

Patricia B. Yocum

Patricia B. Yocum earned a B.A. with honors in English Literature from SUNY-Binghamton and masters degrees in English Literature and Library Science from the University of Michigan. She has pursued her career in large academic libraries and science libraries in particular. At the University of Michigan she has headed the Natural Sciences Libraries, served as Coordinator for Collection Development of the Basic Science and Engineering Libraries and is currently responsible for instruction, reference services, and the development of information resources in the geological sciences at the Shapiro Science Library. Active in the Special Libraries Association she has served as President of the Michigan Chapter and Chair of the Biological Sciences Division. Since 1993 she has been a member of the IFLA Standing Committee on Science and Technology Libraries and currently serves as Committee Secretary. Her library publications have focused on collection development and professionalism especially as they relate to the sciences. She can be contacted at the Shapiro Science Library, University of Michigan, Ann Arbor, MI 48109-1185, USA (fax: (1-313) 7639813; e-mail: pyocum@umich.edu).



Libraries and the Electronic Journal in Science

Digital technology has been a feature of the library landscape in developed countries for nearly 30 years. As with many production systems libraries first used computers to handle large, repetitive functions such as cataloguing and circulation where economies of scale could increase access if not lower overall operating costs. In the 1970s libraries began to offer their clients mediated access to bibliographic databases especially those holding citations to the journal literature. A decade later OPACs (online public access catalogues) appeared, ushering in an era of user self-service not only to the holdings of a particular library but increasingly to bibliographic indexes on CD-ROMs or the library's computer system.

Overall these developments did not change the essential nature of libraries, their work, or their relationship to their suppliers and clients. Developments in the 1990's, however, have brought all these into question in a very short period of time. Personal computers, abundant software and digital communication networks – the Internet in particular – have already suggested the power they have in tandem to revolutionize the way we humans create and communicate knowledge. Further developments in technology can be expected to propel more change.

The long-term effect on libraries is not yet clear. The same can be said of the other sectors with whom libraries deal. These include authors, publishers, vendors, and of course library users. We are all in a state of flux, trying, first, to learn what the new technology is and, secondly, how it might be usefully applied. Yet even in these early stages questions of pertinence, value and role quickly come to the fore. In the electronic era everyone can be an author; will they be? What will publishers contribute? Will vendors be needed more or less than now? What will libraries offer that is unique, under what conditions, and to whom? Above all, will users benefit or will the multitude of

sources, systems, and protocols overwhelm and isolate them in their specializations or, worse, in apathy and ignorance?

No field of knowledge is immune. In one way or another most are wrestling with these questions and experimenting with the new technology. Experimentation often focuses on the genre central to a discipline. Thus, in literature we see projects to digitize books; in geography it is maps. In art efforts aim at digitizing images while music digitizes sound, and film and video combine the two. It is not surprising then that in science the focal point is the journal. Though books are important, the journal article remains the principal medium scientists use to issue their findings. As such it is an indispensable link in the chain of scientific communication and of intrinsic interest to anyone involved with the system.

Libraries of course have an additional interest in developments affecting science journals. Since the end of World War II library subscriptions have increasingly borne the major costs of journal publishing. As prices rose libraries responded by canceling duplicates and lesser used titles while seeking and sometimes winning budget supplements to cover the increases. The irony in these efforts, however, was that they failed to achieve equilibrium. The more subscriptions were canceled the more prices rose to cover what is called "first copy costs". By the 1980s and continuing into the 1990s, the occasional "funding crisis" thus became a nearly relentless cycle of price increases and subscription cancellations. The turmoil which resulted has been felt throughout libraries.

It is not only costs which spur our interest. Changes in scientific communication are likely to produce new models, new systems and new conditions of work. Librarians of course are already engaged in extensive experimentation. For practical reasons we want to know what works and what doesn't, what is efficient and what isn't, what needs to be done and what can be left behind. Such knowledge is imperative if we are to influence developments in a changing environment. What happens to scientific communication in the

electronic era, especially over the next decade, is thus of great importance to us. It is quite worth our while then to take a closer look at the situation, to note changes already underway, and to engage the issues which are emerging. This special issue of the *IFLA Journal* was assembled with these notions in mind.

We begin with two overview articles. The first is a report of the 1996 UNESCO/ICSU Press meeting, "Electronic Publishing in Science", which brought together representatives from sectors in the chain of scientific communication. The five-day meeting was an ambitious effort whose broad sweep serves here to give us a glimpse of one of the contexts in which libraries operate. It is heartening to note that the vital role libraries play in that context was well recognized at the conference. This is a very encouraging signal to librarians, verifying to others as well as to ourselves that we have much to offer in the electronic era and demonstrating how effectively we can perform as partners in its development.

