

Open Access

M. Carl Drott
Drexel University

Introduction

An important role of library and information science has been the identification of better ways to understand and support the “effectual transmission of information” (Weiner, 1948, p. 156) in an ever-changing intellectual and technological context. One of the important vehicles of scholarly information for the past 300-plus years has been the journal. The fundamental nature of this long-established organ may seem destined for reshaping in the light of the recent so-called open access (OA) movement. At the heart of this phenomenon in publishing and distributing information to the community of researchers is the principle that all those who want to read articles published in scholarly periodicals should be able to do so at no cost. In our current model, access costs are borne by libraries and other publicly and privately supported institutions, whereas open access implies broader access without institutional or technical constraints.

One of the widely influential definitions of open access comes from the Budapest Open Access Initiative (BOAI) convened in Budapest by the Open Society Institute (OSI, 2004):

By “open access” to this literature, we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.

(2001) warns against such deals on the grounds that they add to costs and tie up a disproportionate share of library funds with a small number of publishers. In 2003, the Massachusetts Institute of Technology Libraries (2003) explained that they were refusing three-year packages from Elsevier and Wiley because such a commitment would inappropriately limit changes in title holdings. They have since been joined by other libraries.

In a sense, it does not matter what the objective truth of journal price increases is. It suffices to note that rising journal prices and relatively static budgets have galvanized librarians, individually, in collective groups, and through their professional organizations, to assume a significant leadership role in the open access movement. It is clear that in any discussion of journal cost, benefits must also be weighed. As noted earlier, electronic journals offer significant additional benefits to the user. When subscription prices are viewed in terms of cost-per-access, there may be dramatic changes in the perception of which journals are truly "expensive." For example, Morgan Stanley Research (Morgan Stanley & Co., 2002) used 1999 data from the University of Wisconsin to calculate cost per use (University of Wisconsin-Madison Libraries, n.d.). *Brain Research*, which at that time had a subscription price of \$14,669, cost \$8.25 per article use. On the other hand, *Hospital Medicine*, with a subscription price of \$398, had a per use cost of \$66.33. However, such thinking may disadvantage researchers in fields with a small readership that are nonetheless vital to the synergy of scholarly work in larger fields.

One cannot leave a discussion of journal costs without looking at the polemics of the issue. The *San Francisco Chronicle* (2004), in a comparison more sensational than illuminating, equated the cost of a year's subscription to *Nuclear Physics A & B* to the price of a new Toyota Camry. Similarly, Elsevier, the for-profit publisher of both titles and some 1,700 other scholarly journals, is frequently excoriated because their margin of return (before taxes) on STM journal publishing approaches 38 percent. In response, Crispin Davis of Elsevier (U.K. House of Commons. Science and Technology Committee, 2004c) has explained that nearly half of this amount is invested in research and development. Plutchak (2004, online), discussing the difficulty of assessing "fairness" in journal pricing, observes that a "fair price" for a journal may simply be a substitute for "a price that is so low that I am happy to pay it." Public Knowledge is an organization devoted to the political aspects of open access and many other intellectual property issues. Its mission is to serve as an "advocacy group working to defend your rights in the emerging digital culture" (Public Knowledge, 2004).

It is beyond the scope of this chapter to review the literature on serials costs, but it is worthwhile to identify some important sources. The 2000 monograph by Tenopir and King presents a comprehensive study of scholarly journals and their users and, although their focus is on print publishing, they also include some information on electronic publication.

Some have argued that open access can be achieved without change to the present subscription-supported journal model by the creation of repositories by individual authors or their institutions. Under this model, authors publish their articles through traditional journals but also make a copy available on a Web server. Supporters of this model point to the long acceptance of preprint servers in some areas of physics. Skeptics note that author posting requires either journal policy changes or negotiation of rights by individual authors, because there are so many variations in the transfer of copyright required by most journals as a condition of publication.

In evaluating the various models for open access, it is important to recognize that the issue of open access is as much about social-political issues as it is about scholarly communication, technology, or economics. Discussion thus moves into an arena in which the rhetoric may be more focused on proselytizing than on careful articulation of scholarly argument. In such an atmosphere, even authors who show impeccable semantic hygiene in their own research work are given to expressing themselves in a more populist style. Thus, there can be no completely satisfactory definition of “open access.” Representatives of different points of view seek to characterize the term in ways most agreeable to their own conclusions. Similarly, there can be no *neutral* view of the situation. In this respect, I have attempted to provide a *balanced* view. As part of this effort, I have used the first person voice as a reminder that any position is subjective in the heated conflict that surrounds the topic of open access. Because the debate about open access is not strictly a matter of scholarship, much that is written appears in online discussion groups and individual Web sites. Such sources may not have the complete scholarly apparatus that allows recognition of the originator of a particular view. Rather than risk misattribution, I have tended not to identify these sources. I apologize to those whom I have inadvertently denied credit for their ideas.

Finally, I want to note that issues involving open access include many topics that have been the subject of chapters in past volumes of *ARIST*. Readers who wish to explore any of these in greater depth will find a wealth of supporting references. I would especially note: “The Internet and Unrefereed Scholarly Publishing” (Kling, 2004), “Preservation of Digital Objects” (Galloway, 2004), “Digital Libraries” (Fox & Urs, 2002), and “Legal Aspects of the Web” (Borrull & Oppenheim, 2004).

Overview

The emergence of the discussion of open access as a viable alternative to traditional publishing rests on developments in three main areas: economics, technology, and social justice. The issues in these areas are complex and intertwined, but the foregoing division will serve to set out the main themes to be discussed.

For many, especially those in the library community, the continuing and substantial rise in journal subscription costs over several decades has been a great burden. In addition, the costs of binding and storing back issues of journals have continued to climb. Moreover, the cost of computing has dropped dramatically and the growth of extremely cheap electronic networking has been remarkable. At the same time, advances in technology have meant that almost all authors produce their original manuscripts in digital form. Word processing and page layout programs have simplified editing and proofreading and have made it much easier to prepare manuscripts for publication. Web servers and browsers along with network technology make the dissemination and retrieval of electronic documents a largely transparent task. This means that most manuscripts are easily available via electronic access systems, whether on the Web or as part of more limited services.

In addition, the press for open access satisfies a growing awareness of issues that are best labeled matters of ethics or even social justice. Many advocates would explain the philosophical ramifications of the current system as follows: The public, through government funding of both research and universities, pays a significant part of the cost of producing the research that underlies scholarly articles. The people are then charged additional amounts, through support of libraries, for access to the published product that they have already subsidized. An additional unfairness is seen to lie in the growth of information-dependent activities in the developing world. This is evident both in the emergence of strong indigenous universities and educational institutions and in the creation of new industries that are highly information-dependent. In these countries, the vast majority of research is published in journals that are priced according to Western economic models, making them almost unaffordable in local economic terms.

