Are We There Yet?
Online E-Resources Ten Years After

ANN OKERSON

ABSTRACT

THIS ARTICLE REVIEWS PAST TRENDS REGARDING electronic resources and publishing on the Internet, analyzes critical issues involving electronic resources, and makes predictions for the years 2000 through 2005. Important developments are reviewed on a year-to-year basis from 1991 through 1998/99. Archiving, usage, utility, and copyright are identified as key issues, while licensing is also covered.

INTRODUCTION

Everything people say about the Internet seems to be future-oriented: This or that wonderful thing will come to pass very soon now. But if Internet time is as different from ordinary time as people say, and if change happens with blinding rapidity, then surely history itself will accumulate more rapidly than used to be the case. This discussion is an exercise in Internet history as it relates to online electronic information resources. It is designed to help keep librarians, scientists, and scholars from losing their bearings.[1]

A few years ago, it seemed to many in the library, educational, and research communities that the coming of the Internet offered great promise for a revolution in scholarly and scientific communication. Clearly, the Internet has arrived, but it is far from sure that the promise we imagined has been fulfilled, at least in the ways we had imagined or wished that it would happen. The purpose of this article is to review the history of the very recent past in order better to understand our present and our future.

The reader of these pages shares with me both a belief in the importance of scholarly and scientific communication and a concern for its economic and social viability.

What was it that we thought we glimpsed in the future of the Internet, those of us who watched this scene thoughtfully a decade ago? In those days, we knew that we had a "serials pricing crisis"—i.e., skyrocketing prices, skyrocketing numbers of new journals, limited library budgets, and customers who demanded all the best and the latest information libraries could provide.[2] What had been in the 1950s a benign revolution—the great increase in scientific research and consequently the introduction of the commercial scientific, technical, and medical (STM) journals—had turned into something far more ambiguous. More high-quality information than ever was being distributed, but institutions of higher learning feared greatly for their ability to pay the price.

Ten years ago, we noted other weaknesses in the print system of publication. Print journals are oftentimes slow to appear (the time from submission to publication can be many months), and they come to libraries through a distribution system replete with pitfalls, not the least of which are contributed by the world's postal systems. Access to the individual copy of a printed journal is limited to one person at a time, and further reproduction is legally limited—and may be expensive where the publisher's permission is required—and at all events labor-intensive. Reliably searching print text is difficult, even where great quantities of labor have gone into building indexes, though, to be sure, *browsing* print text is relatively easy and immensely comfortable. In short, research requires access to collections limited by location and access, and that access can be slow and inconvenient.

The economics of the print system also proved anything but favorable. By the 1970s and 1980s, for various reasons, prices had already escalated beyond ordinary inflation. Increase in the quantity of material published per journal is one fairly obvious cause, but currency swings and publishers' attempts to hedge themselves against those swings are also a factor. During the 1980s (and since), often bitter debates grew up between publishers and libraries—was the one charging too much or the other allocating too little to purchasing budgets? It was and is certainly the case that academic communities contribute to a publishing system in which they lose ownership—and thus control—of their works as authors sign over copyright to the publishing sector, a system with its downsides as well as upsides.[3]

The intuition that librarians had ten years ago about the future of network-delivered electronic publishing contained much truth. Already we could grasp that electronic texts would be made available more rapidly than printed versions, simultaneously to many more users; these publications would have powerful new features—e.g., searchability across mul-

tiple texts and titles. A few visionaries even imagined something called "hypertext" as a way of linking text and parts of text together. Simultaneously, the economic prognostications about electronic texts at the time were scarcely less optimistic. Many believed that e-texts could be produced *far* more cheaply than paper ones and that numerous middlemen might be eliminated. Electronic journals would thus become very inexpensive and effective ways of competing with the behemoth print journals that were sapping universities' economic resources.

In those optimistic days of a decade ago, librarians and readers already had some limited experience of electronic resources benefitting the scholarly and scientific communities. For example, these communities already had ten or more years' experience with electronic abstracting and indexing services supplied through proprietary systems such as Dialog. Access was limited in various ways and for various reasons, to be sure, but the services were powerful. In the 1980s, we saw the beginnings of availability of a few full-text resources, similarly through mediated service providers.

At the beginning of the 1990s, only a handful of academic e-journal titles were available for distribution via new electronic networked modes, and their technological forms were primitive. These journals delivered their content in plain ASCII text over e-mail (Bitnet) with no frills, no graphics, and many limitations—e.g., no proper equations, no foreign characters, and no typographical features such as boldface or italics. Some of these journals persist today. The oldest networked electronic journal recorded is *New Horizons in Adult Education (NHAE)*,[4] which began distribution in fall 1987. *NHAE* was published by graduate students in education at Syracuse University in New York. Next, in 1989, Stevan Harnad, then of Princeton University and now at the University of Southampton, launched *Psycoloquy*,[5] followed a year later by the earliest humanities journal, the still prominent *PostModern Culture*[6] edited by Eyal Amiran and John Unsworth of North Carolina State University (Unsworth has since moved to the University of Virginia, where he leads the Institute for Advanced Technology in the Humanities, which "publishes" scholarly information in a way quite outside the traditional publishing economy[7]). Another early e-journal entrant that has shown great staying power and migrated with new distribution technologies is Richard Hamilton and James O'Donnell's *Bryn Mawr Classical Review*.[8]

A REVIEW OF THE LAST DECADE

In a nutshell, ten years ago the world of network-delivered scholarly and scientific resources was very small—mostly just a few simple electronic journals—and the pioneers felt very brave indeed. Many things have changed. Let us review briefly, year by year, the highlights and changes of the 1990s.

1991

In 1991, the first-ever directory of electronic journals was published by the Association of Research Libraries in Washington, DC, building on the earlier work of Michael Strangelove of the University of Ottawa and Diane Kovacs of Kent State University.[9] The *Directory* belonged to its time in that it covered both journals and scholarly network discussion lists, and it continues irregular publication to this day under ARL's aegis. When it appeared in July 1991, the slim desktop-published volume of that first edition comprised twenty-seven electronic magazines and journals. In a key commercial development of about that same period, Elsevier Science, a publisher of over 700 largely STM journals, was busily purchasing Pergamon Press, a publisher of some 400 titles, to establish a line of over 1,100 print journal titles. Among other things, Elsevier Science stated that they were positioning themselves to take the next scientific publishing steps—into electronic publication of their journals. It was not yet clear, but perhaps it should have been, that the print publishing giants would be able to represent themselves vigorously in the electronic world.

