes important points in contrasting the "indirect" methods of history with "direct" methods of other social sciences. The historian uses artifacts of the past but cannot ever come into direct contact with or recreate it. This is the place of the library in the work of the historian—the repository of the textual/graphic record (artifacts) of the past. As the historian must examine all of the evidence before presenting a case before his peers, the historian must have access to all of that evidence. To serve the historian, the library must have access to all of that evidence. Primary evidence consists of artifacts: published text (including inscriptions, official public records, official private records, newspapers) and unpublished text (personal records and correspondence). Secondary sources are important to the historian marshaling his evidence, both to verify that all the primary evidence which is appropriate for his argument has been used and to argue his case in scholarly debate either along similar lines as fellow historians or to dispute their interpretations.

The work of the historian involves the collection of evidence and its selection, organization, analysis, and interpretation. Shera notes that the historian rarely chooses a topic ab initio; his environment often has pressed it upon him—from reading, colleagues, previous projects. From that beginning, each historian tackles the topic in an individual fashion. Ideally, the first step is a review of all of the outstanding literature. Here the structures of the historical discipline are most helpful—bibliographies, journals, books, directories, library catalogs—in determining the scope of the question and previous attempts at addressing it. The historian, simply by dint of the task, picks and chooses phenomena to emphasize, though he does not accord this its central role in the practice of history. Peter Uva (1977) outlines a five stage process of historical research: (1) problem selection (involving preliminary work and hypotheses), (2) detailed planning of data collection, (3) data collection, (4) analysis and interpretation of data, and (5) presentation of findings (p. 16). He notes that stages overlap and some work may be simultaneous, as does Orbach (1984, 1991) in her exploration of the historian's research process. Orbach (1991) also notes that the end product intended, time frame available, as well as amount of material available, play a role in the process, and that at a certain point further materials are not used as the shape of the narrative has been formed and anything more would be an overload (pp. 34-35). Charles Tilly (1990), provided his answer to "How (and what) are historians doing?" His article provides a historian's
perspective (albeit colored by sociology) on historical evidence. For Tilly, at least, the historian and the evidence he uses is less important than the intellectual task of writing.

In contrast with this sympathy of aims and goals through mutual activity (historians as librarians, librarians as historians), both fields have become specialized and professionalized. Historical scholarship slowly became professionalized and developed a pattern and methodology. Shera (1953) points out that it was not until after 1800 that history was separated from other academic disciplines, and only in the late 1800s was the professorate formed in the United States along the lines of the German model (p. 87). History became an academic career, including a credentialing process of producing and defending a dissertation. Associations dedicated to historians were formed, most notably the American Historical Association in 1884, and the Mississippi Valley Historical Association (now the Organization of American Historians) in 1907. Librarians developed a similar credentialing process and cluster of professional organizations. The demands of each profession make it harder to be both a librarian and a historian. Computer technology has widened the gaps between them as well. The historian and the library may work at cross-purposes—the historian may fail to take fullest advantage of the resources available, and the library may fail to serve the historian to the fullest extent possible. Indeed, the irrelevance of some library tools to historical (and other humanistic) scholarship has been featured in several recent studies (Gould, 1988; Wiberley, 1991).

Therefore, both history and librarianship call into play issues of professionalization and technology. The historian is driven by the need to carve a unique niche, with the dissertation and then with articles and books, in the pursuit of a professional (and typically academic) career. This exploration in depth drives the historian beyond the resources of his home library to other libraries and archives or to use of interlibrary loan. As an individualistic pursuit, this also militates against extensive use of that technology which is cooperative and generalizable. The historian has less to gain by adopting those information technologies which the library might use to provide greater access to materials—i.e., electronic mail, electronic file transfer, and digital storage of text and images, and trial applications in the sciences and perhaps even in the humanities at large. While technophobia is an individual trait, not readily generalizable to the practitioners of a discipline, the practice of history itself is an impediment to the adoption of new technology.

Often the historian uses not just a text but its context which may include everything from the era in which the document was written to the paper on which it was written and the ink used. This
need for contextual evidence gibes uneasily with the decontextualizing effects of digitization (similar to the reduction of context in microfilmed materials). Having materials digitized might indeed provide greater access to the intellectual content and could allow the user to select the appropriate materials quicker but cannot obviate the need to see the actual document. The expense of providing this secondary indexing capacity is difficult to justify for the use of the individual scholar. Popular materials may indeed be rehoused in this format, but it is often unique materials the historian is after, has the hardest time accessing, and is least willing to share. Historians are not monolithic in their adoption (or nonadoption) of computer technology, just as they are not monolithic in methodology or ideology. Indeed, those historians whose methods are more social scientific and data-oriented are more likely to adopt computers to manipulate that data (e.g., see Burton & Finnegan, 1989).

Serving this gamut of historians means devoting more resources to old and new technologies—books, periodicals, computers, CD-ROM, online catalogs, and electronic mail. The library acts as a conduit for information about available resources and as a means of access to nonlocal materials. New technologies, applied appropriately, can help.

The relationship between library and historian and computer technology offers opportunities. Glancing at the table of contents of Reference Sources In History (Fritze et al., 1990), one can see the resources which the library provides to the historian currently and probably shall forever. Bibliographies, book review indexes, periodical guides, periodical indexes and abstracts, newspaper indexes and newspapers, dissertations and theses, government publications, biographical sources, geographical sources, historic statistical sources, archival, manuscript, and special collections are all resources too great in scope, too specialized, or simply beyond the ordinary needs of an individual. These secondary and primary resources are what the library can provide the historian. Some resources used by historians in their research have been, can, or should be made available electronically. The card catalog has all but been replaced by the online catalog (a more flexible tool, though less browseable) which can be dialed up and consulted off site.

As an ever-greater number of historians are exposed to the technological changes that have affected the scholarly publishing industry during recent years, it would benefit us to consider what the future may bring to publishing in history. To do this we will examine recent developments in publishing, experiences in other fields with electronic communication, and the issues raised of particular relevance and importance to historians.
VARIETIES OF ELECTRONIC PUBLISHING

It was not so long ago that the word publishing could mean only one thing: the application of ink to paper and the subsequent manufacture and distribution of the books and journals so produced. However, during the past decade, both the methods and meaning of publishing have become blurred—there is no longer such an enterprise distinct from the industries of computing, telecommunications, and, yes, even broadcasting. This blurring of boundaries, of techniques and audiences, is assumed by the term electronic publishing.

Electronic publishing refers to the distribution of information in machine-readable form. As such, it can appear in a bewildering variety of form and content—as a document on magnetic disk produced on a personal computer by word processing software; as a historical simulation on a microcomputer; as a machine-readable encyclopedia on a CD-ROM disk (an optical medium similar to that used for audio compact disks); as journal article abstracts over phone wires from a remote database; as an electronic bulletin board for the exchange of scholarly letters and manuscripts; or as an online catalog of book citations found in a university library. Other authors (e.g., Seiler & Raben, 1981; Gibbins, 1984) have offered somewhat narrow definitions of electronic publishing. However, for the purposes of this discussion, electronic publishing will be considered to encompass online databases, electronic library catalogs, optical storage devices, scholarly word processing, electronic journals, computer bulletin boards, and electronic mail networks.

Electronic Writing

A fitting place to start a discussion of electronic publishing and the historian is with historians as authors of scholarly texts, many of whom have made their own contribution to electronic publishing through the adoption of personal computers for writing. Case (1985a, 1986) found that the chief use of computers by scholars has been for word processing rather than for more highly touted applications like statistical, database, and spreadsheet programs. Many academics make their living by writing as well as by teaching. It is no surprise that a general purpose device for symbol manipulation should be used for this most basic of tasks. The computer eliminates much of the drudgery formerly associated with composing, typing, and revising manuscripts, while adding relatively little “overhead” of its own, only the need to learn procedures for saving and printing out files. Although many scholars cling to whatever writing methods have proved successful for them in the past, many more have adopted the computer as a writing tool. Historians, in particular, have been
rather quick to embrace computers for this purpose despite some misgivings among humanists regarding the implications of such an action (Lyman, 1989; Case, 1985a). One small survey of historians (Case, 1991b) found seventeen out of twenty using word processing in their work. In the positive view, word processing is merely one more step along an evolutionary line of human expression that started with cave paintings—it is a kind of super typewriter (Bolter, 1987). Other scholars (e.g., Heim, 1987) express misgivings about the effect of this new tool on our capacities for both writing and thinking.

The very fact that scholars are now using computers to compose monographs and articles gives great impetus to electronic publishing. Whether publishers use the author's own file for typesetting or input the text anew, they are increasingly making use of computers in the processes of composition and printing. Aside from the obvious efficiencies, the use of the computer opens up new possibilities for additional products: citations and abstracts may be stripped out of the full text and passed along to a bibliographic database producer or the complete text may be sold as an electronic product. Several books have been written for the scholar using a computer, including *The Electronic Scholar* by John Lawrence (1984) and *The Scholar's Personal Computing Handbook* by Bryan Pfaffenberger (1986). Lawrence discusses word processing, e-mail, electronic filing, online searching, electronic manuscript submission, and other uses of the computer (and issues such as copyright). Articles discussing word processing are numerous; one written specifically about historians is Patrick Peebles's (1988), "The Impact of Computer Technology on Historical Research." We will next examine the computerization and aggregation of texts into various forms—letters, journals, books, and libraries.

*Electronic Letters and Journals*

Kronick (1976), Ziman (1976), and Case (1985b) have examined the origins of modern scholarly and scientific journals, and Stieg (1986) has examined the origins of historical periodicals in particular. An eighteenth-century outgrowth of personal letters and meeting proceedings, journals play a key role in the scholarly discourse of many fields. Periodicals devoted to history began much later than scientific journals—the first scholarly historical periodicals were of nineteenth-century German origin and the first of those to survive to the present, the *Historische Zeitschrift*, began in 1859. The *Historische Zeitschrift* created a model of scholarship for the rest of the historical academy to follow.

Given their origin in exchanges between individuals and small groups, it makes sense that some electronic equivalent to journals
is likely to evolve. Many communities of scientists and social scientists already exchange queries, findings, and opinions via electronic mail systems, bulletin boards, and conferences. Special services connect linguists and chemists in swift and surprisingly personal exchanges. Special facilities are not needed—virtually any academic in a research university can send mail through the Bitnet that connects major universities in North America and many others around the world. The scholarly use of electronic mail, at present, is more a question of personal preference rather than the availability of resources. The list HISTORY on Bitnet has sparked only sporadic usage, perhaps due to the individualistic nature of historians, the informal nature of the medium, and the interpersonal distance built into electronic mail—it is hard to create a "faculty lounge" atmosphere through electronic mail, and it is difficult to engage in meaningful debate in such an open forum.

The electronic journal (Seiler & Raben, 1981; Case, 1985b) is a computer-based version of a print journal. In its fullest implementation (e.g., as described by Roistacher, 1978) the electronic journal is a complete system of editors, referees, and subscribers. Contributors may submit text files directly from their own computer to a central store where they are read, judged, and publicized by editors. Readers dial into a central database of these submissions to select the articles they wish to read; they may scan the articles online, printing only the most desirable ones. Such systems could encompass all aspects of the journal producing process—including screening by referees. Indeed, one of the attractive things about Roistacher's vision of an electronic journal is that it has no page constraints; it could "publish" all submissions, allowing subscribers to judge quality for themselves.

Librarians have begun to take advantage of the publishing possibilities of electronic communication. For example, librarian Charles W. Bailey, of the University of Houston, edits the PACS Review. The approximately 1,600 subscribers to the PACS-L (Public Access Computers List) mailing/discussion list receive notices regularly announcing the newest issue and how to retrieve individual articles. The journal is not automatically sent to list members, but each article must be individually requested.

One of the drawbacks of electronic journals is that most scholars typically prefer that someone properly accredited should screen material for quality; editors play a key role in the system of scholarly communication by encouraging the quality and discouraging (we hope) the quantity of publications. In turn, the process of refereeing creates a motivation for submitting an article in the first place—the reward system is constructed around the prestige of publishing
in certain places and computer files are not yet so regarded. Indeed, one of the problems that was noted in the first experimental electronic journals was the lack of recognition associated with such publications (Turoff & Hiltz, 1982). The very value of electronic communication has been questioned. Harnad (1990) has likened electronic publishing to scholarly "skywriting." Studies have shown the need to retain other aspects of paper journals—e.g., designating "issues" of a journal is still necessary so that subscribers will know when to access the system to see new material.

Electronic communication may create additional problems for scholars. Access to and use of equipment are obvious problems—these turned out to be sticking points in early implementations (Shackel, 1983). Other problems are less obvious. Paul (1981) and Hannemyr and Flood (1985) point out the difficulty entailed in citing electronic documents or letters. Such documents lack fixity. They may be altered, expanded, or erased completely—unlike the printed word. To use Harvey Wheeler's (1987) words—an electronic document is fluid and fungible. One cannot be absolutely sure of its authenticity. For historians, who put a premium on the veracity of a record, this constitutes a serious flaw. A document must have fixity to be of use. Even conversations are quoted with almost as much fixity as possible, narrowed down to the particular day (though not time).

In summary, publishing journals in electronic form is possible and has been done in other academic fields, but the record so far holds little promise for historical journals. As in other fields, the disappointing outlook is due in part to lack of resources and in part to human factors such as unfriendly equipment and lack of recognition for publication. The need for quick publishing simply does not exist in history as it does in other fields such as the hard sciences and medicine. Another consideration working against electronic journals is the heavy reliance among historians on publication of scholarly monographs. Historians rarely make a career of publishing scholarly articles, and the whole process of research and writing, the time involved, and the kind of ideas presented and developed, resists the publication of short works and rather encourages monographic publication.

However, the use of the computer for personal communications between scholars is in keeping with the individualistic perspective of historical scholarship. Outgrowths of electronic mail, such as bulletin boards, for the exchange of notes about historical topics and materials, hold promise for use by historians. At least one special system, HumaNet, already exists for this purpose (Rütimann, 1987). HumaNet, online since summer 1986, covers history, philosophy, religion, and English (Slatta, 1986). HumaNet represents half of North
Carolina State University's ScholarNet, begun in 1985 as a medium for sharing of data and text, teleconferencing, and e-mail. The companion system, PoliNet, covers political science, public administration, and criminal justice.

Subscribers to the system may volunteer to function as "online editors" coordinating information on a topic, collating articles, data files, bibliographies, and other appropriate materials. Connected to sixty-five other countries, scholars can easily communicate with their foreign colleagues. Online databases, produced by ABC-Clio, can be accessed through a gateway to DIALOG on both HumaNet and PoliNet. ScholarNet is growing but more slowly than its Director Richard Slatta had hoped (Schick, 1987, p. 519).

Electronic Books and Libraries

Many historians know that bibliographic databases exist even though they may not use them. The electronic equivalent of printed indexes to publications, they exist in many forms and cover a bewildering variety of subjects, and their numbers are growing incredibly. In 1988, the number of databases available to the public was estimated at nearly 4,000 (Cuadra/Elsevier, 1988). In 1991 that number has climbed to nearly 6,000 (Marcaccio, 1991). Only a fraction of these cover humanities subjects and only a few concern history specifically. The most widely known databases are ABC-Clio's Historical Abstracts and America: History and Life, both available in machine-readable form as well as in printed versions (Boehm, 1978; Falk, 1981). But humanists in general have not taken to online searching (Rütimann, 1987; Katzen, 1986). Both the expense of database searching and the frequent lack of a precise and unambiguous vocabulary are at fault (Frye, 1973; Wiberley, 1983). Historical databases offer particular problems especially in searching by historical period (Falk, 1981b; Grinell, 1987).

Historians often remark that the very design of printed and online indexes often makes them useless for serious searching because the full text of the article must be scanned to appreciate its true content. Most databases were designed for the sciences, in which the results of investigations may be more concisely stated. Indeed, Maurice B. Line (1982, p. 38) suggests that few articles need to be produced in full text, the abstractor's summary having already said it all (and that "all" not being very much in some cases). Here the literary nature of much historical writing conflicts with the technology—unlike scientific materials, historical works would lose much of their value if produced chiefly in abstract form. Most importantly, abstracts simply do not currently contain the information that scholars find most important—e.g., point of view, theme, etc. (Tibbo, 1989), simply
due to their brevity and the "physical science" model followed by abstracting and indexing services.

However, databases are changing in two ways that are especially significant for historians given the nature of their enterprise—first is the increasing availability of full-text databases; second is the development of CD-ROM for database distribution. Advances in both publishing and storage technology are making full text more and more common. Entire articles and newspapers, such as the Wall Street Journal, Washington Post, and Christian Science Monitor, are reproduced in machine-readable form for rapid searching. These are available not only from remote computers but also on CD-ROM. CD-ROM has several advantages. It is local rather than remote and the need for modems, phone lines, and operating knowledge of such is eliminated. The CD-ROM is used in conjunction with microcomputers which are familiar to many academics. Finally, and perhaps most significantly, the costs are fixed rather than based on unit of time—once the library subscribes to the database it may be used for any length of time without additional charges (Rütimann, 1987). In fact, the more often a CD is searched the more cost effective it becomes.

If computer-based journals are less likely to appeal to historians, how about electronic books? One can imagine in the future a computer, essentially just a screen, perhaps LED, about the size of an 81/2 by 11 inch page and about as thick as a good sized book (Starr, 1983). Transportable, it perhaps need not have a large memory, only the ability to hold a 31/2 inch disk which would contain a book (or one or more issues of a journal, for that matter). It could be plugged into a printer for hard copy, and quotations could be excerpted for reading. Such a device is a natural extension of current CD-ROM technology; Sony Corporation's "Data DiscMan Electronic Book"—a hand-held CD-ROM drive with its own liquid crystal display—is an evolutionary step in this direction (Kountz, 1991).

Compact book-like research devices have been the dream of technologists ever since Vannevar Bush's prophetic essay, "As We May Think" (1945). Bush described a desk-like device (the MEMEX) that would store research materials and connect to libraries containing other materials. Not only would it allow reading of such materials, but it would enable the user to browse subject areas in varying depth, connecting one item with another through electronic glosses. Portions of this concept have been implemented in two forms: (1) the scholarly workstation, and (2) hypertext files.

Workstations for Scholars. The Scholar's Workstation, as it is called at Brown University (Moran et al., 1987), is an attempt to create something like Bush's "MEMEX" using current technology. The
centerpiece is a very fast and powerful computer, devoted to a single individual scholar, yet connected to a local network of other computers, peripheral devices (such as laser printers), and databases (such as the library catalog and CD-ROM disks). Such workstations are envisioned as synergistic tools for knowledge creation, allowing the user to create documents and pictures, search online databases, and communicate with other scholars. With such a device, one could, for example, consult a variety of reference works in the course of a project as Crane (1988) describes:

> When studying an idea, we need to move rapidly back and forth between a number of sources, such as maps, dictionaries, texts, or encyclopedic information. A single compact disk devoted to a single subject could certainly store a compact online library. The five hundred or so books that could fit onto a CD would not, of course, replace a major research collection, but they could easily include the most basic resources (texts, dictionaries, grammars, bibliography, commentary, etc.). (pp. 7-8)

As one might expect, the costs for such equipment are quite high and are consequently out of reach of most humanities departments within the near future. Brown University is considering the acquisition of up to 500 workstations to be attached to a campus-wide network. The broadband network would connect all major computers at Brown and would be capable of transmitting conversations and pictures as well as text and other data. The result will be an integration of computations, word processing, information retrieval, data analysis, computer graphics, network communications, and library access (Moran et al., 1987).

**Hypertext.** Hypertext is a term coined by Ted Nelson (1967) to describe a system that would index and link very large numbers of documents building on the “MEMEX” notion of Vannevar Bush. Hypertext is a way of organizing material in which units of text are linked by users in a flexible and relatively effortless manner. In its ideal form, hypertext would allow a user to form (and follow) chains of ideas as they appear in massive files of electronic text—a virtual library of the world’s writings. Unfortunately, the term has become so popular as to be diluted in meaning, as various software publishers have used it to describe new products—all of them far removed from the visions of Bush or Nelson—for writing and searching text files (Borgman & Henstell, 1989).

The presumed advantage of hypertext would be the connection and juxtaposition of relevant items of text to provide new insights—something not too distant from what many historians do currently. The book, it is said, is too linear, too physically constraining, to allow this. But is hypertext really an advantage over the book or merely over earlier versions of computer technology? We are reminded
of the words of Northrop Frye (1973): "the book qua book is not linear: we follow a line while we are reading it, but the book itself is a stationary visual focus of a community. It is the electronic media that increase the amount of linear experience, of things seen and heard that are as quickly forgotten" (p. 15).

While the trend in computing machinery has been toward easier manipulation and navigation, as with notebook computers and the introduction of new pen interfaces (Reinhardt, 1991), until a computer is more like a book kinesthetically, electronic publishing of either journals or books is not likely to be very popular among historians. There is nothing quite so "user-friendly" as a book.

**Current and Future Applications in History**

One could imagine other applications of computer databases in history. A current approach is the development of machine-readable, full-text files of historical material, along the lines of a litigation support database. For instance, published source materials, such as the collected letters of dozens of American historical figures (e.g., Thomas Jefferson), would be potential candidates for publication on CD-ROM. In fact, the University of Virginia has announced their intention of putting the collected diaries and correspondence of George Washington on CD-ROM for distribution to libraries in 1992. Oxford University Press has established an electronic publishing division and is now offering magnetic disk versions of the works of David Hume and John Locke as well as a microcomputer version of their concordance software (Micro-OCP) and a CD-ROM version of the *Oxford English Dictionary*. Specialized electronic publishers have sought opportunities in the discipline of history: one called The Bureau publishes a disk of *Constitution Papers*, featuring the full text of documents relating to the founding of the United States, including the Constitution, the Federalist Papers, the Declaration of Independence, the Monroe Doctrine, and many other documents. While one could argue that such files have limited utility for most scholars, their existence suggests the type of materials that could be made available in this popular electronic format.

Calendars—standard primary historical resources—would be a great boon to the historian as well, for example, the calendar of letters and papers of Henry VIII. A good number of other large primary sources, such as the *Calendar of State Papers, Venetian* (38 volumes), the *Calendar of State Papers, Simancas* (4 volumes), the *Journals of the House of Lords* (208 volumes), the *Pipe Rolls series* (85 volumes), the *Domesday Book* (35 volumes), the *Harleian Miscellany* (3 volumes), and Strype's *Ecclesiastical Memorials* (3 volumes), standard tools for historical research, could be made much more accessible if put into electronic form.
Texts that were typeset using a computer would be much easier to place in machine-readable format; those that were not could be read into a file using optical character recognition (OCR) devices—although OCR remains rather finicky about what it will read reliably. The creation of full-text databases is expensive and labor intensive, beyond the reach of either individual scholars or history departments. Also, the economy of scale in mass market CD-ROM disks would not be reached. Financial support would be required from foundations or consortia of historians or universities to make such products a reality.

Although expensive, such projects could allow more sophisticated manipulation of texts along the lines of those scholars exploring libraries for lost works of Shakespeare and finding them through use of word frequencies. Here the descriptive aspect of history and the evaluative would conflict. The scholar might enjoy manipulating texts, but his or her main goal is a reasoned interpretative description. Devoting too much time to the data defeats the purpose of its existence. The work that a computer can perform is merely preparatory. Putting the Florentine catasto of 1427 into machine-readable form is a worthy accomplishment in that scholars will be able to analyze more easily demographic data (Herlihy et al., 1978, 1985). “Publication” of unwieldy chunks of statistical material like the catasto in electronic form is quite a time-saving marvel for the historian and will improve scholarship, and similar data sets should be published.

Several history-oriented databases have reached production, typically with foundation or university support. One is the Thesaurus Linguae Graecae (Raben, 1986; Brunner, 1991), a collection of pre-A.D. 600 Greek texts. Such projects are not limited to text: Project Perseus (a joint project of Harvard and UCLA) has compiled a visual database of 10,000 images in addition to textual databases on the classics (Crane, 1988, p. 41).

The publication of smaller texts is less feasible. Electronic forms face a problem in the singular solitary aspect of historical scholarship. Historians generally work alone on projects, each carving his own niche in some time period and some region. The catasto was a promising thing to make machine readable because it was so large that many historians could study different aspects of Florentine society using the same raw data. Smaller data files may offer fewer “economies of scale.”

**DISCUSSION: HISTORY AND ELECTRONIC TEXT**

In this age of computerization, many aspects of publishing, from typesetting to transmission of text, have changed. These technical and economic changes are bound to affect what is published and
how it is published (Horowitz, 1986), though some types of materials and some disciplines are likely to resist more than others. One of the fields in academia which has resisted technological innovation is history (Wallach, 1988), not only because it is so deeply rooted in the past but also because particular forms of historical scholarship have not had the resources to use expensive equipment and software.

Hanham (1971) and Case (1991a) point out that photocopying has been much more revolutionary than computers. Photocopying allows the transcription and collation of texts and personal and transportable use for scholarship, away from the holding institution's library, and in the historian's office at home or at the university. Electronically published material may be a step backward in some essential ways. The material is mediated by an expensive machine, lacking ready transportability and permanence. It can be readily manipulated but that manipulation leaves no trace or history—the document is seamless; it is both inflexible and too flexible. The cost of electronically mediated publications hearkens back to the days of papyrus rolls and vellum manuscripts; it drastically reduces access. And, until recently, faculty did not have easy access to computers to allow manipulation of electronic materials.

The diffusion of computer use into the historical profession will be determined by the appropriateness of such technology to the kind of scholarship pursued. Those historians most interested in quantification (a task which the computer can do very well) will be the most enthusiastic (Rowney, 1982). For example, Leland Carlson (1981) attempted and abandoned the computer in his attempt to establish the authorship of the works of Martin Marprelate. He felt he could do a better job in textual and linguistic analysis, being unable to pose the problem in any coherent fashion to a computer.

That the mechanics of producing a journal are greatly eased by computerization is indisputable. However, the potential transfer of responsibility for the physical production of scholarly works is one some scholars deplore, seeing themselves responsible for the content and not for its format. Case (1985b, pp. 312-13) describes the evolution of electronic journals through a series of intermediate steps of electronic production, computerized composition, and electronic editing and reviewing. It may be a path that only a few historians travel. Historians will probably never become enamored of the "paperless society," a development which could deprive future generations of historians of many records; this is especially true considering the rapid obsolescence of computer systems and software, a tendency that could make yesterday's electronic text harder, rather than easier, to retrieve.
CONCLUSION

As more material becomes available in machine-readable form, the historian undoubtedly will deal with it in some fashion rather than ignore a valuable resource. Electronic publishing—defined here as encompassing online databases, electronic library catalogs, optical technologies, word processing, electronic journals, bulletin boards, and their related electronic mail networks—offers a new world of information for the scholar. The chief use of computers by scholars has been for word processing rather than for applications like statistical and spreadsheet programs, and since what historians do mostly is read and write rather than "compute," this predominance of word processing is to be expected. To move the historian from word processing to accessing the larger world of machine-readable text will be difficult at present until the development of computers that are able to switch easily and transparently between applications, along the lines of Bush's MEMEX. Ever smaller and lighter laptop computers are a step in the right direction, allowing "electronic" note taking and easy transferral of those notes to a personal computer. New pen-based interfaces for computers may help, too. However, at present some of the information systems and much of the hardware and software is simply not easy enough to use to make learning to use it worthwhile for the historian—and the law formulated by Calvin Mooers's holds: an information system will not be used if it is more painful to get the information than to do without it.

Writings on the work of historians seem to indicate that they would take advantage of a system which allowed easy access to secondary sources online, such as online library catalogs and online indexes, combined with word processing (see, for example, Reif, 1991). The viability of electronically published journals is less certain. While there has been criticism of the narrowness (and consequent irrelevance to many readers) of articles published in journals such as the Journal of American History, the opportunity electronic publishing holds for publishing more articles may not appeal to the profession. The speed of electronic publishing appeals most to the hard sciences and medicine where new experimental results need quick publication. The publication structure of the scholarly historical journal, built up since the 1850s, partly as an attempt to structure the profession as a whole, is slower and more deliberate. Whether this gatekeeping/refereeing structure can (or should) be replicated online is debatable. Publication in electronic journals must be recognized, and this may not happen before a more widespread adoption of both computers and modems by historians (so that they might have access to the electronic publications). Also, since much of the scholarship of history is published in monographic format, a portable electronic book must be developed before machine-readable text will be truly convenient.
The creation of full-text databases of use to historians will be
e xpensive and labor intensive, so financial support would be required
from foundations or consortia of historians or universities to make
many such products a reality. Historians can turn to other initiatives
in the humanities for examples of successful projects. In philosophy,
a consortium of university departments and faculty from across the
United States—the Electronic Peirce Consortium—is pulling together,
in electronic format, the archives of the philosopher Charles Sanders
Peirce (Neuman, 1991). Involved in this project is full-text digitization
of the text of Peirce's writings. In parallel is support of digitized
images of writings which illustrate his writing in various versions,
rewriting, hand-illustration, calculations and formulae, and even
doodling. Similar projects in history following this model would
facilitate more sophisticated manipulation of texts. The possibilities
are tremendous, as Sir Thomas Elyot (1531) would have realized: "So
large is the compass of that which is named history, that it
comprehendeth all thing[s] that is necessary to be put in memory"
(p. xxv).