The second article provides an overview closer to home. In it A. S. Chaudhry reviews the development of networks and their impact on libraries. In addition to serving as an improved communications tool to expedite operations, networks provide access to a wealth of information sources, formats and services including access to electronic journals and specialized materials. In the area of collection development networks raise a number of issues, four of which the author deems crucial. These are 1) ownership of material versus access to it; 2) copyright management; 3) standardization; and 4) training and education.

Next, we examine some models for creating, distributing, accessing and archiving the electronic journal. Learned societies have traditionally promoted communication as one of their primary purposes. Many have long histories of publishing the primary literature and several, such as the American Chemical Society, are the foremost publishers of the secondary literature in their fields. Like libraries many societies are exploiting the power of computers to expedite operations, handle increased volume, and devise new forms of communication. As an example Brian McMahon describes for us the electronic publishing system the International Union of Crystallographers has developed and continues to refine.

Trade publishers have also been experimenting with electronic publishing. Initial efforts focused on automating the production and distribution of print products and on financial management. Subsequently, personal computers enabled authors to submit text on discs while networks allowed them to transfer material to publishers online. The ultimate goal, however, has been to provide widespread, convenient user access to multiple titles on a consistent basis. In a case study involving a partnership between a university library and an STM publisher, C. C. P. Kluiters discusses some of the technical challenges Elsevier Science is addressing in this regard and the practices devised to meet them.

Although access to current articles occupies much attention the need to archive back issues of electronic journals is a critical concern. Discovery in science is rarely made in a vacuum. Usually working in worldwide communities termed "invisible colleges", scientists draw upon and contribute to each others' work through rigorous protocols for citation. In this system the genealogy of discovery, as shown in the articles a paper cites, is essential. So too is public access to the articles as they appeared when published. To date libraries have offered unique, unsurpassed support of this system by archiving print journals in their collections. In the new era libraries may also archive electronic journals but, as Wim Luijendijk notes, they may well share the function with other sectors.

Examples of pilot studies and projects appear widely throughout the papers in this Special Issue, reflecting the pioneering spirit in libraries today. S. Michael Malinconico details several of the best known experiments and reviews the financial situation which is a driving force behind them. More experimentation can be expected in the future. Though the particulars may vary, results already reveal some distinct models with identifiable characteristics. F. Rowland discusses several of these models along with their strengths and weaknesses, and offers a glimpse of an ideal system.

The prototyping of electronic communication has been done largely in industrialized nations, but applications and experimentation transcend geo-political boundaries. Increasing note is being made of the potential which electronic communication has to promote education, training, research, business and public affairs in developing regions. Realizing that potential involves special challenges. Buhle Mbambo reviews some of those, including technical, administrative and political problems, faced in Africa. Noting variations throughout the continent, she also discusses achievements made to date, especially in networking, and highlights future needs.

Regardless of where they are located libraries face the question of how to manage the new medium. Despite much use the term "electronic journal" has yet to achieve standard definition. Similarly, in the electronic environment the notion of "collection" is open to discussion. Librarians, of course, cannot suspend their work to debate semantics. They are more likely instead to develop new definitions by working through issues on a practical basis. To aid this process and our understanding of collection development in the electronic era, Thomas E. Nisonger reviews some of the issues with which librarians deal and the policies they are developing to select, evaluate, and archive electronic journals. A selective, extensive bibliography follows.

A pivotal question involving electronic sources concerns the extent to which scholars use them in their work. There is of course a distinction to be made between sources which are helpful and those which are regarded as also authoritative. Electronic mail, for

example, is extremely popular and is assumed to be very useful. The authoritativeness of its content, however, is a more complex matter. Similar distinctions can be made for electronic journals, bulletin boards, World Wide Web sites, electronic files, etc. One way to measure both utility and authority is to examine the scholarly record for citations to networked sources. Yasar Tonta reports the results of such a study of scholarly papers which appeared in the early 1990s.

No review of electronic publishing would be complete without reference to the critical issue of copyright. Copyright was established to deal with printed materials and its extension to the digital environment is the subject of much discussion and concern worldwide. Libraries have worked effectively with copyright in its existing form and have a profound interest in how it will be handled in the future. With leadership provided by Sandy Norman, IFLA Copyright Advisor, IFLA has drafted an "IFLA Statement on Copyright in the

Electronic Environment", which will be reaffirmed by the Executive and Professional Boards during the IFLA General Conference in Beijing in August 1996, and thereafter circulated widely.

It is quite clear that the emergence of the electronic journal involves enormous experimentation. It is also apparent that such exploration involves curiosity, imagination and the capacity for taking risks. These qualities alone though cannot account for the achievements, both large and small, already realized. Rather, they point unmistakably to a vision of the future and the belief that it can be a good one. There is of course no single vision propelling change but more likely to be as many visions as there are people. We conclude this special issue with B. Hatvany's view of a worldwide library. We invite you to consider it and the other visions offered in this special issue in light of your own vision of what the future may hold.

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