At the same moment, an entirely different kind of initiative was in the making. In an experiment in what he then called "desk-bottom publishing" (so-called from the location of the server that animated the initiative), Paul Ginsparg of the Los Alamos National Laboratories established the first electronic "preprint" server, XXX, providing a free hosting site for new articles in high energy physics.[10] That is, in the early 1990s, Paul Ginsparg led scientists in many fields, initially in the physical sciences, to take advantage of electronic communications to build on and begin to replace a developed para-publishing ("preprint distribution") system whereby authors would mail dozens of copies of their new articles well in advance of formal print publication to likely readers and departments around the world. That many fewer resort to postal distribution of their preprints in 1999 is a sign of the success and timeliness of Ginsparg's initiative, which has grown in acceptance, size, and comprehensiveness. It has become a leader for others and a household word in electronic journal publishing.

1992

The second edition of the *ARL Directory* appeared in March 1992; it now identified thirty-six electronic magazines and journals. Technology had not advanced much; accordingly, e-journals still staggered into their readers' mailboxes via ASCII e-mail. To be sure, out in the Minnesota prairies, a brave little gopher stuck his head above ground and offered a new form of electronic access—essentially nothing more than automated file transfer with indexing, but for its brief life, the gopher technology represented a quantum leap in access to information at a distance and offered a foretaste of enhancements to come.

At ARL, we were proud in those days to have played a part in bringing together some of the visionary and puzzled people then on the not-for-profit academic publishing scene to talk about networked publication issues and prospects. In 1992, 1993, and 1994, ARL hosted a series of symposia that addressed topics such as vision, economics, conversion to electronic format, and delivery.[11] In the thirty months or so that separated those symposia (the first occurred in about the month the first gopher appeared, the last in about the month Netscape was released), one can begin to see the emergence of a consensus that electronic publishing would be real, important, and more complex to understand than we had surmised.

In the same year, two significant scholarly publishing players offered the scholarly community harbingers of the e-world to come. The American Association for the Advancement of Science (AAAS) experimented via the *Online Journal of Current Clinical Trials (OJCCT)* in July 1992.[12] Its concept was that high quality, rapidly published information about outcomes of clinical trials of pharmaceuticals and procedures would be of high value to practitioners, high enough value to take advantage of the rapid turnaround time of e-publishing. At the same time, Elsevier began its Tulip experimental project, delivering page images from their print journals to library users.[13] Both ventures failed as such, but they signaled immense changes to come. Of particular interest was the fact that the *OJCCT* had great difficulty in attracting authors and submissions. Its story presaged a fact of the publishing landscape: that established journals enjoy the confidence of authors—in some ways their most important market—and the most successful e-journals appear to be those that have moved from print publication and, in most cases, still retain it. Gaining submissions from distinguished authors for startup electronic journals proved at least as difficult as gaining them for traditional paper startups—and on reflection, this should not be surprising.

1993

The Year of the Gopher was 1993, but it was marked as well by a new curiosity. The National Center for Supercomputing Applications at the University of Illinois released a program, freely available for download over the Internet, called Mosaic. Mosaic was the first graphical World Wide Web browser generally distributed. In what seemed only a few months, the paradigm of the WWW took hold. People who saw their first demonstration of the WWW in 1993 and early 1994 "got it" and quickly transferred their affections from the gopher to the Web. In 1993, there was little scholarly content for most users of the Web to view—in many cases the one resource that everybody knew was Library of Congress' 1993 image-rich exhibit featuring Treasures of the Vatican Library.[14] Many appreciated a delicious irony: that the new age of Internet text would begin

with images from the collections of the oldest continuously functioning library of manuscript and print materials in the Western world.

Toward the end of 1993, colleagues and I developed the idea of starting an Internet-based announcement service for new electronic journals. Why? Because, suddenly, the startup of e-journals and their availability on the WWW eclipsed the ability to capture them in the then-annual *ARL Directory* in any immediate fashion. We named the announcement service *NewJour* and it found its first home on a server of the American Mathematical Society; it would move in 1995 to the server of the Center for Computer Analysis of Texts at the University of Pennsylvania, where it is still published. Happily, *NewJour* almost immediately acquired an archival Web site at the University of California at San Diego.[15] *NewJour* has its own numerical story to tell (see below). There were already in 1993 and 1994 several hundred subscribers who wanted to be notified of the emerging e-journals field and, in 1999, there are over 3,900 subscribers receiving up to fifty to sixty notifications a week.

TEN YEARS OF GROWTH

- **ARL Directory**
  - ◆ 7/91 - 27 e-journals & magazines
  - ◆ 3/92 - 36 titles
  - ◆ 5/94 - 181 titles
  - ◆ 5/95 - 306 titles

- **NewJour online archive and list**
  - ◆ 5/96 - 2,000 e-journals & magazines
  - ◆ 5/97 - 3,634 titles
  - ◆ 11/98 - 6,777 titles
  - ◆ 9/99 - 8,000 titles

1994

In 1994, as e-journals began to take off, the *ARL Directory* identified 181 electronic magazines and journals. Debate over the implications of electronic publishing focused on the first draft of a White Paper on Intellectual Property (the draft of 1994 was called a Green Paper) prepared by a special commission appointed by President Clinton.[16] This commission addressed fundamental national policy issues regarding intellectual property protection in a digital era, specifically how copyright holders could or

should protect their rights in an age of rapid information transmission. That draft report marked the coming to the fore of what can be called "net anxiety." If virtually everyone who spoke of electronic publishing and its future in 1990 spoke as a zealot and an optimist, by 1994, caution had emerged as the theme of the newcomers, and concern centered on preserving rights and forms in transition rather than on the emergence of innovation. In retrospect, this report marked a key turning point. Just as the actual production of electronic resources began to explode, the place of anxiety and restraint in the public discourse about such issues was strengthened by no less a voice than that of the U.S. Government. There is irony here, because President Clinton and Vice President Gore deserve substantial credit for making the "Internet" a household word through their optimistic promotion of its benefits, starting in the 1992 presidential campaign. Nonetheless, having attained power, their administration has erred—if that is the right word—on the side of control and of assurances made to traditional producers.

By October 1994, the newly-founded Netscape Corporation released to the public the first version of its graphical Web browser. Probably no product release in history has seen such a successful penetration of the market in so short a time. Within weeks, Netscape was ubiquitous, and new users of the net were rushing to take advantage of what it offered. To be sure, Netscape's business plan had the advantage of giving away its product for free to end-users, but at the time this seemed to observers on all sides a plausible business strategy. (It is probably a landmark of the history of the Internet that 1999 saw the takeover of Netscape by AOL, another startup of the same vintage. From its earliest days, Netscape was the darling of enlightened Web observers, while AOL and AOL users were widely mocked. But AOL has, at least at this point, found and conquered a market in business terms.)