One cannot, in the end, overlook an aspect of electronic
publishing which jars uncomfortably with the historical profession;
the historian deals with artifacts of the past in some physical form,
written or graphic, poetry, prose, or statistics; it is not just the
information a document might contain but the evidential value of
the physical document the historian uses. Electronic publishing can
be impermanent, as anyone who has lost a file knows; in fact, any
scholar on the Pacific Rim would be wise to contemplate the fate
of the works on his or her hard disk in the face of the next earthquake.
Word processing simply allows the quicker and neater production
of physical copy. The idea of electronically producing text and having
its only form being electronic and never tangible will not appeal
to many, even as publication in microfiche is not considered much
of an accomplishment. An online catalog has magical "black box"
qualities to it, but it only contains a document surrogate, a skeletal
representation, useful only in retrieving the actual item. An intangible
historical treatise is a virtual contradiction in terms.

History is not a science nor will all agree on whether it is either
a social science or humanity. It is both an art and a craft (Becker,
1978). History which employs social science methods may be better
suited to take advantage of and be more amenable to electronic
publishing, which is ill-suited to conveying the art of written text.
For the craft aspects of historical research, however, electronic
publishing promises useful tools.

References


Wallach, R. (1988). *The muses and the computer: Why information systems are incompatible with humanistic research.* Unpublished specialization paper, Graduate School of Library and Information Science, University of California, Los Angeles, California.


Religious Studies and Electronic Information: A Librarian’s Perspective

MARK STOVER

ABSTRACT
The field of religious studies has seen an abundance of computer-based tools and publications during the last few years. Bibliographic databases, full-text databanks, and electronic Bibles are in many ways changing the face of biblical and theological studies. Librarians, according to a recent survey, see themselves as facilitators to electronic information in religion, but actual figures from theological libraries suggest that academic departments and computer centers may be competing with libraries for the right to disseminate religion-oriented electronic texts. This article surveys the broad range of electronic informational resources in religious and theological studies and discusses the impact that these tools may have on theological librarians.

INTRODUCTION
Most religion scholars on the university level use one of three approaches in their study of religion—the historical, the phenomenological, and the social-scientific or behavioral. This article, focusing as it does on the humanities, will look primarily at religious studies from a historical perspective, although this will not of necessity exclude the phenomenological or the behavioral. Theological seminaries, while including the above three approaches in their curricula, concentrate much of their efforts (in both teaching and scholarship) on the theological-philosophical implications of the historical approach to religious studies. Theology, then, is an

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integral part of the study of religion and will be included within the scope of this article.

The broad field of religious studies, encompassing such subdisciplines as biblical studies, historical religious research, and theology, has long been at the forefront of humanities computing. Hockey (1980), in her classic work on computer applications in the humanities, mentions several Bible-oriented computer projects that were in progress even as far back as the early 1960s. Biblical scholars, for reasons mostly related to their work in analyzing and concording ancient canonical texts, have for many years been interested in the capabilities of the computer. But it has only been in recent years, with the advent of CD-ROM and powerful (and inexpensive) microcomputers, that a broader array of religion scholars have entered the world of information technology.

The usefulness of electronic texts for religious studies is undeniable. Two areas seem especially ripe—textual criticism and literary studies of the Bible.

The field of biblical textual criticism has burgeoned with the advent of computers. In the past, the work of textual criticism was often impossibly long and tedious. Attempting to restore the original text of the Bible meant comparing thousands of ancient documents. Today the sorting and collocating capabilities of the computer enable scholars to concentrate on the intellectual work of textual criticism.

Biblical scholars who study the Bible as literature use electronic texts to amplify their understanding of the ancient writings. Computers are especially powerful in discovering patterns in grammatical constructs and finding connections among similar concepts, images, and ideas. Ancient texts are sometimes confusing to the reader who lacks historical perspective, and the electronic publication of primary and secondary source material (especially when built around a hypertext model) can often provide the necessary cultural and linguistic context (Crane, 1991).

There are many electronic religion publications in use today (Hughes, 1987b; Gould, 1988, pp. 34-39; Kraft, 1991). Most librarians are familiar with bibliographic tools like Religion Indexes on CD-ROM, but the parameters of this article go far beyond computerized indexes. Microcomputer-based Bibles, huge databases of ancient religious texts on CD-ROM, local databanks of morphologically oriented texts, online discussion groups, and CD-ROM publications of theological reference works are some of the other ways that electronic publishing is changing the face of religious studies.

BIBLIOGRAPHIC DATABASES

Most bibliographic databases were born as printed indexes to periodical literature, graduated to online status in the 1970s or 1980s,
and reinvented themselves as CD-ROM databases for the 1990s. Religion scholars and theological librarians sometimes use cross-disciplinary databases (such as *Dissertation Abstracts OnDisc*) and nonreligion databases (like *Philosopher's Index OnDisc*) (LaGuardia, 1991). For most bibliographic research in religion, however, the scholar or librarian can turn to one of two CD-ROM databases: *Religion Indexes on CD-ROM* or *Religious and Theological Abstracts (R & TA)* on CD-ROM.

*Religion Indexes on CD-ROM*, currently published by the American Theological Library Association (ATLA) under the WilsonDisc interface, is the most widely used religion bibliographic database today (Stover, 1991). While some reviewers have noted difficulties in searching certain topics (Scrimgeour, 1990, pp. 47-48), for the most part, *Religion Indexes* has received very positive reviews (Scott, 1990; Womack, 1990). One of its greatest strengths is its broad coverage of journal articles, book reviews, Festschriften, conference proceedings, and D.Min. (Doctor of Ministry) research projects. An online version is accessible through DIALOG and BRS, and a print version is available through ATLA.

*R & TA on CD-ROM* (formerly known as *REX on CD-ROM*) is the other major player in the religion bibliographic database arena. Published by Religious and Theological Abstracts, it does not have as large an installation base as *Religion Indexes* (Stover, 1991), but it does offer certain advantages over its competitor. *R & TA* provides useful (and indexed) abstracts for all of its articles, which cover a thirty-year period (Stover, 1989). The user interface is also in many ways easier to use than *Religion Indexes* but provides coverage of far fewer journal titles (Scrimgeour, 1990, p. 48). A print version exists, but there is no online version of *R & TA* available.

Many other indexes in religion could potentially be converted to machine-readable form, most notably the *Elenchus Bibliographicus Biblicus*, an internationally acclaimed index in biblical studies, published in Latin by the Vatican, which covers both books and journal articles. Others, such as the *Bibliographical Information Bank in Patristics* at the University of Laval, are available for dial-up access but are not yet accessible through a major network or online service (Gould, 1988, p. 35).

**Biblical Studies**

The study of the Bible (including the Jewish Bible or Old Testament and the Christian New Testament) has, without a doubt, spawned the largest number of electronic publications in religious studies (Wilderoter [1991] counts fifty-five separate computer Bible projects). These publications include microcomputer-based electronic
Bibles, CD-ROM biblical reference works, databases of various translations of the Bible, and highly analyzed (grammatically, morphologically, syntactically) databases of the Bible in its original languages of Hebrew, Aramaic, and Greek. (The special difficulties of creating an encoded electronic text in Greek and Hebrew are explored in Tov, 1988; Cover, 1989; and Hughes, 1987b, chapter seven.)

Hughes (1990a) divides the world of biblical computer tools into seven categories: (1) Bible concording, (2) grammatical concording, (3) CD-ROM, (4) portable electronic Bibles, (5) Greek and Hebrew fonts, (6) machine-readable Bible texts, and (7) language-learning programs. While categories 5 and 7 are beyond the scope of this article, the other categories are relevant and will be used here as standardized nomenclature.

Recovering the Ancient Text

When we speak of the original texts of the Bible, we of course do not refer to the Autographa, or original autographs. What we today call the Hebrew Bible and the Greek New Testament are critical editions created by many scholars over a period of several hundred years. Using the semi-scientific rules of textual criticism, scholars have reconstructed what they believe is the earliest possible written form of the biblical text (without delving too much into the oral transmission and redaction that predates the written text). This is no mean feat, since tens of thousands of manuscripts and fragments are extant today and since many errors have been introduced into the text through scribal mistakes and theologically motivated emendations. Textual critics have been at work for centuries and have produced labors of love in collocating, identifying, and comparing ancient manuscripts in their quest for a restored original text. Computer-aided research has already brought about discoveries of errors in the finest critical editions and will undoubtedly lead to a more pristine and scientific approach to textual criticism.

The most widely accepted critical edition of the Hebrew Bible today is the Biblia Hebraica Stuttgartensia (BHS). This massive work is based primarily on Codex Leningrad of the Masoretic Text, a cantillated, punctuated, and vocalized (and sometimes emended) textual tradition compiled by Jewish scribes, called Masoretes, during the first millennium of the Common Era (C.E.) (Wurthwein, 1979, p. 12ff.). The oldest manuscript of the Masoretic Text extant today is from the 10th century C.E., although comparisons with older fragments show it to be highly accurate. BHS also includes a critical apparatus designed to alert the reader to textual variants. This apparatus refers to almost as many variant texts as are extant, but especially focuses on the Septuagint (a Greek translation by rabbis
in the second century B.C.E.), Aramaic Targums (ancient Jewish paraphrastic translations), the Samaritan Pentateuch, and the Dead Sea Scrolls. There are today four principal machine-readable texts of the Hebrew Bible (from which almost all other computerized Hebrew Bibles have developed); three of them are based on BHS, and the fourth is based directly on Codex Leningrad (Tov, 1988). 

BHS is likely to be supplanted (or at least updated) in the near future by a computer-guided critical text of the Hebrew Bible.

New Testament studies today boast of several published critical editions, but the two most commonly used are the text of the United Bible Society (UBS) and the edition prepared by Eberhard Nestle and updated by Kurt Aland (usually referred to as "Nestle-Aland"). These editions are eclectic in that they do not rely solely on one textual tradition but choose one variant over another using the tools of textual criticism. This contrasts sharply with most pre-nineteenth century textual critics (as well as the translators of the King James Version) who relied heavily on the Byzantine textual tradition (also known as the "Textus Receptus" or "Received Text"). Today's critical editions are based on a large number of extant Greek manuscripts and papyri (some dating as far back as the third and fourth centuries C.E.), but are also informed by ancient translations such as the Latin Vulgate and the Syriac Peshitta (Metzger, 1968).

Concording Programs

Microcomputer-based Bibles, or Bible concording programs, enjoy wide circulation today. Their relatively inexpensive costs have brought them into church offices, libraries, homes, and scholar's workstations. These tools are used mostly as powerful concordances with the capability to perform fairly complex Boolean searches and truncation. Most of these "e-Bibles" come bundled with search-and-retrieval software programs, which are generally fairly easy to search but lack flexibility. Text-only packages are more difficult to use but are also more flexible and allow the user to employ the same (familiar) search engine across a spectrum of text files (e.g., the Bible, Shakespeare, etc.). ASCII files can usually be created from selected texts and dumped into a separate word processing program. Most programs on the market make several different English translations of the Bible available, including the King James Version, the New International Version, and the Revised Standard Version. Many also provide the option of purchasing the biblical text in its original languages. With enough memory and the right operating system, some of these programs can window two or more screens of different translations simultaneously.

One problem with electronic biblical concordances is their lack of subject indexing. Searches must be performed using "free-text"
or "post-coordinate" terminology, and this can easily result in less than complete search results. For example, the user who searches for the idea of "endurance" in the Bible will probably miss Galatians 6:9, "And let us not be weary in well-doing: for in due season we shall reap, if we faint not." Some Bible concording programs have started to address this problem by including controlled vocabulary, but even so the existence of metaphors and other figures of speech will continue to baffle the biblical database searcher.

While many microcomputer Bible concording programs exist (Hughes, 1990a), perhaps representative of the genre are two tools published by Zondervan Electronic Publishing (a subdivision of HarperCollins). Macintosh aficionados can use MacBible (formerly the Perfect Word), an easily mastered system that can load various English translations as well as the Hebrew Bible and the Greek New Testament (Kraft, 1991, p. 28). Those who prefer IBM may use NIVpc, a complex program (not for beginners) that contains the New International Version (NIV) of the Bible and the eclectic critical Greek text used by the NIV translators (Kraft, 1991, p. 29). Other microcomputer-based Bibles available include such creative names as Compu-Bible, HyperBible, and The Word Processor. Most of these are aimed at the popular market, but serious scholars can also use them with profit.

While electronic (primarily English-based) biblical concordances are useful, they often fail to cope with the complexities of searching for lemmas (grammatical roots) in Greek and Hebrew. Grammatical concording programs are highly sophisticated computerized biblical texts which meet the challenges of lemmatization and cut through the morass of diacritical marks in the biblical languages. GRAMCORD, produced by the GRAMCORD Institute at Trinity Evangelical Divinity School (Deerfield, Illinois), is the premier grammatical concording program for the Greek New Testament (Kraft, 1991, pp. 26-27). Using a critical Greek text, it is able to locate and display all genitive absolutes, all future participles, all articular infinitives, all first-class conditions and all masculine, plural, accusative, comparative adjectives. In addition to being able to concord whole classes of grammatical objects, GRAMCORD can concord parts of speech, simple inflections, words and complex grammatical constructions. (Hughes, 1990a, p. 66)

**CD-ROM Bibles**

CD-ROM Bible resources are priced somewhat higher than microcomputer-based Bibles, but they offer comparatively "more for the money." Most of these "laser Bibles" contain multiple versions of the biblical text (including original language texts), as well as theologically oriented dictionaries, encyclopedias, lexicons,
handbooks, and other full-text reference works in religion. One major drawback to most of these products is their transliteration of the original Greek and Hebrew texts into Roman characters.

While several CD-ROM Bibles have been reviewed in the literature (Stover, 1990; Allen, 1989; Bloom, 1990), the most outstanding example from this genre is CDWord (Kraft, 1991; DeRose, 1991), published by CDWord Library, Inc. and Dallas Theological Seminary. CDWord has received rave reviews in the literature (e.g., Zahavy, 1990), and these accolades are, for the most part, well deserved. It operates under a Microsoft Windows environment and in many ways is a veritable "Biblical Memex" with almost all of the tools necessary to do both scholarly and nonscholarly biblical research.

One of the distinctive qualities of CDWord is its use of scholarly full-text materials. While the other CD-ROM Bible resources on the market include a large number of research tools, they are, for the most part, outdated and/or of marginal significance for modern scholarship. While some of CDWord's reference sources could be described as "popular," most are scholarly and geared toward those with at least a working knowledge of New Testament Greek. The producers of CDWord have not allowed the lure of public domain (and thus free of cost) texts to draw them into what might have been the publication of an inferior product. Instead, they have insisted on including high quality and up-to-date reference sources, including Bauer's *Greek-English Lexicon of the New Testament* (University of Chicago Press, 1979), *An Intermediate Greek-English Lexicon* by Liddell and Scott (Clarendon Press), Kittel's *Theological Dictionary of the New Testament* (Eerdmans, 1985), and *Harper's Bible Dictionary* (Harper & Row, 1986). The Greek texts used are *Novum Testamentum Graece* (the Nestle-Aland Greek New Testament, 26th edition with diacritics but no critical apparatus) and Rahlf's *Septuaginta*. The English translations include the King James Version (public domain), the Revised Standard Version (National Council of Churches), the New American Standard Bible (Lockman Foundation), and the New International Version (International Bible Society). Each Greek word in the New Testament is fully parsed so that grammatical information (lemmatization and morphological analysis) can be accessed simply by clicking on a word in the text. Hypertext links (placed thoughtfully throughout the database) allow instantaneous cross-referencing among the various reference sources and biblical texts, and even maps of the ancient world and other graphics are included. For the most part, CDWord is a model design for all others to follow.

*Portable Electronic Bibles*

Hand-held electronic Bibles are a recent phenomenon, but their usefulness within the library environment is questionable. Both
Franklin Computers and Zondervan Electronic Publishing produce these gadgets (Hughes, 1990a), and Sony is likely to make a portable electronic Bible available in the near future in conjunction with its Data Discman Electronic Book Player. While library use of these novelty items at the present time is doubtful, they may very well become the future prototype of the electronic book.

**Machine-Readable Biblical Texts**

Machine-readable biblical texts are stored in large databanks at academic computing centers throughout the world. These texts range from simple ASCII versions of an English translation to highly sophisticated, morphologically analyzed Hebrew and Greek texts. Two of the largest and most important databanks of biblical electronic texts are at Oxford University Computing Services and at the Center for the Computer Analysis of Texts at the University of Pennsylvania (Hughes, 1990a, p. 66). Wilderotter (1991) gives a nearly exhaustive listing of worldwide biblical text databanks as well as commercially available products. Most of these computerized Bible texts can be accessed in various ways, including Internet access; online dial-up access; distribution by diskette, tape, or CD-ROM; and local access.

**Jewish Studies**

Although many electronic publications under this heading also contain biblical texts, there is enough uniquely Jewish (primarily rabbinic) material to require a separate section. Perhaps the most ambitious project in computerized Jewish studies is the Global Jewish Database/Responsa Project at Bar-Ilan University in Israel (Hughes, 1987a). Initially funded as a database for rabbinic Responsa (questions and answers in Judaism), today it has become a gigantic computerized repository for Jewish life and culture. It includes not only 50,000 Responsa covering over thirteen centuries, but also the cantillated and vocalized Hebrew Scriptures, the Talmud, Midrashic literature, almost all of the medieval Jewish commentaries, and many works of modern Jewish literature, law, rabbinics, and philosophy. The database can be searched online (direct dial-up), but subscription fees and telecommunications charges may make the service prohibitive for individuals.

Several CD-ROM and microcomputer-based electronic texts are available for the Judaica scholar, although most of these concentrate on the Hebrew Bible. One notable exception is a CD-ROM called the *Computerised Torah Treasure*, published by Machon Otzar HaTorah HaMemuchshav in Israel (Zahavy, 1990). Along with the Tanakh (Hebrew Bible), it also contains much of the important rabbinic literature including the Talmud (Mishnah, Tosefta, Talmud
Bavli, and Talmud Yerushalmi) and several medieval rabbinic codes and commentaries.

Many other electronic publications for Jewish studies exist, mostly unpublished research at academic computing databanks (see Lowry, 1990, pp. 16-17 for a discussion of the differences between published and unpublished electronic texts). A major project under the auspices of Johns Hopkins University and Hebrew Union College is the Comprehensive Aramaic Lexicon, which (when completed) will include all extant Aramaic texts (small portions of the Bible, much of the Talmud, and all of the targumic literature). While the ultimate goal of the project is to create a multivolume printed series, the machine-readable texts will always be available for searching by qualified scholars. Similar projects (Cohen, 1988; Charlesworth, personal communication, March 27, 1991) are underway at Princeton University (with the Cairo Geniza texts) and at Princeton Theological Seminary (with the Dead Sea Scrolls).

**CLASSICAL AND PATRISTIC STUDIES**

Classical studies include the languages, literatures, and cultures of ancient Greece and Rome, usually ending around the 5th century C.E. This discipline is closely related to religious studies primarily due to the influence of the Greek language upon both the New Testament and the Septuagint. Studying ancient civilizations also provides context for the study of the Bible.

Another related area of religious studies is patristics. Patristics refers to the theological writings of the “Fathers” (Christian theologians writing in either Greek or Latin during the first eight centuries of the Common Era). Patristic studies give us insight into how the doctrines of early Christianity (and to a lesser degree the medieval church) were developed and codified.

The *Thesaurus Linguae Graecae* Project (*TLG*) has been, since its inception, a revolutionary tool for classical studies (Brunner, 1988; Hughes, 1987c). The project was begun and continues to be led by Theodore Brunner at the University of California, Irvine. *TLG* attempts, with great success, to compile all extant Greek texts up through the 6th century C.E. Searches for similarities in sentence structure and matching word variants that would have taken “numerous lifetimes” (Brunner, 1988, p. 7) in the past, today take only a matter of minutes. Many self-confessed computer illiterates in classical studies have become first awed by, and then enamored with, *TLG*, and it is becoming the research tool of choice among classical scholars.

The *TLG* disk is licensed to both individuals and institutions over a period of years. For example, the present institutional license
for a single user TLG disk is $850 for five years (Brunner, 1991a). While TLG was originally designed to run on the specially designed Ibycus computer workstation, recently several different software developers have written search and retrieval packages for TLG to run on both IBM and Macintosh platforms. The installation base of TLG appears to be relatively strong. In September 1991, there were almost 700 TLG disks in circulation worldwide (Brunner, 1991b). The percentage of these disks in theological libraries is apparently fairly small (Stover, 1991).

Another important project for classical studies has been undertaken by the Packard Humanities Institute (PHI) in Los Altos, California. PHI currently offers two CD-ROM disks for licensing. PHI Disc 5.3 contains all of the Latin literature up to 200 C.E. as well as a large number of biblical texts (unanalyzed) including the Hebrew Bible, the Septuagint, the Greek New Testament, the Latin Vulgate, and ancient biblical versions in Coptic, Armenian, and Aramaic. PHI Disc 6 contains 87,000 Greek inscriptions (prepared primarily at Cornell University) and 32,000 Greek documentary papyri (a project completed under the auspices of Duke University). The licensing costs for these disks are extraordinarily low: each disk can be licensed (on an annual basis) for $40 or both for $60. The PHI disks do not come bundled with a search engine, but (like TLG) can be accessed by a variety of search-and-retrieval software programs.

Yet another system with importance for classics scholars is the Perseus Project (Hughes, 1990b, pp. 33-38; Crane & Mylonas, 1991). Developed by Gregory Crane and others at Harvard University, it is essentially a very large text and image database of classical Greece running under Hypercard. Encoded with SGML (Standard Generalized Markup Language) codes, the texts in the Perseus database include three categories—translations (into English) of Greek texts, the Greek texts themselves (with a Greek-English lexicon), and background materials (including thousands of images) that provide context for studying Greek civilization. The complete Perseus package (CD-ROM and videotdisk) is currently available from Yale University Press for $350. The CD-ROM alone sells for $150.

In the field of patristics, two major electronic publications have recently been announced. Chadwyck-Healey is marketing the Patrologia Latina Database, a high-priced machine-readable version of Migne's Patrologia Latina, a nineteenth-century critical edition of the Latin fathers. The Belgian publisher Brepols will publish on CD-ROM the Cetedoc Library of Christian Latin Texts, a less expensive database containing more recent texts than Migne (see the article by Edward Shreeves in this issue of Library Trends for a more complete discussion of these Latin databases).
Another important undertaking in patristics is the Bibliographical Information Base in Patristics at the Universite Laval in Quebec. This unpublished databank, built through collaborative efforts by patristics scholars worldwide, contains the complete indexing of the patristic content of over 300 journals and over 20,000 analyzed references to the Latin fathers. CD-ROM would be an ideal distribution method for this database, but at the present time it remains a local project.

**Other Electronic Publications**

A variety of other electronic publications in religion are available, mostly on CD-ROM. The Krishnamurti Text Collection (EPI-Centre, 1991) contains about 21,000 pages of text from the writings of Jiddu Krishnamurti, a teacher on spiritual issues in the Hindu tradition. It is published on CD-ROM by EPI-Centre, a division of BRS Software Products.

*The Published Writings of Ellen G. White on Compact Disc* contains, as might be expected from the title, the complete works of Ellen White, the founder of the Seventh-Day Adventist Church (Graybill, 1990). White's prolific work includes more than 100 books, 160 pamphlets, 5,000 magazine articles, and 1,400 manuscripts. Published by the Ellen G. White Estate, the disk also offers extensive biographical works about White as well as the King James Version of the Bible.

The Islamic Computing Centre in London has created two databases for Islamic studies—a Koran database and a series of "al-hadith" databases (hadith are Islamic traditions usually attributed to the prophet Muhammad). Since the databases consist of public domain English translations, they have limited usefulness for scholars or researchers (Finnegan, 1992). However, these projects are probably the first step in provoking a more scholarly set of Islamic electronic texts.

*The Library of the Future*, published on CD-ROM by the World Library, Inc., contains hundreds of classic works (all public domain English versions) of literature, history, and philosophy. Among the titles that could be considered religious documents are the *Egyptian Book of the Dead*, the *Bhagavad Gita*, the *Life and Teachings of Buddha*, selected writings of Confucius, Augustine's *Confessions*, the Book of Mormon, and English translations of the Bible and the Koran.

Most works of medieval philosophy have strong religious undercurrents, primarily because of the powerful influence of the church on almost all aspects of life during the Middle Ages. Peter Abelard and Saint Anselm of Canterbury are two medieval philosophers whose writings (in the original Latin) have been
converted to machine-readable form by the Literary and Linguistic Computing Center at the University of Cambridge.

There are a growing number of online discussion groups and electronic newsletters in religion, most of which are available at no charge on Internet or Bitnet. Some of these include discussions of humanities computing (<humanist@brownvm>), Judaism in the Greco-Roman world (<ioudaios@yorkvm1>), North American Buddhist studies (INDRANET located at <jamiehubbard@smith>), Indian and Buddhist studies (<buddhist@jpntohok>), Renaissance and Reformation (<ficino@utoronto>), personal ideologies (<belief-l@brownvm>), Judaic studies (<judaica@umnin1>), and comparative and world religions (<religion@harvarda>). A few of these are peered electronic newsletters, but most are wide-ranging "anything goes" discussion groups.

A different kind of electronic newsletter is OFFLINE, edited by Robert Kraft at the University of Pennsylvania and distributed through various electronic and print media. OFFLINE deals primarily with computer issues in biblical studies but occasionally discusses other religion-related topics. Although not an official organ of the Society of Biblical Literature (SBL), OFFLINE serves as the de facto electronic communiqué for SBL's Computer Assisted Research Group.

**Library Issues**

This article has demonstrated that many electronic publications exist for both the scholarly and popular study of religion. Yet the question of domain continues to confront librarians. Where should these resources live? Who should take care of them? Many librarians believe that the answer is simple: libraries and librarians should continue to facilitate access to information whether printed or electronic.

Computer-aided biblical studies provide a test case for the domain question. Can librarians continue to offer the same service for electronic resources in biblical studies as they have in the past for printed materials? To help answer this question, a survey (see Appendix) of electronic tools in theological libraries was sent to 182 North American member libraries of the American Theological Library Association (ATLA). There were ninety-two responses received. While the survey was not meant to be a scientific instrument, this author believes that it does accurately measure the attitudes of theological librarians toward computer-aided biblical research. It should be noted, however, that the makeup of the ATLA membership may have somewhat skewed the survey results. While some ATLA member libraries are affiliated with strong research institutions, many
others are small seminary libraries with anemic materials budgets. Thus a survey of ATLA libraries should not expect to find the same level of research support as one would find in a survey of members of the Association of Research Libraries. Yet even small seminaries are expected to provide graduate-level education, and a weak library budget should not be an excuse for uninformed or irresponsible collection development.

While almost two-thirds of the survey respondents provide access to a religion-oriented bibliographic database on CD-ROM, only about one-third own any kind of electronic Bible text. This is surprising in light of the low cost of many of the microcomputer-based Bible software programs on the market (most of which can be purchased for less than $100). The relatively low ratio of electronic Bibles to libraries also seems to be contradicted by the answer to another question on the survey. When asked, Which do you consider to be the most appropriate domain of computer-aided research in biblical or religious studies?, seventy-eight responded “Library,” seven responded “Computer Center,” and nine responded “Other” (some marked more than one choice).

Another portion of the survey allowed librarians to elaborate on the role of theological libraries in the implementation of computer-aided research and electronic information. The overwhelming majority of respondents were optimistic in their predictions. However, many also seemed to be aware of the pitfalls involved (including high costs, standardization problems, training issues, etc.). Theological librarians, on the whole, seem ready and eager to pursue the idea of providing access to electronic publications. In practice, however, they have been relatively slow in implementing electronic resources.

Some nonlibrarians believe that electronic publications in biblical studies do belong in libraries (Kraft, 1989; Kerr, 1990, pp. 35-37). Many others, however, seem to bypass libraries in their pursuit of electronic information. Some scholars may feel that librarians do not have enough knowledge of the intricacies of the biblical languages to assist in computer-aided studies of the Bible. Others probably have not thought about the implications inherent in the library domain question (centralization of resources, the specialized training of librarians to perform database searching, etc.), and simply use electronic resources wherever they are provided. In the end, it does not really matter why librarians are ignored in this process. The bottom line will always be this: whoever provides the information—whether it is a library, a computer center, or an academic department—will be perceived as the primary facilitator of access to that information. If a library fails to keep pace with technological
advances, even if it is a small seminary library with inadequate funding, it will lose its place (perceived or real) as the primary information provider.

CONCLUSION

The written word has for centuries played an important role in religious studies, primarily because of its significance in transmitting theological constructs and the faith of religious communities. The scroll, the codex, and, finally, the printed book each succeeded in bringing knowledge and understanding to the adherents of various religions as well as to those who studied these religions. The electronic word is simply another step forward in the evolution of religious and theological communication.

Yet forward steps may not have completely linear implications. Mullins (1990) shows that electronic Bibles (especially of the hypertext variety) reflect broader cultural changes in society. Fragmented, relativized, and changeable, the computerized text symbolizes the antithesis of the printed word. When sacred text becomes hypertext, the postmodernist vision of a world without absolutes creeps closer to reality. Electronic documents in a very real sense undermine the static nature of the canonical "word," but they also allow for a personal interaction with the text that previously was not available. These observations are meaningful for the philosopher and the cultural critic, but they also send a message to the theological librarian—i.e., the world is rapidly changing, and those who do not change with it eventually lose their relevance to society.
APPENDIX

Survey of Electronic Tools in Theological Libraries

(1) Does your library have an online public access catalog?

(2) Is your library connected electronically with an institutional computer center?