Financial Pressures on Libraries

One of the driving forces of the open access movement has been the increase in subscription costs of scholarly journals and the resultant pressure on academic library budgets. Regardless of how the data is analyzed, the average costs of subscriptions to scholarly journals have risen faster than the average inflation rate. This is true even when one takes into account the increase in journal size measured by the number of pages published annually. One estimate places the overall annual rate of increase for journals at 12 percent, only half of which can be attributed to average inflation and increased size. The increases have been particularly troublesome in science, technology, and medicine (usually abbreviated as STM), both because the rates of increase have been higher and because journals in those areas account for a large fraction of the serials budgets of many major libraries. Buckholtz (2001) summarizes the situation by noting that in the 15 years prior to 2001, serial

unit cost rose by 207 percent, general inflation was 52 percent, faculty salaries rose 68 percent, and healthcare costs increased by 107 percent.

The growth in journal subscription cost has varied with the nature of the journal publisher. Journals published by commercial for-profit publishers have had steeper average increases than have those produced by professional societies or nonprofit publishers such as university presses. To some of the advocates of open access journals, this has been seen as evidence that commercial publishers are making excessive price demands on the essentially captive customer base of academic and research libraries. However, averages are misleading, and there are examples of steep price increases for every type of publisher.

Publishers have argued that they have made large financial investments in providing electronic accessibility and that the extra income allows them to take risks in supporting unprofitable journals. In particular, nonprofit publishers, such as learned societies and academic presses, note that surpluses from journal sales are used to support projects that advance both scholarship and the benefits to the public that derive therefrom. The *Washington DC Principles for Free Access to Science* (<http://dcprinciples.org>) was written by a coalition of nonprofit publishers who see their mission to “enhance the independence, rigor, trust, and visibility” of scholarly journals. They argue that their revenues support “scholarships, scientific meetings, grants, educational outreach, [and] advocacy for research funding.” Another report on the benefits of nonprofit publishing has been prepared by the Association of Learned and Professional Society Publishers (2004).

A complicating factor in assessing the rise in journal costs has been the growth of journals that are available online. Such journals may be distributed in both print and online formats, or increasingly, in online only versions. Online availability has changed both the nature of the financial transactions between libraries and publishers and the services that the library can provide to users. Instead of purchasing the issues of a journal produced in a single year, libraries contract for one year’s access to all available current and back issues of one or more journal titles. In some cases, for example *Lancet*, this amounts to a run of over 150 years. Further, this access is available to every member of the community served by the library around the clock and, in many cases, anyplace in the world from which they have Internet access. This is clearly an expansion of library services that, without electronic journals, would be far beyond the budget dreams of librarians. Thus, one reasonable position is that, with electronic access, increased subscription costs have purchased vastly increased user service.

A complicating factor in acquiring electronic journals is the fondness of some publishers for offering multiyear packages consisting of a large number of titles for a fixed price. The process of negotiating contracts for electronic access has become a significant burden for some librarians. This so-called “big deal” often combines journals that the library wants to acquire along with many that would be considered marginal. Frazier

(2001) warns against such deals on the grounds that they add to costs and tie up a disproportionate share of library funds with a small number of publishers. In 2003, the Massachusetts Institute of Technology Libraries (2003) explained that they were refusing three-year packages from Elsevier and Wiley because such a commitment would inappropriately limit changes in title holdings. They have since been joined by other libraries.

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King and Montgomery (2002) and Montgomery and King (2002) examine cost per use and the economics of a shift to an electronic environment. Both Holmström (2004) and Cox (2003) add information on the cost per article-reading. Cox notes that the cost per use of the electronic-only Emerald Fulltext is lower than that for the nonprofit Institute of Physics Publishing subscription, which offers a combination of print and online journals.

Journal Quality and Reputation

The enterprise of academic journal publishing has been characterized as a “gift economy.” Authors write articles and submit them for publication with no expectation of direct payment. The peculiarity of scholarly authorship is that, unlike other forms of property, almost none of the benefits to the author derive from actual ownership of the work. The benefits derive from acknowledgment of the work by others. In its most abstract form, authors achieve the intangible benefit of the recognition and respect of their colleagues. But the very real reward structure of tenure, promotion, salary raises, and better employment and research opportunities is strongly dependent on the researcher’s publication record. The ways in which those who evaluate authors recognize the “quality” of research publications is a complex and largely unstudied one. Evaluation ranges from knowledgeable senior researchers who carefully read and judge a work, to administrators who simply compare the journals in which the author has published against some list of “good” titles. In the U.K., the evaluation of research publications is a part of the Research Assessment Exercise that has a direct bearing on government funding for individual universities (U.K. House of Commons. Science and Technology Committee, 2004b).

With respect to what constitutes a “good title,” the impact factor developed by Garfield and published by ISI may well be the single most widely accepted measure of journal quality. Simply put, impact factor is the number of citations to articles published two and three years ago in a particular journal divided by the number of articles published by that journal. Impact factor has been subject to a great deal of both praise and criticism, the discussion of which is beyond the scope of this chapter. However, two observations are particularly germane: The impact factor measure favors established journals and works against new ones; and, for good or ill, impact factor is soundly entrenched in the evaluation strategies of a great many administrative bodies. A hope for the future expressed by Harnad (2001) is that the creation of open archives will increase both the availability and the impact of the papers included. Web-based citation services such as ResearchIndex (also called CiteSeer) will offer broader citation counts than the ISI database and thus may serve to validate open access materials.

A recent study by McVeigh (2004) using ISI’s *Journal Citation Reports* compared the impact factors of open access journals with traditional journals

in the same subject fields. There are many factors to consider in evaluating this analysis, but, in general, OA journals tended to have somewhat lower impact factors. On the immediacy index, which counts citations to articles in the calendar year of their publication, OA journals performed better, but were still slightly below traditional journals. These data are sufficiently close and subject to interpretation that either side could claim their support. ISI attempts to select the most important journals for coverage so the increasing number of OA journals (now 239 titles out of about 9,000 covered) is a sign of the growth of this model. It is also instructive to note that the fastest growth of OA journals has been in South America and the Asian Pacific regions.