1995

NewJour moved from the AMS to the University of Pennsylvania distribution site in early 1995 with 250 titles in its archive. The fifth issue of the *ARL Directory* appeared in May of that year with 306 titles and the remarkable note that 140 of those titles were WWW-based only. The rapid takeover of networked information delivery by the Web paradigm was well on its way. An informal ARL survey of the world's twelve largest STM publishers indicated that all of them had big plans for Web migration of their print journals for the period 1996-2000, plans that have largely materialized as most of the large publishers now provide Internet access to most of their journals. Meanwhile, HighWire Press was being established by the Stanford University Library, which acted on the belief that academic research libraries should become players in online distribution of scholarly journal information. HighWire implemented a hybrid model: an

academically-based, price-sensitive outlet for high profile, high quality jour-
nals, chiefly from learned societies in the biomedical fields[17] (HighWire
has since moved from strength to strength, particularly in the biomedical
journal area in which it is the online publisher for about 150 of the most
heavily cited not-for-profit society titles).

Thus, on all sides, began the first steps to develop, on a large scale,
delivery and pricing models for electronic resources. The year 1995 was,
not surprisingly, the year that a memorable debate erupted across several
e-mail lists about the potential for academic self-publishing to revolution-
ize the world of scientific information at a sharp reduction in costs. The
chief proponent of such a system was (and still is) Stevan Harnad, a re-
search psychologist at the University of Southampton in the United King-
dom.[18]

1996

By 1996, *NewJour* was reporting (rather suddenly) over 2,000 journal
titles as being available in electronic form. Subjectively, one recalls this as
the year of the sudden dominance as well of the .com domain in Internet
sites. Business enterprises of every stripe discovered the Internet and made
it a vehicle for delivery of information and advertising. The old notion
that the Internet was a place apart from the hurly-burly of the market-
place, a quiet, traffic-free communications roadway dominated by research-
ers and teachers, faded quickly as our society came to take for granted
that all could look up airline schedules, current weather, newspapers, stock
quotes, catalogs of merchandise, and movie star fan sites on the ever-ex-
panding world of the Web. The early pioneers began sometimes to feel
like old trappers who had come down out of the mountains to gaze on the
rising towers of late nineteenth century Denver. Some of them might even
be recognized and remembered, but the world they made possible quickly
became one in which the pioneers were no longer dominant figures.

The same year, in the world of scientific and scholarly communities,
important milestones were passed. New economic models for the distri-
bution of information were introduced, such as the large multi-year
consortial-only e-journal packages developed by Academic Press in its
IDEAL program.[19]

At the same time, the EU's passage of the European database direc-
tive (which legislated fifteen years of protection—in effect almost per-
petual protection for databases that are updated might not otherwise be
protected under copyright regimes) began to put pressure on the United
States to adopt more extensive database protections. The upshot was that
librarians began to see licensing or contracting regimes begin to displace
copyright regimes, at least for the management of electronic informa-
tion. Licensing was already somewhat familiar, having for a decade or more
been used to manage consumer and institutional software sales, but it was

a relative newcomer and novelty in the domain of scholarly journal and
database subscriptions. Librarians and other customers reacted thought-
fully but firmly to these developments and began to take a hand in nego-
tiations that would shape the future of intellectual property management
without waiting for revisions of law or other new government policy.

1997

By May 1997, *NewJour* had reported 3,634 e-journal titles and would
now level out in adding approximately 2,000 title reports a year. As one of
the moderators of that list, I can say that the *NewJour* numbers now sub-
stantially underestimate the total quantity of e-journals available for online
delivery. The reason is that it is quite simply impossible to keep up with
the progress that large publishers such as Elsevier, Springer, Taylor and
Francis, Blackwells, and all the rest are making in mounting their entire
journal lists via the Web.

In the United States, discussions arising out of the Copyright White
Paper of September 1995 had been proceeding. The U. S. government's
authors of that paper had asked publishing and user communities to make
an attempt to define standards for fair use in the electronic environment,
but two years later the ongoing conversations among representatives of
about seventy stakeholder associations and organizations were on the verge
of declaring limited success at best.[20] That these monthly discussions car-
ried the acronym CONFU (Conference on Fair Use, following the CONTU
established some twenty years before) was perhaps an unhappy omen. No
one issue thwarted agreement; rather, the caution was that the partici-
pants in these discussions knew too little of the future to be able to make
concessions that they might regret afterward. At any event, the impact of
the more or less failed CONFU talks (at best, only the multimedia guide-
lines might be declared as accepted) was to reinforce moves toward li-
censing as a means of regulating intellectual content electronically deliv-
ered. Libraries began to see the rapid emergence of a world of negotiated
contracts, worked through carefully on a case-by-case basis between sup-
pliers and their customers. Out of that collection of achievements, the
practices emerging to dominance today were being born.

Notably, late in 1997, there was an attempt to bring together two of
scholarly journal publishing's giants in a proposed merger of Reed Elsevier
and Wolters Kluwer, but that union proved to be too large for govern-
ments and the public to accept, and the merger failed. But, on a smaller
scale, plenty of industry buy-outs and strategic partnerships continued to
emerge. At this point, it became clear that the flowering of the Internet as
a medium has done little if anything to undermine strategic conglomera-
tion of publishing power. Far beyond the domain of scientific and schol-
arly publishing, our society witnesses an ever-increasing series of such
mergers and combinations and the regular emergence of newer and bigger

giants composed of entities many had long thought quite gigantic enough already.

At least partially in response to these appearances of persistence and domination by large publishers, there began to emerge a series of library-based consumer actions and groupings. The Liblicense Project and listserv (liblicense-l@lists.yale.edu), begun in 1997 with funding from the Council on Library and Information Resources and developed/housed at Yale,[21] brought together the library community around serious discussion of licensing issues (and today the Liblicense project even provides software to use proactively in building a license agreement). Rather than necessarily accept a license offered to libraries by the publisher (rather as tenants are in the habit of accepting lease agreements handed to them by landlords, agreements in which it somehow seems that most of the rights are the landlord's and too many of the responsibilities are the tenant's), the Liblicense software enables the librarian to work through complex clauses and make intelligent choices. It turned out that publishers became more than willing to accept negotiation on many matters of concern to librarians and their readers and, in the universe of such negotiations, publishers to agree to some important modifications of what they were able to offer several years before, even to the extent of writing into their contracts provisions for Interlibrary Loan and also for fair use that went well beyond what at least the most restrictive interpretations of copyright laws would permit.