(3) Please list the CD-ROM databases that you own or lease:

(4) Does your library own any Bible study computer aids (such as Thesaurus Linguae Graecae, CDWord, MacBible, etc.)? If so, please list:

(5) Do you make these Bible study computer aids available to the public, or do you limit their use (to faculty, etc.)?

(6) Do you make available any multi-lingual (especially Hebrew and Greek) word processing programs for student or faculty use? If so, which program(s)?

(7) Is computer-aided research in theology or Biblical studies a major part of the work of any of the faculty at your institution?

(8) Which do you consider to be the most appropriate domain of computer-aided research in Biblical or religious studies?

   _____ Library
   _____ Computer Center
   _____ Other

(9) Do you believe that computers and electronic publications will play an important role in the future of the theological library? Please elaborate.
REFERENCES


Electronic Texts in English and American Literature

ANITA LOWRY

ABSTRACT

The past five years has seen a rapid increase in the publication of electronic texts in all humanities disciplines including English and American literature. Librarians need to know more about the characteristics and use of electronic texts and text banks in order to meet the changing expectations of students and scholars. To that end, this article will examine the major electronic editions of Shakespeare's work and will survey selected electronic text publications currently available in English and American literature.

INTRODUCTION

Over twenty years ago, in a paper presented to the World Shakespeare Congress (Vancouver, British Columbia, 1973), the prominent textual critic T. H. Howard-Hill (1971) argued that, "the establishment of a generally accessible computer-readable Shakespearian text is the first necessary step towards the most useful computer study of Shakespeare" (p. 54). He proposed the creation of a database of old- and new-spelling texts of Shakespeare along with appropriate software for use by the "computationally-naive scholar" (p. 54) as a way of meeting the scholars' and students' need for "easy and fast access to Shakespearian materials on magnetic tape" (p. 54).

While Howard-Hill's vision of a comprehensive Shakespeare textual database is yet to be realized, the microcomputer revolution has made possible a proliferation of electronic editions of
Shakespeare's works, each promising "easy and fast access" for scholars investigating images, themes, motifs, linguistic features, and structure in his work. The many commercially available electronic versions of Shakespeare are emblematic of the explosion that has occurred since the mid-1980s in the publication of electronic primary source texts in the humanities. Today hardly a month goes by without the announcement of a new electronic text publication (or a new edition of an "old" one) in literature, philosophy, religion, or classics; many of these electronic texts represent important works in English and American literature.

This article will examine the major electronic editions of Shakespeare's work and will survey other electronic text publications currently available in English and American literature. It will also take a look at how these electronic resources are beginning to change the perceptions and expectations of librarians and library users alike.

**Published Versus Unpublished Texts**

This discussion will concentrate primarily on published electronic texts. Published electronic texts are those whose goals and processes of production and distribution parallel the goals and processes that we associate with formal publication. That is, the electronic text is intended for distribution or sale to an audience beyond its creator. The text and analytical software that may be supplied with it are subject to editorial control to ensure completeness, accuracy, and usability. The text is documented regarding source, modifications made, encoding and mark-up or tagging schemes used in the text, and so on. Instructional manuals are provided. Technical support for the text and accompanying software is available from the publisher. (Lowry, 1990, p. 16)

While publishers of electronic texts vary greatly in the degree to which they observe these standards, most meet at least some minimum standards that facilitate the acquisition and use of their texts.

In addition to published electronic texts, there are thousands of unpublished electronic texts "created by an individual or a research project without being intended for distribution beyond...[their] initial users" (Lowry, 1990, p. 16). Because unpublished electronic texts are difficult to identify, acquire, and use, this article will not deal with them, except for those preserved in, and distributed by, the Oxford Text Archive (Oxford University).

**Publishers and Publications**

The first publishers of electronic texts and analytical software in the humanities were nonprofit scholarly editing projects or centers like the *Thesaurus Linguae Graecae* (TLG) at the University of California at Irvine; the American and French Research on the *Treasury of the French Language Project* (ARTFL) at the Centre
National de la Recherche Scientifique and the University of Chicago, the Center for Computer Analysis of Texts at the University of Pennsylvania, and the Humanities Research Center at Brigham Young University. There are now several hundred nonprofit scholarly editing projects around the world devoted to the creation of electronic texts or text banks in the humanities. Some of these distribute texts themselves while others are collaborating with a growing number of commercial publishers interested in electronic publishing.

In the world of commercial publishing, companies like InteLex Corp. (Clayton, Georgia.), Johnson & Company (American Fork, Utah), and Shakespeare-On-Disk (Clinton Corners, New York) specialize in the publication of electronic texts and software. They are now being joined by such print publishers as Oxford University Press, Niemeyer Verlag, Brepols, and Chadwyck-Healey, which are adding electronic texts to their lists. With the exception of Brepols and Niemeyer, all of these firms publish electronic texts of interest to scholars of English or American literature, including InteLex, which publishes an excellent series of works by English philosophers.

Sources of Information about Electronic Texts

The Humanities Computing Yearbook, 1989-1990 (1991) is the best, most comprehensive, source of information about electronic texts and analytical software in all disciplines of the humanities, though inevitably an annual publication is out of date as soon as it is published. Other sources include the journals Computers and the Humanities and Literary and Linguistic Computing, the newsletter Bits & Bytes Review, the network discussion group HUMANIST, The Georgetown University Catalogue of Projects in Electronic Text, and a recent article by John Price-Wilkin (1991) of the University of Michigan Library. The "computer files" file in the Research Libraries Information Network (RLIN) cataloging database contains records for many electronic texts, primarily the unpublished holdings of the Oxford Text Archive. And the new Center for Electronic Texts in the Humanities, a cooperative project of Princeton and Rutgers universities, intends to play a national role in gathering and disseminating information and resources.

HAMLET: "WORDS, WORDS, WORDS"

—The Tragedy of Hamlet Act II, Sc. II, Line 192
(Riverside Ed. on the WordCruncher Disc, Vol. 1)

There are countless megabytes of Shakespeare's words in electronic form and at least nine published electronic versions of some or all of his works. By examining some of these publications,
we can begin to understand not only the differences among them, but also the nature and characteristics of electronic texts in general. The following are some of the major characteristics that librarians must consider when evaluating electronic texts and must understand in order to assist users of these texts:

1. **Quality of the Text:** Which printed edition is being reproduced by the electronic text? Is it a standard edition? Does the electronic version omit those parts of the text not written by the author (for example, introductions, critical notes and annotations, etc.) or reproduce everything? Has the text been carefully proofread to match the source text? Have errors found in the source text been corrected in the electronic text or left so that it will exactly match the printed text? Is the editor of the electronic text a scholar or specialist who is knowledgeable about the texts and about scholarly editing standards?

2. **Software:** Is search software supplied with the text, and, if so, what are its capabilities? Can the software also be used separately from the text it comes with, and, conversely, can the text be used with different software? What kind(s) of encoding or markup does the software permit or require?

3. **Markup:** Does the electronic text contain encoding or markup of any kind? What is the nature of that markup, and what software is it compatible with? Does it use the Standard Generalized Markup Language (SGML)?

4. **Medium:** Is the text distributed on CD-ROM, diskette, magnetic tape, or online via dial-up access? On what microcomputer platform does the software run?

5. **Documentation:** How well are all of the above characteristics documented in printed and online documentation?

6. **Price:** What does the electronic text and/or software cost? Are site or network licenses available?

Given these criteria for evaluation, how do the electronic Shakespeares stack up?

**WordCruncher Shakespeare**

WordCruncher Shakespeare actually refers to two slightly different electronic publications of the Riverside edition of the Complete Works of William Shakespeare, one on CD-ROM and one on diskette, both of which are searched using the software program WordCruncher. Originally produced by the Electronic Text Corporation, the WordCruncher Shakespeare texts are now distributed by Johnson & Company (American Fork, Utah). The Riverside edition, edited by G. Blakemore Evans and published by Houghton-
Mifflin in 1974, is a standard and widely used edition of Shakespeare's plays and poems. The electronic text was scanned and proofread, but occasional errors do appear. For example, Kenneth Steele (1990) has identified seventy typographical errors introduced into the WordCruncher Shakespeare.

The WordCruncher Shakespeare is included, along with a number of other texts, on a CD-ROM titled The WordCruncher Disc, Volume 1 (1990); it runs under DOS ($249. Network licenses are available). The WordCruncher software (WCView) supplied with this CD-ROM is menu driven, interactive, and manages to be both easy to learn and use as well as sophisticated and powerful.

A user may search through all of Shakespeare's works at once, through an individual work, or through all the works in a particular category (comedies, tragedies, histories, and romances and poems). WordCruncher automatically displays an alphabetical list of all the words in the text (including titles, character lists, and stage directions) from which one can easily select words to search. A rich complement of full-text searching capabilities is at the user's fingertips—left and right truncation; searches for single words or groups of words; Boolean AND, OR, NOT combinations; proximity searches specifying the order of words and the desired context (within the same act and scene, within the same line, or within $x$ number of characters). The displays of search results are clear, highlighting the search words and precisely identifying the location of the terms in the text; the number of lines displayed as context can be determined by the user. By moving the highlighting bar to an occurrence in the list and pressing the enter key, the user opens a full-screen window onto the text and may, from this point, read forward or backward throughout the text as he or she wishes.

The ease and quickness of this process—from formulating the search to viewing the hits in context to opening a wide window onto the text, moving easily back and forth—make possible a new way of experiencing the text, one that does not replace traditional ways of reading but that supplements them. Students find that it enables them to explore ideas or hunches about the texts that they might not otherwise have pursued and that, indeed, the process of moving so smoothly back and forth between word and text, between question and answer, between conceptualization about the text and immersion in the text itself is stimulating and thought provoking.

In addition to its excellent search, display, and output capabilities, WordCruncher has an interesting feature for showing frequency distribution and relative frequency distribution of a search word or combination of words across a group of texts or within a particular text. So, for example, not only can one find all the occurrences of
words relating to the image of masks in Shakespeare, but one can also quickly determine in which plays, acts, and scenes that imagery is concentrated—useful not only for identifying key parts of the works to examine most closely but also, perhaps, for finding patterns or structural significance in the placement of that imagery within a particular play or group of plays. Other features of the software include a program to create printed concordances or indexes from the works, the ability to go directly to a specified point in the text for reading, and the ability to save search strategies and result lists to disk for recall later. Search results can be sent to disk or printed in a variety of formats.

WordCruncher software supports up to three hierarchical levels of structural markup. In the Riverside Shakespeare electronic texts, those levels correspond to work, act/scene, and line. Thus these are the structural entities that the software can identify in the text and that can be specified as the context when searching for combinations of words within the text(s); in other words, the location of each hit in a search is identified according to the work it appears in, the act/scene numbers, and the line number, and users may specify that Boolean combinations of words appear within the same act/scene or within the same line (or within x number of characters of one another).

Documentation is the weak point of the WordCruncher Shakespeares. The pamphlet supplied with the CD-ROM does not adequately explain the more advanced features of the software, while the full manual that accompanies the stand-alone version of WordCruncher (WCView and WCIndex) is thorough but poorly organized, scattering information on a single topic among different sections of the manual. Fortunately the searching program itself (WCView) is well-organized and consistent and, with a few exceptions, the instructions for its most basic and frequently used operations are presented clearly on the menus; online help is available.

The WordCruncher software may also be purchased in a stand-alone version ($299 for DOS machines. Network licenses available) consisting of two main programs: WCView (features are essentially the same as those of the WCView program on the CD-ROM) and WCIndex, an optional program that enables the user to index his or her own ASCII text files for searching with the WCView program. Johnson & Company also sells on diskette a number of the texts from the WordCruncher Disc CD-ROM, including the Riverside Shakespeare (complete works are $300; subsets are $100 each); these texts are encrypted so that they can only be read by WordCruncher.

With its high quality texts, excellent software, and an amazing price of $249, the WordCruncher Disc (1990) CD-ROM is quite a
bargain. While a number of libraries have found out how easy to use, valuable, and popular the *WordCruncher Disc* can be, it deserves to be more widely known and available as a reference tool and as a unique resource for examining not only the works of William Shakespeare but also the other texts included on the disk (see *WordCruncher* texts discussed later).

**The Oxford University Press Electronic Shakespeare**

In 1986, Oxford University Press (OUP) published a new edition of Shakespeare's complete works under the general editorship of Stanley Wells and Gary Taylor. From this modern-spelling edition an electronic edition was prepared jointly by William Montgomery (one of the editors of the printed edition) and Lou Burnard (Oxford University Computing Service) and published by OUP in 1989 ($300; educational site licenses are available). A meticulously produced and documented electronic text, *William Shakespeare: The Complete Works, Electronic Edition* (1989) (hereafter the OUP Electronic Shakespeare) is a model to be emulated for the scholarship, accuracy, and thoroughness of both text and documentation; the twenty-six-page manual that accompanies the text explains in ample detail the preparation of the text, the meanings of all special characters, the markup language, and how it may be used with the Micro-OCP software. However, it is a very different type of electronic text from the *WordCruncher* Shakespeare. Examining those differences will illuminate several important issues relating to how electronic texts may be used, the nature and function of markup in electronic texts, and the challenges these texts pose for librarians.

The OUP Electronic Shakespeare consists of plain ASCII text files—a separate file for each play, the sonnets, and other poems—on floppy diskettes formatted for DOS machines. Although these files can be read by word processors and other programs, they are designed to be used with a stand-alone program called Micro-OCP, also published by Oxford University Press ($295; multiple-copy discounts and educational site licenses available). The Micro-OCP and *WordCruncher* programs are as different as night and day, and Micro-OCP betrays its roots in the mainframe software Oxford Concordance Program (a widely used mainframe program for producing concordances and analyzing texts). A rarity in the microcomputer environment, Micro-OCP is a batch program rather than an interactive one. The user of Micro-OCP must master a command language for writing short programs (called command files) that describe the text to be processed and define the actions to be performed on the text. Fortunately the program has a menu, a number
of default command values, and error trapping to assist the user in creating and “debugging” the command files. After carefully typing in the command file and pressing the F10 key to begin its execution, the user waits while the program runs and writes the results to a disk or prints them to a printer. Depending on the speed of the microcomputer, the size of the file being processed, and the complexity of the command file, this can take many minutes or even hours. When the process is finished, the user may read the results on the printout or view the results file on the disk.

The OUP Electronic Shakespeare and Micro-OCP obviously are not tools for casual users or for interactive interrogation of a text—purposes for which the WordCruncher Shakespeare is superbly suited. Who and what, then, are they good for?

One key to the unique capabilities of the OUP Electronic Shakespeare lies in the extensive markup that has been added to the electronic text. This markup not only identifies a wide range of significant features of the text but also supplies additional information about the text. The markup scheme identifies:

- author (including other names besides Shakespeare in cases of divided or uncertain authorship)
- title of each work
- relative order of composition in Shakespeare's oeuvre
- date of composition
- kind or genre of the work (play, narrative poem, sonnet, commentation, or miscellaneous)
- line numbers (corresponding to the printed edition)
- amphibious and split verse lines
- act and scene
- prologues and epilogues
- act intervals
- whether text is verse, prose, or song
- stage directions
- name of speaker with text of his/her speech

Using these markup codes, Micro-OCP can search, sort, and statistically analyze a file of the OUP Electronic Shakespeare with great precision. For example, while WordCruncher can find all the occurrences of the word “king” in *Hamlet*, it cannot limit its search to find only those occurrences in the speech of a particular character like Hamlet himself; an abbreviation for the speaker's name does, of course, appear in the text of the WordCruncher Shakespeare, but there are no markup codes to indicate where that speaker's words begin and end. In contrast, Micro-OCP can be instructed to limit its search for the word “king” only to the text of the speeches of
Hamlet because the markup codes define the extent of his speeches. To give another example, the search for "king" in the WordCruncher Shakespeare will retrieve that word in stage directions, character lists, speakers' names, etc., as well as in the actual text of the play; with Micro-OCP and the OUP Electronic Shakespeare, the user may specify that "king" NOT appear in these parts of the text, or, conversely, may limit the search to occurrences in one or more of these special parts of the text exclusively. However, Micro-OCP can only search through one file—and therefore one Shakespeare play—at a time and cannot merge the results of searches in different files.

In addition to specifying exactly which parts of the text to search, the user has great discretion (including right and left truncation) in defining the words or character strings, the ranges of words, and the phrases or collocations for Micro-OCP to find. Micro-OCP is, essentially, a concordance-generating program that creates lists of words in one of the following formats: a list of words with or without frequency of occurrence; an index of words with their frequencies and location in the text but without any context; or a concordance of words with references, context, and frequency. The user can determine the order of the words (for example, alphabetically by beginning or ending of the words, or according to frequency) and nearly all aspects of the layout of the final lists.

Micro-OCP can also produce a simple statistical table appended to a word list, index, or concordance. This table shows the total number of words retrieved (tokens); the total number of unique words retrieved (types); the ratio of unique words to total words (type/token ratio—a measure of vocabulary richness); the frequency of words (how many occur once, how many twice, etc.); and the relative frequency of words (for example, words occurring once, twice, etc., make up what percentages of the total).

WORDCRUNCHER SHAKESPEARE VERSUS OUP ELECTRONIC SHAKESPEARE

While we might think of WordCruncher as opening interactive windows onto a text in order to highlight the words we are looking for and frame them in a larger context, we could think of Micro-OCP as pulling words out of the text in order to count and arrange them into a fixed order depending on the characteristics of the words themselves. Both WordCruncher and Micro-OCP will locate a word or combination of words in the works of Shakespeare and indicate where it appears in their respective editions, but only WordCruncher will find it in all the works at once, and only WordCruncher will take you there.

The WordCruncher Shakespeare meets the needs of most students and faculty who want to locate words in Shakespeare's works in order
to understand better the meaning and expression of themes, images, motifs, etc.; its major disadvantage is its inability to limit a search to the speech of a particular character or to eliminate stage directions from the search. The OUP Electronic Shakespeare and Micro-OCP meet the more specialized needs of scholars doing extended close analysis of Shakespeare's vocabulary or of the words of particular characters. The text and program are not easy to learn or use and do not constitute a reference tool, as most libraries understand that term, but they certainly constitute a significant electronic research tool. Like complex numeric data files, with which social science data librarians have dealt for some time, texts and programs like the OUP Electronic Shakespeare and Micro-OCP have a place in research collections.

Folios and Quartos

As T. H. Howard-Hill (1973) has pointed out:

The old-spelling and modern-spelling computer-readable texts commend themselves to investigators for different reasons. For instance, a computer-aided study of the imagery of some of Shakespeare's plays should probably use the modern-spelling text from which, so far as this can be done by an editor, errors, obscurities and inconsistencies have been removed. On the other hand, investigations into textual or orthographical questions (and some other matters of linguistic interest) should probably use the old-spelling text where peculiarities of text and language supply the scholar with some of his most significant evidence. (p. 53)

Electronic versions of fifty-five of the Shakespeare folio and early quarto texts have been preserved in the Oxford Text Archive at Oxford University and can be purchased from the archive by scholars for approximately the cost of reproduction on magnetic tape, shipping, and handling. Like their printed counterparts, these texts are not for amateurs, and any individual or library contemplating them should read Whitney Bolton's analysis of the daunting problems relating to the editing, accuracy, and reproduction of the electronic folio and quarto texts. These problems are complicated by the lack of full documentation for the texts, variations in the markup codes used in them, and difficulties in converting them from the mainframe tapes on which they are supplied onto diskettes for use on a microcomputer (Bolton, 1990).

Other Electronic Editions of Shakespeare

Not surprisingly, the number of published electronic versions of Shakespeare is surpassed only by electronic versions of the Bible. In preparation for this article, seven electronic Shakespeares were reviewed including the CD-ROM and diskette versions of the WordCruncher Shakespeare. Among them, the WordCruncher Shakespeare and the OUP Electronic Shakespeare are without rival
because of the importance of the editions that are reproduced, the quality of the texts and markup, the thoroughness of the documentation, and the sophistication of the software. The other electronic Shakespeare texts are, essentially, consumer items rather than reference or research tools, and each of these has significant, if not fatal, flaws.

Survey of Electronic Texts in English and American Literature

Shakespeare alone does not a library make. And yet, to date, relatively few other English and American literary texts have been published in electronic form. Scholars and students of English and American literature do not enjoy a substantial body of reliable electronic texts as do their colleagues in classics (who have the Thesaurus Linguae Graecae and the Packard Humanities Institute's [Los Altos, California] classical Latin CD-ROMs) or in French literature (who have the ARTFL online database whose pre-1925 texts are soon to be released on CD-ROM). However, recent announcements of forthcoming electronic publications by Chadwyck-Healey and Oxford University Press promise to increase dramatically the number of high quality English literary electronic texts.

Oxford University Press and Chadwyck-Healey

The OUP and Chadwyck-Healey publications present rather different approaches to electronic publishing in the humanities. OUP is initiating a series of separately published texts called The Oxford Electronic Text Library and has announced individual or collections of texts by the following authors for publication in 1992—Austen, Chaucer, Coleridge, Dickens, Wordsworth, Hardy, Matthew Lewis, Milton, Mary Shelley, and Mary Wollstonecraft. All electronic editions are based on printed editions by OUP (except for the Riverside Chaucer by Houghton-Mifflin) and, one hopes, will achieve the high standards set by the OUP Electronic Shakespeare texts and documentation. However, two noteworthy differences between these new texts and the OUP Electronic Shakespeare promise to make these even more useful and more significant as milestones in the publication of electronic texts. First of all, each text is encoded according to the Text Encoding Initiative (TEI) recommendations using the Standard Generalized Markup Language; thus the markup of these texts will be consistent among them and consistent with texts from other publishers using these standards—and they may be analyzed by any software that can recognize and exploit SGML markup. Second, OUP is publishing in fall 1992 the Oxford Text Analysis System (OTAS), an interactive SGML-based program for microcomputers for use with
these texts and with other ASCII texts containing SGML markup. Priced at around $100 each and formatted for IBM PC compatibles or Apple Macintosh computers, the publications in The Oxford Electronic Text Library are within the reach of individuals as well as institutions (site licenses available). With the marketing force of OUP behind it, this series is likely to bring electronic texts to the attention of a broad audience of scholars, students, and librarians and make them increasingly aware of what can be done with these new tools for research and teaching.

Never one to shy away from vast projects, Chadwyck-Healey has plunged into electronic text publishing with two enormous databases—the Patrologia Latina Database and The English Poetry Full-Text Database, both announced for publication beginning in 1992. The English Poetry Full-Text Database—encompassing the poetical works in English of 1,350 English, Welsh, Irish, and Scottish authors from 600 to 1900—has no counterpart in print or among electronic publications in English literature. It will make possible innovative new literary, linguistic, and historical studies not only of the works of individual authors, but across authors, time periods, types of poetry, etc. Laudably, Chadwyck-Healey has also adopted TEI-compliant SGML for encoding its texts, adding another important publisher’s voice to the support for these standards. Unfortunately, its impact on scholarship and on the development of the electronic library is likely to be mitigated by its extraordinary cost. At prices ranging from $37,500 to $54,000 for CD-ROM (with text analysis software) and $44,250 to $72,000 for magnetic tape (without software), the complete English Poetry Full-Text Database will be, by many thousands of dollars, one of the two most expensive electronic text databases in any field of the humanities, equaled only by Chadwyck-Healey’s Patrologia Latina Database ($60,000 for either CD-ROM or magnetic tape). As a result, few institutions will be able to make these resources available to their patrons. One wonders why the production costs of these admittedly ambitious databases might not be recouped by selling significantly more copies at a significantly lower price—a strategy that would encourage the development of institutional environments to support electronic research in the humanities to the ultimate benefit of electronic publishers as well as libraries, students, and scholars.

WordCruncher Texts

The WordCruncher Disc Vol. 1 has little competition as the best collection of texts in American literature. The many strengths noted in the review of the WordCruncher Shakespeare (discussed earlier) apply equally to the other texts on this CD-ROM, including works
by the following American authors—Cather, Emerson, Faulkner, Franklin, H. James, Jefferson, Hawthorne, London, Melville, Thoreau, Twain, Whitman (all are also available individually on diskette). These texts are produced from the Library of America editions and, for the most part, contain selected rather than complete works of the authors. The CD-ROM also includes The Constitution Papers, a collection of forty-two seventeenth, eighteenth, and early nineteenth century historical documents relating to U.S. Constitutional history—the Declaration of Independence, Constitution, Federalist Papers, colonial documents and early state constitutions, speeches, Common Sense, The Virginia Statute of Religious Liberty, etc. The Riverside Shakespeare, the King James and New International versions of the Bible, the Constitution Papers, the Library of America texts (and a few miscellaneous speeches and documents)—along with the excellent WordCruncher software, which makes the WordCruncher Disc a valuable and popular reference and research tool for high school, undergraduate and graduate students, and faculty.

The Library of the Future

Because of its sheer size and scope, The Library of the Future Series Second Edition CD-ROM (1991) straddles the fence between consumer item and reference tool. It contains 970 works (including many short stories) by over 100 authors from A (Aeschylus) to W (Wollstonecraft), all in English or English translation. Selected works by forty-one English and twenty-two American literary authors, essayists, and philosophers are included on the disk. In addition to these texts, The Library of the Future CD-ROM contains many other important works of world literature, philosophy, religion, and science.

With a few exceptions, the texts are produced from out-of-copyright printed editions, which are not identified (only the translator's name gives some clue to the editions of the translations). An obvious typographical error in one of the titles ("Women" is substituted for "Woman" in Mary Wollstonecraft's A Vindication of the Rights of Woman) makes one wary of the accuracy of the texts. Its software is menu driven and easy to use but is much more limited than WordCruncher—for example, it allows the user to find a word or combination of words in an individual text, in a selected list of texts, or in all the text(s) but does not show the number of occurrences in each or readily identify their exact location in the works. Because it does not use inverted file indexes to the texts, even simple searches can be extremely slow. Options for printing are limited to a screen at a time or to the entire work. Although the quality and documentation of its texts and the functionality of its
software leaves much to be desired, nevertheless this CD-ROM makes a large and eclectic selection of texts readily available for reference purposes.

Milton on Disk
Shakespeare On Disk has also published an edition of the complete poetic works of John Milton in English ($97 on diskette). The old-spelling editions of 1645, 1671, and 1674 (safely out of copyright) were used to produce the electronic versions under the editorial direction of a Milton scholar, Roy Flannagan of Ohio University. The spelling of many words in these old editions is unusual and inconsistent—perhaps not a problem for a Milton specialist but certainly a hindrance to successful word searching by nonspecialists unfamiliar with the variant spellings. Like this company's Shakespeare texts, Milton On Disk (1990) contains no markup, but, because it represents the only published electronic edition of Milton's work, some libraries have found it worth the effort to add structural markup so that the texts may be used with programs like WordCruncher.4

Distek Literary Series
Distek Publishing, Inc. has published inexpensive editions of Wuthering Heights, The Mayor of Casterbridge, Pride and Prejudice, Huckleberry Finn, Persuasion, Heart of Darkness, and Tess of the Durbervilles; Turn of the Screw is in preparation. The texts are encrypted so that they may be read only with Distek software which is quite primitive.

DiscLit: American Authors
The vast majority of electronic texts in all fields of the humanities are primary source texts—works of literature, philosophy, religion, political theory, etc. However, G. K. Hall has put 143 volumes of secondary sources—the bio-critical studies in the Twayne United States Authors Series—onto the DiscLit: American Authors (1990) CD-ROM, along with the OCLC American Authors Catalog, a bibliographic database of over 127,000 citations to related books, serials, audiovisual materials, and manuscripts from the OCLC Online Union Catalog. The search software offers nearly all the options one could want for searching and moving around in these databases; with its pull-down menus, on-screen prompts, and context-sensitive help it is reasonably easy to use. Whether or not a comprehensive keyword index to the Twayne United States Authors Series and a subset of OCLC is worth $995 is another question.
Other texts not examined for this article include *Sherlock Holmes On Disc* CD-ROM ($99 from CMC ReSearch, Inc., Portland, Oregon); *Greatest Books Ever Written*, a multimedia CD-ROM ($295), and *Monarch Notes* CD-ROM ($99 from the Bureau of Electronic Publishing, Parsippany, New Jersey).

**Electronic Texts in Libraries**

The electronic revolution is changing scholars' expectations about how information is organized, manipulated, and delivered. Word processing has given students and scholars in the humanities unprecedented control over their texts and introduced them to simple word search operations. Library online catalogs and CD-ROMs have given them "hands on" exposure to the power of computer-based information retrieval. Words like "keyword" and "wildcard" are creeping into their vocabulary. Scholarly associations and publishers are bringing new electronic resources to their attention, and they are beginning to imagine the possibilities inherent in "dynamic texts":

Edited texts available in computer-readable text, data and image archives have become "active", "powerful", "dynamic", and "volatile" not just by virtue of the speed with which we exchange them over computer networks. The software that we use to access these texts transforms them before our senses. The text and its translations, the copy text and its variants, or the book and the images, texts, and sounds to which it is linked hypertextually by way of commentary, indebtedness and influence are superimposed on one another; we experience a kind of multiple vision. Just as remarkable are the many style- and content-analysis programs that may now co-exist with the text or data and through which they may be transformed into frequency tables, distribution graphs, and the like. (Lancashire, 1989, p. v)

These assertions can be illustrated by several concrete examples of the growing interest in "dynamic texts," drawn at random from the experience of three libraries that have made substantial commitments to providing access to electronic resources in the humanities.