The increasing “citedness” of open access journals is an important indicator of their quality. Even more intriguing is the possibility that the ready availability of open access articles may actually increase the number of citations that they receive. A study of the relation between online availability and citedness by Lawrence (2001b) has provided significant support for open access. From a sample of nearly 120,000 conference articles in computer science whose publication spanned the decade of the 1990s, he found that articles available online averaged 7.03 citations each, whereas those not so available averaged only 2.74. This is an increase in citedness of 157 percent. This difference held even when online and offline articles from the same conference in the same year were matched. Lawrence (2001b) reasons that articles from the same conference are likely to be similar in quality and finds that in this comparison the advantage to articles available online is even greater (an increase of 336 percent) than when articles are compared across conferences. Unfortunately, some who cite Lawrence commit the fallacy of *post hoc propter hoc*. They assume that online availability is the cause of the increase in citations. This ignores possibilities such as biases in the citation data that he derived from ResearchIndex or that “better” authors have greater access to online storage for their papers or greater incentives to provide such availability. Oddly, this research illustrates a problem with self-archiving of preprints. Lawrence’s self-archived version (2001a) is titled “Online or invisible?” The published version (2001b) changes the title to “Free online availability substantially increases a paper’s impact.” This change seems to lead the reader to only one of a number of possible conclusions to be derived from the study.

Journal quality and reputation are important issues for both authors and evaluators. It should be no surprise that subscription-based journals argue that their long history of developing and preserving journal quality should not be taken lightly. Open access advocates reply that there is no reason that their journals cannot achieve or maintain high levels of quality.

Peer Review—Quality Control

The process of peer review, or refereeing, is generally considered the gold standard of quality control for academic publishing. In its simplest form, peer review is the judgment of a submitted article by experienced researchers (generally two or three reviewers per article) concerning whether the work should be published. In explaining the importance of rigorous peer review in a high-quality journal O’Nions said,

the importance of a piece of work sometimes takes many, many years to establish, but people can feel assured that the piece of work will have been rigorously peer reviewed, and therefore has a high chance of being free of error, and will be timely and will not be just a repetitive piece of research. It is that sort of assurance that people feel. What its real impact is on science may be minimal or may take another 30 years to discover. (U.K. House of Commons. Science and Technology Committee, 2004c, p.18)

As O’Nions notes, the quality of peer review in a particular journal must be judged over many articles and a long period of time. This presents a serious problem for any new journal. Because new open access journals have sought to establish credible claims to quality by emulating the practices of established journals, in assessing these claims, it is worthwhile to consider the process of manuscript acceptance and some of the recommendations for establishing open access journals of high quality.

The quality control of a journal begins with an editorial board. The board is ideally composed of senior scholars with well-established reputations within the field. Such a board is especially important for a newly created journal, since board members are expected to submit some of their own papers to the journal and to encourage prestigious colleagues to do the same. PubMed Central (<http://www.pubmedcentral.gov>), described later, will accept articles from new journals only if the board members are funded researchers. The new open access journal *PLoS Biology* published by the Public Library of Science has gained in prestige from having Nobel laureate Harold Varmus and many other scientists of international repute as active members of its board.

An editor, again a prestigious scholar is best, is appointed to handle the regular running of the enterprise. One of the primary responsibilities of the editor (in the case of a popular journal there may also be several associate editors) is to receive article submissions, reject those that are clearly unacceptable, and to select appropriate referees to judge the remainder. The referee may judge the importance of the topic to the journal and to the field, the conformance of the methodology to the field’s research paradigms, the clarity of the presentation, and even the way the submission links to the previous research in the field through citation.

Finally, it is the job of the editor to combine the judgments of the reviewers and to decide for publication, against publication, or to request that the author revise the submission subject either to re-refereeing or to the editor's satisfaction that the reviewers' comments have been addressed. These functions are considered important to maintaining the quality of a journal, and a journal of any publishing model must have the resources to carry them out.

Up to this point, most of the effort has been either uncompensated, for most referees and many editors, or under-compensated for some editors. There is, however, clerical effort that involves tracking manuscripts and correspondence with authors and referees. A number of free or low-cost software packages are available to support editors in this task and thus reduce both the cost and effort of these quality control steps. For example eFirst XML, eprints, Electronic Submission and Peer Review (ESPERE), and myICAAP. The Open Journal Systems software from the Public Knowledge Project (n.d.) supports both the refereeing and the editing phases of the process. DSpace software supports digital archives (<http://www.dspace.org>).

The clerical effort of handling manuscripts is proportional to the number of manuscripts submitted, so that highly selective journals, those with high rejection rates, incur substantially greater costs per article actually published. Journals of high reputation report rejection rates of over 90 percent, so that each article published represents the accumulated costs of 10 articles refereed. Any business plan for a journal, whether open access or not, must have a way of covering such expenses.

One of the areas of uncertainty in the production of open access journals is the issue of how much the review process is likely to cost. This point is important because OA advocates tend to present low numbers whereas traditional journals present higher ones. Data on the compensation of editors is rare and scattered. It is probably the case that most editors receive little or nothing in direct compensation and that payments for clerical support, if any, are likely to be small. On the other hand, it is not uncommon for universities to partially support editors with clerical time, computers, office space, and time off from other duties. In terms of compensation from the publisher, Birman (2000) reports on four journal editors who received \$6,000, \$12,000, \$14,000, and \$22,500 per year. In another case, she reports that an editor for the journal of a professional society received \$12,000 for clerical support. Knuth (2003) reports receiving \$1,000 per year as editor of *The Journal of Algorithms* published by Elsevier. In addition, he received \$1,667 for clerical support and two complimentary copies. Guédon reports (private communication) that one editor of a commercially published journal received \$50 for each manuscript sent out for review. It is not clear if this was compensation for editorial effort or if it was intended to support clerical costs. Editors and referees may also receive other perks such as support for attendance at conferences.

Even when a journal is owned by a commercial publisher, the compensation of editors and referees is largely the intangible benefit of being seen as a gatekeeper protecting the quality of research in a discipline. The prestige of serving on the board of a respected journal may give individuals leverage in making decisions about the future of open access. Knuth and the editorial board of the commercial *The Journal of Algorithms* (Elsevier) resigned en masse to found the open access *Transactions on Algorithms* (ACM). Similarly, the board of *The Journal of Logic Programming* (Elsevier) resigned to found *Theory & Practice of Logic Programming* (Cambridge University Press). Individuals, too, have taken stands against excessive journal subscription rates. Economist Ted Bergstrom (2002), in a widely circulated letter, announced that he would refuse to review articles for journals whose subscription charges exceeded certain limits. On the other hand, the political nature of the debate over open access may lead to divisive characterizations of those who remain on the boards of subscription journals. Guédon (2001, online) chastises professors who have agreed to become editors of commercial journals; “but I must admit, alas, scientists often place the enhancement of their personal career ahead of the collective good.”