The same year saw strengthening of numerous local and regional consortia of libraries—both in the United States and internationally—engaged in negotiating not merely usage terms but also prices on behalf of large groups of libraries and their information users. These scaled-up combinations of buying power are an extremely promising development in the marketplace of scholarly and scientific communication. Never before had libraries found ways to bring together user demand as an economic force in the way that these consortia make possible. For example, the International Coalition of Library Consortia (ICOLC) aggregates the consortia themselves—through meetings with vendors, development of policy statements, and multi-consortial licenses—and is becoming a force in the field.[22] Twice a year, ICOLC invites to its meetings representatives of the publishing and vendor communities, influencing positively the offerings to libraries and the terms under which the resources are offered. The publisher and vendor communities, in turn, respond positively to consortial arrangements, because these information providers recognize the power that is beginning to be wielded by the librarians in these unified communities.

Deploying yet another strategy, the Association of Research Libraries in 1996 began to build an initiative that it named SPARC,[23] a coalition based in academic libraries but reaching out to learned societies and other

not-for-profit publishers. SPARC seeks ways to support new initiatives in scholarly electronic publishing in order to encourage competition to high priced scientific, technical, and medical journals. SPARC helps to fund startup journals or e-conversions in selected fields with the proviso that these journals seek out and establish new models for doing business that achieve and pass on economies to academic users. SPARC's library members believe passionately that the venture will succeed over time in displacing high-priced for-profit journal titles.

1998 and 1999

By December 1998, the *NewJour* archive comprised 6,900 titles—and by September 1999, the number had passed 8,000. These days, the balance of producers distributing electronic journals has completely shifted. Where once, in the early 1990s, there was a predominance of freely distributed electronic-only academic journals available, now it would be a conservative estimate to say that the great majority (90 percent—certainly that in new titles) represents traditional journals *still available in print* delivered by traditional publishers. Exceptions, such as *Bryn Mawr Classical Review*, which ceased its print edition in 1998, are only rarely apparent. What many of us now imagine, but do not yet see in any appreciable number, is the transition that will come when publishers of traditional print journals abandon print in favor of electronic-only publication. It is reasonable to imagine that in a very competitive world, such a transition will happen quickly when it does occur, but real signs of it have not yet emerged because some of the difficult issues, such as perpetual access and archiving, remain for the moment unresolved. It remains true, at least at this point in time, that most resources are higher priced to libraries in electronic form than in print; not infrequently, users of the electronic version pay a premium over the print subscription in order to get the electronic version as well. Publishers have yet to design sufficient incentives to encourage users to migrate away from print.

Not surprisingly, this relative stasis in the economics of publishing has continued to advance consortia and other consumer-initiated licensing initiatives. Signs of progress include the decisions in 1998 of both Elsevier and the American Chemical Society, two of the largest and most important STM publishers (Elsevier a for-profit publisher, ACS a not-for-profit learned society publisher) to allow interlibrary loan in their license contracts. These two were quickly followed by other publishers, and in 1999 the contractual provisions for ILL have been further relaxed.

Consumerism has become active in yet another way. The Los Alamos preprint archive struck arrangements with learned societies in several disciplines—the American Mathematical Society, the Association for Computing Machinery (ACM), and the American Physical Society—to mount electronic preprints with the societies' blessing and to potentially become

a prelude to formal submission of these preprints for refereeing and other publisher added-value. Over the spring and summer of 1999, a potential force emerged on the preprint scene. Harold Varmus, director of the U.S. National Institutes of Health—perhaps the most important single funding agency for medical research in the world—called for free-to-user public preprint sites for all work supported by that agency. After a period of consultation and debate, the proposal has been revised under the name PubMedCentral, and rollout of a first instantiation is promised in early 2000.[24] PubMedCentral imagines two parts to its service: (1) an unrefereed portion into which any legitimate biomedical and life sciences work can be deposited; and (2) a refereed portion into which publishers will deposit their articles after publication in a known journal. Throughout the year, the proposal has drawn fire, particularly from editors and publishers associated with the formal journal literature. Several of these publishers have announced a preprint initiative of their own (which may, in fact, have been the sort of outcome that the NIH hoped for). In the summer of 1999, the U.S. Department of Energy began to develop plans for PubScience, a non-life-sciences complement (of sorts) to PubMedCentral.[25] According to Kathleen Chambers, librarian at the Department of Energy at Oak Ridge, Tennessee, the Department of Energy's (DOE) Office of Science would be launching PubScience on October 1, 1999. The Government Printing Office will provide public access through its GPO Access WWW site.

KEY ISSUES EMERGE

Archiving

The electronic publishing issues of the day are now very practical ones, and they have wide-reaching implications. What, for example, will be the model for archiving scholarly and scientific information in the electronic future? In the world of print, research libraries have effectively contributed as a public good their services as after-market preservers and maintainers of archives. There are real and quite substantial costs associated with this service, costs that have traditionally not been accounted for in the overall economics of information distribution. If it is now the publisher who insists on keeping information on his own servers, the better to control and monitor it, what incentive has that publisher (or vendor) for keeping that information fresh and accessible? Will he continue to charge users, year after year, for access to information for which they or their institutions have already paid in the form of subscriptions at the time of publication? The fear is that information which has lost its *commercial* value may disappear if left in the hands of commercial (both for-profit and not-for-profit) owners only; but there is yet no model for transferring control and responsibility to any not-for-profit entity or group of entities.

Usage

Another concern is usage and measurement of usage. As libraries spend increasing amounts of money on electronic resources, many suspect that it should be possible to use the actual electronic media to track usage of these resources more carefully than it was ever possible with paper journals. There are significant issues of privacy in such monitoring, of course, but those can and will be dealt with in ways that ensure anonymity of the data. But once librarians and publishers gather usage data, what have we learned? Who stands to benefit or lose from what is learned as a result? And how will it be possible to use quantitative data to protect the vital value of the least economically profitable information? This question ties, in part, to archiving issues. That is, it is a conventionalism, but a true one, that many articles in learned journals have very few readers over the course of a lifetime. But the function of an article may in some cases be to make a specific single fact or discovery public in a way that is of high value to a small number of future readers—who may not emerge for many years. Yet, that value can be so high as to be astronomical if the preliminary discovery turns out to be a key step toward a scientific or medical discovery of immense importance. If libraries and publishers bean-count usage, they could be tempted to take steps that effectively thwart the publication of material that does not show some immediate quantitative return on investment.