In 1989, a graduate student came to the Butler Reference Department, Columbia University Libraries, to ask if the complete works of Immanuel Kant, in German, were available on CD-ROM (he had been using the Wilsondisc *Humanities Index* and imagined being able to search Kant's texts in similar ways)—the answer was "no". In 1991, when a faculty member asked if the library would acquire the new electronic edition of Kant's *Gesammelte Schriften*, the answer was: "We just received it; would you like to have a demonstration?" He brought ten graduate students and faculty members from the Philosophy Department with him to the demonstration, and the Kant texts (searched with WordCruncher) have since been used by both graduate and undergraduate students in the Electronic Text Service.
In the Dana Center\textsuperscript{6} of the Barnard College Library (Columbia University), the \textit{WordCruncher Disk} is one of the most popular CD-ROMs in the library. In the fall semester of 1991, two Barnard history professors gave class assignments exploring various political and philosophical concepts expressed in the \textit{Constitution Papers}—one of the first fruits of the library's ongoing efforts to integrate electronic texts into the undergraduate curriculum.

In 1991, the 300 registered users of the UMLIBTEXT\textsuperscript{7} collection of electronic texts on the University of Michigan campus network logged an impressive 3,817 accesses to the system, which includes a large body of English and American literary texts.

The development of library facilities and projects like these for electronic texts is predicated upon several basic assumptions:

- that rapid growth in electronic primary source publishing in the humanities is imminent;
- that electronic texts and related computer-based research tools will become increasingly important for scholarship and teaching in the humanities; and
- that the library has a natural and central role to play in collecting, preserving, and providing service and instruction for these new resources.

The first assumption is being borne out by the many electronic text publication projects in progress around the world in all fields of the humanities including those surveyed in this article.

The second assumption is being borne out by the experiences of libraries whose patrons increasingly are asking about electronic textual resources and are making use of those that are available. In the experience of the Electronic Text Service (ETS), for example, people are using these to examine a concept, image, or motif in a single work: the work of an author or in a group of works related by time period and/or genre; investigate possible allusions or references in one work to another; locate a particular phrase or quotation; or identify, date, or reconstruct fragmentary Greek papyri. And, to date, the most frequently used text banks in the ETS are the \textit{WordCruncher Disc}, the \textit{TLG}, the \textit{PHI CD-ROM} \#6 (Greek inscriptions and papyri), the \textit{PHI CD-ROM} \#5.3 (ancient Biblical and classical Latin texts), \textit{ARTFL}, and the \textit{CETEDOC Library of Christian Latin Texts}; the Riverside Shakespeare and the King James Bible are the most popular individual titles.

The third assumption seems self-evident, a necessary and logical extension of the library's traditional roles—which is not to say that acquiring, preserving, organizing, providing access to and services for electronic texts and research tools will be simple. Librarians
seeking to expand their conception of the electronic library to encompass nonbibliographic electronic resources face many challenges—among them the fact that librarians have a great deal to learn about the characteristics and use of nonbibliographic electronic resources in the humanities, and that there are, as yet, relatively few sources for in-depth evaluations of them. This article has attempted to take a first step toward meeting those challenges.

NOTES

1 Descriptive markup is extremely important in electronic texts because it categorizes the parts of a text so that analytical software may recognize those parts, much the same way that field labels (MARC tags, for example) in a bibliographic database define bibliographic structure. Descriptive markup is necessary because, in the words of the Text Encoding Initiative:

A text is not an undifferentiated sequence of words, much less of bytes. For different purposes, it may be divided into many different units, of different types or sizes. A prose text...might be divided into sections, chapters, paragraphs, and sentences. A verse text might be divided into cantos, stanzas, and lines. Once printed, sequences of prose and verse might be divided into volumes, gatherings, and pages. Such units are most often used to identify specific locations or reference points within a text...but they may also be used to subdivide a text into meaningful fragments for analytic purposes.... Other structural units are more clearly analytic, in that they characterize a section of a text. A dramatic text might regard each speech by a different character as a unit of one kind, and stage directions or pieces of action as units of another kind. Such an analysis is...useful...for facilitating comparisons between the words used by one character and those of another, or those used by the same character at different points of the play (Guidelines, 1990, pp. 11-12).

In general, the more descriptive markup in an electronic text the finer and more precise the searching and analysis that may be done using the text.

A markup language is “a set of markup conventions used together for encoding texts. A markup language must specify what markup is allowed, what markup is required, how markup is to be distinguished from text, and what the markup means” (Guidelines, 1990, pp. 9-10). There are many markup languages that have been used in electronic texts in the humanities, nearly all of them incompatible with one another; as a result, the tagging in a text encoded with one markup language cannot be read by software that is designed for another unless the codes are converted (which may not be easy to accomplish). Out of this chaos, the Standard Generalized Markup Language (SGML) has emerged as an international standard. The Text Encoding Initiative (TEI) is an international project to define text encoding guidelines and a common interchange format for literary and linguistic data using the SGML language. Increasingly, publishers of electronic texts intended for scholarly research are using TEI-compliant SGML encoding in their texts.

2 These electronic texts are based on the electronic texts created by Howard-Hill during the preparation of his Oxford Shakespeare Concordances
published in the 1960s; some of them have markup and other changes added later.

3 In addition to the aforementioned WordCruncher Shakespeare and OUP Electronic Shakespeare they are:

- **Shakespeare On Disk**, an electronic version of the Shakespeare Head Press Edition (published early in the twentieth century); the complete plays and sonnets or selected subsets are available as plain ASCII texts without markup or software. Publisher: Shakespeare On Disk, Clinton Corners, New York.

- Distek Literary Series: Shakespeare, which offers thirteen plays, sold individually on diskette with Distek search software. Publisher: Distek Publishing Inc., Windsor, Ontario.


- A version of the OUP Electronic Shakespeare that is included in the "Digital Library" that comes with NeXTstation microcomputers; Digital Librarian search software is also included. Publisher: NeXT, Inc., Palo Alto, California.

I was unable to examine the Shakespeare CD-ROM with DiscPassage search software, available for IBM PC compatibles and Macintosh computers from CMC ReSearch, Inc., Portland, Oregon.

4 In the Electronic Text Service I have added WordCruncher markup codes to the Milton On Disk texts so that they may be searched using that software. For the UMLIBTEXT project at the University of Michigan, John Price-Wilkin has added SGML encoding to these texts so that they may be searched with PAT software (Open Text Systems, Inc., Waterloo, Ontario).

5 The Electronic Text Service (ETS), a facility affiliated with the Butler Library Reference Department in the Humanities and History Division, was established in 1987/88 in order to enable the Columbia University Libraries to integrate electronic primary source materials into its collections and services. The ETS collection currently includes texts and hypermedia research tools in Coptic, English, French, German, Greek, Hebrew, Italian, Latin, Spanish, Tibetan, as well as translations into English from these and many other languages. Titles number in the thousands (thanks to such large text banks as ARTFL, the TLG, and others). ETS services include: a 1.5-credit course, "Research in the Humanities: A Practicum on Resources and Methods," taught in the Graduate School of Arts and Sciences; demonstrations and workshops; and individual reference and research consultations.

6 Established in 1990 with a grant from the Charles A. Dana Foundation, the Dana Center is a key component of the Barnard Library's program to strengthen the teaching role of the library. The Dana Center collections include electronic texts and hypertext programs in the humanities and social sciences (it was selected as a test site for the Library of Congress American Memory Project), and its programs focus on the integration of these resources into undergraduate research and teaching.

7 In 1989, John Price-Wilkin, data services librarian and English language/literature selector in the Harlan Hatcher Library at the University of Michigan, began a pioneering project to make electronic texts available over the campus network. Selecting the menu option "UMLIBTEXT" on the network now transports University of Michigan students and faculty into
an online world of Old English texts (from the Oxford Text Archive), materials from the Michigan Early Modern English dictionary, the Riverside Shakespeare and Library of America texts (from the WordCruncher Disc), the Milton On Disk texts, English philosophers (from InteLex Corp.), the King James Bible, and selected unpublished English and American literary texts (from the Oxford Text Archive and Cambridge Text Archive). In order to make texts available over the campus network, Price-Wilkin has negotiated network licenses for them from their respective publishers or owners—licenses that grant access only to University of Michigan students, faculty, and staff. The search software for UMLIBTEXT is a program called PAT, which runs under UNIX and was developed by the Centre for the New OED at the University of Waterloo. Price-Wilkin has edited all the texts, except the Old English corpus, to add SGML tagging. Thanks to the time invested by Price-Wilkin in the development of UMLIBTEXT, including a substantial amount of time spent encoding texts, the University of Michigan community has access to a significant body of electronic texts in English and American literature from inside or outside the walls of the library.

REFERENCES


The Georgetown University Catalogue of Projects in Electronic Text (computer database compiled by the Center for Text & Technology, Academic Computer Center, Georgetown University).


Humanist Discussion Group. (Electronic listserv discussion group). Elaine Brennan & Allen Renear, Moderators. (Network address: <humanist@brownvm>.


Electronic Databases for Linguistic and Language Research

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Abstract
Machine-readable language data have increased enormously because of computer-based publishing, online record-keeping, online generation of business and government documents, and electronic mail, to mention just a few sources. This article reviews electronic language data oriented specifically toward linguistic and language research, including dictionaries, other text material, speech databases, bulletin boards, and news groups available over common networks.

Introduction
The availability of machine-readable language data is growing rapidly because of computer-based publishing, record keeping, and documentation. The enormous amount of information represented in natural language serves as a rich resource for research about natural language. In recent years, the accessibility of machine-readable language data has begun to shift basic approaches in language analysis toward corpus-based research, describing linguistic patterns—especially lexical distributions—as they are reflected in actual data. These large databases have generated increased interest in lexicography and also in statistical approaches to language analysis, a trend that is documented in Aarts and Meijs (1990), Church (1991), and Garside, et al. (1987).

This article describes some of the major sources of such data, focusing on large databases that are commonly available, widely used,
and of broad interest to linguists and language researchers. The emphasis is on sources that could serve general needs of librarians, scholars, and students. Not included in this survey are instructional materials such as specific computer-assisted language learning programs and editing and formatting programs to handle nonroman scripts and specialized fonts. Also omitted here is mention of standard reference databases already well known and easily available through DIALOG or BRS such as Linguistics and Language Behavior Abstracts (LLBA) (see DeMiller [1991] for a concise discussion on the major online and CD-ROM databases).

Four main types of electronic databases are included:
1. machine-readable versions of established dictionaries;
2. running text (e.g., newspapers, books);
3. speech data with phonetic/orthographic transcriptions; and
4. newsgroups and bulletin boards available over networks

**Dictionaries**

Virtually all modern dictionaries are produced electronically and are available in both print and machine-readable form, but that situation is very recent. Just over twenty years ago, the first machine-readable version of a dictionary was Webster's Seventh Collegiate Dictionary which had been generated by key-punch entry by John Olney (1968) as part of his philosophical research on word senses. A review of the development of electronic lexical databases since that time can be found in Evens (1988, pp. 9-16).

Essentially all American dictionaries are now available on CD-ROM or magnetic tape or through online access with supporting search software. A recent article in CD-ROM Librarian (Urrows & Urrows, 1991) provides an excellent review of electronic dictionaries and other language aids, a few of which are described here.

Webster's Ninth New Collegiate Dictionary is available on CD-ROM compatible with the Macintosh Plus, Macintosh II, and Macintosh SE and includes optional audio output with recordings of all words.

The American Heritage Electronic Dictionary is available in a licensing arrangement from Houghton Mifflin in three versions (comprehensive, concise, and compact), along with Roget's Thesaurus, and language and grammar tools. Houghton Mifflin also offers online access to a computerized version of the Random House Dictionary.

The Longman Dictionary of Contemporary English (LDOCE) is notable because its grammar coding system is the "most comprehensive description of grammatical properties of words to be
found in any published dictionary in machine readable form” (Boguraev & Briscoe, 1987, p. 203). The *LDOCE* has 60,000 entries which are labeled with relatively rich grammatical subcategorizations and has considerable information on phrasal verbs, noun compounds, and idioms generally not found in dictionaries.

The CD-ROM version of the *Oxford English Dictionary (OED)* represents the twelve volumes of the 1933 edition. It comes with eight indexes and support software for the IBM PC/XT/AT/PS2. The developers intend to maintain the dictionary indefinitely and make it available in both print and machine-readable form (Simpson, 1985).

*Languages of the World* is a composite multilingual dictionary on CD-ROM containing material from eighteen bilingual dictionaries covering twelve languages plus the *NTC Comprehensive Dictionary of American Idioms*. The languages included are Chinese, Danish, Dutch, English, Finnish, French, German, Italian, Japanese, Norwegian, Spanish, and Swedish. The software allows searching and selecting on any combination of languages and supports linkage with common word processing programs so that dictionary entries can be inserted into a document.

**Text Databases**

Corpora representing running text are an important source of language data. Such databases are generally derived from printed sources of running narratives and may include newspapers, books, and journals. In addition to the text itself, these databases may include concordances and grammatical tags (e.g., noun, adjective) for each lexical item.

One of the most significant American lexicographic efforts was assembled at Brown University in the 1960s. Kucera and Francis (1967) collected 2,000 words each from a variety of newspapers, books, and periodicals to construct a 1 million word machine-readable corpus of modern American English, the largest of its type at the time. Over several years, intensive work by staff and graduate students resulted in concordances for each word and grammatical tags. Frequency lists of the Brown corpus are available in many forms—e.g., it is included as a part of the *MRC Psycholinguistic Database* available at handling cost from the Oxford Text Archive (e-mail: <archive@vax.ox.ac.uk>).

The Brown corpus has been the basis for many language processing studies in the past twenty-five years and continues to play an important role in lexical research. However, a million word database is now considered quite small, especially as a foundation for significant statistical analyses.

The British equivalent of the Brown corpus is the Lancaster/Oslo-Bergen (LOB) corpus described in a two-volume set analyzing
tag and word frequencies and combinations (Johansson & Hofland, 1989). Sampling methods and text categories are similar to those of the Brown project, and the database continues to play a similarly significant role in studies of modern British English. The corpus is distributed by the International Computer Archive of Modern English (ICAME) based in Bergen, Norway (contact Knut Hofland, e-mail: <fafkh@earn.nobergen>).

A larger database for British English (and including German and Dutch) is the CELEX lexical database being developed at the Centre for Lexical Information within the University of Nijmegen (e-mail: <celex@celex.kun.nl>). Based on the 18.7 million words of the Birmingham corpus, CELEX is distributing word frequency lists for 100,000 British English headwords and their inflections. The database represents extracts from mainly British English texts published between the 1950s and the early 1980s.

Also representative of current larger databases is the British COBUILD (Collins Birmingham University International Database) database being developed by the University of Birmingham, Birmingham, England, in cooperation with Collins Publishers (Sinclair, 1987b). The total corpus is 20 million words collected from books, magazines, newspapers, and journals plus transcripts of speeches from radio interviews. All materials were written after 1960 so the database is representative of modern English. Most of the sources are British, but specific efforts were made to include data from Australian, South African, Indian, and American English.

Concordances are available for the entire COBUILD database along with the source so that subsets of data representing dialect or style can be identified. This project required development of a large number of lexicography tools for database entry and access, and a learners dictionary has been published (Simpson, 1987a).

An even larger database is being developed through the Data Collection Initiative (DCI) established by the Association for Computational Linguistics in early 1989 (Liberman, 1989). More than 300 million words of text have been acquired so far, with an initial release of a 30 million word sample. Materials include the 1979 edition of the *Collins English Dictionary*; articles from the *Wall Street Journal*; parallel bilingual French-English translations of Canadian parliamentary proceedings (the so-called Hansard database); scientific abstracts; about a dozen novels and plays; the Bible; economic reports from a Swiss bank; the Swiss Civil Code in French, German, and Italian, and at least one speech sample of a National Public Radio news report with orthographic, phonetic, and prosodic transcriptions.

Coding and annotation for this project is being coordinated through the Text Encoding Initiative (TEI) jointly sponsored by the
ACL, the Association for Computers and the Humanities, and the Association for Literary and Linguistic Computing (ACL, 1990). Funding for the TEI comes from the National Endowment for the Humanities and the European Economic Community, and the goal is to define standards for coding and tagging a wide range of texts to encourage sharing of data and cooperative research efforts. One of the main issues arising in electronic lexicography is the need for such standards in the face of the diverse array of formats and notational conventions in which data has been coded.

Over fifty scholars from Europe, the Middle East, and North America are participating in the TEI efforts to define sets of tags for marking features of texts and to code the tag sets within the framework of the Standard Generalized Markup Language (SGML). This will allow marking of physical features of text, such as character sets and page layout, and also linguistic features, such as metrical structure or syntactic constructions.

Information for tape requests on the ACL/DCI and TEI initiatives is available from Donald Walker at the Association for Computational Linguistics (e-mail address: <walker@flash.bellcore.com> or <dci@flash.bellcore.com>.

SPEECH DATABASES

Speech recognition and synthesis efforts in the 1980s plus advances in storage technology have led to establishment of shared speech databases that can be used for algorithm development and system evaluation and testing. As speech database collection is both labor and computationally intensive, the accessibility to shared data can considerably accelerate research progress. Such databases also provide a common reference for evaluation across systems and techniques.

The issue of standardization is even more acute in speech data collection because of the significant effects of microphone, sampling frequency, and recording environment on the data and on the algorithms with which they will be used. In addition, standard alphabets and notational conventions for orthographic and phonetic transcriptions and time-aligned labeled acoustic data are also needed. Speech data differ considerably from text data, with pauses, interjections, and other hesitation phenomena which affect the realization of the spoken language. These standards issues are reviewed in Fourcin et al. (1989).

The DARPA-supported spoken language systems research has resulted in several speech databases, including the large TIMIT database developed by Texas Instruments and MIT. The database represents ten utterances elicited from 630 male and female speakers
for a total of 6,300 sentences. The utterances are phonetically transcribed using semi-automatic labeling tools and hand correction. An inventory of sixty standard International Phonetic Association symbols is available for transcription. This database is being used in ongoing speech recognition research and is available from the National Institutes for Science and Technology (formerly the National Bureau of Standards).

The JEIDA Japanese language database includes data from 150 people—75 male and 75 female—speaking monosyllables, discrete words, and connected digits, for a total of 323 utterances, repeated four times by each speaker, reading from word lists.

A similar database for French is GRECO, representing speech from thirty-two speakers, including words; phrases; hundreds of figures, numbers, and number sequences; letters and spelled words; and several hundred consonant-vowel utterances.

The European ESPRIT project collected data from four speakers in each of five languages (Danish, Dutch, English, French, and Italian) for a total of twenty speakers. Utterances included single digits and digit sequences. The Centre for Speech Technology Research at Edinburgh collected data from sixty speakers, male and female, who read a pre-written speech plus a prose reading passage. A NATO project recorded digits and digit sequences from nineteen speakers of British English, American English, French, German, and Dutch, for a total of 1,400 isolated digits and 25,000 digit sequences. It is clear that the availability of speech databases is not as advanced as that of text databases because of the logistics and resources associated with speech recording under controlled conditions.

**Network Resources and Other Sources**

The availability of international electronic networks, such as Bitnet and Internet, has fundamentally changed communications among scholars and students in linguistics and languages. Direct contact with colleagues, immediate answers, and global broadcasting of queries and responses all serve to support interchange of data and research results.

In addition to newsgroups on various topics available on all networks to all users, there are focused electronic bulletin boards oriented toward the language scholar. One of these is LN, an international distribution list for computational linguists. The list has several hundred members worldwide and serves as a forum to exchange information, including calls for papers, conference announcements, project descriptions, and requests for data or bibliographic references. Sponsors are the Association for Computational Linguistics and the Association for Computers and the
Humanities. Members subscribe (at no cost) and receive all postings. Moderators are Jean Veronis (e-mail: <veronis@vassar.bitnet>) and Peter Zweigenbaum (e-mail: <zweig@frsim51.bitnet>). Notices are in French or English and often provide very useful contacts about research in French language and linguistic studies in particular and international efforts in general.

To address the issue of tools for handling large amounts of text data, a research consortium has been established at the Computing Research Laboratory of New Mexico State University. The Consortium for Lexical Research is sponsored by the Association for Computational Linguistics and funded by the Defense Advanced Research Projects Agency (DARPA). Members of the consortium will pay an annual fee and will share lexical data and tools used for research on natural language dictionaries and lexicons and communicate results of the research. Participants contribute resources to a repository and withdraw other resources that support their research. A major activity of the consortium will be to negotiate agreements with providers of tools for the mutual advantage of both suppliers and researchers. Information on the consortium is available by e-mail from: <lexical@nmsu.edu>.

Sample current materials include Roget's 1911 Thesaurus, the Wordsmyth 47,000 entry dictionary, several major natural language processing software tools from Bolt, Beranek and Newman, and sample data collected as part of the Text Encoding Initiative.

Another source of information about language processing tools and other natural language software (as distinguished from lexical corpora) is the Natural Language Software Registry (e-mail: <registry@tira.uchicago.edu>). To make evaluation and exchange of natural language software easier, the University of Chicago's Center for Information and Language Studies has begun to catalog both research and commercial products. Developers are asked to submit descriptions, including type of system (e.g., commercial or research), application (e.g., machine translation, database query system, parser), system components, hardware and software platform and other system specifications, availability and distribution, and restrictions on use.

The Bibliographic Database (BDB), focused specifically on computer processing of language data, is available from the journal Paralingua based in Montreal. As of August 1989, there were approximately 38,000 international citations in the BDB representing 21,000 different authors. The BDB covers a wide range of topics, including character recognition, document processing, information retrieval from text, and literary computing.
CONCLUSION

Computer technology is contributing significantly to development of language databases to support linguistics and language research. Because of the increasing size of the databases, more data sharing, and better communication among researchers and system developers, several major issues have emerged.

1. The availability of data is actually changing the methodology that language researchers use. Techniques that were intractable a decade ago because of constraints on computing resources and on data can now be employed. Statistical inference (or bottom up or data driven) techniques, such as Hidden Markov Models and n-gram statistics, can be tried in computational linguistic applications such as machine translation which traditionally has relied on top down methods. Recent years have seen an explosion of interest in lexicography, a direct result of computer-based publishing.

2. Sharing of data and sharing of software tools requires a framework of standardization in collection, transcription, and maintenance of data, issues being addressed by the Text Encoding Initiative. Not only are the text strings themselves important but also spatial information such as placement on the page and order of characters (not left to right in all languages, not horizontal in all languages).

3. Access to common networks has made the research community closer, more communicative, and more likely to work in a collaborative way. The contribution of electronic mail, bulletin boards, and news groups cannot be overestimated. The print medium or the telephone is no longer the way to keep current with research peers.

4. The nature of professional publication is also changing as the value of high quality databases is acknowledged. Scholars will count database development and dissemination on a par with journal articles, and professional achievement will be measured based on sharing of data as well as research results.

REFERENCES


Navigator, Mapmaker, Stargazer: Charting the New Electronic Sources in Art History

Marcia Reed

Abstract

Two issues of Library Trends have dealt with the developing technology for images and ways to index and access this information (Stam & Giral, 1988; Rorvig, 1990). This article discusses a related topic—the current developments in electronic reference sources for the history of art. The advances in automation and the proliferation of databases and projects are viewed in the context of the traditional focus of the discipline. This article describes the new literature in terms of the topics with which art history deals, with special note of the characteristic formats, and the organizations and institutions which have contributed to its development. A review of the currently available databases demonstrates the extensive coverage of art history by electronic sources and discusses their use for librarians and researchers.

Introduction

The literature of art history documents the production, collection, and study of art. The first books on art were published during the Italian Renaissance, and the writings soon developed characteristic genres. The models supplied by classical sources were important, and many publications on art from the fifteenth to nineteenth centuries were biographies of artists, treatises, and travelers' reports. There were also inventories and catalogs of collections, practical manuals, and "books of secrets" on materials and methods. Systematic studies in the discipline of art history came relatively late,
commencing in the latter half of the eighteenth century. The growth of universities and museums, as well as the many exhibitions in the nineteenth century, stimulated the production of books and articles, and these have continued to proliferate during the twentieth century.

The early books were similar to modern art literature because they dealt with the same types of information. The data of art history are the names, titles, places, and dates which identify the art works. Theoretical works and criticism are important in the historical development of art literature, but the central concern is the work of art which is taken as evidence of culture. Images, artifacts, and symbols are art history's primary subjects. The discipline has a special expressive and documentary mode which is visual.

The focus on works of art creates the distinctive character of the documentation. Art can be an earring, a sketch, a painting, or an architectural complex. The historical dimension of the art works is the bearer of a changing aggregate of information. A painting may have been part of an altarpiece in a church which no longer exists, but now it is part of another altarpiece in a new church, or perhaps the painting was taken out of the church and sold and now it is in a museum. Good indexing of the painting supplies information on the artist, subjects depicted, medium, measurements, patrons, former collections, present location, any restoration work, and its frame. At first glance, information about art works is deceptively simple since it merely describes the physical aspect of the work. Following from the formal analysis, art historians assemble a complex set of related facts concerning the depiction and its meaning.

Art history has basic texts, such as *Le Vite (The Lives of the Artists)* by Giorgio Vasari (1550, 1568). However, unlike the fields of religion and English literature, the discipline has no canonical text like the Bible and Shakespeare to which scholarship continually reverts for reinterpretation and criticism. The corpora to which art historians refer and return to study are the works of art. Reproductions and descriptive physical information about art have signal importance to the discipline.

The formats of documentary materials on art have great variety. There are the usual books and journals, but art libraries also collect exhibition, sale, and gallery catalogs; artists' sketches; and architectural drawings. Occasionally falling into the category of works of art themselves, these materials have specific relevance to subfields of art research. Catalogs of auction sales, for example, are essential to research which traces the history of collecting and provenance of art works. Collections of art literature contain an increasing range of formats. These include original editions and artists' books and prints, in addition to facsimile editions, video disks,
and CD-ROMs. Multimedia sets include texts, images, and objects. Sometimes a set of documentary materials has the appearance of a box by Marcel Duchamp. Other typical formats include slides, picture files, photographs, videos, audio tapes, microfilms, and fiche. For integrated research, good access to various types of materials and formats is important.

Foreign language materials form a substantial component of the literature. Art history is a product of the European academic tradition, and its texts and documents are studied in the original languages. A final feature which broadens the scope of art historical resources is the interdisciplinary focus of research. The subjects of art history are characterized by the elastic nature of the categories and kaleidoscopic combinations. This includes the scholarship of professional art historians and that which is produced by other researchers whose subjects deal with art. All of the persons referred to in the title of this essay come from fields outside the humanities. However, the literature of voyages and travels, astrology, and geography have a traditional association with art history. These auxiliary subjects are examples of fields which provide profitable excursions for art historical research, and the professions themselves are emblematic of how librarians and researchers can extend the boundaries of scholarship.

The new electronic publications reflect these traditional characteristics of art literature. Compared with older formats, the automated sources are flexible and efficient. Even in their first incarnations, they allow for greater ease in searching. They provide better linkage between diverse types of literature and supply assistance with the variations which foreign language materials bring to scholarship.

CURRENT PROJECTS AND DATABASES

The most recent decades were a period of creative thought and independent development of databases on art. In 1988, the SN/G Report on Data Processing Projects in Art listed almost 250 automated projects of various types; these included databases for institutional collections, typological corpora, and inventories of monuments. There are a surprising number of important reference sources which are generally available. Several have overlapping coverage; two of these have combined forces recently to become one greater index. Many smaller databases were created which describe collections or list limited subject areas. Others were created only to generate a printed document. A problematic development of this fertile period were the databases with similar types of information produced in incompatible or inaccessible formats. Lutz Heusinger's (1989)
comment about video disk projects which either failed or are not for sale is: "How many art-historical books one could have printed and given away as presents with the money spent on these discs..." (p. 16). One could say that these projects were useful as stepping stones in the evolution of electronic sources. These sorts of projects have not been described here since they represent an immature stage, and they are discussed in other publications.

In this period, there were dreams of systems with powerful capabilities that would store and access data in many subject fields and various formats. These visions were based on the successful mounting of shared files of bibliographic data by OCLC and RLIN and the establishment of online search services in institutions of higher learning. Indirectly, the ideas of enhanced systems also came from the need for increased security. This required good accessible descriptions of materials for better control of collections. "Automation...allowed vast quantities of data to be stored and retrieved easily and cheaply, and there was the promise of relational databases in which scholars could link a variety of information within one system" (Petersen, 1990, p. 645). However, when the prospects of the utility of common software and shared access to database management systems and files were examined carefully, it was evident that the incompatibilities of both users and formats made for difficulties which would need to be addressed.

During the 1980s, major projects emerged and gelled. Especially in the case of libraries, the values of cooperation in the creation and use of shared files, and the reasons for use of consistent descriptive terminology for names, art works, and subjects were recognized. When financial resources became scarce, the values of cooperation and collaboration became self evident. It should be noted that, compared to museums, libraries found it easier to cooperate and share information.