As I mentioned earlier, there are no clear cost figures for this quality assessment stage of the publication process. The Wellcome Trust (2004) suggests that a conservative (that is to say, high) estimate for refereeing costs for a journal with an acceptance rate of 12 percent, would be \$600 per article published, and for a journal with a 50 percent acceptance rate, the estimated refereeing cost would be \$300 per article accepted. These numbers seem high compared to Knuth’s clerical remuneration of under \$2,000 a year reported earlier. A professional society confirmed informally that a figure of \$1,000 to \$2,000 per year would be reasonable clerical support for an editor. Rowland (2002) put the cost of refereeing at \$200 per paper published, and Tenopir and King (2000) give a figure of \$20 per page reviewed. If we assume that the prestige of office allows editors to obtain a reasonable fraction of the refereeing cost from their employers, then, not counting the labor of the referees or the editor, refereeing may have a cost to the journal of below \$50 per article published.

Editorial Processing

After an article is accepted for publication, it must go through a process of editorial correction and formatting. In traditional journal publishing, this is the point at which the editor sends the accepted manuscript to the publisher. The cost of the effort required to edit and format an article are referred to as “first copy costs.” Values for these costs reported in the literature vary greatly. In part, the effort is field-dependent—articles that are largely text are easier to prepare than those with equations, figures, and pictures. One issue with formatting is the extent to which a journal wishes to impose a consistent “look and feel” on all

articles, but it is generally assumed that readers expect that any reasonably good journal will have well edited copy that is clearly formatted. Regardless of the standards of the journal, there is nearly universal agreement among editors that authors are largely incapable of preparing acceptable publication-ready copy. Boyce and Dalterio (1996) discuss the difficulty of turning manuscripts into journal copy. They point out that future searchability depends on strict adherence to formatting standards. They suggest that as long as publishers prepare both electronic and paper copies, improvements in technology are not likely to save more than 25 percent.

It is first-copy costs that make up the most significant portion of the cost of producing any journal. Data from the Wellcome Trust (2004) suggest that first-copy costs are about 33 percent of the total cost for a print journal. This is also the kind of effort that is most likely to require hiring skilled staff—both editors and proofreaders as well as those who do page layout. The Public Knowledge Project (n.d.) estimates the cost of freelance editing to be \$20,000 for 1,000 pages. This puts the cost of editing a 10-page article at \$200. The Entomological Society of America (2004, online) imposes an “editorial review charge” of \$48 per page for members and \$75 per page for nonmembers, but it is unclear to what extent either of these figures reflects actual costs.

One way of trying to estimate first-copy costs would be to work backward from total income per article. According to the Wellcome Trust (2004), Blackwell Publishing, with over 600 journals in a wide variety of scholarly fields, reported generating an average revenue *from libraries* of \$1,425 per published article in 2003. On the other hand, Odlyzko (1999) says, without support, that in general each article brings the publisher \$4,000. Applying the 33 percent factor yields first-copy costs of \$470 to \$1,320. These costs presumably still include profit, so let us give a range of \$350 to \$1,100. If you add in something like \$100 for refereeing, the result is very close to the going rate for most open access journals. Along the same line, Harnad (1997, online) quotes “brave souls who have launched electronic-only journals” as reporting that their costs are about 25 percent of the cost of a print journal. His estimate results in somewhat lower numbers—but scholarship is diverse and it would be fairly conservative to assume that the costs for different journals vary by a factor of two or three.

The discussion of the actual costs involved in producing a scholarly journal has suffered both from lack of data and from lack of agreement on how to make data from various sources comparable. The development of a formalized economic model of the scientific publishing process by Björk and Hedlund (2004) offers hope.

I should perhaps conclude this discussion by noting some of the costs that are not incurred by open access journals. The most obvious are printing and distribution. There are additional costs of maintaining subscription lists, sending bills, and handling payments. These all apply to subscription journals whether they are online or print.

Subscription journals have sales costs. The demand for the top journals in a field is relatively inelastic, but lower-tier journals are in competition for the remaining subscription funds. Further, as the complexity of the “big deal” packages marketed to libraries has increased, so contract negotiations have become more time consuming and, thus, expensive. Online journals of whatever publishing model incur costs for servers, computers, storage, and Internet access. Subscription journals that are available online must maintain security arrangements to limit access. On the other hand, open access journals must track and collect author payments.

Archiving

Given the growth of electronic publishing, archiving is an important factor in the context of open access. As more publications shift to electronic form, the archives themselves can become vehicles for materials to be more widely available. No journal publication scheme, open access or traditional, can meet the needs of scholars unless it is supported by an archiving function. In the case of print journals, archiving has been largely the province of libraries. Libraries bind and store back issues of journals—for less-used materials, they may coordinate their efforts with other libraries. They also provide access, both on site and through interlibrary loan. In the U.S., special provisions have been written into the copyright law to facilitate both preservation and lending. In the U.K., government-established Depository Libraries receive, store, and lend materials that are published in print form. The development of electronic publishing has presented a challenge both to national libraries and to national laws requiring the deposit of published materials.

The archiving of electronic publications presents special problems. In the first place, rapid changes in computer technology make it very likely that any current archives will have to be converted to match new standards. This is less of a problem for text, but may be significant as electronic-only journals add nontext features such as multimedia, video clips, and three-dimensional renderings. The all-electronic *New Journal of Physics* is one that incorporates such materials. Another problem for many academic libraries is not only the potential cost of archiving electronic materials, but the issue of ownership. In any scheme in which libraries are not owners, but licensees, governed by contractual terms, the options for them to continue to perform the function of archiving may be limited or nonexistent.

To some extent, the move to archiving of electronic journals may simply be a matter of the time it takes to shift long-standing library practice. Both the British Library and several European National Libraries have agreed to accept electronic archiving of the *New Journal of Physics*. Elsevier has entered into agreements with several national depositories to provide copies of all of its electronic journal files. The agreement is

that, if the material were no longer available in any other way, the libraries would have the right to distribute it.

The positive side of electronic archiving is represented by Ginsparg's (1996) pioneering work in developing arXiv.org as a preprint server in high-energy physics. Since 1991 this project has grown to include other physics specialties and other fields. Because developments in high-energy physics move faster than the journal-refereeing and publication process, the research community in that field has long used preprint distribution. The server is heavily used both by authors who deposit their preprints and by users who generate over 100,000 connections per day to the archive. This electronic archive has proved to be a sustainable enterprise even though it depends on contributed effort and resources. Preprints are accepted by the scholarly community even though they have not yet been refereed—indeed, arXiv.org data show that preprint access continues even after the refereed versions are published. In encouraging much wider preprint archiving, Ginsparg notes that the academic leaders in physics have become comfortable with evaluating candidates using evidence based in part on preprint publication. He believes that absolute consistency of format among papers is not necessary, and, in a memorable phrase, characterizes print publication as the “chemicals adsorbed onto sliced processed dead trees” format (Ginsparg, 1996, online).