Utility

On a more practical level, librarians and readers are now beginning to confront, more than ever before, the blessings and difficulties of abundance. The flood of new electronic resources released in the last several years has been too powerful to moderate. The result is a world in which electronic information is still poorly integrated, in which multiple interfaces need to be navigated in order to find information, and in which the interfaces themselves do not communicate. There is no shortage of possible standards for managing data at various levels, from SGML and its more powerful successor XML for structuring documents, to the Z39.50 protocols and the like for linking resources across multiple sites. But, in practice, we are still far from the stage at which researchers will be able to concentrate their attention on the content of their inquiries and pursue them undistracted by difficulties of navigation and interpretation.

Who Gets Access?

At a more superficial technological level, but one of great social significance, is the unevenness with which institutions and individuals have access to given pieces of the information universe. Electronic information will become increasingly vital, and readers will demand a level playing field so that, for example, all science could be available to all scientists. Electronic interlibrary loan may help in this direction, but it may ultimately be something like the NIH-Varmus proposal for public preprint servers

that seizes the day and begins to make information access a standardized good.

Copyright and Related Rights

In the domain of intellectual property management, the past year has seen renewed concern and legislative efforts. The U. S. Congress passed, and the President signed, the Digital Millennium Copyright Act (October 1998), a chief immediate effect of which was to extend copyright protection for the author's life plus seventy years from life plus fifty. The effect of such extensions over the life of copyright legislation has been to place significant restraint on the expansion of the public domain. The world since World War II has seen the great effusion of published information and creativity in the history of the universe, but where that material would just now be beginning to enter the public domain under a life +50 regime, society must wait another twenty years. Activists fear that ultimately protection will become effectively eternal. From the point of view of publishers and heirs, material that continues to have economic potential should be protected; yet in many ways extended protection can be more worrisome for borderline cases. If one suspects that a work is still in copyright but cannot find the rightsholder (who may be dead, bankrupt, and/or utterly uncaring), one may be deterred from taking what could be socially very useful action in making material available. Endless copyright protection may be where old intellectual property goes to languish unused and unavailable.

Issues arising out of copyright ownership continue to attract attention from even the least likely parties. For example, one U.S. learned society reacted to the growing preprint movement by threatening a university preprint site with a copyright infringement lawsuit—a case where the preponderance of right may be with the publisher (if the author has signed copyright transferal agreements), but where it is wiser to seek a negotiated settlement. The assertion of right in this case and in general seems to be encouraging scientific and other authors to renewed discussion about retaining their own copyrights while assigning only limited rights to a print publisher. Such discussions in 1998 gained increasing visibility with an editorial in *Science* by a working group of the American Academy of Arts and Sciences[26] and through discussions about de-coupling peer review from publication instigated by a meeting of Association of American Universities' Provosts at a meeting at the California Institute of Technology in 1997.[27] For a long time, it has seemed that the acculturated habit of authors transferring their copyrights to print publishers in order to achieve the cachet of print was resistant to change, but if electronic representation turns out to be the place in which authors gain recognition from their peers, that could very well change.

WHAT NEXT: 2000-2005

What does e-publishing history teach about our immediate future? This is the point at which to outline a few of the main themes that will face the international educational and research communities in the next half decade.

First, it is easy to predict that within five years (and probably much sooner than that) we will see all of the world's significant STM journals on the WWW. Only somewhat more slowly, they will be (are being) linked and interlinked with each other. Abstracting and indexing services, which have been joining their journal cousins on the Web over the last few years, will increasingly be the primary gateways to journal content. That is, researchers will find references and follow links through the A & I providers, caring only secondarily about the precise target. This development will have a significant economic impact. If a researcher approaches information through an A & I provider, he or she will only be able to get to full content if the institution has the rights to that content. Journals will discover that, in order to gain scientific attention, they will need a renewed sales effort to ensure that their content is available through the major portals. Another gateway might be a library's online catalog, where each licensed e-title is hot-linked to the actual content.

In a slightly more venturesome vein: the next few years will be the period when electronic books sweep onto the WWW. If the late 1990s saw the migration of journals, the early 2000s will see the migration of scholarly and popular books. One interesting model is that provided by netLibrary.com, which has already negotiated distribution rights for partial lists with dozens of university presses and other publishers.[28] netLibrary.com offers several possibilities: through a single interface, individual users may browse and read some freely accessible texts or purchase access to others; or users in organizations with site licenses may navigate freely all the available texts with different forms of presentation— from read-on-the-screen to download-for-later-reading to printing. The advantage netLibrary.com offers is a common interface; the disadvantage so far is an exceedingly limited and random collection of titles. If this collection grows, netLibrary.com and other e-book purveyors could indeed be a force to reckon with. It is too soon to tell what e-book models will prevail and prove to be the economic power in the book arena.

Today, we find ourselves moving into a user-centered, rather than a collection-centered, world. Librarians are already finding that their mission lies in customizing information for their users—and publishers are seeing a similar role for themselves. The practices of individual users will be much better known and catered to. Librarians may have the advantage over publishers in approaching users given the institutional interests and relationships that join users and the library.

It appears certain that agreement about archiving solutions will emerge, achieved only by publishers and librarians working together. Such agreement must emerge because concern over archiving remains the barrier to dropping print subscriptions and print production—and if producers and librarians must support dual systems, the information world will remain hugely expensive. Real confidence in archiving futures will make it possible to leave print behind—at first in the STM world and then increasingly in others as well.

Additional financial transition issues will emerge over the same time frame. Where now libraries and others buy journal subscriptions as a block—a given journal is an all-or-nothing purchase—those traditional subscriptions will dissolve into many types and models. Readers and institutions will be able to buy by the article or the block of articles in various aggregations. (A particularly interesting experiment called PEAK, Pricing Electronic Access to Knowledge, has been conducted by the University of Michigan Library utilizing Elsevier journals.[29] Results could, at the least, be said to be surprising.) The "loss leader" will make the transition from the discount drugstore to the scholarly journal community as publishers vie for the continued attention of their readers. At the other end of the market, large packages or bundles are already appearing. In these new deals, the more attractive materials may be sold at a preferred price *if* the customer purchases some marginal items as well. These are only two of the pricing techniques that we can expect to multiply.