In an article summarizing the development and results of the Museum Prototype Project, Allen (1988) brought up some of the differences among the types of research collections and corresponding activities in the field of art which libraries and museums sustain. While libraries have always had a strong tradition of cooperation, museums have developed as autonomous collections. The genesis of museums was often as private collections or endowed foundations, thus, by nature, they stressed an individual approach to the operation of a collection. The typical museum staff is a mix of art historians, professionals with business and administrative backgrounds, artists, educators, conservators, scientists, and editors. All bring different research backgrounds to their work with collections. Library staff tend to be a more homogeneous group. Art libraries tend to contain
similar collections of books and periodicals. They do shared cataloging of their collections, creating and using records in online bibliographic systems like OCLC and RLIN. By contrast, museums collect unique objects and keep unique files on them; museums tend to have unique ways of describing objects. Unlike the author, title, and imprint of books, the basic information about museum pieces, such as artists' names, titles, date, and material, is not contained or inscribed on the objects. In the past there has been comparatively little standardization for object descriptions. Foreign languages bring additional problems of different definitions and historical usage which compound the difficulties of shared files. This is particularly true when the things to be described are elements of historical national patrimony, and the project is supported by official sponsors such as the Canadian Heritage Information Network (CHIN), the Museum Documentation Association (MDA) in the United Kingdom, or the Inventaire Generale des Richesses Artistiques de la France (Allen, 1988, pp. 191-92).

Most of the electronic sources on art which became available during the 1980s were based on printed reference books. These were indexes published by professional associations, academic institutions, and commercial publishers. Unlike reference works and research tools in certain other disciplines of the humanities, art indexes have been well supported, and these sources have improved steadily since their electronic inception. There are several general indexes for art as well as sources for architecture, photography, and conservation. Distinctive formats, such as auction sales catalogs, are represented in special databases.

The most notable example of a cooperative endeavor is the long-awaited marriage of the two major indexes to current art literature—RILA, the Répertoire international de la litterature de l'art and RAA, the Répertoire de l'art et d'archéologie. Conceived at an international conference on art bibliography sponsored by the College Art Association in the early 1970s, RILA was one of the first projects of the Getty Art History Information Program (AHIP) which took over its support in 1982. Since 1985, RILA's entire file, from its first volume published in 1975, has been available through DIALOG. The Répertoire de l'art et d'archéologie is one of the oldest art indexes. It began in 1910 as a very small publication that simply listed journal contents. By the 1970s it was one of a group of publications on art and archaeology supported by the French Centre National de la Recherche Scientifique (CNRS). While RAA indexed literature on Western art from the early medieval period to the present, the other indexes which were part of the FRANCIS-H group covered art in other regions (FRANCIS-H stands for Fichier de Recherches
Bibliographiques Automatisées sur les Nouveautés, la Communication et l’Information en Sciences Sociales et Humaines). The printed versions of these indexes were part of the larger Bulletin Signalétique series. Bulletins Signalétiques with online files pertaining to art are 525: Préhistoire et Protohistoire and 526: Art et Archéologie, Proche-Orient, Asie, Amerique. The RAA is file 530.

The first volume of BHA (Bibliography of the History of Art), appeared in 1991 after more than five years in development. It begins with coverage of 1989 publications and has superseded RILA as file 191 in DIALOG. For searches of earlier literature, DIALOG can be used for RILA, and the FRANCIS database distributed by QUESTEL gives access to almost two decades of RAA back to 1973. BHA is published jointly by the Institut de l'Information Scientifique et Technique in Paris and the Getty Trust. Although their publications are similar, the two sponsoring organizations are quite dissimilar, expressing the different ways in which art and scholarly projects are funded here and abroad.

In France, the Institut National d’Information Scientifique et Technique (INIST) is a part of the state supported CNRS. The INIST is a center of documentation and a library where the indexing is done on the FRANCIS databases. RILA and the BHA are projects of the Getty Trust’s Art History Information Program and are produced at the Sterling and Francine Clark Institute in Williamstown, Massachusetts. While RILA in its earlier format was really a computer-assisted print publication, the BHA was designed to function as a database, although its present use is primarily in print rather than online. It features a completely bilingual (French and English) vocabulary, subject to rigorous authority control, which is used to index the citations by keywords and index strings (Rinehart, 1990, p. 135).

The Bibliography of the History of Art indexes all types of literature about art—books, exhibition catalogs (but not sale catalogs), conferences and other collections of essays, microforms, machine-readable data files, and about 4,000 journal titles. Most of the citations have brief abstracts, a helpful feature in a subject field known for allusive titles. While there was substantial overlap among the citations included in RILA and RAA, BHA has twice as many citations as the earlier indexes. BHA combines the subjects covered and chronological range which was shared by its parent indexes. Reflecting traditional art history, the focus is on Western art from late antiquity to the present. Along with the exclusion of Greek and Roman art, BHA does not cover prehistory or Oriental, Islamic, African, Oceanic, or Native American art.

ARTbibliographies Modern (AbM) takes a different perspective of the current literature. Its indexing concentrates on modern art,
particularly the fields of art, design, and photography. It lists both books and articles; since 1988, architectural subjects are not covered. The online files reach back to 1974. Given the expanded and strengthened state of bibliographic coverage supplied by BHA, one wonders if this index is worth producing. How much would AbM be used if it were not part of DIALOG's cleverly conceived one-search strategy for "ARTS" which encourages the use of several databases (possibly more than are actually needed) in the course of a single search strategy? AbM has a lively multicultural bent because it includes the arts of Asia, Africa, Oceania, and other regions excluded from BHA. Very recently established journals are indexed, so the references are particularly good for contemporary work and new trends.

The journals covered by Art Index (from 1984 to the present) span the fields of fine arts, architecture, archaeology, museums, crafts, and photography. Its strength lies in its general coverage of the leading journals and museum periodicals. In deference to the importance of European publications in the field of art, the Art Index includes foreign language sources. It is the only Wilson index which indexes foreign language materials. It omits books and scholarly, but arcane, publications like dissertations and Festschriften. Academic art historians have shunned Art Index, dismissing it for the limited coverage it provides. However, this is a hasty generalization which overlooks Art Index's main purpose which is the utilitarian popular emphasis characteristic of all the Wilson indexes. A recent study at the Avery Architectural and Fine Arts Library of Columbia University compared the use of the paper and CD-ROM versions of Art Index. It confirmed the index's efficiency for ready reference searches using incomplete citations and for locating book reviews, reproductions, and reviews of exhibitions. Art Index is equally useful for initial searches of topics and for current articles not yet listed in other sources. The respondents to a questionnaire distributed during the study favored the CD-ROM version of Art Index because it was a cumulative source. Researchers no longer want to go through a series of annual paper volumes. They indicated that it was faster and convenient because they could print out their search results. CD-ROM searching was termed "fun" by some users. They liked the fact that many access points were offered and could be combined in the searches (Sykes-Austin, 1991, pp. 14-17). Art Index provides access to a selection of more general art periodicals. It serves the public interest in the arts and is useful as a step up from the platform of Readers' Guide to more specialized literature. The index is available in three modes—paper, CD-ROM, and online.

Art & Humanities Search (AHS) is published by the Institute for Scientific Information (ISI). Its format is similar to the Science
and Social Science Citation Indexes. AHS's strong points are also its weaknesses. Although its integration of the arts and humanities stresses a broad interdisciplinary approach to research, the structure of sources, citations, and Permuterms® is complex. It requires a knowledgeable expert searcher to use it effectively. The printed format of AHCI (Art & Humanities Citation Index) with its awkward Permuterms®, brief author cites in the Permuterm® volumes, and truncated versions of the lengthy art-historical titles, makes it so unfriendly to novice users that they are hardly led on to searching the computerized version. This is unfortunate. Since it was designed as an electronic source, use of the online version is much more rewarding and even stimulating for research. On the plus side, the format of AHS's listings of source citations elicits patterns of thought and related authors whose works might also be of interest. At the moment, one needs to be either very interested in searching or a sophisticated searcher to take advantage of these capabilities. However, the ISI will be releasing AHCI very soon on CD-ROM. ISI indicates that it will be easier to use than the online version because of improved software with user-friendly menus. Because of its broad range of humanities coverage, AHCI on CD-ROM should be interesting and profitable to search and to browse without the pressures associated with online searching.

Architecture is often viewed as a subfield of art, yet it is the most comprehensively covered by electronic sources. The Bibliography of the History of Art and Art & Humanities Search include publications on architecture, Art Index covers more general articles, and two more files, representing extensive coverage from slightly different points of view, are both available in DIALOG. These are the Avery Index and The Architecture Database. Both provide citations on world architecture with overlapping coverage in the area of periodicals. Produced by the British Architectural Library at the Royal Institute of British Architects (RIBA) in London for its constituency of scholarly users and practicing architects, the Architecture Database grew out of that library's printed lists—Architectural Periodicals Index and the Books Catalogue of the British Architectural Library. The database includes books as well as periodicals from 1978 to the present and not only current publications. More than 2,000 descriptive records of early books on architecture from the library's Early Works Collection were recently added to the file. The RIBA library has a stellar collection of early treatises, pattern books, and building manuals, travel and guidebooks, and other rare works which are important to architectural historians. So this retrospective file is a useful addition to the files of current literature. Another feature of the Architecture Database is the British Architectural Biography 1834-1914. Continuing the coverage
provided by H. Colvin's *Biographical Dictionary of British Architects 1600-1840* (1978), the database stores information on British architects drawn primarily from the RIBA collection of Nomination Papers. These were completed by all prospective members of the RIBA from its establishment in 1834. The project was funded by a Getty Grant, and it is one of the first biographical sources on art to become generally available online.

The Avery Architectural and Fine Arts Library at Columbia University is the leading architectural collection in North America. The periodical indexing in the Avery Index is produced from the Avery collections. Currently, the Avery files are available in both the RLIN system and through DIALOG; a CD-ROM of the database is about to be released. Based on its printed precursor, the Avery Index to Architectural Periodicals, the index covers only journal publications on world architecture. The library's book holdings were published in the *Library Catalog of the Avery Architectural Library*. This is supplemented by new listings in the RLIN bibliographic files.

The AVIADOR (Avery Videodisc Index of Architectural Drawings On RLIN) project is a parallel effort to provide comprehensive integrated access to the Avery library's collections. Records for the library's architectural drawings collection are listed in the RLIN VIM (Visual Materials) files. The project runs on a personal computer connected to the RLIN system; an RLIN program links the text to 45,000 images stored on a video disk. Architectural drawings are important sources for architectural history, particularly for research on individual architects, designers, corporations, and official building projects. With the implementation of the AVIADOR project, the Avery library took the first step in creating links between descriptive texts and images. Although its name evokes metaphors of flight, Angela Giral's (1988) article on the project's implementation brings to mind an intellectual exercise equivalent to the challenges of a white-water float trip. Her account of AVIADOR is illuminating for an understanding of the debates and discussions which surface when bibliographers go beyond books. Materials like architectural drawings require specialized descriptive terminology and cataloging practices which provide appropriate access to their characteristic features and formats. Presently, two consortia of institutions, the Architectural Drawings Advisory Group and the Foundation for Documents of Architecture, have developed guidelines for the description of architectural drawings and collections. These are scheduled for publication in 1992.

In comparison to fields which are bereft of electronic sources for reference and research, access to information on architecture is very good. However, as in art history, the indexing is somewhat redundant in the area of current periodical literature.
Another type of serial publication is covered by RLIN's special database for auction sales catalogs, SCIPIO (Sales Catalog Index Project Input Online). Unlike a periodical index which analyzes the contents of individual issues, the SCIPIO records account for sales catalogs in terms of holding institutions. Users may search by the names of auction houses, sellers and collector's names, dates of sales, and title words of the auction catalog. SCIPIO is not a guide to sales but a union catalog which reflects the library collections of its members. The Art Institute of Chicago, the Cleveland Museum of Art, and the Metropolitan Museum of Art were the original members of the SCIPIO project. Among other participating libraries which are now part of the project are the National Gallery in Washington, the Nelson-Atkins Museum of Art, the University of California at Santa Barbara, and the Getty Center. Unlike most of the tools discussed here, SCIPIO is an excellent retrospective source; records in the database go back to catalogs published in the seventeenth century. SCIPIO's files are used primarily for advanced research in the field of provenance, assisting researchers who pursue the movement of art in collections and on the art market. Provenance work provides authentication and sheds light on the persons who collected art. The database now includes over 110,000 records for sales catalogs. It is a comprehensive source for a category of publications which has fallen through the cracks between books and journal literature. Although it was designed as an automated file, SCIPIO's only drawback is that its records are not in MARC format. In considerations of building integrated catalogs which list all types of materials, the intractability of the SCIPIO records poses problems.

Tracking sales on the art market, ArtQuest is an electronic source which analyzes the contents of auction sales catalogs. The ArtQuest service provides online access to the ASI Databank of international auction sales. Coverage is best for two dimensional works sold at auction since 1970; sculptures and three dimensional works have been added from 1983 to date. It should be kept in mind that this database includes only auction sales. Art is sold through dealers and private sales; it occasionally moves into museums and public collections by donation. Available through Pergamon Financial Data Services, ArtQuest corresponds to the printed version of Art Sales Index. For individual searches, requests may be made to ASI's Enquiry Service. Another ASI databank, STOPICS, lists stolen art works and is available to the international police and ArtQuest subscribers. The Canadian Heritage Information Network (CHIN) has a similar online database—the Register of Stolen Art and Artefacts produced by Interpol Ottawa.

Preservation and conservation have received recent attention; however these are not new fields. Reference indexing of the literature
dates back to *Technical Studies in the Field of the Fine Arts* which were published by the Fogg Museum at Harvard from 1932 to 1942. The publication was continued by the International Institute for Conservation's (IIC) *IIC Abstracts*. The latter became *Art and Archaeology Technical Abstracts (AATA)* and were published by the Conservation Center of the NYU Institute of Fine Arts for the IIC. In 1983, the Getty Museum took over responsibility for the abstracts, and two years later the project was passed on to the Documentation Program of the new Getty Conservation Institute. Now the *AATA* has been subsumed into the greater data banks of the Conservation Information Network (CIN). Subscribers to the network have access to a number of files. These include retrospective indexing loaded from the earlier volumes of *IIC Abstracts* and *AATA*. This bibliographic database includes the holdings of the world's largest collection on conservation at the International Centre for the Study of Preservation and Restoration of Cultural Property in Rome. It lists materials from several other large conservation collections at the Canadian Conservation Institute, the International Council on Monuments and Sites (ICOMOS), and the Conservation Analytical Laboratory of the Smithsonian Institution. In addition, the Conservation Information Network has a materials database with information on commercial products, a suppliers database, and the National Library of Canada's Photographic Conservation Universal Decimal Classification System database. The network runs on the computer systems of the Canadian Heritage Information Network which provides technical support. The long and varied life of this conservation index is its own testimony to the persistence of interest in preserving culture. The CIN is an extraordinary cooperative effort to share information by all the institutions which contributed to the development of the network.

Many institutions' library catalogs are now available through Internet. The George Eastman House Interactive Catalog is a similar application which is an extremely useful reference source for the history of photography. The Eastman House in Rochester, New York, is the first museum to allow access to its collection via modem. Using an interactive video disk, it is possible to display images from the collections. The catalog is accessed through the University of Rochester's computing center. The online catalog corresponds to the *Index to American Photographic Collections*, edited by Andrew Eskind and Greg Drake (2d ed., Boston, 1990). However, the interactive catalog provides more information, including recent additions to the files. The catalog supplies biographical notes on makers, bibliographic references, subject headings, exhibition histories, and information on the holdings of other photograph collections. Like
the printed edition, the catalog provides the names, addresses, and contact persons at other museums.

To survey the coverage of art reference sources is useful because it charts the course of art literature. In most cases, literature indexes make a conservative selection which determines what is read and what is collected by libraries. It is no surprise to find that the standard publications on Western art history are well covered. This is the canon for art history and one expects to find good coverage in what is considered polite scholarship. While the two indexes which have become the new Bibliography of the History of Art were very similar in coverage, lacuna still exist. These correspond to the exclusions from BHA. It may not be surprising to see little access to non-Western culture groups in the art history indexes, but what is astounding is the dearth of electronic indexing for literature on ancient art. While there are three printed indexes covering classical art—Archäologische Bibliographie, L'Année Philologique, and Fasti Archeologici—none is available online. Art Index provides some general listings for the period, and the indexes for architecture cover ancient buildings and monuments. Recently the Library of the Deutsches Archäologisches Institut in Rome, the source of the Archäologische Bibliographie, released DYABOLA. Covering publications from 1956 to the present, it is a subject index to ancient studies with a focus on archaeology. The programs are multilingual, and users may opt to search in German, English, French, or Italian. DYABOLA is available by subscription on disks which can be used on a personal computer.

In the wake of creating specific database applications, there were more global visions of integrated resources to provide both facility and greater compass to the art historian's ability to search for information. What was needed was a common language. This was the genesis of the Art and Architecture Thesaurus (AAT), a hierarchically structured list of terms used to describe art. The endeavor was "to construct a language that would represent knowledge in the field of art and architecture as well as be surrogates for the images and objects being described." By providing a hierarchical structure for the vocabulary which indicates how to find ideas and images, "it was designed to provide the 'hinge' between the object, its images, and related bibliographic material" (Petersen, 1990, p. 644).

The success of the AAT project proved that technology does not have to be seen as a limitation on vocabulary. Quite the opposite, it structures thought and furthers research, thereby providing rigor to the use of words in context. A thesaurus could be seen as just a list of words, but the AAT is a far more important endeavor—to map the mentalités of Western art history at the end of the twentieth century. The open-minded discussions which characterized the
participative development of the *AAT* have given the thesaurus a leading role in the world of machine-readable databases. *AAT* is currently used by a growing number of indexes, libraries, and projects, including BHA, the Avery Index, the Conservation Information Network, many art and museum libraries, archives, and visual resource collections. Although it was developed to be used online, the *AAT* is available in print, on disk, and in RLIN.

The many different art organizations which needed to share and use similar information made the issues of standardized vocabularies and uniform systems imperative. In the greater world of art history, the success of the *AAT* is a limited one, since the English language is only one among those (German, Italian, French, and Spanish) which are used regularly in research and publications. In 1984, a committee was established under the aegis of the International Committee for the History of Art (CIHA). The Thesaurus Artis Universalis project established a number of goals for automated systems in art history. These were to establish model formats and authority structures for biographical data and historical geographical information and to develop a multilingual thesaurus. No simple tasks, these were ambitious efforts to pool the resources which were already available in several large databanks of art and architectural information. The development of terminology for the Art & Architecture Thesaurus Multi-Lingual Project will begin with the hierarchies established in the *AAT*.

The challenge for the future is epitomized by the thrusts in the development of the *AAT* which were based on real collections and used real language. The thesaurus integrates scholarly and popular terminology, realizing the virtues of standardized vocabulary while remaining flexible enough to respond to evolving usage and changes in the discipline. With the inception of the *AAT*, new types of projects were born which were not limited to a single collection of objects or materials or created for a single subject area.

A community of interest has developed among those who research art and those who curate and catalog collections of printed materials and archival documents. Great collections like the large North American museum libraries, the British Architectural Library, and the Avery Architectural and Fine Arts Library have been crucial in building a solid structure for electronic sources in the field of art literature. The support of strong professional associations has also been an important factor. Among the most significant groups which provide leadership in the development of computerized resources and technology are the College Art Association, the Art Libraries Society of North America, the Visual Resources Association, and the Museum Computer Network. All these organizations have provided forums
through their meetings, committees, special interest groups, and publications for the discussion of issues related to electronic resources for the dissemination of images and documents about art.

Two organizations deserve recognition for the fundamental impetus they provided in the development of automated resources for art. In some ways the J. Paul Getty Trust and the Research Libraries Group took a similar role in supporting art information projects to that which official institutions and projects, such as the Centre National de la Recherche Scientifique and the Canadian Heritage Information Network, played in the development of electronic resources for art research in France and Canada.

Almost a decade ago, following the settlement of J. Paul Getty's will, the Getty Trust took over the publication of a number of the important indexes to art literature. The trust assumed support for RILA in 1982 and, in 1983, it undertook financial responsibility for the Avery Index to Architectural Periodicals and for Art and Archaeology Technical Abstracts. As the number of art databases proliferated and access to personal computers increased, there came a recognition of the diverse needs which different groups and institutions had for machine-readable information.

The Getty Art History Information Program was established in 1983. The program took over the bibliographic projects for which the Getty Trust had assumed financial responsibilities—RILA and the Avery Index—and several projects to gather information on special areas of art history.

The Witt Computer Index was one of these original projects. As a collaboration with the Courtauld Institute in London, the index accesses the information stored in the photo archives of the Witt Library. The collection of reproductions of European paintings was founded at the beginning of the twentieth century by Sir Robert Witt. Now part of the Courtauld Institute, there are 1.5 million reproductions of works by over 75,000 artists. The size of the collection led to considerations of electronic storage and retrieval. The first section of records on the collection to be automated is the American school from the seventeenth to the twentieth centuries. Formerly, access was primarily by artists' names but, with automation, the files can be searched by subjects, collectors' names, exhibitions, and dates. With structures similar to catalogs raisonnés, the conventions of the automated Witt files are characteristic of art historical data. Each work of art may accumulate a series of records with information about different states, preliminary versions, restorations, and copies. Because of the complexity of the files, the Witt Index is available only in London; however, queries concerning the collection are encouraged. Answers to reference questions take the form of print-outs
if searches have yielded information, plus copies of the pictures for a small charge.

Another early art information project, the Provenance Index, was originally part of the Department of Paintings at the Getty Museum. Its primary interest is in archival sources such as lists of collections, archival documents, and inventories which identify art works, as well as records of auction sales and published inventories. The index collects and publishes information on the history of art collecting in terms of sales, inventories, and biographical information on collectors with a focus on European paintings. Access is mainly by artists and titles of works rather than images. In the past, the Provenance Index databases have been available only in Santa Monica, California, with research in the files available upon request. Very soon, approximately ten collaborating institutions in North America and Europe will receive CD-ROMs containing the Provenance Index databases.

A similar distribution project (the Census) is about to be implemented for the Census of Antique Art and Architecture Known to the Renaissance. The Census stores texts and images which document and describe the classical works still extant during the Renaissance. The files can be loaded onto a personal computer; images are stored on an accompanying video disk (in European format). Copies will be available at the Getty offices in Santa Monica, at the Warburg Institute in London, and at the Bibliotheca Hertziana in Rome. The latter institutions compiled the Census, and AHIP provided support for automating the database.

In recent years, the Getty Art History Information Program has begun to work on the other projects given a mandate by the CIHA. Two projects concerned with language and standards for art-historical names and places are the work of the Vocabulary Control Group (VCG). The VCG has developed two databases: The Union List of Artist Names (ULAN) and the Thesaurus of Art-Historical Place Names. ULAN is a database of artists' and architects' names produced from merging the files of nine Getty projects (among them RILA, the Avery Index, the Census, the Witt Index, and the Provenance Index). The contributors have received a preliminary edition of ULAN which is the precursor to the electronic version to be released in 1993. The final automated version will contain variant forms and reference sources for more than 110,000 names.

Produced from an experimental database of artists' names which was part of the Museum Prototype Project, Synoname is a software tool which is useful for matching and linking variant forms of artists' names without privileging particular forms. This is a new approach to authority control and reference research which allows for varying
forms of names. Synoname is currently available on diskette from the Art History Information Program.

The Thesaurus of Art-Historical Place Names is a similar list of places associated with art history and related research in the humanities and social sciences. As is the case for standard forms of artists' names, the use of standard place names for locations of monuments and for loci of artists' activity is essential to sharing data. Scheduled to become available in 1993, the thesaurus is being produced from merged files of Getty projects and the geographic information from the two leading producers of atlases, Rand McNally and Times Books.

Along with the specific bibliographic and information projects to which the Art History Information Program has given support, the program works closely with committees and associations of art historians, museums, and other interested groups on issues related to the automation of art information resources. With emphasis on the interdisciplinary nature of art history, AHIP is presently working with the American Council of Learned Societies on issues relating to linkages of art information with automation projects in the humanities. AHIP participates in the College Art Association Subcommittee on Electronic Information to promote awareness of the uses of new technology in the art community. A more specialized group was brought together at the 1990 College Art Association meeting. The Art Information Task Force has twelve members who discuss and recommend standards for information on art which will facilitate new ways to share information among the various types of art collections such as museums, slide libraries, and photo archives.

During the 1970s and 1980s, most of the large North American art libraries in academic institutions and museums were members of the Research Libraries Group and participants in its Art and Architecture Program Committee (AAPC). The strength of RLIN's holdings in art and the gathering of representatives from forty-five art collections allowed the group to address specific issues and accomplish a number of projects which provided greater online access to art information. The committee targeted projects of special use to art research, such as the AAT, and promoted greater implementation of the RLIN files for archives (AMC) and visual materials (VIM) for expanded access to art information. The AAPC advocated the addition of special files and databases to RLIN. A recent example was the loading of records for materials in the Archives of American Art. These are now part of the AMC file.

Apart from its specific programs addressing art information, RLIN has two important features which enhance scholarship. The general bibliographic files have special depth in the area of art
bibliography. This is because of the retrospective conversion projects which brought in records for the New York Public Library's art book collections and approximately 120,000 records for art books from other Art and Architecture Program Committee libraries. In 1991, the records for the impressive collections of exhibition catalogs at the University of California at Santa Barbara were added. The holdings of the two newest North American art and architecture collections at the Canadian Centre for Architecture and the Getty Center for the History of Art and the Humanities have been entered into RLIN as they are processed. Reflecting the collections of the major North American art libraries, RLIN is especially useful when searching for older materials. At the beginning of 1991, it was estimated that there were 800,000 records for art books in the system.

A second notable feature is that RLIN extends beyond books. Researchers can pursue name and subject searches through the auxiliary files and special databases to locate sale catalogs; manuscripts; ephemeral materials; visual materials like slides, posters, and prints; and machine-readable data files, as well as specialized holdings in architecture such as periodical articles and architectural drawings. An additional enhancement of the system are the machine-readable formats for non-Roman scripts: Japanese, Arabic, Chinese, Korean, Persian, Hebraic, Yiddish, and Cyrillic. Until recently, the study of art history has focused on the Western European tradition. The current debates about the canon in the educational process have injected doses of multiculturalism into traditional research. RLIN's ability to store and access information in non-Roman scripts allows for searches about the arts of cultures that are new subjects for art historical research.

Following some major organizational changes in 1991, RLG is expanding the RLIN data files and services. The Art and Architecture Program Committee has ceased to exist, although continued communication about art research is supported by an electronic bulletin board, RLGART-L. RLIN continues to be a major source for humanities research. Plans for the future are built on RLG's successful work with art library collections and on similar programs with archives and manuscript collections. Presently RLG is developing a prototype local system Archives and Museums Information System (AMIS). Projected for the end of 1992, the AMIS is a concrete step toward the establishment of a much discussed international database of primary cultural and scientific resources. AMIS is a microcomputer-based system which will allow museums and archives to store and manage all types of text files, as well as provide support for digitized images of architectural drawings, photographs, artifacts, films, and sound and video recordings.
Two of the newest files scheduled to be available later in 1992 extend RLIN's holdings further in the realm of nonbibliographic materials for research. Records from the Program for Art on Film will be added to the VIM file. A joint project of the Metropolitan Museum and the Getty Trust, the program has compiled a collection of over 16,000 records on international film and video productions on the visual arts. Also scheduled to be available this year, the Inventory of American Sculpture consists of more than 100,000 records from the database created at the National Museum of American Art. The inventory indexes public and privately owned sculpture which was created by American artists or produced in America from the colonial period to the present.

One final project which is important to mention is the source for current information about automated projects. The Clearinghouse on Art Documentation and Computerization is located in the Thomas J. Watson Library of the Metropolitan Museum with Patricia Barnett as its director. Founded in the early 1980s to assist the museum in systems development and to stay abreast of the rapid advances in art information systems, the clearinghouse consists of a database and document collection. The electronic resources consist of two files: an information directory on projects, systems, conferences, and organizations, and a bibliographic file of published and unpublished documents. The clearinghouse is used by a wide variety of art professionals and researchers who need information on computer technology projects and applications for art research. Staff are currently investigating ways to establish a shared database and increased access to the resources of the clearinghouse.

CONCLUSION

Recent decades were a period of intellectual voyage and discovery for computer applications in art history. Papers were written, articles were published, and cooperative projects were initiated. Many databases were mounted and used with success. Congresses and conferences were held on both sides of the Atlantic Ocean. Both DIALOG and RLIN now have a variety of files containing art information. These include most of the important current indexes to art literature.

The use of electronic resources in art as an autonomous field for study and research was marked by a book of essays entitled Computers and the History of Art (1989) and by the appearance of a journal in 1990 with the same name. Both emanated from the British professional association, CHArt. Yet the initial experiments with computers still have a tentative feeling not unlike the first years of television when we watched performers reading radio plays.
Art history allows for a great range of subjects which shed light on artists and their works. The process of gathering materials for research often leads through diverse subject fields. Art information is found in a variety of formats, and all these data must be integrated. This is the work of researchers, librarians, and information specialists. Proper indexing and cross references among systems would allow this work to be done by computer searches across disparate files.

There are many recent electronic reference tools which index the secondary literature. Most of these text databases have emulated their previous printed incarnations as single titles. New approaches to automated reference literature include groupings of related sources. The Architecture Database contains retrospective literature and the full text of a new publication which is not an electronic version of a printed edition. Experiments are just beginning with linkage of reference texts and images of the works described. The AVIADOR project and the Eastman House Catalog are examples of new kinds of collection catalogs which include graphics accessible via an accompanying video disk.

The second wave of computer applications are the thesauri and dictionaries of names and places. Developed to coordinate the various resources, projects, and source literature, these have the potential not only to provide links but also to become important independent reference sources for biographical and geographical research.