Although arXiv.org is an example of one of a number of subject or *discipline-based* archives, a growing number of universities including Cornell, Harvard, MIT, Stanford, and others have begun their own *institutional* archives. To support other universities considering the creation of electronic archives, the Digital Library Federation (2003) has collected case studies and supporting materials.

Archiving as an Alternative to Open Access Journals

The intriguing argument that open access can be achieved through author archiving rather than the form of publication has come from Harnad (1999). He has been a strong leader in promoting open access and especially in encouraging authors to electronically archive their manuscripts (preprints) when they are submitted for publication. He then proposes that, after the manuscript is accepted, the author either append a list of the changes that were made, or substitute a revised version of the paper. He argues that the language in many copyright assignment forms allows authors to create collections of their own works without violating the terms of the agreement and thus the archiving of the finished article is legal. Where the author does not have such rights, Harnad argues that posting the preprint and list of corrections would avoid copyright issues. Others have noted that, no matter what the legal situation, young scholars especially could place their careers in jeopardy by behaving in ways that angered editorial boards or publishers.

I should note that the open access community has come to use the word “archive” as a synonym for “store.” This reasonably annoys

archivists who would prefer to think of their duties as a far step beyond storage, including preserving and providing access for an indefinitely long future. With apologies, I use the terminology as it appears in the open access literature.

To simplify information exchange on this topic, Harnad, Brody, Vallieres, Carr, Hitchcock, Gingras, et al. (2004) have proposed a classification system for journals according to their policies on making free copies of articles available. According to this scheme, *gold* journals provide open access as a matter of policy. *Green* journals explicitly permit authors to self-archive materials. Harnad et al. (2004) estimate that 5 percent of the world's journals are gold and 90 percent are green. This seems high when compared to estimates of others who typically estimate that less than 1 percent of scholarly journals are open access. But it points up the difficulty stated at the outset with respect to lack of agreement on what constitutes open access.

The advantage of a policy of self-archiving with the permission of the journal (green) is that it does not require that a journal make the admittedly risky shift to full open access. More than 10 years ago, Harnad (1995) labeled his proposal for self-archiving "subversive." Unfortunately, open access advocates can no longer claim such a radical title. In June 2004 Elsevier, the world's largest commercial publisher of STM journals, turned "green" by announcing that that it would explicitly permit authors to post final versions of their articles on personal or institutional Web sites.

One of the concerns raised by self-archiving, or any archiving not under the control of the original publisher, is identity, or whether the archived document is the same as the published version. Such a concern has apparently not affected the use of preprint collections even after the material has been published. Now that Elsevier (Elsevier Ltd., 2004, online) has agreed to permit self-archiving of final article versions by authors, rehearsing its former arguments against the practice would be churlish. However, because the arguments continue to be used by others, they remain relevant to the issue of open access being considered here. This is Elsevier's former argument:

The scientific communication process revolves around the peer review process and the question of what the scientific record is. Researchers need to know when they obtain an Elsevier journal article that it is the article as published, that is, as having been edited and peer reviewed in conformity with the quality which the researcher associates with that particular journal. Having the article on an Elsevier server provides the integrity seal of approval for researchers. Permitting the same article to be published elsewhere on public servers, with researchers unsure about which version was actually peer reviewed, is confusing and potentially harmful to science.

It might be tempting to categorize such an argument as crass commercial justification rather than deeply held commitment to the integrity of science. On the other hand, concerns about the veracity and reliability of documents found on the Web are widespread. I would argue that any author who considers it necessary to include a date of access in a citation to a Web document, especially to an item that is an archived version of an article, is expressing exactly such concerns about integrity. Unfortunately, electronic documents are easily mutable and no widely accepted standard for version control has yet emerged.

It remains to be seen whether creating author or institutional archives can ever capture more than a scattered fraction of the published literature. Advocates believe that as universities see the publicity benefits of institutional archives, and as deposit in archives becomes accepted by trend-setting faculty, the movement will grow. Cynics view the acquiescence of commercial publishers to self-archiving as an indication that it represents no threat to their existing business models.

Author Fees for Open Access

The predominant model for the support of open access publication is one of “author pays.” That is, for each accepted article the author is charged a fee of from \$300 to over \$3,000 depending on the journal. These numbers seem comparable to the cost estimates for a journal of average selectivity of \$470 to \$1,320, which were presented earlier. The large spread of these numbers is in part due to differences in what services the fee must cover—support for the refereeing phase, the extent of editorial processing, and the number of formats supported, sophistication of online access including special search features, and long-term archiving. For journals with high rejection rates, an alternate author-pays model is one in which each submission is subject to a fee regardless of the referees’ decision. So far, this has been a much less popular option. The two major sources of debate over the author-pays model are: “Who really pays?” and “Are costs fairly borne in proportion to benefits?”

Proponents of “author pays” argue that, in the case of funded research, publication should reasonably be covered by the research grant. In support of this mode of funding, the Howard Hughes Institute, an important supporter of medical research in the U.S., has announced a policy that it will support up to \$3,000 per year in open access fees, beyond the grant amount, for any researcher it supports. In the U.K., the Wellcome Trust, a major research funder, has taken a number of initiatives to support open access fees. Other funders, both government and private, have indicated a willingness to allow the inclusion of publication fees in research grants.

Another source of author fees can be the author’s institution—especially if it is a university or research organization. One line of reasoning

is that open access journals significantly cut journal subscription costs and hence author fees represent a transfer of funds rather than an additional cost. Plutchak (2004) observes that a shift to open access could result in a shift in university budgets—moving money from libraries to support membership fees for OA publishing groups. It is not surprising that librarians, who consider their present budgets “under siege,” are not enthusiastic about this argument. Quint (2004) argues that in the short term, libraries must form purchasing consortia to combat the power of publishers, but that as open access grows, libraries that wish to keep their budgets will have to emphasize their service focus to their institutions.

Some open access publishers offer institutions “memberships” so that, in return for an annual fee, all authors who belong to that institution may publish without additional fee. In Europe, both the U.K. and Finland have announced membership participations that are national in scope. Memberships have proven to be an attractive option because the costs are known in advance and can be included in an annual budget. The problem that faces open access publishers is an institutional preference for a small number of agreements that cover a large number of journals. There is thus a clear advantage for publishers to form consortia—at least for marketing purposes.