Consortia will continue to grow in power. This means a change both for publishers (who will develop strategies and hire staff to cope with the growing power of the consumer) and for libraries, who will see local library financial decision-making authority diminish where some crucial information resources (generally the larger, more expensive ones) are involved. Consortia already raise significant competitive issues in the sense that institutions that are members of large aggressive consortia will be able to offer their patrons more and richer electronic resources than institutions that are not so connected. Could this be an issue for the prosperous U.S. private universities that are not part of a state system? I suspect so. Dealing with new models of payment and new forms of organization will also create budgeting discontinuities and conundrums that will drive libraries to rethink the amount of money they spend on specific resources and the sources from which they derive those funds.

Will libraries *ever* achieve the hoped-for savings from electronic publishing, those dreams we had ten years ago? Here we need a Ouija board more than an expert opinion. At a guess, if the present economic and social structure of the publishing industry remains in place, real cost savings are unlikely or will be slow to develop. If, on the other hand, alternatives such as the preprint model evolve energetically and begin to prevail in some of the fields where the most expensive journal resources are to be

found, change is possible—not that the traditional publishers will be driven away, but that real competition in the *form* in which information is provided will drive publishers to innovate in their products, in their services, and in their economic models. We have not yet seen enough of that kind of innovation.

Over the next half-decade, copyright and licenses will raise transition issues involving intellectual property. Copyright and related rights will strengthen through more legislation designed to protect producer investments. Likely, more litigation will be pursued in order to enforce the rules. A decade or more ago, the so-called Texaco case changed the landscape and the consciousness regarding article photocopying.[30] A comparable case could be equally influential for electronic information, but such cases often occur in ways that are not strictly relevant to the most pressing concerns of the bulk of an industry (this was true of the Texaco case itself), and the real effects on behavior after such a case are not always the ones that would seem required by the decision of the court. If the court asks for the impractical, then creativity will find new ways to achieve the practical.

It is safe to say that the information world will find itself increasingly operating under a series of multiple intertwined licensing arrangements. Authors will negotiate their own licenses, giving publishers specific limited rights to reproduce and distribute content. Then publishers will license third parties to gain access to their information—e.g., abstracting and indexing services—and re-deliver it to customers. In turn, libraries and consortia of libraries will license content for their users. In this way, there will be established a new kind of circle of rights, beginning with the academic community as creators of ideas and ending with the academic community as consumers of ideas. We cannot for a moment deny that this world will be a confusing one, but that may be because it is easy to notice the confusing part of new worlds; the familiar world of print publication and consumption of information is in many ways at least as complex and as riddled with inconsistencies. It is, in fact, a feature of new media that they call attention to hidden costs, unlikely compromises, and contradictory practices in the management of old ones.

A DIGRESSION INTO LICENSING

Our work at Yale in recent years has focused on learning to navigate and help others navigate the confusions and opportunities brought to librarians by the licensing of information. It is worth spending a few lines here emphasizing some of the most important features of this new playing field, the better to bring out the possibilities and limitations of a relatively unfamiliar way of thinking about information management.

Copyright and licensing achieve similar goals through different vehicles. Both approaches are in fundamental agreement as to the underlying intellectual assumptions. Turning ideas and words into property was a

remarkably fruitful intellectual advance, and licensing in no way aban-
dons that fundamental conception.

But copyright works as an act of state. In the creation of free mar-
kets, forms of government are important, and copyright is, at bottom,
an authoritative and government-centric notion. The ideas of an author
need have no merit and no commercial value whatever in order to enter
the domain of copyright—what a child scribbles on a writing tablet is, in
the eyes of the law, protected by copyright from the moment she drops
the piece of paper on which she has been writing, and the protection is
in the first instance a protection that comes from government. Registry
of copyright with a government agency is a privileged act even today, a
means of assuring that right of property protection, and our society
spends substantial national resources providing registration services.
Copyright treats everything it protects equally—protection for the dura-
tion of an author's life plus a certain number of years is absolute and
does not vary according to the value of the individual piece of property.
The Library of Congress's Copyright Office handles all requests for reg-
istration of copyright, from unpublished adolescent verse to best sellers,
even-handedly.

Licensing, on the other hand, arises from the domain of private law.
It occurs where a willing buyer and a willing seller meet. It is time-consum-
ing and, therefore, for the most part, no one bothers with licensing prop-
erty until and unless there is the possibility of money changing hands.
Licensing works one deal at a time in a constantly changing marketplace.
If in 1999 the licenses that libraries sign are different from what they were
in 1995, that is the result of no elaborate legislative process, but of the
workings of the marketplace, as one influential deal provides a model for
others in a world of at least implicit competition.

What will happen to copyright in a world in which the fundamental
technologies of copying are rapidly changing is a good question. The U.S.
White Paper of 1995 became stuck, many thought, when it began to worry
about just how many copies are made of a document and where they are
made as they travel from server to user. The discussion of whether cached
files are copies and whether information stored in a video display's RAM
at the same time similar information is stored in the computer's CPU means
that *two* copies are being made, struck many as redolent of the discussions
of medieval scholastic philosophers who were made fun of for worrying
about how many angels could dance on the head of a pin. The difference
is that there is no evidence that the scholastic philosophers ever really
had that quarrel, but the quarrel about how many copies and where has
been a real one. Technology will continue to change, promising to upset
any such debates and their resolution on a regular basis.

Licensing of information resources is pragmatic and present-oriented.
Negotiators strike deals under existing technologies. Licensing allows both

parties to a contract to take a risk (usually for a limited period of time), the risk that their predictions about behavior and technology will prevail. If circumstances change, the renewal of a license provides the opportunity for both parties to reopen discussions and make a new deal.

Both copyright and licensing require adaptation in order to work in the electronic environment. It appears that licensing may be proving more adaptable over shorter periods of time and thus more useful. But there is no calculus of right or wrong, good or bad, in the comparison of the two. Each has and will continue to have its uses, and reasonable people will remain attentive to the comparative benefits of both and use both when circumstances warrant. And it certainly is clear that licensing of intellectual property ought to be grounded, for the benefit of our society, in copyright legislation based on an analysis of the public good. Good information licenses will be best developed against a framework of good national law.

SO, FINALLY, WHAT'S HAPPENING?

In the 1990s, we have witnessed real changes at a variety of levels in society, with undeniable impact on the scholarly communication community and its ways of working. Change happens quickly—it is said nowadays that, in some fields, two years' service makes a valued and loyal employee to be recognized with a gold watch when he leaves the company. Life cycles of products and processes in a high-tech world are very short. Where once librarians thought that they could subscribe to a journal and their readers could read it undisturbed, merely through paying subscription fees for years to come, now all must live with deals that last a year or two. By the time the contract is due to be renewed, there may be new prices, new content, new participants on both sides—e.g., new corporate ownership of the publishing entity, new consortial combinations among the reader community.