Electronic text sources in art history have taken three directions. One is to automate print sources and provide more efficient access. The second is to compile files of new types of information which were too cumbersome for indexes prior to the advent of computers. The third is to automate files of the basic data such as artists' and collectors' names and place names. These projects link variant forms and supply foreign language equivalencies for better cross-indexing among related reference tools.

Electronic publications provide very good access to art information published in the most recent decades. Several of the indexes overlap, and this makes for unnecessary redundancies in literature searches. For publications prior to 1950, coverage becomes uneven and, for some areas, it is nonexistent. Searching this earlier literature is difficult and indexing is scattered among a variety of disparate sources—online databases, printed library catalogs, subject bibliographies, and annual volumes of periodical indexes. This is surprising for a field where older literature retains its value for research.

Historians in the fields of art and architecture often base their studies on the original texts. The latter were published in late eighteenth-century and nineteenth-century books and periodicals;
many are part of larger general studies. It is these early publications which are the raw materials of research, and yet these seem to have the lowest priority for indexing. It is paradoxical that the materials of greatest interest to scholars have the lowest priority for online indexing. One project which addresses this problem is Mary Schmidt's index of nineteenth-century American art journals (Gould, 1988, p. 16).

In this new and continually expanding world of possible sources, librarians must play the roles of mapmakers, navigators, and stargazers to chart paths for researchers. Resources for art historical research include books and dissertations, exhibition catalogs, sales catalogs, art prints, photographs, audio and video materials, slides, cassettes, video disks, lecture notes, correspondence and other archival materials, and online communications—e.g., e-mail and electronic bulletin boards.

Researchers in art history are just beginning to be aware of the benefits of computer systems. They appreciate the efficiency of word processing. They like to use e-mail and FAX to communicate quickly with colleagues. Access to online catalogs assists scholars in planning trips to other libraries and collections. These simple modes are very popular. They probably will play the role of seducers, leading scholars on to complex applications. The discipline and its data are well suited to information systems and database management software. It is the methods of scholarly research which are slow to change.

Scholars in art history have a problem with delegating online research to "expert searchers." Most scholars like to work alone. They find out about new subjects by communicating with colleagues. They store their knowledge in their heads and their data in boxes of three by five cards. Serendipitous discoveries made in the process of research are important, and browsing has always had great value for art historians. The lack of specificity in titles of books and articles and the use of metaphoric language makes it desirable for researchers to work their way through bibliographic listings themselves. Yet the complexities of search commands and the need for efficient search techniques works against this. Databases on CD-ROMs and access to reference sources via networks on personal computers will go a long way to mitigate these temporary barriers to accessing information directly. Both sources obviate the high costs of online searching and allow for the contemplative browsing which is a popular activity among art historians.

Although art historical research is based on facts about artists and art, the discipline is an interpretative one. Much like archaeology and anthropology, art history constructs explanations of the past based on the information presently available; new discoveries make
Art history concerns itself with philosophy and theory, questions of criticism, connoisseurship, and taste. What is the place of art and what does it mean? What is good work and how do we know it? It would be unfortunate for the study of art to follow the lead of history, which has become one of the social sciences, in a rash attempt for legitimacy. Art history is illuminated by new data and discoveries of sources, but it has never been a science like chemistry with formulas describing its substance.

Further evidence that art history is neither science nor social science is the acceptance that the data of art history and the auxiliary fields are highly variable. Artists' names change with time and foreign languages. In many cases we do not even know their names. Dates for people who lived long ago, or sometimes even recently, are problematic. Many works have no specific title; each author calls it something different. Dates of works are often the subjects of research. Most art works have a variety of dates associated with them and therefore possess individual art histories which must be accounted for. There are the problems of geography in standardizing place names, or even locating the places, after time has passed. In addition, the names of museums and other institutions associated with art, and linked to places, change frequently. In short, all of the institutions and structures implicit in the assembling of art information supply volatile data. These data are difficult for individual minds to compass but well-suited to the large files and search capabilities of automated systems.

With this in mind, we can recognize that art information systems do not threaten the very nature of the discipline, they only help to better account for it. In the past, art historians based their work on first-hand knowledge of the original sources. They drew material from diverse sources—i.e., art works in museums, monuments in situ, and archival documents in obscure collections. Recent developments have afforded more open access to documentary materials. New technologies, such as microforms of manuscripts, full texts available online, and imaging for works of art, allow general access to the building blocks of research. The intellectual ability to absorb much more information than in the past and to select and synthesize will be the new challenge for scholars, for soon they will be able to browse through texts and images at their own workstations.

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REFERENCES


Siegfried, S. L., & Wilde, D. N. (1990). Scholars go online. Art Documentation, 9(Fall), 139-141.


Electronic Information and Applications in Musicology and Music Theory

Mary Kay Duggan

ABSTRACT
In the field of music, the impact of electronic information goes beyond research on music and writings about music to the processes of creating, notating, printing, performing, and recording music. The overview of electronic publications and information resources selectively covers: (1) bibliographic citations of books, articles, scores, and sound recordings; (2) electronic network resources; (3) databases, some with music incipits or complete scores in image or sound or both; (4) music laboratory environments; and (5) commercial multimedia products.

INTRODUCTION
Both the scholarly study of already existing music and the creation and performance of new music are being transformed by the proliferation of electronic music information hardware and software. The nature of the music curriculum and the music library that supports that curriculum undergo continuing revision as the boundaries of both what is studied and how such study is accomplished are redefined. The latest manifestations of that revision are accompanied by electronic resources that suggest a fundamental reexamination of the relationship of the student, scholar, music department, and library. A diminished relative importance of local resources comes with easy, efficient, and inexpensive access to equally important outside resources. To the roles of librarians as collectors, catalogers, and servers of information comes a new role of provider

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of hardware and software interfaces that link users to outside information and allow them to process it, and a new key role of educating users themselves to access invisible resources. The relationship of the library to what is outside of it—in laboratories of the music department; laboratories of other departments; centralized campus installations; or regional, state, national, and international networks—has begun to transform former concepts of what the library is for, what librarians do and what they should and can do (Dougherty & Hughes, 1990, pp. 10-18; Woodsworth, 1991). Scholars and students of music who have grown up with the computer go to the libraries and networks with great expectations of access to the world of scholarship and with the knowledge of the ability of that world to accommodate research results and pedagogical tools that use the full range of resources available. Fulfillment of such expectations has been the goal of music libraries in the past and this full utilization of resources in and outside the library will continue in the future.

Today's scholars in musicology and music theory require a variety of information formats. There are those who find materials for research on their own shelves and manage to exchange information orally with those in the world whose ideas are important to them. At the opposite end are those who find or create their research materials on the computer and constantly use electronic communication to seek those in the world who can stimulate their thinking. In between are the mass who wish to exploit all kinds of information—oral, printed, and digital. None is content with what is in the local library; scholars never have been. Electronic information processing promises to serve these users by abbreviating those years of productive life spent in the search for, and study of, music and writings about music.

Even greater change is taking place as the computer affects the processes of creating, notating, printing, performing, and recording music. In a recent article on computers and music, David Crawford (1991) pointed out that the artistic, educational, and social issues surrounding computerized performance and composition are especially controversial, though they are nevertheless the issues which grip the campus, the training of children, and the music around us (p. 35). As computer workstations acquire the capability of displaying notation, analyzing it, printing it, playing it, and interfacing with electronic musical instruments, they provide composers, performers, and researchers with an attractive and relatively inexpensive tool for such activities as composing and storing music. Educators use workstations to follow the individual performance of a room of electronic instrument novices; train students in melodic memory, pitch, and rhythm; teach paleography by inputting transcriptions, listening
to the resulting polyphony, and printing in a variety of notations. Listening and composition laboratories become interactive multimedia experiences as scores and structure are displayed on the monitor, high quality speakers produce sound, and computer keyboards are used by students to control activities and learning levels. Instructors, students, departments, libraries, and campuses have purchased hardware and software individually or through committees. No matter where computers for music are located, careful decisions on operating platforms, software, and output to systems and printers will take into consideration issues of electronic music information that go beyond the local laboratory. It is likely that the hardware and software used for music research, teaching, composition, and performance is the same that will be needed in the future to serve electronic music information to users on networks and in libraries.

The overview of electronic information and applications in music that follows surveys selected publications and information resources in several categories and summarizes major issues in providing that information. It begins with bibliographic citations of books, articles, scores, and sound recordings, an area of astounding growth in recent years that has transformed all levels of research from that of the beginning high school student to that of the most advanced researcher in need of up-to-date citations. Next, consideration is given to the resources of Bitnet and the Internet for professional communication via electronic mail, LISTSERVs, and networked databases. Even more selective is the introduction to music databases, some with text, some with incipits or complete music scores in digital searchable form or in images, some with sound incipits or complete works. A brief section reviews computer music laboratory environments and the variety of alternatives being utilized on campuses today. A final section looks at electronic multimedia commercial products, probable precursors of normal scholarly publications of the future. Major issues that arise in providing that information involve the role of the music and general libraries and librarians and their relationship to: (1) the computer laboratory and computer networks in providing music information; (2) accessibility; (3) the nature of service to electronic end-users; (4) the future of music printing and publishing; and (5) the position of music in relation to the developing importance of multimedia art forms and interdisciplinary research strategies, a position that already makes an isolated chapter on music an impossible challenge.

BIBLIOGRAPHIC CITATIONS

A pervasive and transformational electronic tool in music, as in other research areas, is the online library catalog of records in a standard MARC format, grown over the years to include large
numbers of music scores and sound recordings deliverable to the personal workstation. It epitomizes the positive aspects of electronic information since it is prepared by professionals in standard format, constantly updated, accessible in sophisticated interfaces for the novice, and provided through networks at no cost to users. A good online catalog provides access to high-quality and detailed information through fields never searchable in drawers of cards (for example, by date or language) and allows Boolean combinations of fields that narrow results to a precise goal. Despite the amalgamation into centralized catalogs of music scores and sound recordings formerly housed in separate drawers in the music library, music materials can again be isolated by the use of appropriate command language (search by "form music scores" or "form sound recordings" as well as the newer electronic formats, "form databases" or "form CD-ROM"). By providing special search capabilities unique to music—key, music publisher, thematic catalog numbers such as Köchel numbers for Mozart, personal name for performers, corporate name for performing groups, highly refined subject access—online catalogs have become the best available bibliographies of many composers, performers, genres, and so on. For example, begun in 1977, MELVYL is the catalog of the books, periodicals, scores, sound recordings, and other materials of the nine University of California campuses plus periodical holdings at California State University, California State Library, Stanford, University of Southern California, The Getty Center for the History of Art and the Humanities, and the Center for Research Libraries (as of October 1990, 6 million book titles and 800,000 periodical titles). A sample search of music materials uses form commands to isolate the field and the special index of key (mk); others available include music publisher (mp) and thematic catalog number (thematic K. 318).

With the assistance of federal funding, retrospective conversion of card catalogs has made it possible for some music collections to put their entire holdings into catalogs. Cables that network campus buildings allow individual users in offices or dormitories to have instant access to catalogs through their personal computer. Modem and a password provides access to general users; in addition, international access is provided free to the academic community through Internet. MELVYL was found to be the most used library catalog on Internet, a compliment to the designers of the friendly user interface.

Several national projects have issued electronic music information on CD-ROM. For access to musical scores, the British Library published its printed music catalog up to 1980 in paper, but the supplement to 1990 has appeared on CD-ROM (CPM Plus,
Bowker/Saur, 1991) where it can be searched by composer, title, keyword, publisher, place and date of publication, publisher or plate number, and series title. It can be updated by CPM Plus (see later discussion). Other CD-ROM products for coverage of British holdings include printed books in the British Library Catalogue of Printed Books to 1975, and BNB on CD-ROM (British National Bibliography from 1950 to present on two disks, over 1,200,000 records). A search of music truncated ("music#") in the BNB on CD-ROM to October 1991 retrieved 10,163 titles. The British Library CD-ROM can be updated by online access by subscription to Blaise (a search of "1977-", retrieves 22,000 records on "music"). The same software is used for the CD-ROM catalogs of the Bibliothèque Nationale of France and the Deutsche Bibliothek of Germany. The Music Catalogue of the Netherlands (MCN MUSICROM) contains cataloging for 200,000 printed scores in libraries of that country.

| f pa mozart and form music scores | 5,537 |
| f pa mozart and form sound recordings | 2,430 |
| and date current [current = the last three years] | 149 |
| and mk g | 8 |
| display 1-4 [The default display is a short entry; complete is available] |


Figure 1. MELVYL (University of California Catalog)

While it may seem trivial to have begun an article on electronic information for music with online bibliographic catalogs, it is the genre which offers the most in the immediate future as the goals of international bibliographic coverage are realized. Though it is often easier for librarians to use the larger bibliographic utilities to which they, as professionals, have access as a privilege of their position, they can as well become skilled users of Internet resources in order to instruct users in resources that are free to workstation users, make current directories of the library catalogs available, and
describe the relevance of holdings for music researchers. Over 250
library catalogs, including some forty academic and research library
catalogs of the United Kingdom, available through a gateway to
JANET (Joint Academic Network), the centrally funded academic
network in the United Kingdom, are available to users of Internet
(Farley, 1991). The MARC records of the catalog of the Library of
Congress are now accessible to specified libraries in the United States.
With initial funding in place for NREN (National Research and
Education Network), a broadband national network that will allow
rapid transmission of full text, image, and sound files, national
network services promise to grow. Similar developments are taking
place across the globe (Dierickx, 1990, pp. 97-103) that will affect
access to electronic information in all categories.

Very large files of music records are held by the bibliographic
utilities OCLC and RLIN (Research Libraries Information Network).
Developed as tools for catalogers, the databases are usually accessed
by librarians at special workstations by contract with the utilities,
although it is now possible for any user to acquire a password and,
for a fee, search OCLC or RLIN through Internet (see Figure 2).

Figure 2. Databases available on OCLC and RLIN

Both utilities have been the beneficiaries of large bodies of music
records from retrospective conversion projects (jazz recordings,
librettos, sheet music, etc.). Music was a participant in the development
of the RLG (Research Libraries Group) conspectus to describe,
through the LC classification system, the level of comprehensiveness
at which an institution collects materials in a given subject area. The
widespread application of the conspectus to record conversion within
the research library community brought much music into RLIN and
OCLC, though not always with the comprehensiveness intended
(Hewitt & Shipman, 1987; Farrell & Reed-Scott, 1989). As regional
and national databases and networks increase access to freely shared
information resources, the role of the utilities as national suppliers
of bibliographic information is undergoing revision.
While indexes of periodical and newspaper articles have not traditionally formed a significant part of American library catalogs, online catalog vendors have begun to offer users integrated access to their own indexes (CARL [Colorado Alliance of Research Libraries]) or to other commercial databases (Current Contents, ERIC, InfoTrac, Academic Index including six months of the New York Times, the H. W. Wilson indexes including Humanities Index [reviewed with music examples in Tseng & Dixon, 1990, pp. 94-115]), ISI's citation indexes including Arts and Humanities Search, and Newspaper Index, covering a wide body of music titles. In 1991, the two following music indexes moved to a CD-ROM format to offer electronic access on music library PCs to a focused music user group, on many campuses putting themselves in competition with coverage that had been contracted for on the campus network.

The Music Index on CD-ROM (Chadwyck-Healey, annual subscription) covers material from 1981 to 1988 gathered from about 350 journals, primarily English language. Citations include illustrations, biographies, portraits, etc., although indexing is limited to words in four fields: subject (index heading), subject subdivision (index subhead), title/author, periodical title. Since titles and authors are entered in the same field, it is not currently possible to search a "surname, first name." Boolean searching is possible, but a search of "J? Nelson" in the title/author field would retrieve any word beginning with J and Nelson. One can search a surname and browse an index of all words in the title/author field which includes surnames with first names (Nelson, J.; Nelson, Judy; Nelson, Judith). Searches are discarded after use; a search strategy may be saved in a named file. Records may be output as word processing files (for example, WordStar, ASCII) or as database files (for example, dBASEIII[+], Lotus).

The CD-ROM MUSE (MUsic SEarch, NISC, annual subscription) contains the complete RILM Abstracts of Music Literature, over 100,000 records from 1970-1984, covering books, journals, newsletters, conference proceedings, catalogs, dissertations, and reports of government and international bodies. Indexing by an international thesaurus of terms is available in print in seventeen languages. A publication developed from the start for online access but the least used of DIALOG's humanities databases, RILM on CD-ROM could at last bring electronic access to music scholars. The publication is trying to make coverage more current, a constant struggle with the international corps of volunteers who collect citations and write the abstracts.

Because of RILM's lack of currency, electronic means are useful as a way of supplementing its coverage. Syntagma Musicum is an
electronic file of recently published musicological articles based in Turin, Italy, that permits users to type in messages to other users and input information of their own (CiM, 1990, p. 136). Coverage so current that it may beat the actual issues to library shelves is found in *Current Contents* and *Arts and Humanities Search* (ISI, available online on some campuses or from DIALOG and BRS) for seventy-seven of RILM's periodical titles (listed in Duggan, 1990, pp. 5-6) though only with keyword access and without abstracts. Many libraries now subscribe to an electronic periodical index that covers some music journals (*Academic Index*, Information Access, eighteen titles; *Humanities Index*, H. W. Wilson, fifteen music titles). Music dissertations with abstracts are included in the more current *Dissertation Abstracts* (UMI, online or CD-ROM). Current coverage of new books and conference proceedings can be found on CD-ROM through the following commercial in-print literature:

*Books In Print* (Bowker), or *Books In Print Plus*, with reviews. 840,000 books plus 40,000 from the BIP supplement and 85,000 from Forthcoming Books. Updated bimonthly with 10,000 titles. Lists 9,980 titles under the keyword "Music" (1990).

*British National Bibliography*. Over 1 million books published in Britain since 1950.


*Alice-CD* (Alcor). Over 240,000 books published in Italy.


While not yet electronic in publication format, *The MPA Printed Music Catalogue on Microfiche* has been prepared by the Music Publishers' Association with the capacity and currency of the computer. Already up to 240,000 entries on title and composer fiches, the catalog contains entries for printed music currently available for sale through United Kingdom publishers and distributors. Updated twice a year, the catalog will retain titles which are no longer available, adding the reference O/P.

Representation of sound recordings in the bibliographic universe has been greatly increased by online library catalog coverage as evidenced by the OCLC *Music Library* CD-ROM (Silver Platter, 408,000 recordings). A 1991 entry in the field is the *Billboard/Phonolog Music Reference Library* (BPI Communications, Inc., annual subscription with quarterly updates), a CD-ROM containing entries for over 1 million songs and over 80,000 record albums of "classical, country, pop, rock, jazz or any form of music in-between." Long popular in libraries as the Phonolog looseleaf service, the
electronic format allows searching of ten fields plus Boolean and keyword searching. Future issues promise *Billboard* chart data and reviews. Another CD-ROM, *CD Guide* (Audio Compact-Discs, annual subscription, updated quarterly), contains entries for over 40,000 recordings, 5,000 of which include reviews from the journal of the same name. Audio samples of a few titles seem to be all that are possible due to copyright restrictions and the constraints of the optical medium. Directed at marketing, each entry includes title, artist(s), number of disks, ADD/DDD etc., ref., running time and track information, year of recording, and release and performance quality ratings by professional reviewers. The obvious advantage to users of sound samples in sound recordings citations was recognized by Bowker in their CD-ROM *Music Directory Plus* announced for 1990 but was postponed as negotiations with ASCAP (The American Society of Composers, Authors, and Publishers) and its British counterpart continued. In a paper given at the IAML (International Association of Music Libraries) conference in Boulogne, 8-13 July 1990, this author demonstrated one hardware and software package for the creation of a local sound catalog of CDs (Duggan, 1991, pp. 74-75), a logical extension of the digital information of the current CD catalogs. With better compression techniques for storage, broadband networks for transmission, and standards for multimedia, distribution of MARC records with images and sound should become common (see multimedia discussed later).

**Network Resources**

For many campus scholars, the freely distributed network resources on Bitnet and Internet are changing the way they communicate (Kalin, 1991; Arms, 1990). Informal and uncontrolled at some levels, filtered in both content and participants at others, such resources include person-to-person electronic mail, free-wheeling bulletin boards, electronic discussion lists (LISTSERVs) for particular subject areas with monitored messages, edited electronic newsletters and journals, and full-text complete files. Music users can join interdisciplinary discussion groups such as HUMANIST, HISTORY, or Women's Studies, or join thriving music lists such as MLA-L (Music Library Association) and NOTMUS-L (Notis Music Library List). *EthnoForum* is another well archived and indexed discussion digest on work in ethnomusicology (*EthnoForum*, ongoing). The Society for Music Theory Network (1991) began a discussion group in spring 1991 and the International Musicological Society's Study Group on Musical Data and Computer Applications is currently seeking to establish a group based at the University of Oslo (Vollsnes, ongoing). An early music discussion group provides news on records, books, musical events, etc. (*EARLYM-L*, ongoing).
Electronic journals for music have also begun to appear. An early entry was *Musicus: Computer Applications in Music Education* (*Musicus*, 1989 and ongoing), which was reviewed in MRD, February 3, 1991. *MRD (Music Research Digest)* provides current access to music software information (MRD, ongoing). *HUMBUL*, the Humanities Bulletin serving United Kingdom universities on JANET, posts announcements on symposia, grants, publications, and positions (*HUMBUL*, ongoing). Major problems of access and communications standards have kept many from taking advantage of these resources, but changes underway promise to simplify use and enlarge capability.

Internet is a group of connected networks that share a common network protocol (TCP/IP) and, in the United States, communicate over a high-speed network called NSFNET that in 1989 connected 346 separate computer networks. Legislation for NREN (National Research and Education Network), passed by both the U.S. House and Senate, would move scholarly communication to a broadband network capable of carrying immense files including images and sounds, making possible the electronic equivalent of a "virtual" library that could offer full score and sound files to music users (Cline, 1990, p. 30). Since Internet is not governed by a central agency, no one body has responsibility for providing directories of users' numbers or lists of resources. Access to its information has relied on the efforts of dedicated individuals, and it is difficult to know who is available on Internet, what is available, and how to use it. Provision of directories and indexes must deal with the three standards relating to finding or accessing information on a network. First is the ANSI/ISO Z39.2 standard which is used by most automated library systems for the exchange of US MARC records. Another is the information retrieval protocol Z39.50 standard, developed during the Linked Systems Project for communication between the Library of Congress and the major bibliographic utilities, "which enabled a requesting computer to 1) request that the responding computer search a specified database and identify records which meet the specified criteria, and 2) request transmission of, and receive some or all of the identified records..." (McGill, 1989, p. 29). The third standard, X.500, developed in Europe by the International Telegraph and Telephone Consultative Committee, provides a mechanism for describing objects associated with a network such as people, organizations, distribution lists, applications, and network hardware. Both Z39.50 and X.500 conform to the standards of Open System Interconnect (OSI) now being developed by the International Standards Organization for intersystem and internetwork communication. Efforts to use these standards to create tools for access on Internet include the use of MARC data elements for describing resources (Dalton, 1991, Figure 1)
and X.500 standards for user directory information (Dalton, 1991, Figure 2). A prototype project of the University of California uses existing standards and provides access within institutional library catalogs. Alternatively, a front end Z39.50 application (Brewster Kahle of Thinking Machines Corporation) puts the software on Internet but allows code to be downloaded so that searches are processed on a personal workstation rather than burdening Internet.

Some have refused to wait for the creation of optimal access tools. The New York State Education and Research Network (NYSERNet) has already implemented an X.500 directory of system users as has Merit, a network linking eight state-supported Michigan universities. The Internet-Accessible Library and Database Catalog lists accessible online public access catalogs and information on how to reach them (St. George & Larsen, 1990- ). Since there is little online assistance to novice users, a committee of librarians has developed a useful guide to these resources (Farley, 1991). An Association of Research Libraries publication brings Strangelove's Directory of Electronic Journals and Newsletters and Kovacs's Directories of Academic E-Mail Conferences into a directory of United States and Canadian sources (Directory, 1991). Items related to music are listed under the broad discipline "Social Sciences and Humanities" and also listed alphabetically by title in the index. Meckler promises a directory of directories on Internet (Metz, 1992).

In addition to the standards for access to text on networks, work is going forward to allow network access to music notation and sound encoded digitally. Currently several systems of encoding are in use, some of which can be used with software for music analysis. All systems can produce printed output, and some can produce sound (for a discussion of available systems and software, see recent issues of CiM). In 1987, the Standard MIDI (Musical Instrument Digital Interface) File format (ANSI X3VI.8M/88-6) was adopted to enable communications between electronic instruments and microcomputers (CiM, 1990, pp. 51-53). Computer workstations are now equipped for MIDI output or can be upgraded with boards for doing so. In addition, standardization of communication between the proliferation of encoding systems for music notation and other software is moving forward. The American National Standards Institute Committee on Musical Information Processing (MIPS) hoped to issue a first draft of a proposed national Standard Music Description Language (SMDL) in 1991 (Newcomb, 1991, pp. 76-79). OMR (Optical Music Recognition) (Carter & Bacon, 1991), using the standard SMDL, could facilitate large-scale transfer of music scores to digital form for musical data interchange on the network, emulating the full-text files that are emerging for other fields in music (see Thesaurus Musicarum
Latinarum discussed later) and the other humanities (Price-Wilkin, 1991; Tibbo, 1991). With the establishment of a North American Center for Machine-Readable Texts at Rutgers University and the appointment of Susan Hockey in October 1991 as the first director, a mechanism is now in place to ensure access to digitized texts and avoid duplication of effort in digitization of material. The commercial push to multimedia products is also providing an impetus for movement toward international standards for music and images.

Network participants move from novice to expert through a series of levels. The usual strategy of beginning users of electronic network resources is to enroll and get a password, become familiar with a telecommunications protocol and the UNIX commands of an Internet account, and learn to function as an online participant in electronic mail and conferences. As users tire of irrelevant mail messages, they become interested in starting a Bitnet LISTSERV or Internet conference aimed directly at a small group who share interests (opera, jazz, early music). There is no doubt that a local resource person is essential for success at the beginning and a music librarian fluent in network use and information service is accessible and logical for that role. Likewise it is essential for the success of electronic music on the network, such resources as those described in the following sections, that there be a sufficient body of skilled users and librarians. From the formulation of research projects and analytical techniques, to bibliographic searching, to the presentation of research to peers, network resources have transformed music research.

Electronic Music Applications

Thanks to some recent publications, readers can find current printed discussion and bibliographies of computer music applications to supplement the brief descriptions provided here. Thus an important part of this section is the review of published sources that can provide depth of coverage of books, periodicals, conference proceedings, electronic digests, followed by a brief look at selected projects of different types—bibliographical, full text, full score, analytical, tutorial, studio, and multimedia.

A current discussion of computer applications is the issue on music of Advances in Computing in the Humanities (Goffredo Haus, guest editor) that covers tutorials, music processing, and music studio reports (Haus, 1991). Haus is also the editor of the anthology Music Processing to be published by A-R Editions in 1992 (Haus, in press). Articles on applications in musicology and composition were collected by Helmut Schaffrath in Computer in der Musik: Über den Einsatz in Wissenschaft, Komposition, und Pädagogik (Schaffrath, 1990). An annual review of electronic music activities
appears in *Computing in Musicology*, edited by Walter Hewlett and Eleanor Selfridge-Field at the Center For Computer Assisted Research in the Humanities. In addition to summaries of new projects in music history, theory, composition, and performance, *CiM* includes sections on such topics as software for music printing, representation and analysis software, and OMR, as well as a current chronicle and address list of contributors. As the volume of contributions has grown, annual issues have become more selective and Deta Davis's (1989, 1991) bibliography of computer applications up until 1989 is a welcome auxiliary publication. Hewlett and Selfridge-Field (1991) provide an overview of the electronic music applications they have reviewed in an article "Computing in Musicology, 1966-1991."

To keep abreast of current activities, the electronic journals listed earlier and several of the print journals that follow offer a variety of approaches:


*Computing in Musicology*.

*Electronic Musician*.


*Perspectives in New Music*. Quarterly.

In addition, published proceedings of conferences on computers and music provide detailed articles on specific projects. The following are some examples (for annotations, see the "News" sections of *CiM*):


Since currency is so important as technology changes and research possibilities expand and because publications on paper often take years to appear, electronic discussion groups and bulletin boards are essential for news of conferences and proceedings.

Many current computer projects in music are bibliographical in nature, from informal localized efforts to well-funded large-scale published databases. RILM and Syntagma Musicum, mentioned earlier, are quite different approaches to the bibliography of scholarly music writings. RILM is comprehensive with abstracts and Syntagma is current with citations partly dependent on contributors. Nearly 12,000 librettos predating 1800 in the Albert Schatz collection of the Library of Congress were cataloged under Marita P. McClymonds and Diane Parr Walker (1986) (e-mail: <dpw@virginia.bitnet>) at the U.S. RISM Libretto Project, University of Virginia (currently searchable on RLIN in conjunction with a comprehensive guide and 244 reels of microfilms of texts). An Italian project (ACOM, Archivio Computerizzato Musicale veneto) is now cataloging about 50,000 librettos as well as hundreds of thousands of other items on the seventeenth- and eighteenth-century Venetian theater. Norman L. Wick's Music Theory Index, built with FoxBASE+Mac, covers books and articles published in English that pertain to music theory (some 15,000). It will be published by Pendragon Press about 1994 and a CD-ROM format is under consideration. RELICS (Renaissance Liturgical Imprints: A Census) built by David Crawford (1991, pp. 39-42) provides descriptions of about 5,000 liturgical books with multiple fields for Boolean searching, including a note on the presence of music (i.e., mostly, some, no music). Access is now limited to printed output at the library or searching the mainframe at the University of Michigan. Pending funding for data conversion, it may be loaded on RLIN.