Proponents of author charges for open access frequently argue that the major benefit of the publication of an article is increased prestige for authors, their institutions, and their funding agencies. They also note that, in some fields, authors who publish in subscription journals already bear the costs of page charges or added charges for color in pictures or diagrams. Thus, some authors already pay publication fees and seem to find them acceptable.

Author payments clearly impose a special burden on authors who do not have institutional support, and especially on authors from developing countries. Almost every open access journal has a policy of permitting authors to request that fees be waived. Some of these journals are careful to keep the author’s payment status unknown to referees to avoid introducing any bias. Clearly, fees must be set so that paying authors bear sufficient charges to cover those for whom the fee is waived.

The author-pays model of journal publishing raises the specter of the vanity press in which willingness to pay is the only criterion for acceptance. Journals that adopt an author-pays model tend to claim scrupulous attention to the refereeing and editorial control process. Critics warn that the temptation to increase income by accepting marginal papers presents a danger to scholarly integrity. OA supporters point out that subscription journals are susceptible to similar temptations to maintain their page counts or to use growth in the number of articles published to justify price increases.

If fees shift from information consumers to information producers, the economic burden of publication may become more concentrated in a

small number of universities and research centers. Plutchak (2004) provides a hypothetical example suggesting that a shift to an author-pays system could concentrate the costs currently spread over 1,000 institutions plus 1,000 individual subscribers to as few as 200 research institutions. Arguments about such extra charges have even been raised on a national level. Policy makers in the U.K. have noted that the country is a net exporter of scientific research. The implication is that many of those "exports" go to well-off countries that would disproportionately benefit from author/sponsor-funded publication (U.K. House of Commons. Committee on Science and Technology, 2004b). A similar fairness issue involves companies, especially those in pharmaceuticals and chemicals, who are heavy users of the journal literature. These organizations are well able to pay subscription fees, but under open access would be relieved of such expenses.

The literature on open access suggests additional sources of income besides author fees (see, for example, the publications of the Open Society Institute), some of which have already been mentioned. Even though these sources may be viable for some journals, there are very few examples among existing open access journals of anything except the fee-for-publication model and its cousin, the flat rate membership fee for all institutional authors. A variation on the author fee is to charge for each submission rather than each publication. Although this would have the effect of reducing fees for the most selective journals, it could be discriminatory against younger researchers who might have higher rejection rates.

Additional possibilities for income include advertisements or corporate sponsorships. Income could be generated from the sale of offprints or CD versions of the journal. But all of these possibilities represent special situations for particular journals in particular fields. It may also be that print subscriptions can coexist with online open access. As early as 1996, the Entomological Society of America began experimenting with electronic access to articles. Authors publishing in any of its four journals could voluntarily purchase immediate free Web access to other articles. The intriguing aspect of this proposal was that the price for immediate free access was set at 75 percent of the cost of 100 reprints—about \$90. The idea was that if the number of subscriptions fell, the fee would be raised. Thomas Walker (2001), a strong advocate for open access, announced the policy in *Nature* in 2001. Walker's (2003) Web site presents data showing that between January 2000 and January 2004, the fraction of authors taking advantage of this opportunity rose from 13 percent to 66 percent.

The collection of micropayments, a small fee for each reading, from readers is contrary to most of the open access definitions that have been published. Thus, it is little discussed in the open access literature. Graczynski and Moses (2004) argue that author costs are too high and propose the use of such payments from readers to reduce them. Odlyzko (2003) summarizes a number of reasons why it is unreasonable to expect

micropayments to come into wide use. Odlyzko's arguments about the high costs of making multiple small payments may apply to employers who support author payments.

Key Perspectives Ltd. (2004) reported a survey of 311 authors split almost evenly between those who had published in open access journals and those who had published in conventional journals. The study presents a good history of open access and a very complete analysis of the survey responses. Commentators on both sides of the OA debate have already found support in this study. I would note the relatively high error in so small a sample (± 4.6 percent). The two author groups differ mainly in terms of: (1) their knowledge of OA publishing, and (2) their comfort with OA journal quality. An interesting finding was that only 4 percent of the OA authors paid their own fees. For the rest, fees were either waived, paid out of grants, paid by their institutions, or covered under membership agreements.

Concerns About Open Access

No one involved in the open access movement denies that, if carried to all scholarly journals, it would produce great economic, technical, and social shifts. The discussion between those in favor of open access and those concerned about the effects of changing the status quo has grown so heated at times that Kaiser (2003, p. 16) compares it to “estranged lovers fighting over child custody.” The following authors whom I present here are not alone in their concerns, but reflect some of the major issues that have been raised. Considerable debate has also arisen about whether open access would actually improve matters for developing countries. Some scientists have argued that they would feel stigmatized in asking to have author fees waived. Others have noted that, in many regions of the world, Internet access is expensive, undependable, or even nonexistent—so open access would represent no access in these regions.

In an editorial in the *Journal of the American Medical Association (JAMA)*, DeAngelis and Musacchio (2004) argue against the author-pay system, noting that *JAMA* accepts only 8 percent of submissions, thus placing the cost per article published well over the frequently quoted estimate of \$1,500 per article. They express concern that such a system favors authors with the means to pay and might tempt journals to accept more papers (thus lowering quality) in order to increase income. They also set out *JAMA*'s plan to increase access under the current subscription model by (1) providing immediate free access to one major article per issue; (2) providing free access to all major articles and editorials that are between six months and five years old; (3) unlocking online article PDF files so that readers can highlight and annotate the copies that they read; (4) providing 25 free accesses (a kind of online offprint) for authors who reside outside of the United States; and (5) Participating in HINARI, the Health InterNetwork, which provides free and low cost access in the poorest countries (<http://www.healthinternetnetwork.org/src/eligibility.php>).

Held (2003), in an editorial in the *Journal of Cell Biology*, warns that attempts to pressure all journals into the open access format are premature. In particular, he is responding to the "Public Access to Science Act" (H.R. 2613) introduced into the U.S. House of Representatives by Martin O. Sabo (and since withdrawn). Held considers the open access model economically untested and perhaps unsustainable. He notes that many journals, in addition to scholarly reports, also publish news and commentary, which are valued by the scholarly community. The authors of these portions are paid for their work, but most proposals for open access ignore this cost component. He notes that the Rockefeller University Press, of which he is executive director, works with other medium-sized publishers to make content available electronically through HighWire Press. Finally, he warns that allowing authors to retain copyright would complicate obtaining rights for further dissemination and might lead to "misuse of the materials by third parties or commercial organizations."