Within all this turmoil, it is clear that the value chain is shifting downstream in publishing, goods and services being tailored to the end-users' needs. In a flood of information, the user and his or her choices and navigating strategies will increasingly be the focus of attention. Publishers who now give away content for free on the Internet are often said to be doing this in order to monitor usage and gather information about what readers *really* want. It is not known to what extent such practice is occurring with scholarly or scientific journals, but it is certainly reasonable to expect that publishers will monitor usage patterns carefully to see what can be learned. It is no longer clear that owning information objects is mandatory for libraries; perhaps providing service that adds value may ultimately become far more economical and far more beneficial.

AFTER ALL . . .

What has become of the early promise of networked information? The dreams of 1989/90 have come a long way, but they have a long way

further to go in order to become reality. In legal and economic terms, much of what has happened so far is the replication of the world of the print index, journal, and book in an online environment. Ownership of content has become stronger and more concentrated through legal developments and canny agreements. While more information is available to more readers than ever before, prices also seem higher than ever. The players on the scene are mostly the same, except where smaller fish have been gobbled up by bigger corporate fish.

So there will be a new reality—there already *is* a new reality. But it is not the one librarians and technologists predicted ten years ago. It is far more complicated and offers a more puzzling mixture of blessings and curses than we either hoped or feared. The natural and tempting reaction is to attempt to reach out and manage the turmoil, to try to find the magic bullet that will "solve" the scholarly communications "problem." But the laws of unintended effects ought to caution us, and we have the advice of management gurus that changes in media and methods of communication are simply too powerful to manage.

What should librarians do? Librarians must work to develop and reassert a vision for their communities for the year 2005—a pragmatic and reasonable vision—and then work toward it. Our profession should do what our commercial information suppliers are doing: focus on the users, their needs, their wants, and their practices of using information. Librarians should strengthen consortia as customers for scholarly and scientific information, strategically aggregating demand and supporting an active consumer agenda. Librarians should work with users to integrate electronic resources of all kinds into the work life of research and education as rapidly as feasible. In support of that movement, librarians should prepare and expect to have to upgrade institutions' electronic infrastructure on a continuing basis. That is truly the most substantial new cost of electronic information for academic and research institutions—one that cannot be shirked or minimized.

Among academics and together with publishers, librarians should, of course, try experiments and projects designed to test and advance knowledge of the environment into which society has moved. And, of course, librarians need to be canny and resourceful in deploying copyright law and licensing agreements to benefit scholars everywhere.

Most of all, we need to remember that numerous media, including (and still particularly) print, are vital for library users. Libraries are the places where information sources in any and all media converge for the benefit of information seekers. While electronic resources and technologies may currently occupy much of our energy and attention—how could they not dazzle and captivate us?—maintaining a balance and interaction among information sources is part of the challenge.

CONCLUSION

It is always tempting to talk about the future, but prediction is very much a way of revealing anxieties and the constraints of the past. Current debates about the future of the electronic information marketplace reflect the history of the 1980s and the 1990s at least as much as, and perhaps more than, they teach things about the future. What we have learned so far is that both catastrophe and utopia are unlikely. The future will resemble the present and the past most of all by being just a little more of a muddle and a little less simple than we might prefer. We are left to choose the way we will navigate our muddle. Essential to successful navigation of the muddle is collaboration between libraries and their readers, and consultation and negotiation with providers of information. These will enable us to build a community of practice from which all can accept and prosper. Our greatest fear should probably be directed toward the forcing move, the Diktat, the unilateral decision. If any party to today's conversations turns out to be a big "Winner," then someone else must be a "Loser"—and if there are many losers, we may all be losers.

FOR FURTHER READING

Cairncross, F. (1997). *The death of distance: How the communications revolution will change our lives.* Boston: Harvard Business School Press.

NOTES

[1] "Silicon Valley and Wall Street, like the press, usually heed the "three dogs barking" rule. Let one dog bark, another joins in, then another . . . ." So wrote Ken Auletta in "The Last Sure Thing," *New Yorker*, November 19, 1998, pp. 40-47. We have all become increasingly familiar with the barking dogs of the Internet, in the last year or two particularly. Companies never before heard of offer stock for sale and see prices soar (then swoop dizzyingly back down and up again), while companies whose names and services we have just gotten to know and rely on suddenly disappear in a cloud of smoke, bought up or sold down river in the frenzy of the marketplace. And every little while, the dogs start barking again for some new arrival on the scene. At times like these, it is easy to lose our bearings.

[2] The by-now classic study of the situation confronting academic research libraries at the turn of the 1990s is the Andrew W. Mellon Foundation's Study (1992), *University Libraries and Scholarly Communication*, Washington, DC: Association of Research Libraries, November. This book can be found online at http://www.lib.Virginia.EDU/mellon/mellon.html.

[3] For an in-depth study of the copyright issues affecting academic authors, see *Report of the AAU Task Force on Intellectual Property Rights in an Electronic Environment* submitted to the AAU Presidents Steering Committee on April 4, 1994, Washington, DC and endorsed by the AAU Presidents, April 18, 1994, Washington, DC. This report can be found online at http://www.arl.org/aau/IPTOC.html.

[4] *New Horizons in Adult Education* is an electronic journal established to describe and advance current research and ideas in its field. It is refereed and provides graduate students, faculty, researchers, and adult education practitioners with an outlet for current thinking. It can be found at http://www.nova.edu/Inter-Links/education/aednet.html.

[5] *Psycoloquy* is a refereed journal of peer commentary in psychology, neuroscience, and cognitive science. It publishes brief reports of new ideas on which the author wishes rapid peer feedback and reproduces the commentary (open peer review) along with the original paper. It can be found at http://cogsci.ecs.soton.ac.uk/~harnad/.

6   *PMC* has enjoyed much visibility and staying power, now incorporating multimedia as part of its scholarly discourse. It has climbed upward in the prestige chain, moving from local ownership to Oxford University Press. Its current publisher is The Johns Hopkins University Press. To view the text-only issues for free, go to http://www.iath.virginia.edu/ pmc/contents.all.html. The full-featured articles are available through JHU's Project Muse, at http://muse.jhu.edu/ for a subscription charge.

7   The site at http://www.iath.virginia.edu is well worth browsing.

8   *Bryn Mawr Classical Review* http://ccat.sas.upenn.edu/bmcr publishes extensive reviews of scholarly literature in the humanities. It was so successful that it spawned an offspring, the *Bryn Mawr Medieval Review*, now called *The Medieval Review*, at http://www.hti.umich.edu/b/bmr/tmr.html.