A comprehensive bibliography of French music and dance of the seventeenth and eighteenth centuries by the Atelier d'Etudes of the Centre de Musique Baroque de Versailles is scheduled for public access in 1992 (CIM, 1991, p. 33). The project consists of five databases: (1) WORKS—citations of writings after 1800 (8,000 entries); (2) MUSIC—information about printed and manuscript sources for musical works and source concordances; (3) WRITINGS—pre-1800 documents; (4) NAMES—a list of researchers, librarians, booksellers, and musicians currently involved; and (5) POETRY—literary sources of texts set to music.
A more ambitious bibliographical project is the database of music in manuscripts dating from 1600 to 1800 sponsored by the Répertoire International des Sources Musicales (RISM). More than 100,000 musical and text incipits and associated bibliographical data for manuscripts with call numbers from libraries all over the world can be retrieved from a relational database mounted on a personal computer at the headquarters in Frankfurt. Music notation for incipits was encoded in the Plaine and Easie Code developed in the 1960s which, despite its name, is not at all easy for the novice to use. The ability to search the actual music melodies moves music bibliography into a new realm that need not depend on words but can use melody, rhythm, and other notational clues as well as keyword, tempo, and instrumentation (INFO RISM, 1990). Other RISM projects have been printed on paper or microfiche, but CD-ROM may prove a viable alternative. By means of a contract with RISM headquarters, national RISM groups may acquire the software and RISM data transmission program to accelerate communication of entries.

As a byproduct of the RISM project, an online index of names of composers and their works has been created that, as of 1991, contained 7,000 entries and 90,000 titles. A composer file includes references to variant names, pseudonyms, and initials, as well as birth and death dates and is an invaluable biographical dictionary, especially for lesser-known composers (INFO RISM, 1991, pp. 7-17).

A new project is the International Inventory of Villancico Texts for printed and manuscript villancicos of the sixteenth to nineteenth centuries. Three files provide access to: (1) bibliographic information (library and call number, institution, feast, year, composer, printer); (2) music incipits of the printed villancicos; and (3) textual incipits of the manuscript villancicos. David Martinez and Paul Laird (e-mail: <plaird@ducair.bitnet> or <plaird@athena.cair.du.edu>) at the University of Denver used SAS on a VAX for data processing for analysis (CiM, 1991, p. 45).

Another bibliographical project now underway that promises to include musical incipits is the new edition of Heyer's Music in Monuments, Sets, and Series being prepared under George Hill as a multifaceted database. A paper publication is scheduled to appear in 1992 (Fallen Leaf Press, Berkeley, California) that will vastly improve the entries and indexes of the previous edition. An optical edition to follow will provide the sophistication of computer searching and extend music indexing into the realm of melody and rhythm.

A full-text project already available on Internet is the Thesaurus Musicarum Latinarum (TML), an evolving database of more than half a million words that will eventually contain the entire corpus
of Latin music theory written between the sixth and mid-sixteenth centuries, both published and unpublished. Searching can be done on every occurrence of a particular term, phrase, or passage, or group of terms in close proximity. TML is centered at Indiana University-Bloomington under Thomas J. Mathiesen, Department of Musicology (e-mail: <Mathiese@iubacs> or <Mathiese@ucs.Indiana.edu>) and is available free of charge (e-mail: <listserv@iubvm> or <listsrv@iubvm.ucs.Indiana.edu>). Access to full-text periodicals includes a proposed CD-ROM of Tom Griffin's edition of music material in the Gazette di Napoli (Fallen Leaf Press, Berkeley, California). The Register of Musical Data in London Newspapers (1600-1800) by Rosamund McGuinness (Royal Holloway and Bedford New College, University of London (e-mail: <uhwm001@vax.rhbnc.ac.uk>) is limited to citations for material in the main newspapers of the time (CiM, 1991, p. 49).

Full-score projects include:

Walter Hewlett's Bach project at the Center for Computer Assisted Research in the Humanities (e-mail: <XB.L36@stanford.bitnet>); digital music files are available for display, sound, searching, analysis, and printing.

Essen University's monophonic songs of German-speaking lands. More than 13,000 songs encoded in ESAC (Essen Associative Code) appear in one field of an AskSam relational database for display, sound, searching, analysis, and printing (CiM, 1991, pp. 30-32). The files, software, and documentation are available free by license to scholars from Helmut Schaffrath (e-mail: <jmpl00adeohrzia.bitnet>.

The European Repertoire Information Service (EURIS) plans to distribute to public libraries scanned images of score pages together with MARC cataloging, graded level of difficulty, and information on where to order the scores. The first repertoire chosen is brass band music, the entire corpus of which is estimated to fit on one CD-ROM (CiM, 1991, pp. 34-35).

Several current projects are notable for their additions to existing software programming to allow analysis of various characteristics of music. One such project is NeurSwing of Denis L. Baggi is a "a system of connectionist models, or neural nets, to investigate swing in Afro-American jazz by simulating the operation of a jazz rhythm section" (CiM, 1991, p. 85). Hilde M. Binford-Walsh (Stanford University) encoded Aquitanian tropes in SCORE and applied a code to each neume that provided data for statistical analysis and comparison through Turbo Pascal programs and SAS (Statistical Analysis System) (CiM, 1991, pp. 41-42). John Walter Hill (University
of Illinois) entered melodic (pitch) incipits and full poetic texts of Vivaldi arias to find clues to reused arias in the absence of surviving scores (CiM, 1991, p. 47). Hill is also creating a full-text database of manuscripts of Italian monody to c.1630 with melodic incipits (CiM, 1991, p. 46).

**Tutorial and Laboratory Projects**

The proliferation of tutorial music applications is reviewed in the annual *MTNA Guide to Music Instruction Software* (Music Teachers National Association), the British electronic journal *Musica: Computer Applications in Music Education* (1989-), ERIC (U.S. Dept. of Education), and in Schaffrath's recent *Computer in der Musik: Ein Einsatz in Wissenschaft, Komposition und Pädagogik* (1991). Both commercial and music studio software creation is highly dependent on specific hardware platforms. Early electronic music applications were on mainframes because of the very large demands of music sound and notation, both for storage and for processing, and are found today in research universities where mainframes are available (Mathews & Pierce, 1989). When the Macintosh appeared with a MIDI interface for keyboard input and HyperCard for the manipulation of sound and image segments, local and commercial applications exploded. Digital sound input and editing were easily accomplished through an inexpensive piece of hardware called the MacRecorder, though only at 22 kHz (Duggan, 1991, pp. 71-75). The NeXt computer builds in the sound digitizer (44 kHz) as well as the MIDI interface and software for editing and manipulation and adds fast processing in a UNIX environment with optical storage for large sound files. More recently, hypermedia software has become available for the DOS platform. Because of that sequence of development, it is not uncommon for music computer laboratories, music tutorial facilities, and music libraries to use several hardware platforms for creation, training, and information services. Despite the difficulty for staff in maintaining a current knowledge of several platforms and current software for each, the library will need to support various platforms if it is to remain in touch with the variety of electronic applications.

University music and performing arts laboratories (Flurry, 1988, 1989; Gregory, 1988; CiM, 1990, pp. 125-28; Craner, 1991) are developing multimedia workstations linking an interactive music environment, a composition module, and tools for modeling such processes as musical knowledge acquisition, synthesis of the singing voice and other music performance, or a new computer musical language not dependent on the normal limitations of pitches based on the octave and rhythm based on divisions of a beat. Often they
use a few powerful and current UNIX machines together with several Macintoshes all linked to a campus mainframe and networks. An anthology of articles from the *Computer Music Journal, 1980-1989*, called *The Well-Tempered Object* (Pope, 1991) describes activities in such laboratories, focusing on the object-oriented software of the NeXt and Mac. Workstations take on a role in the curriculum much as tape decks did forty years ago. For example, assignments in paleography can be done at the digital keyboard of the workstation, viewed on the screen, and played back. Learning the rules of counterpoint can proceed interactively with a computerized “Gradus ad Parnassum” (Schottstaedt, 1989). A thoughtful review of computers for music composition by Gareth Loy (1989) describes the way music composition programs and programming language for music help and affect the writing of music. When Loy wrote his article, he noted that musical computing was in a league with research in vision and particle physics in the sheer volume of computational demand it placed on the computer. With the move away from the mainframe to the multipurpose individual workstation in the last three years, music computing hardware and software is moving back into the central focus of the music department and, in some cases, to the music or performing arts or multimedia computer laboratory in the library.

Computers with analytical programs may be reservoirs of score and sound material. The project *Humdrum Database* brings whole libraries of scores with software for analysis to the hands of students at the workstation.

The *Humdrum Database* includes about 2,300 scores ranging from the twelfth-century Notre Dame School to twentieth-century works out of copyright, 90 percent of which are polyphonic. The project is notable for the Humdrum system of music tools for UNIX, including a tool kit of some fifty interrelated software tools written in *awk* and/or C, designed to work in conjunction with standard UNIX software tools (Hewlett & Selfridge-Field, 1991, pp. 32, 66-67). Further information is available from David Huron, Conrad Grebel College, University of Waterloo (e-mail: <dhuron@watervl.uwaterloo.edu>).

Case Western Reserve University's *Musical Scores Project*, developed in cooperation with music instructional staff and the Library Collection Services Project, puts together on a DOS platform: (1) digital music scores; (2) a searchable database/index about the works; (3) links to commercial or university recordings; (4) graphics and text tools to allow the on-screen analysis of musical works either as a “clear” overlay on the score image or as a separate document (Duggan, 1992, p. 99).
Where does the library fit in? Information delivery—of citations, full text, full score, music, image, or all of the above—can be electronic through cables in addition to or instead of print, tape, CD, interlibrary loan, or photocopy. Local information development of files of scores, sound, and instructional material can be facilitated by the cooperation among library, instructional, and computing services staff and can be coordinated with regional, state, and national digitized music information and delivery systems. Information hardware and software sites can be located in supervised service areas of the library with professional staff for consultation. The indispensable link between such library service and the user is a librarian or information specialist deeply interested and well trained in computerized information service. Invisible electronic information, software, and communication among different kinds of music activities on campus can become more visible through the librarian. The same multiple hardware platforms used for tutorials and creative activity can serve information in the library. In fact, the activities of electronic tutoring and creative work can be placed in the library as well. As more and more of the work of the library moves to interactive multimedia workstations, the library becomes a laboratory and the laboratory becomes a library.

**Interactive Multimedia Publications**

At the risk of creating a category of information that is not really separate from work going on in the laboratories described earlier, this final section is devoted primarily to CD-ROM and CDTV titles now appearing in the marketplace. Despite the risk of commitment to a transitory hardware platform, the great potential of emerging platforms for a new kind of music information service demands the attention of those collecting publications for music readers or users. The high quality of the CD is not matched by the standard computer monitor or television screen technology, but improvements in both areas are promising. Similarly, the software for handling very large files of sound and images is not yet capable of the compression and decompression techniques and storage capabilities necessary for easy delivery, but progress in the last two years has been phenomenal and will likely continue. Powerful scanners with high resolution are becoming available on campuses as is the hardware to capture short audio events from CDs and video events from videotape (for example, Voyager's CD AudioStack and VideoStack). Authors can plan on incorporating sound and images into their "manuscripts," and libraries must plan on delivering multimedia electronic publications.

A current music project that stretches the limits of multimedia is the Edvard Grieg Project to create a multimedia catalog of the
manuscript music, notes, sketches, letters with transcriptions, and early sound recordings of this composer on deposit in the Public Library in Bergen, Norway. Scanned images of music scores and other manuscripts, digitized sound input through a MIDI keyboard to produce encoded music files, and textual transcriptions of alphabetic materials are projected to become available on CD-ROM at UNIX workstations for simultaneous presentation of image, text, and music files in windows and speakers (Duggan, 1992, Figures 1-3). The printed volumes and recording archives of complete works that take up so much space in music libraries today could be replaced by CDs through such visionary projects. MusikFUNN, a music information network using the fourteen FUNN centers in Norway, is preparing the database (contact person, Bård Uri Jensen, Western Norway Research Centre, Sogndal, Norway) (CiM, 1990, pp. 151-52).

Commercial CD-ROMs are taking advantage of computer workstation software in multimedia publications directed at the mass music market by authors interested in entertaining as much as learning. Warner New Media's Audio Notes is a series of CD-ROMs that uses HyperCard on a Macintosh to present interactive performances and commentary on well-known music. The first publication, Mozart's "Magic Flute" on three CD-ROMs based on a 1988 German CD release, can be synchronized with a video disk of the Ingmar Bergman production, a necessity since quality of monitor images is so poor. Supertitles in German or English (with other languages promised); musical analysis at two levels, high school and college; and plot synopses can be changed at a touch of the mouse through an attractive icon interface (Duggan, 1991, Figure 2). The music is full stereo quality of 44 kHz but the black and white images at 72 dots per inch on the small HyperCard screen barely allow more than two lines of music to be displayed on the screen at a time. Brahms's "German Requiem" and Beethoven's String Quartet No. 14 (edited by Cynthia Woll) are the latest releases of the series that promises Stravinsky's "Sacre du Printemps," Berlioz's "Symphonie Fantastique," Beethoven's Seventh Symphony, Britten's "Young Person's Guide to the Orchestra," and Schoenberg's "Pierrot Lunaire," the last written by Schoenberg Institute head Leonard Stein, as well as jazz and popular titles.

Voyager has issued Beethoven's Ninth Symphony and Stravinsky's "Sacre du Printemps" as CDs with HyperCard stacks on diskettes to explain musical instruments, structure, themes, and translation of lyrics. Music notation with corresponding sound are coupled. Authored by music historian Robert Winter, the electronic tool communicates what he has to say and is a powerful learning instrument. Future titles promise the first three Brandenburg
concertos and histories of early jazz and mid-1950s rock, as well as a five-camera shoot of Mozart's Quartet K. 465, for the first time adding video to Voyager's options.

With the introduction in 1990 and 1991 of better quality images through CDTV, a hardware concept by Commodore that links the television monitor with CD-ROM or CD and a small controller or full computer keyboard and mouse with a computer, the stage is set for inexpensive and high quality multimedia publishing. The CD-ROM encyclopedias, atlases, and other reference tools provided to purchasers of the hardware include quality sound and color moving images.

THE MUSIC PUBLISHING FUTURE

The movement of music scores and sound to a digital format is a revolution being accomplished by companies, institutions, and individuals, each of which challenges the traditional concept of the music publisher. To avoid the issue of copyright contracts, major multimedia publishers have been purchasing rights to archives of images and sound (Time Warner purchased MGM/UA; Bill Gates of Microsoft has purchased the rights to entire holdings of certain museums). As major repositories of information that scholars would like to see become available in digital form, research libraries may also wish to become publishing partners in an effort to continue to provide information service to their users in the most democratic and inexpensive manner possible (Ostrow & Zich, 1990). Examples mentioned earlier include the Bach repertoire by the Center for Computer Assisted Research in the Humanities, the Edvard Grieg archives in a Norwegian public library, and the Case Western Reserve Library Project that includes university music performance tapes and scores. Fair use under copyright and publication in new formats of material under copyright are issues with new ramifications in an electronic age.

As software for printing music has developed in recent years, CiM has reviewed processes and has printed examples of pages with copy chosen for its difficult passages. A glance at those pages proves how far the software and laser printers have come. Some of the packages that do very well on such passages are not easy to use and professional music printers are investing large sums developing their own solutions. A-R Editions for example has developed a system on a UNIX platform that is known for its flexibility and aesthetic solutions to printing problems. Such professional software may be the "MusicPerfect" of the future. In the meantime, libraries that must function as desktop publishers for internal software can choose from a number of capable products. Until a standard is developed
that will allow movement from one system to another, moving from music notation to print will be software dependent. When such a standard appears, network transmission of full-text full-score files for delivery in library environments may make the library into a large-scale printing establishment.

One bottleneck for music has been the development of a system for the entry of large amounts of notated music into a database by optical scanning which would permit fast error-free encoding of a large number of sources or an extensive repertoire and then provide for the analysis and output of the data according to the requirements of a particular study. That has been solved for text by OCR (Optical Character Recognition), a system now routinely used for standard fonts and rapidly developing for use with the most demanding text. Optical Music Recognition (OMR), the automatic recognition of printed music by scanners, is still in its infancy. Recent work by Nicholas Carter at the University of Surrey takes significant steps toward a solution by a staff line-finding process that recognizes staff lines, removes them from characters, defines characters in relation to these defined stavelines, and then is able to draw the lines and position the characters. "Further work needs to be done in order to cover a larger vocabulary of symbols, but the foundations of a robust, omnifont and size-independent system which has significant tolerance of noise and rotation, are in place" (Carter & Bacon, in press). A related technique of scanning for staves and eliminating them to recognize pitches is used by McGee and Markley (1991) to scan medieval music; once the repertoire is scanned they are able to collate music and textual variants and compare modal and liturgical assignments (pp. 47-53).

Projects are now underway to scan brass band music, medieval music, nineteenth-century sheet music (Library of Congress "American Memory" project), and numbers of others. It is time for the North American Center for Machine-Readable Texts in the Humanities to take note of music scores as they tumble onto the networks. Publishers and printers are also taking note. Already, computer shops are promising electronic books printed on demand (SoftServ Electronic Book Publishing, advertisement in Computer Music Journal). The Note-Station is an electronic library of some 12,000 music items on CD-ROM. A user selects a title, views the music on the screen, listens to a segment, instructs the machine to transpose it (if desired), and selects parts to be printed with automatic billing and royalty accounting (available in both laser-printed copies and MIDI sequences) (CIM, 1991, p. 15).

In 1990, on the Music Library Association's LIST-SERV, Andrew Potter of Oxford University Press published a questionnaire
concerning the publication of music in electronic form, prior to the press's initiation of a series of music publications in machine-readable form. He prefaced the questionnaire by asking for help “in ascertaining the type of repertoire, the form it should take, and the way it might be used in order to be of most use to scholars and others in the musical community.” When asked if readers would find it beneficial to buy multivolume works in machine-readable form, such as complete editions or editions of musical genres which could be accessed by proprietary software, nineteen of the forty respondents said yes, four said no, and seventeen had no comment. When scholars who are creating giant research projects are doing so in digital form complete with software for analysis and statistical processing, they are unlikely to submit that scholarship to a rigid printed format which is no longer susceptible to the same type of use.

But, for many, printed or electronic notation is no longer necessary. In a recent book on artificial intelligence, Raymond Kurzweil (1990) predicted that:

> intelligent software incorporating extensive knowledge of musical theory and styles would be extensively used by professional musicians in creating musical compositions and preparing performances, by amateur musicians who can jam with their computerized instruments, and by students learning how to play. The advent of musically knowledgeable software-based accompanists will provide children with exciting musical experiences at early stages of their knowledge and skill acquisition. (p. 444)

The so-called intelligent software referred to by Kurzweil presents theories of chords, progressions, rhythm, and structure without music notation; software replaces music printing in such teaching tools and moves directly to sound. Kurzweil speaks of a new type of musician, one who specializes in sound design, and speaks of an age when one could not imagine a book about music that had no sound. For that book the electronic music keyboard may be more important to music library computers than the normal computer keyboard.

REFERENCES


**MRD (Music Research Digest).** (Ongoing). Moderated by Stephen Page and distributed outside the United Kingdom by Peter Marvit. (Available by e-mail: <music-research-request@cattell.psych.upenn.edu> and in the United Kingdom from <archive-server@uk.ac.oxford.prg> as well as on HUMBUL.)


St. George, Art <stgeorge@unmb.bitnet> & Larsen, Ron <rlarsen@umd5.umd.edu.> (1990-). *Internet-accessible library catalogs and databases.* Albuquerque, NM: University of New Mexico. Available by e-mail: <listserv@unmvm.bitnet> Message: get library package.


Society for Music Theory Network. (1991-). Available from Lee Rothfarb, Department of Music, Harvard University; e-mail: <rothfarb@husc4.harvard.edu>.


Vollsnes, A. (ongoing). Proposed electronic tool for the International Musicological Society through the Study Group on Music Data and Computer Applications. Address inquiries to Prof. Vollsnes at the Dept. of Music, University of Oslo, P.O. Box 1017, Blindern, 0315 Oslo 3, Norway; e-mail: <arvid@ifi.uio.no>.


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ABSTRACT

While computerization has affected many library operations, it has had relatively little impact on most humanities work other than to make library collections more accessible within libraries (e.g., the OPAC) and among libraries (interlibrary loan systems). However, recent advances in technology are much more likely to have an immediate impact on arts and humanities work and its relationship with the library. The development of microcomputers and locally controlled laserdisk databases has already tended to a decentralization of control over information. This decentralization may cause libraries some problems such as those related to an increase in expenses and in the difficulty of bibliographic control. Electronic mail, by changing the way people communicate, may improve interdisciplinary contact, or it may create two categories of information rich and information poor scholars, as will technology in general. On the other hand, as the other articles in this issue of Library Trends indicate, there are many areas where machine-readable text and interactive computer systems will greatly assist the humanities scholar and possibly even improve general access to the humanities for the average person. In the short run, the most likely prospect is for all current systems to continue with electronic formats merely adding to the richness of the human record. In the long run, electronic information technology will very likely have important effects, but many of the changes will be so gradual as to be unnoticeable to those experiencing them until they look back.
When considering the humanist as a user of modern information technology, one must remember that information technology's fundamental design is based on the needs of the physical sciences and engineering. Even the name "computer" suggests the strong numerical bias at the start of the information age, a fact clearly evident from histories of information technology aimed at textual computing. Ironically, the earliest public demonstration, in 1960, of textual searching on a computer involved the *Golden Book Encyclopedia*, a general reference book. However, nearly all later work for years was dedicated to the storage and retrieval of scientific and engineering literature (Bourne, 1980). More recently a number of inventors and designers have worked farther from the industry's roots, but this distance tends to extend only as far as business applications. The graphics capability of modern microcomputers, such as the Macintosh, began primarily as a means of easing people into computer use; more sophisticated graphics began with CAD/CAM (Computer Aided Design/Computer Aided Manufacturing)—computer aided engineering—rather than art as such.

One obvious implication of this situation for the humanities is the dearth of relevant databases. The 1992 edition of *Computer Readable Databases* lists 6,383 databases of which 248 (about 4 percent) are classified as "humanities." On the other hand, the 1988 edition of this same directory classified only 2 percent of the databases in this category, suggesting the situation may be changing although slowly ("State of Databases Today," 1992). To put it another way, the humanities, although a growing part of the database world, are still a very small part of that world.

The arts and humanities have a number of characteristics relevant to the use of computer databases, whether these are very large remote systems, local library catalogs, personal or departmental systems, or any others. First, there is relatively little money available for the humanities and particularly for individuals. In 1988, for example, total federal funding available in arts and humanities was $296.3 million dollars, versus over $19 billion dollars for nondefense research (U. S. Bureau of the Census, 1990, pp. 237, 585). In part, this lack of funding is related to the perceived lack of need. The stereotypical writer, for example, needs only a cold garret, some paper, and ink to produce a masterpiece, while most science requires at least some equipment, and much modern science requires very large and enormously expensive equipment (Price, 1963). However, as the need for any level of technology grows, so does the need for money. The relation of technology's costs to money available is very important to any discussion of the future, because information and communication technology imply a need for money. If the individual
lacks the money to obtain a highly sophisticated workstation (which sells at present in the realm of $5,000-$10,000 for a full system composed of processor, high resolution color monitor, and necessary peripherals), then that person obviously cannot use it. Yet if total sales for such equipment are small, then the unit cost will continue to be high.

A second critical factor to consider is the humanist's need for considerable amounts of older material, a need very different from most other science and social sciences disciplines and most "practical" applications such as business. The extreme example is probably in the study of religion and philosophy where scholars still routinely study writings thousands of years old, some of which are available only in the original or in very few copies (Heisey, 1988).

Librarians are very conscious of the extreme difficulty in keeping humanities collections to a manageable size—each generation leaves an unweeedable residue; the collection continues to grow. Regardless of the medium in present vogue, the humanities scholar will continue to use earlier technology for the foreseeable future. In practical terms, this means continued reliance on manual literature searches regardless of preference. Few chemists, for example, need refer to the pre-online Chemical Abstracts; few historians can avoid (even if they chose to) to use pre-1963 Writings on American History. For example, studies of citations in humanities fields show considerable use of older material, both primary and secondary, as opposed to other fields (Budd, 1989, pp. 13-15; Garfield, 1980; McCain, 1986). It is interesting that the recent Research Libraries Group analysis of information needs in humanities (Gould, 1988) found that all the humanities fields listed several types of retrospective bibliographies as a pressing need and listed rather few really radical electronic systems.

A third aspect of scholarship in many humanities fields is a heavy reliance on text. The actual words in various documents are very important. An abstract, no matter how good, only rarely can replace the actual text of a document. Imagine, for example, the number of poems whose content could be summarized as "nature is beautiful," a description of little value. This reliance on words used by a document's creator extends to the style and often to errors and corrections in different drafts and editions, so that different versions of the same document can be critical to many kinds of research (Weintraub, 1980, pp. 25-27). A related situation applies to visual "documents." Certain kinds of work (notably art and art history) rely very heavily on the use of extremely good visuals. The definition of "good" does not imply only an accurate representation of graphics; it often includes such things as the specific tone and value of given colors, the presence or absence of brushstrokes, and the like.
In brief, then, humanities research tends to require a large amount of material and often needs access to highly accurate copies of several variations of the originals if not the originals themselves. Thus, for example, a mere transcription of a document's text, no matter how accurate, may not be sufficient for a scholar. He or she may need to see the specific typefaces used, the page layout, and, perhaps, additions to the original document such as marginal notes. She or he may also need to see all graphics included with the document (Broadus, 1987; Garfield, 1980; Weintraub, 1980).

In addition to accuracy of reproduction, the earlier discussed needs clearly imply a requirement for large amounts of space. While electronic media are becoming ever more efficient, they are still far from the ability to handle practically infinite amounts of storage space. For example, a typed page, in retrievable digitized form, requires about 16,000 bytes of storage, but a full color visual of that same page requires about 1 million such bytes (Crawford, 1988, p. 200). The paper version of the color picture and the simple text, on the other hand, each require about the same amount of space with perhaps a thicker page for the picture (e.g., due to use of coated paper).

A fourth aspect of humanities work with very important implications for electronic information is the vocabulary issue (Wiberley, 1983, 1988; Wiberley & Jones, 1989). First, there is a general lack of standardization in terminology. Words may deliberately be used in more than one sense either because of the equivocation inherent in many languages or because the writer wishes to make a point. In fact, writers often will coin new words or use old words with slight changes of meaning because no current word precisely expresses the required thought. Second, words often change meanings over time, sometimes ending up expressing the opposite meaning from the original. This phenomenon applies to all use of words, but, of course, becomes most important when documents of considerably different ages are used, a common phenomenon in the humanities. A philosopher or historian may need to use very old material and will probably use documents more than a couple of generations old in any event, thereby increasing the chance that some words will have changed meaning.

A third aspect of this situation, of course, is that apparently similar words will mean different things in different languages, and sometimes even in the same language. This phenomenon becomes a particular problem when the writer or researcher must work in more than one language or dialect (SantaVicca, 1986; Winograd, 1984).

All of these difficulties with languages are particularly important because many retrieval and storage systems rely heavily on verbal
access. Most computer indexing systems do much of their work automatically, normally making no distinction among variant meanings of a homograph. Even human input systems, however, can run into the language problem, especially when translating from one language to another. The physical sciences and even business have been able to develop nonverbal systems such as the Standard Industrial Classification or chemical formulas in order to avoid some of the terminology problems. Many of the sciences have even been able to agree upon controlled verbal subject systems such as Medical Subject Headings (MeSH) while many humanities and arts subject fields lack even the rudiments of such a system. The continuing difficulty surrounding attempts to classify fiction merely for user convenience, suggests that more sophisticated work may be a long way off (Baker & Shepherd, 1987; Pejtersen & Austin, 1983; Shepherd & Baker, 1987).

A relatively recent development which addresses some of these issues is the *Arts and Humanities Citation Index* (A&HCI). While this approach has been common in the physical sciences since the early 1960s, the A&HCI only became available in 1978 (Garfield, 1980, p. 44). Rather than relying on either verbal or symbolic subject access, citation indexes operate on what could be called document matching. Since a given document tends to cite existing documents discussing the same topic, the citation indexes allow the searcher to avoid attempts to define the "aboutness" of a document. Rather, having identified a relevant document, the user merely asks the system for other documents which have cited the known one. It is interesting that relatively few humanities scholars appear aware of this database in either its print or machine-readable form and that its development was so late compared to the sciences. The latter was apparently due to the general lack of citation standards in many arts and humanities fields. The former may be due to the combination of lack of knowledge on the users' part and the fact that the current database indexes only cite *journal articles* while humanists tend to rely just as heavily on books and other monographs (Garfield, 1980). Note, however, that while the A&HCI is produced by computer and is available in several electronic formats, the true innovation has little to do with any electronic medium at all.