Babbitt, in 1997, predicted the demise of open access journals, noting that many of the current open access journals are supported by subsidies either from foundations or from universities. He also expressed concern that the enthusiasm that leads creators of open access journals to contribute great amounts of time and effort will not be sustained as the founders need to be replaced. Manuscript preparation by authors is likely to be erratic, and this will either require significant editing and formatting costs or compromise the appearance of the journals.

Although generally in favor of open access, Björk (2004) concludes that progress toward open access has not been as fast as many had earlier believed. In particular, he identifies the most difficult problems facing OA journals as the academic reward system, business models, and marketing and critical mass. The latter two can be seen as related. He notes that many business plans depend on volunteer labor and informal employer support. Both of these will be stressed if a journal grows, thus inhibiting strong marketing and economies of scale. He finds that there have been fewer barriers to the growth of repositories, although he notes that individual archiving is still the most common form of open access.

Ewing (2002) argues that present publishers are too well entrenched and that they will be able to make adjustments to their pricing and access policies that will allow them to retain their dominant role. One of the difficulties with any balanced presentation of open access is that many of those raising objections to OA are directly involved in the publication of subscription model journals. If we wish to believe that all such commentators are self-serving and seek only to preserve their lucrative positions in the status quo, they can be easily dismissed. On the other hand, it would seem unwise to so glibly dismiss the views of individuals with so much experience in the journal publication process.

Finding Archived Material

Fundamental to the success of individual, organizational, or topic-focused archives is the ability of potential readers to find the materials they want. In this respect, the most commonly used resource, the Web search engine, is not adequate. In the first place, there may be a considerable delay before the site is revisited by the search service's robot. In the second, the vast size of the Web means that unless the readers have at least an author and title, they will be unable to find the item. Even worse, a subject search, rather than one for a specific item, will be overwhelmed by pages that are not scholarly publications. Google's (2004) introduction of the Google Scholar search service, which is aimed at locating scholarly materials on the Web, is a strong positive achievement with respect to this problem.

The Open Archives Initiative (OAI) has been a leader in setting standards to facilitate indexing and retrieval of materials in scholarly archives. Its approach has been twofold: First, it has worked cooperatively with other organizations to develop standards for including descriptive metadata (think of indexing information: author, title, etc.) as a part of each deposited document. Second, it has developed standards (protocols) describing how a Web server that hosts archival papers can interact with a program that collects metadata to use for creating indexes. Such a collection program is called a "harvester." An important aspect of the OAI approach is that archive operators may make metadata available (the term used is "expose") without the requirement of providing free access to the actual document. In the words of the Open Archives Initiative, "open is not the same as free."

If search engines for archived materials are to work effectively, the metadata for the individual articles must be consistent and of high quality. The metadata standards are based on a limited subset of the Dublin Core. These are standards familiar to catalogers and so, in many universities, the library participates in preparing materials for the institutional online archive.

The OAI standards have made possible a number of indexing projects to locate scholarly material on the Web. The University of Michigan Library (2004) runs the OAIster Project, which shares its indexing with Yahoo!. The most comprehensive source for locating open access journals is the Directory of Open Access Journals run by Lund University Libraries (2004). J-STAGE (<http://www.jstage.jst.go.jp/browse>) serves as both a search service and an electronic publisher for materials from Japan. Similarly, SciELO (The Scientific Electronic Library Online; <http://www.scielo.br>) provides indexing and access for scholarly work from Brazil as well as other South American and Caribbean countries.

Copyright and Ownership

The principal question involving copyright for both open access publishers and archives designed to support open access is, how can the legitimate rights of the author be protected while advancing the intention of open access to provide the maximum possible utility to the scholarly community? The obvious answer, and probably the one most frequently used, is to allow the author to retain the copyright and to give the journal or archive a nonexclusive perpetual right of distribution.

The problem of leaving copyright in the hands of individual authors is that it may limit future use of scholarly works because it may be hard to locate living authors and even harder to locate heirs to obtain permission for further use. Thus, if one accepts the broadest definition of open access, a document that is under copyright is not a completely open access document.

One of the organizations that has been addressing this problem is the Creative Commons. This organization has used the Free Software Foundation's GNU General Public License as an inspiration. The Creative Commons' slogan "Some Rights Reserved" is a focus of their efforts to provide more user-friendly forms of authorial protection than copyright law. By developing standard language and clear, nonlegalese explanations, the Creative Commons makes it easy for authors to automatically "give away" rights such as nonprofit copying, while still retaining some copyright control. Authors can link to the appropriate Creative Commons' Web page, or provide the link as metadata, to give readers a standard statement of which rights are automatically licensed and which are reserved. This makes it much easier for metadata harvesters to track the rights information for each document. More recently, Creative Commons has begun to explore the possibility of a Science Commons (<http://science.creativecommons.org>), which would encourage sharing not only of published articles, but a great deal of other information produced through scholarly research.

A developing issue in copyright is the ownership of databases. Legislation has been proposed in the U.S., but is further developed in the European Union, to protect database content. This has caused concern, such as that articulated by Elliott (1997), that legislation that is too broad may prevent the open sharing of metadata from scholarly archives. The RoMEO project (Gadd, Oppenheim, & Proberts, 2003) addresses both the issue of protecting metadata and the articles themselves.

Organizations Supporting Open Access

Many organizations have lent their support to open access and the movement continues to grow. Any attempt to list even the major supporters is certain to have omissions. I apologize for these in advance.

The *Open Society Institute*, a philanthropy of George Soros, has committed to a multimillion-dollar investment in the promotion of open access journals. The institute organized the conference that produced the Budapest Open Access Initiative (BOAI). The BOAI model (whose definition of open access is quoted here earlier) views open access journals as completely free to readers and thus subsidized by a combination of author charges, advertising sales, sponsorships, and other support.

One of the significant contributions of the Open Society Institute (2003a, 2003b, 2004) is the set of three documents that are guides to creating business plans for open access journals. These documents, prepared by Raym Crow and Howard Goldstein of the SPARC (Scholarly Publishing and Academic Resources Coalition) Consulting Group, are an extremely comprehensive discussion of a wide range of alternatives and recommendations for those creating and managing open access journals. The strong point of these reports is their attempt to be comprehensive in laying out funding alternatives and discussing the realities of planning and operating a successful business venture. On the other hand, recognizing the vast differences among scholarly fields and the many national economic situations, the guides have little in the way of actual figures for either costs or income. Although the three documents total over 160 pages, there is considerable redundancy within them, and a reader can skip considerable portions. The guides provide extensive links to other available resources.