9   *Directory of Electronic Journals, Newsletters, and Academic Discussion Lists.* (1991). Washington, DC: Association of Research Libraries (1st – 5th editions, edited by Ann Okerson; 6th – 7th edited by Dru Mogge).

10 The umbrella URL for numerous fields that contribute to this "e-print" archive are available at http://xxx.lanl.gov/. The site is a treasure trove of tens of thousands of articles plus numerous "helps" for contributors and background papers, usage data, and much more.

11 See Ann Okerson. (Ed.). (1993). *Scholarly publishing on the electronic networks; The new generation: Visions and opportunities in not-for-profit publishing* (Proceedings of the Second Symposium). Washington, DC: Association of Research Libraries. Then, Ann Okerson and Dru Mogge. (Eds.). (1994). *Gateways, gatekeepers, and roles in the information omniverse* (Proceedings of the Third Symposium). Washington, DC: Association of Research Libraries. And, Ann Okerson. (Ed.). (1995). *Filling the pipeline and paying the piper* (Proceedings of the Fourth Symposium). Washington, DC: Association of Research Libraries.

12 Winner of the 1992 Database Product of the Year Award and the first electronic journal to be indexed in *Index Medicus*, the *Online Journal of Current Clinical Trials* offered peer-reviewed, primary medical research, reviews, meta-analyses, methodological papers, and editorials. Initially published by AAAS, it was sold to Chapman & Hall. It never achieved the hoped for submissions success and folded. The last record we are able to find of it is in a price list for 1996.

13 The final and detailed report of the TULIP experiment is found in: Marthyn Borghuis. (1996). *TULIP: Final Report.* New York: Elsevier Science.

14 The Library of Congress's Vatican exhibit remains online to this date. See it at http://lcweb.loc.gov/exhibits/vatican/toc.html with a preface by Librarian of Congress James Billington.

15 See http://gort.ucsd.edu/newjour. The archive has remained stable for several years at the UCSD site, with continuous improvement and upgrading—so far a genuine archive indeed. The dedicated and reliable librarian who deserves much credit for keeping *NewJour* ensconced at UCSD is James Jacobs. We depend as well on various volunteers for submissions (the most faithful one being Michael Möbius, head librarian of the Hochschulbibliothek der Fachhochschule Düsseldorf - University of Applied Sciences) and student labor for compiling the postings. The student mainstays have been the University of Pennsylvania's Kallan Resnick, Alex Edelman, James Renfro, and Vance Bell.

16 *Intellectual Property and the National Information Infrastructure.* (1995). (Report of the Working Group on Intellectual Property Rights). Washington, DC: U.S. Patent and Trademark Office. Full text is at http://www.uspto.gov/web/offices/com/doc/ipnii/ index.html.

17 HighWire's publishers make earlier issues of their journals available for free. See the titles and access policies at http://highwire.stanford.edu/.

18 Ann Okerson & James O'Donnell (Eds.). (1995). *Scholarly journals at the crossroads: A subversive proposal for electronic publishing.* Washington, DC: Association of Research Libraries. The full text is also available online at http://www.arl.org/scomm/subversive/ toc.html.

19 IDEAL is Academic Press's International Digital Electronic Access Library, with the full text of over 170 of its titles back to 1993. Recently, titles from W. B. Saunders and Churchill-Livingstone were added. Visit the site at http://www.idealibrary.com.

[20] The CONFU (Conference on Fair Use) site is located at http://www.uspto.gov/web/offices/dcom/olia/confu/. There one may find various related documents, including the Final Report to the Commissioner on the Conclusion of the Conference on Fair Use (Nov 98).

[21] See the extensive Web site, LIBLICENSE, A Guide to Licensing Digital Resources, complete with unloadable software that generates licenses, at http://www.library.yale.edu/~llicense/index.shtml. At this site, one can join the liblicense-l list and peruse all of its 1,500 message archive. See also the extensive description in Ann Okerson, "The Liblicense Project and How it Grows," D-Lib Magazine, September 1999, online at http://www.dlib.org/dlib/september99/okerson/09okerson.html.

[22] The Home Page of the ICOLC at http://www.library.yale.edu/consortia identifies over 100 affiliate members of this almost virtual (i.e., informally organized) organization and reproduces its statements and guidelines in various important electronic content areas.

[23] SPARC, the Scholarly Publishing and Academic Resources Coalition, both is story and it tells a story. For information and press releases, see http://www.arl.org/sparc/.

[24] The Web site, with original proposal, comments, responses, etc., is titled An NIH-Operated Site for Electronic Distribution of Life Sciences Research Reports, located at http://www.nih.gov/welcome/director/pubmedcentral/pubmedcentral.htm.

[25] According to the press release, "PubScience, developed by DOE's Office of Scientific and Technical Information (OSTI), focuses on the physical sciences and other energy-related disciplines. This new PubSCIENCE service focuses on the physical sciences and other energy-related disciplines. Approximately 1,000 scientific and technical journals from over twenty participating publishers will initially be searchable from PubScience. It was modeled after the highly recognized PubMed, which covers medical sciences for the National Institutes of Health. Like PubMed, PubScience will continue to expand with the vision of becoming a huge resource of published information." The OSTI Web site is at http://www.osti.gov/resource.html.

[26] Who Should Own Scientific Papers, *Science*, September 4, 1998, can be found at http://www.library.yale.edu/~llicense/POLICYF.HTM. It reasons that authors of scientific papers, especially research funded by public monies, should retain their copyright ownership while licensing publishers. This frees authors to post their papers on any Web sites of their choice as well as to distribute the papers widely in the interests of scientific communications and learning.

[27] The proceedings of this widely discussed and debated conference are available at http://library.caltech.edu/publications/scholarsforum/proceedings.htm.

[28] See netLibrary.com's site, where one can currently view some 2,000+ books in the public domain (largely Project Gutenberg texts) and try out over 4,000 current academic imprints, available at www.netlibrary.com. Other e-book publishers are emerging such as Chris Pooley's "books 24X7" (for technical books) and the American Council of Learned Societies' Andrew W. Mellon Foundation-funded effort to make approximately 600 key scholarly books available online with significant enhancements possible only in electronic form.

[29] In PEAK, libraries were given one of three pricing and packaging options, all of which made available additional content (beyond that subscribed to in print by the participating library) to readers. For a complete description of the project and players, see http://www.lib.umich.edu/libhome/peak/.

[30] For a comprehensive site with the Texaco ruling and commentary, see "American Geophysical Union versus Texaco, Inc." at ARL's http://www.arl.org/info/frn/copy/texaco.html.