Another factor relevant to this discussion is the general lack of time pressure in humanities work. With very few exceptions, humanists rarely need to get the latest breaking developments as soon as they happen. The difference between humanities and sciences appears in two recent controversies. On the one hand, there is the case of "cold fusion." Announcement of this discovery was made without even the usual peer review because of its timeliness (Mallove,
1991). On the other hand, there is the case of the Dead Sea Scrolls where complaints about delay in their release finally led to a "bootleg" version after nearly forty years (Shanks, 1991). Much of the discussion about electronic media has tended to involve time pressures—electronic mail and journals will reduce delay in communication; online databases are better than CD-ROM because they can be updated more easily and quickly. In fact, the humanities have a tradition of accepting slower communications (compare the annual bibliographies in many fields with no intermediate updates) which reduces the attractiveness of the timeliness of electronic communication.

Humanists' need to search considerable bodies of text and a number of different texts also relates in a sense to time pressure. Given the lack of clear consistent indexing, searches often require considerable modification; the results tend to be rather large—several hundred records is not an uncommon retrieval set. Both searching and printing (or downloading) thus can take considerable time. This need is a significant factor in the use of nearly all remote online systems with pricing based on connect time online.

Research style is also a relevant factor. In contrast to the prevalent pattern in the physical sciences and a common pattern in the social sciences, most humanities publications have only one or, at most, two authors (Garfield, 1980; Stone, 1984, p. 294). In other words, to a high degree, humanists work alone. There is some evidence that some very informal collaboration does take place (Crawford, 1986, pp. 570-73; Hood, 1985), but overall the role of the proverbial invisible college appears very weak. Humanities work tends to be individualistic rather than collaborative.

Surveys of humanities scholars show that they tend to be uncomfortable with technology, although a significant minority are now using at least word processing software (Hirsheim et al., 1990, pp. 27-70; Morton & Price, 1989, pp. 33-45). Whether this resistance is merely unreasoning fear, or whether it is a perfectly reasonable response to systems poorly designed for humanists' needs is unclear. However, for the immediate future, the odds are high that many humanists either will not use much technology or will require some assistance at least in the details of its use. Given these characteristics of the humanist-in-general, several relevant trends in the electronic publishing industries are of great interest.

First is the fact that in some ways the industry is "maturing." This can be seen in the consolidation of business firms such as the DIALOG/VuText/Knight-Ridder and BRS/ORBIT/Maxwell mergers. It may also be seen in the increasing cooperation among firms such as the UMI/Wilson agreement to provide full-text articles from journals indexed in Social Sciences Index using UMI software,

At the same time, the laser disk database industry is growing more or less exponentially. Just five years ago, for all practical purposes, there were no laser disks available yet, by the end of 1990, Cuadra felt it necessary to add a new publication, Directory of Portable Databases (1990), which had over 950 listings. As in the case of the original online systems, most of these databases are in the business and scientific fields. However, the last two years have seen an increase in the number and variety of humanities and arts databases on CD-ROM and videodisks (Sweetland, 1991). In particular, much recent work in laser disk technology has involved interactive visual systems. From an early constraint of only a few pictures with motion or a fairly small number without motion, a number of laser disk systems now contain a rather large number of images complete with motion, stop motion, windowing, and other similar features. Even at present there are disks with adequate visual reproduction and at least some motion; the future should see great improvements in this area.

Remote online databases and laser disk versions, primarily on CD-ROM, are already a standard feature of reference rooms. Libraries are finding some major advantages to laser disk technology at least as it applies to "reference books." For one thing, the fact that it has a definite cost (as opposed to most online systems) makes the CD appear much like any other serial to the budget—i.e., the more a given CD is used, the cheaper the per-use cost becomes. This is much better for planning than an online system where the library, in effect, rents the information and so gains relatively little from increased use. Compact disks are also attractive for this reason. Having paid for a CD database, the library has almost no concern that a user is online to that database for over an hour other than the queuing problem of other users who might want to use the same database or the same equipment.

It is currently true that lines may develop, causing some libraries to restrict use—e.g., to fifteen minute segments—or require formal scheduling of CD systems. Of course such scheduling does put time pressure on users, although this is much less than in the case of connect time charges. The queuing problem results from the fact that present laser disks have generally required one workstation per database. Current developments in LAN (local area network) technology allow several workstations to be connected to a CD reader which can handle several disks at once. The simple version of this setup allows each workstation to access any database on the reader;
the more complex version permits multiple users to access the same CD (as it appears to the user) at the same time. The recent announcement by University Microfilms of a "jukebox" player holding up to 240 CDs and able to be connected with up to four other jukeboxes means the theoretical capability of handling over 1,000 different compact disks (Flanders, 1991, p. 858) and will probably be matched by other technology along similar lines.

While these approaches offer a solution to the multiple user problem, they can potentially lead to copyright and contract problems. With a central database accessible to several users at the same time, how many "copies" are being used? This question can be answered by the use of a site license, where the library pays some multiple of the basic price but is then permitted to allow a given number of users to access it at once. Regardless of the exact price of such a license, this does increase the cost of any given database. With a relatively limited budget, a library will be able to purchase fewer different databases as the cost of each rises. Since humanities databases tend to get less use, there is a danger that they will be those canceled or even ignored by the library.

Fortunately, other pricing options are available. H. W. Wilson announced in late 1991 that it would allow unlimited use by a given institution of a copy of its CDs (H. W. Wilson Company, 1991). This permission extends to all branch libraries of an academic or public system and includes remote access (e.g., by telephone). Clearly the firm is taking a serious risk that a group of libraries will not attempt to circumvent the obvious intent of this policy by forming a new megalibrary. But this announcement does suggest that at least one commercial firm feels it can make a reasonable profit without gouging its customers. If this sort of policy is adopted by other major database firms, it could solve many of the problems noted earlier. The danger here is clear: If potential sales of a given database are too small, there is little incentive to produce it unless the price is very high. Yet, if the price is high, only the most popular databases will be sold on the basis of the greatest good for the greatest number. Again, if the restriction is monetary, the odds are that the database not purchased will be in the humanities; yet lack of a customer base will mean lack of decisions to produce such databases. A pricing option which seems to address many of these concerns has been announced for OCLC's new "FirstSearch" system ("Special Report," 1991). This end-user online system requires a flat "per search" fee ranging from 90¢ to 45¢ (one command line is defined as one "search"; all connect time and printing is included in the fee). These sorts of options are very encouraging.

There is a major danger with any of these local database solutions, again connected with cost. An attraction of locally controlled
databases is that they avoid the unpredictable connect time charges of remote databases. However, since funds are always limited, there is a real danger that libraries will purchase copies of only most heavily used local databases, with a corresponding decline in the funds available for use of remote systems. This could be especially damaging to the humanities which tend to lack a single "best" database and to be very interdisciplinary. It would be a real tragedy if the advantages of laser disk systems eventually meant libraries offered unlimited searching in a few very popular medical, business, and physical sciences sources but had to charge fees or send users to outside agencies to search in the arts and humanities. It would be an even greater tragedy if the resulting decline in business led the remote online vendors to drop such databases entirely.

Money concerns are not the only problems. Another very real restriction on widespread acceptance of databases is the lack of compatibility. While hardware problems have been reduced through the development of standards, there seems to be an infinite set of permutations of keyboard plus computer plus monitor plus CD drive plus printer. A brief discussion with almost any librarian with experience in CD databases leads to the inescapable conclusion that not all these combinations will work, and that there is surprisingly little advice available from any source on what will work.

Even with the likelihood that hardware problems will work themselves out, user interfaces vary considerably. Some systems allow Boolean combinations; others do not or allow only "AND". Some systems allow word proximity operators as well, but there is considerable variety among those that do. The exact commands needed also vary, with some systems requiring filling in a menu all at once, others allowing only one step at a time, and the like. Users can become frustrated very rapidly, especially when trying to use several different products in succession at the same workstation. The analogous situation would be if a person needed to learn different methods of reading with the books of each publisher. Since humanists are particularly likely to be frustrated with poorly designed or hard to use systems, they will be unlikely to tolerate libraries which force such systems on them.

While laser disks, as such, are of growing importance for the humanities, perhaps the more important technological development is "hypertext." First appearing as Bush's (1945) MEMEX and proposed in much its present form by Theodor Nelson (1974, pp. 44-45), hypertext has only recently become a reality for the average user. The various versions of hypertext allow more or less random connections among all parts of a document, different documents, or different types of documents. Rather than relying on any form
of indexing, a given user may compare different pieces of text by linking these and then displaying them. For example, a person reading a passage in a poem may go directly to a passage in a biography of the poet. Then, inspired by something in that passage, the reader may go directly to a historical account of the events in the world and in the poet's own city, plus a map of the city, and perhaps photographs of the poet's house and friends. This is possible even if no one had thought of this particular set of connections (Bevilacqua, 1989; Huston, 1990; Marmion, 1990).

Hypertext use is becoming quite common and will probably become even more so in the near future. Often connected with multimedia, hypertext systems designed for the humanist are now commercially available. Chen's "Project Emperor I," for example, includes text, graphics, and photos connected with the excavation of the first emperor of China and became available on CD-ROM in 1992 (Chen, 1991; Chen, in press). A more complex system, Project Perseus, includes considerable material on ancient Greece and was also available in late 1991 (Harward, 1988; Mangan, 1991).

These systems and others like them soon to follow have a number of important implications for both the library and its humanist users. First, hypertext effectively eliminates indexes as presently known. Given a body of text—or text plus graphics plus sound plus motion—a hypertext "shell" is attached to the text by an individual programmer. While the type and number of links attached to this text vary analogously to the access points created by an indexer, there are no terms from the text associated with these links per se. Or, in a very real sense, a number of programmers could create totally different hypertext systems from the same documents. More to the immediate point, however, having attached the shell to the documents, each user creates the links as she or he needs them.

As hypermedia documents become common, the library must consider their impact on access tools such as indexes. Traditionally, libraries first tried to obtain all relevant documents and created in-house access tools to them. As the body of literature became larger, the profession developed bibliographies and, later, collective indexes, first in print and then in machine form. Thus, at present, a library user has article level access to all journals indexed in RILA or the MLA Bibliography even though the local library lacks some of the journals. A growing number of libraries have begun adding at least some of these traditional indexing systems directly to their catalogs, for example, the Colorado Alliance of Research Libraries (CARL) (Lenzini & Shaw, 1991) and several NOTIS libraries have experience with online versions of periodical indexes loaded into their OPACS (Bakowski et al., 1990; Tenopir & Neufang, 1991).
The norm for research requires the user to rely on catalogs and bibliographies for rather broad access to the set of books likely to be of value, obtain these books, and rely on browsing or the books' indexes for more detailed access. Similarly, article or chapter level access is available through indexes and abstracts. Many electronic systems allow selection of words or phrases in these access tools, which permits a greater chance of getting what is being sought but still limits searches to the text of the citation. If the full text of the document is online, it is possible to search the entire text, in effect allowing an expanded form of browsing. Hypermedia expands full-text browsing by providing links among sections of text or even among different documents. Any given term, word, phrase, or image can suggest a connection which the user can follow to another point in the same or different text or to another text indefinitely. While this permits the user to avoid preset connections or indexing terms, hypermedia access is not available at all without the text—lacking an index or catalog, one has absolutely no access unless one has the full text available. While it is clear that reliance on current catalogs provides poor retrieval (Lancaster et al., 1991), such systems as CARL or OCLC do allow users to find out something about documents not owned locally and not in machine-readable form. Even with nearly unimaginable hypermedia access, scholars will still need some kind of cataloging unless all publishing is done on nearly free generally available systems. However, even were this to occur, humanities scholars will still need access to older print on paper material, which is not likely to be converted into electronic form for some time. It is thus encouraging that experiments like CARL and NOTIS, among many others, continue.

Another aspect of hypertext with potentially significant implications for libraries is "repurposing." There are already products on the market which consist not of linear text at all but rather a corpus of images plus text combined with a rather basic hypertext frame. The user of such a package can create a number of hypertext documents. For example, assume one library has a copy of Solar System Tutor (Softdisk Publishing) on a laser disk. Using Apple's HyperCard, a reader could create a "slide show" about Halley's Comet with graphics showing its orbit, photos of its appearance from earth, and a motion schematic showing it moving around the sun. She or he could then add such hypertext links as the capability to ask about cultural figures associated with the phenomenon. A user asking for such a link at this library might obtain a picture of Mark Twain (who was born and died in two successive appearances of the comet), along with some biographical information about Twain. However, given the same basic material, a user at another library might make
a similar link not to Twain but to Bill Haley and the Comets and
a third link to H. G. Wells's In the Days of the Comet. A person
who goes to library A and uses its system could obtain links to
American literature. Later, that same person visits library B, presses
the same "button," and finds not Twain but popular musicians. The
concerned user writes a colleague who then goes to library C only
to find references to British science fiction writers.

Is there, in any traditional sense, a "book" about Halley's Comet
or an almost infinite number of such books? What happens to the
presently accepted pattern of scholarship when neither a footnote
nor a personal reference can be fully relied upon to point all readers
to the same reference? What is the obligation of the library profession
to provide either all possible links among such information or at
least "bibliographic control" over them?

Access problems are potentially much more complex than even
the foregoing suggests. Given the nature of microcomputers and
modern software, almost anyone can generate a new document at
any time with or without hypertext. For example, a number of
developers produce HyperCard documents and advertise them in
computer magazines or newsletters. Project Gutenberg (Graham, 1991)
is trying to encourage entry of existing text into a national system.
Nelson's (1991) Xanadu combines several of these trends, suggesting
a system of "transclusion" in which a new "document" would not
copy text from others but, would integrate portions of others only
when the initial document was read electronically. The problems
of bibliographic control in all this are staggering. Thanks to
bibliographic systems such as OCLC, RLIN, and WLN, it is possible
for many libraries to indicate that they own the same item. This
capability becomes irrelevant if each item, thanks to its access points,
is unique. While some systems (e.g., RLIN) have the capability to
allow each library's specific records to display, the staff time involved
even in entering "notes" for hypertext links could become staggering,
assuming that the creators of such links would even tell the librarians
in the first place.

Hypertext has the potential for changing the way scholarship
is done (Lanham, 1990). For example, some schools of literary criticism
emphasize the text itself in one way or another rather than the context
of that text. Imagine a situation, such as the Perseus Project, where
the text can be connected not only to other texts of a given writer,
but also to background texts (e.g., primary and secondary historical
works), pictures of the physical setting, and schematics (such as floor
plans and maps). Imagine the possibility of connecting these elements
to both music scores and actual sounds of the music of the time,
plus perhaps reenactments of important historical events. Then
imagine that any reader can, within some broad limits, make any desired connections among these elements. In essence, hypertext could be the modern realization of the MEMEX but with even more capabilities than Bush considered (Nyce & Kahn, 1989).

The very nature of authorship may well change as a result of hypertext. Given the ease with which a "reader" can make connections among texts and graphics, the act of reading and the act of authorship may merge. The creator of the hypertext document chooses the pictures, plans, music, sounds, and text to be made available, setting up the original hypertext connections. However, the "reader" then may make new connections, even adding extra text analogous to marginal notes in a traditional linear document, an activity close to the author's role. In a traditional written or printed document, the order of the text, arrangement of chapters, placement of notes and pictures, etc. are set once and for all when the document is printed. This is not true with hypertext.

In most of the experiments and proposals to date, the hypermedia package consists of a series of documents, essentially small "libraries." Given the ease with which a reader could approach these documents, few users would even consider use of other documents in the library, certainly not those available only in printed linear text. To date, many such "libraries" have been put together by nonlibrarians just as documentary collections, textbooks, and the like have always been (although Project Emperor I, of course, is the product of a person with library training). Many library users, especially undergraduates, now prefer encyclopedias or handy collections of "major criticism" of "major poetry" while avoiding the rest of the collection even with the current state of affairs. Given this tendency to use the most accessible sources (Zipf, 1949), it is possible librarians will find a gradual drop in use of all printed documents followed by a decline in use of the more linear versions of the machine-readable texts. Given the enormous amount of documentary material available in world libraries and museums, such a trend would be most unfortunate to say the least.

Related to this is the question of collection development. There has been surprisingly little concern expressed about the implications of the purchase of such document collections. In effect, both the library and the individual abrogate their right to select material to the producer of the collection, much as they have done to the creators of current indexes. The tendency of many small libraries to refuse to obtain periodicals not indexed in Reader's Guide to Periodical Literature is well known. This author's own observations and discussions with a number of users of UMI's Proquest business system suggests that many users and librarians have not even considered
its implications. While UMI does have the entire ABI/INFORM index in this system, it does not in fact have the full text of all journals in that index, only about 90 percent. From this author's very unscientific survey, no one has really questioned the "selection criteria" leading to this result. Unless the profession is careful, even those users who do wish to go beyond "least effort" may be out of luck. Fortunately, there are the beginnings of discussions on this topic among the library profession (Hayes, 1990).

Another development of great importance even in the near future is the increasing number of large, interconnected networks with their related electronic mail and bulletin board systems. A surprisingly large number of libraries and colleges are already connected with each other, primarily through Bitnet and Internet. While the current systems leave much to be desired, they have many advantages besides rapidity of communication. For example, there is a growing number of library catalogs available (St. George et al., 1991; NSF Network Service Center, 1989). For another example, several humanities "discussion groups" already exist, although most are related to computer concerns. A major advantage from a financial viewpoint is that most use of this set of systems is free to the user, at least at this time. Thus one can "attend" a "discussion" in another state or nation without either the travel costs or even the telecommunications costs.

The "Uncover" experiment of the Colorado Alliance of Research Libraries ("On Target...," 1991) suggests a possible example of the near future for such systems. "Uncover" includes most of the contents pages of journals received in member libraries, readily searchable online. In "Uncover 2," while online, the user may scan the contents and order copies of specific articles directly from CARL. Thus a library or an individual user anywhere in the United States can have not only bibliographic access at the article level but actual copies of the documents for a relatively nominal fee. In effect, Uncover provides an expanded version of browsing using traditional access systems. In a similar vein, the Research Libraries Group recently announced its "Document Transmission Workstation" which includes scanning hardware and software to permit transmission of any document between libraries.

The proposed NREN (National Research and Education Network) could help facilitate such activities. NREN could become the equivalent of the telephone system with everyone connected anywhere in the world with relatively simple use protocols. Fortunately, librarians and some humanists are involved in the development of this system which was originally considered only as a high-tech engineering science network. As presently proposed,
NREN would allow rapid access to a very large number of other networks and systems while requiring only one standard access language and standard protocols (Parkhurst, 1990). If it develops like Bitnet or Internet, telecommunication costs would be either free to the user or very inexpensive.

These sorts of national or international systems have the potential to eliminate the library as such. Humanities scholars tend to rely on personal collections, prefer browsing, and yet use many libraries. As of early 1992, it is now possible for the scholar to access thousands of library catalogs and order documents of potential interest at once limited only by budget. In theory, this could eliminate much of the role of the library and of the librarian. But, once again, the simple realities of money must be confronted. Even at a common per article fee of $10 per item and no other communication costs, the search for a few dozen items can easily equal the average scholar's monthly pay. For comparison, one could visit the Library of Congress and all other libraries in Washington for a week for well under $2,000 for all expenses. The same $2,000 would buy only 200 articles or chapters—fewer if the cost were greater than $10 each.

While laser disks and hypertext apply primarily to the local environment, electronic mail is already valuable in the larger world. Most common in business and the sciences, electronic mail is becoming popular with libraries. OCLC and RLIN both have rather sophisticated systems for use in interlibrary loan, and these were adopted rather early in the development of electronic mail, so in some ways we can say that libraries are a bit ahead of many other areas.

Electronic mail has several attractions for both libraries and scholars. It avoids telephone tag: a sender can compose a whole message, send it to the receiver, and be sure that the latter will receive the entire message as sent; the seemingly endless attempts of two parties to talk to each other can be avoided. The most important value of e-mail systems for the scholar, however, is their ability to foster communication among groups within the "invisible college." This can take place in two ways. First, a person can send a message to a number of people coded in such a way that each person's response to it is also automatically sent to all those who received the original message. Second, it is possible to set up a "bulletin board" so that anyone with access to the system can see the original message and all responses, making a response either to the original or to any of the others at any time. In effect, this resembles a conversation or a professional meeting. In fact, current systems are now being used to create exactly such conferences with some degree of success (Nunamaker, 1989).
There are several possible directions for this trend. One obvious possibility is the improvement of scholarly communication in the early stages or the expansion of the invisible college. As travel costs increase and as more people are involved in any given field it becomes more difficult for all interested parties to meet at annual conferences. If instead of, or in addition to, delivering a paper at a professional meeting the presenter also places it in a bulletin board, many who did not attend the meeting would be able to not only obtain the paper, but also engage in a dialogue with the original writer and with others who read the paper. It is possible that electronic communication will increase this sort of cooperative venture, thus facilitating the growth of invisible colleges in the humanities.

Electronic mail may also change the prepublication process. With more input from readers, the author could, in theory, have more information both on content and style before making a formal submission for publication. The entire refereeing process could also be speeded up considerably. The draft article or book, mounted on a restricted e-mail system, could be sent to reviewers for comments, which would be immediately available to the author and editor.

This process could extend to the actual publication of material electronically. To date, discussion of this option has tended to be in the context of speed of communication, particularly in the physical sciences and medicine. However, electronic publication could become quite important for the humanities by providing an "intermediate" form of publication between the article and the book. Given publication and distribution costs, scholars have found it progressively more difficult to publish short monographs (Thatcher, 1990). With its relative lack of expense, electronic publishing may replace the paper publication in this particular format regardless of its other effects.

Such systems could also eliminate the distinction between the publisher and the library (Rice, 1990). With a relatively small investment, libraries could provide access to referees and editors. Particularly in the humanities, libraries already hold much of the raw material of scholarship and produce bibliographic access to it. Adding the actual production of new material would only be a logical extension of these services. Presumably, if libraries became a significant force in publishing, prices and profits would fall and the emphasis would be on publication as access rather than as a source of profit. An early experiment in adding the library as publisher is taking place at Carnegie-Mellon University ("Publishing, The Next Generation," 1989, pp. 11-16).

This new medium has a number of problems, beginning with the requirement of access to the electronic mail system in question.
As with online and laser disk databases, each system requires different access protocols, and many e-mail systems require some financial outlay as well. In time, NREN may reduce these problems, but one will remain: Until a user logs on to a given system, she or he has no idea that there are any messages. This is roughly analogous to the situation if one were required to have a collection of mutually incompatible telephones each connected to a different group of people, and none of the phones rang, thereby requiring the user to pick up each one every so often to see if there were any messages.

A second danger relates both to costs and to the "information explosion." In many ways, the function of the library collection is to permit the user to avoid individual purchase of material through the collective purchase of potentially useful material. Assuming "publication" by e-mail (or any other remote electronic format) of any significant body of material, the library will be expected to obtain all material of relevance and download it for local access and for preservation much as it does with printed material. Since at least some of this electronically published material will be work in progress, the library may have to spend even more money than now for even more material, some of which will be of lesser quality (being in draft form). Again, since the sciences seem especially prone to creating new publications, the humanities could lose out in the competition for funds to download and store the material.

While a number of thinkers see the library's role as preserver of knowledge disappearing, the predictions sound much like what could have been heard in the late 1500s. After all, in theory, printing eliminates the need for libraries since anyone can easily obtain a copy of any new book assuming one has the money and has heard about the existence of that book. Strangely, printing does not seem to have had that effect. Similarly, mass availability of television has not led so much to the elimination of libraries as to the creation of new for-profit "libraries" called videotape rental stores, along with pressure on traditional libraries to add video formats to their collections.

As with lasers and hypertext, libraries will have difficulties with bibliographic control. Unless one posits that the library obtains everything from every electronic system, it will have to be selective in some way. The potential difficulty of finding out what exists could well be insurmountable. Not only will there be a question as to how to identify likely sources, but the question, What is the text? arises again. Since it is possible a given "document" will have comments attached over time, a given library's copy downloaded on Monday of one week, will be incomplete compared to another copy as it appears in the system by Friday. On the other hand, if the library refuses
to become involved in such material (as many libraries now refuse to become directly involved in the exchange of reprints, preprints, and conference papers), it may do a real disservice to scholars.

A case in point is an article that appeared in Academic Computing (Halio, 1990) claiming stylistic differences (for the worse) in student papers written on Macintosh compared to IBM computers. The discussion was also mounted on a Bitnet bulletin board. As one might expect, both the printed article and the electronic version generated comments. Assuming one was aware of the Bitnet version and had the equipment and skill to download, one could obtain a very interesting discussion. While this material can be cited, there is no guarantee it will be available by the time the present article appears, so that the traditional value of citations for further research is damaged. Assuming the material was still available, by the time a reader of this journal looked for it, the total text of the original paper plus the comments will be different from those seen by this writer. As long as e-mail merely replaces telephone conversations, the lack of a permanent record is nothing new. However, if it is a form of "mail" or of "publishing," the value of the bibliographic citation and the role of the library as group memory have been affected as has the meaning of "publication."

Increased use of information technology may change the relationships of the librarian and the humanist. One very important aspect of that relationship is the often minimal role of the librarian. Generally, in contrast to the physical sciences, the librarian is rarely permitted any role as gatekeeper or information analyst. Many physical science operations have had such positions, and social scientists have at least discussed the issue (Line, 1971, pp. 425-26). Possibly the librarian might have a similar role in the humanities, although it is unlikely this would be as a "filter" as in the sciences. Rather, the librarian might become the guide and counselor through the maze of systems, command languages, and access points, not to mention the instructor in bibliographic control of not only the documents to be obtained, but also of those documents held by the individual researcher and those then created by the researcher.

The increasing introduction of automation into research and publication may well change the lack of collaboration considerably. Assuming librarians have some facility with technology and with explaining it in terms understandable to humanists, they may expand their role as "book-keepers" to include some form of bibliographic instruction. It is also possible that the ability to form invisible colleges, as well as this experience with librarians (not to mention programmers and system analysts), may habituate more humanities scholars to some type of collaboration. Of course this may not be
all to the good—the cliche about the camel being a horse designed by committee has some basic truth.

It is appropriate to close with a critical issue which has received surprisingly little attention—preservation. By now most scholars are aware of the rapid deterioration of much of our written heritage. In some ways computers may help deal with the crisis. Modern scanners and digitizers may help not only to preserve material which would otherwise be lost, but to preserve it in machine-readable form, thereby improving access while preserving the text. The quality of scanned images seems to be improving rather rapidly as is the speed of scanners. Many of the more important texts will probably soon be available in easily reproducible machine-readable form, some as part of a preservation project and many as part of projects requiring machine-readable records. One example of the latter is the *Thesaurus Linguae Graecae*. Now available in a CD form, this project began about twenty years ago primarily as an experiment in storing and retrieving text on computers. In the process of development, the compilers have expanded the total corpus of known classical Greek texts considerably (Watkins, 1991).

There is a negative side to this process, however. For one thing, it is not clear how permanent are many computer formats. Even the laser disk, contrary to early opinion, is susceptible to heat and physical damage. Present estimates give a laser disk a life span of only ten to thirty years (Crawford, 1988, p. 130; King, 1991).

The dangers to purely electronic media from the second law of thermodynamics and from magnetic fields are too well known and yet rarely discussed in the glow of all the new technology (Atkinson, 1990). It is possible librarians will expend considerable time and money to “preserve” in a format which will lead to its own crisis much sooner than acidic paper ever did. Present preservation techniques for electronic media recommend copying of all data on a regular basis—the copying restores the “freshness” of the electrons; use of a new piece of the medium avoids physical deterioration (Cribbs, 1987).

The odds are great that only the “most important” texts and images will be preserved and then only in the “most complete and accurate” versions. Since many types of humanistic research are based on variant texts—rough drafts, corrected editions and the like—librarians and archivists have a special obligation to be sure such material is also preserved. It is also likely that few repositories will be prepared with the staff and time to copy significant portions of their collection every year unless the library and archival communities make this issue an important part of their job.

Another potential problem relates to the preservation of the computerized documents themselves. Already there is more than one
generation of computer typesetting records, not to mention more recent word processing and data tapes. As authors and artists begin using the computer in the actual creative process, drafts formerly kept on paper are now only on computer diskettes. Preserving the diskettes, assuming the library ever gets them, is one technical problem, but how can the library be sure the author or artist saves the intermediate material? Few creators of documents consciously keep a copy of every version of every change. With the use of paper, retention of older drafts required only procrastination and a minimum of forethought. With electronic formats, the author must consciously make a new file for every new version, rather than merely saving the file under the same name, which is the customary approach at this time.

The development of machine-assisted information is still in its infancy. The long-term impact on humanists and libraries will be of the same order as the change to the codex from earlier formats or the change to printed documents. The main difference between the current changes and older ones will be the speed of the change. In the short run, it is most likely that many changes will be transparent and thus accepted by humanists with little trouble. For example, thirty years ago some seers predicted people would soon listen to music on computers. Today more and more people are doing just that—the CD player is, in effect, a dedicated computer. Similarly, word processors have become very common to the point where many journals accept or require submissions on floppy disk. On the other hand, most journals are still being produced on paper and many authors still use typewriters (some are rumored to prefer pens or pencils for that matter). In any event, it is well to remember the librarian's "Fifth Law": "The Library is a Growing Organism" (Ranganathan, 1964).

REFERENCES


Garfield, E. (1980). Is information retrieval in the arts and humanities inherently different from that in science? The effect that ISI's citation index for the arts and humanities is expected to have on future scholarship. *Library Quarterly*, 50(1), 40-57.


St. George, A.; Larsen, R.; & McKelvey, K. (1991-). *Internet-accessible library catalogs & databases* [Computer Database]. Albuquerque, NM: University of New Mexico. (e-mail: <stgeorge@unmb.bitnet> OR <stgeorge@bootes.unm.edu>)


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