The Wellcome Trust (2003) has produced a thorough discussion of the current state of scientific journal publishing. This report covers not only economic issues, but the roles of scholarly journals, guidance for those who wish to develop advocacy organizations for open access, and summaries of the varying views of the many OA participants. One interesting point made in this report is the description of scientific research as a “public good.” A public good, as defined in this document, is something that is of value to the public but whose value is difficult either to assess or to allocate to individual people. For example, medical research benefits a great number of people in largely unpredictable ways. Further, the benefit that a person receives from medical research is not traceable to how much they contribute to it. In such a situation, individuals may benefit as “free-riders” by not providing any support. The report notes that in situations of public good, the costs are frequently distributed widely over the population through taxation.

The *Public Library of Science* (PLoS) approaches the idea of open access by trying to create new journals of the highest possible caliber in biology and medicine. Under the chairmanship of Nobel laureate Harold Varmus, this organization has launched *PLoS Biology* and *PLoS Medicine*. These journals have editorial boards of high international standing as well as the ability to attract papers from some of the best researchers. The principal objective is to help to dispel any doubts that scientists may have about the inherent quality of journals published under open access. In addition, PLoS hopes to lead by example,

producing financially viable journals based on an author-pays model. Currently the fee is set at \$1,500 per accepted article. Although it explicitly denies any desire to compete with journals published by professional societies, PLoS is clearly sending a message to commercial publishers that there may be an effective competitor to journals with high subscription prices.

SPARC (<http://www.arl.org/sparc>) (Case, 2002) is not an open access organization. Rather, it is an umbrella group for publishers—especially those wishing to start new journals. Its aim is to assist with pooling resources and experience in order to keep journal costs as low as possible. Johnson (2002, p. 648) characterized the formation of SPARC as “built as a response to market dysfunctions in the scholarly communication system, which have reduced dissemination of scholarship and crippled libraries.”

Within this organization some members do offer open access journals, whereas others use the traditional subscription model. SPARC encourages the creation of both electronic journals and repositories. It has produced a detailed manual to aid in planning such ventures (Scholarly Publishing and Academic Resources Coalition, 2002). SPARC has also supported and encouraged the formation of electronic depositories for use by journals that are mainly distributed in print. BioOne aggregates articles from dozens of journals in the biological, environmental, and ecological sciences. The strong ties between SPARC and the Association of Research Libraries builds confidence in associated fledgling publishers that their new journals will be noticed by libraries and considered for acquisition in a timely way.

PubMed Central is an electronic archive of journal literature in the life sciences. It is operated by a division of the U.S. National Library of Medicine (NLM). The service is offered to journals, not yet to individual authors, and a journal must include at a minimum all of its primary research content. Journals may delay public release of their material for a year or more in order to preserve value to their subscriber base. To qualify, an established life sciences journal must be currently indexed by a major abstracting and indexing service. New journals may qualify if at least three editorial board members are funded as principal investigators on research grants from a major funding agency. Only English language materials are accepted at present.

The principal value to participating journals is that PubMed Central assumes responsibility for the long-term preservation and accessibility of articles. A second significant advantage is that PubMed Central journals are indexed in the NLM's popular PubMed search service and in the other search services that make up Entrez. PubMed Central's use of standardized formats makes it easy for metadata harvesters to collect indexing information for display on other search services. Clearly, both functions would be of significant value to an open access journal. The major cost of participation is the development of the ability to submit text in an acceptable Extensible Markup Language (XML) of Standard

Generalized Markup Language (SGML) format and to transmit images as either Tagged Image File Format (TIFF) or Encapsulated PostScript.

Developing Trends

Any author trying to judge the important events in the history of a movement while that history is still unfolding is likely to provide ample space for his own future chagrin. Yet, it seems to me that two events in 2004 have lent considerable momentum to the open access movement. These are: the evidentiary hearings and subsequent report on open access of the U.K. House of Commons Science and Technology Committee (2004a, 2004b, 2004c, 2004d, 2004e, 2004f), and the proposal by the U.S. National Institutes of Health (NIH) (2004) that all research publications funded by it should become open access within six months.

The extensive hearings and final report of the House of Commons Science and Technology Committee gathered information on many aspects of the OA debate. Some of the evidence submitted to the committee has been mentioned earlier. BioMed Central (2004) responded to some of the testimony against open access, characterizing it as “myth.” The report of the House of Commons Committee agrees that the current subscription model restricts access to research and recommends that the government create a network of freely accessible repositories and require that all publicly funded researchers deposit copies of their articles. The report, however, is not an unqualified endorsement of open access journals, noting that the change to open access would have uncertain and perhaps negative consequences, perhaps weakening learned societies and decreasing the number of high quality scientific publications. The response of the U.K. government could be generally characterized as negative. In most cases the government does not see either a serious problem with the present publication system or the need for increased government support of open access or archiving (U.K. House of Commons. Science and Technology Committee, 2004b).

The debate on open access became considerably more intense when the U.S. National Institutes of Health proposed that electronic versions of all publications based on NIH funded research should be submitted to NIH and then be made freely available through PubMed Central not more than six months after publication. The NIH notice goes on to suggest that those seeking new or extended grants provide links to their work as archived in PubMed. One paragraph also warns investigators not to incur unreasonable or disproportionate charges from publishers. I take this also to be a warning to subscription-based publishers not to institute high-price open access options. Language mandating this policy was written into the appropriations bill for 2004 and passed by the House of Representatives, but the Senate did not concur. It remains to be seen whether the traditional subscription publishers have sufficient political capital to turn back this movement. So far, the main function of both of these developments has been to greatly increase the visibility of

the open access movement and to provide proposals that can be a concrete focus for both sides of the debate.

Concluding Remarks

It is not possible to conclude this chapter by synthesizing both the promises and problems of open access and coming to a conclusion about its future. That future is being created even as this is written, and the final outcome remains uncertain. It is clear that the necessary conditions for a publishing revolution are in place. There are organized battalions of angry librarians. Editors, board members, and referees have thrown their shoes into the machinery of for-profit publishing. Subversive authors are archiving their articles. Organizations in many countries provide advice and economic support. The first free enclaves of open access publishing have been established and have raised their banners as rallying points.

Against this, we must admit that, in its present form, the journal has served the cause of scholarly communication long and well, and continues to do so today. Publishers, both for-profit and nonprofit, not only have strong vested interests in the status quo—they have the economic resources to defend those interests. Editors and editorial boards see the value of their own contributions and find that these outweigh somewhat inflated journal prices. Successful scholars have come to depend on the present system for recognition and new scholars hope to do the same. University administrators and research funders understand present financial allocations and are not anxious to venture into the confusion of reallocation.

There is an old environmentalist slogan, “Think globally, act locally.” The success or failure of the open access movement will depend on the local actions of individual researchers. Scholars will vote with their paper submissions, with their archives, and with their participation in the publication process.

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