

Scholarly Associations and the Economic Viability of Open Access Publishing

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Abstract

The information landscapes within which scholars work is undergoing a seismic shift. The computer monitor that rises out of the photocopy stacks, piles of journals, clippings and correspondence, now offers a new, rich vein of information that seems destined to eventually overwhelm the traditional trappings of desktops, filing cabinets, and bookshelves. After little more than a decade of Internet publishing, two-thirds of academic journals provide online access, while more than 1,000 peer-reviewed journals are published solely in digital form (Tenopir and King, 2001). Faculty and students are increasingly writing with their browsers open to online research sources.¹

Introduction

In moving online, scholarly publishing appears to have taken the next in a long line of steps to increase the circulation of this particular form of knowledge. Yet rather than imagine, in this whiggish way, that advances in knowledge naturally unfold with each new communication technology, it is well to realize that the significant choices made by key players during the early and formative period of the technology will shape the future of each publishing medium. These choices for online publishing have now brought scholarship to a critical juncture. In a very short time, online



¹ On undergraduate writing, a recent study found that 80 percent of the college students used Internet search engines for every or most assignments, although half held that what they found online was not sufficient for their assignments (OCLC White Paper, 2002).

journal publishing has developed two distinct and opposed economic models, one commercial and the other not, even as this publishing is in the unsustainable position of publishing in both print and digital forms. It may not be too much to say that the public standing of academic knowledge depends on which economic model will prevail, that is, on the publishing decisions that scholars and scholarly associations 'no less than related organizations such as foundations, think tanks, institutes, government agencies and other non-profits' make over the next decade.

The commercial model certainly has continuity on its side. It carries the long-standing tradition of subscription fees for journals into the online environment. It is adhered to by both the non-profit sector, represented by the scholarly societies and university presses for the most part, and by corporate publishers. The corporate sector has integrating online journal archives across a great number of titles, with sophisticated indexing, through such services as Reed Elsevier's Science Direct, with 1,500 of its scientific, technical, and medical journals, or Ingenta, which serves some 200 publishers. This integration of scholarly resources has profited, in part, from increasing corporate concentration within academic publishing over the last two decades, led by Reed Elsevier, Kluwer, Springer, and Wiley in the sciences. In addition, many scholarly societies have turned their publications over to the corporate sector, in part, out of a demand for electronic editions.² There have also been cooperative efforts, within this commercial model, perhaps best represented by the innovative Crossref, which is a 'collaborative reference linking service' that enables a reader to move from a bibliographic entry in an article to the work cited. Crossref currently involves 6,809 journals and 5.1 million records from 147 journal publishers, including scholarly societies and commercial operations.³ This ability for the reader to move so readily from reference to reference among close to seven thousand journals is undoubtedly a great boon to scholarship. Access to the journal articles is restricted to journal subscribers, including members of subscribing research libraries, with pay-per-view services available for those journals to which one does not have subscription access. Clearly, this is a

² In terms of scholarly associations turning to commercial publishers, 10 of Elsevier's 13 new acquisitions and launches in 2001 were drawn from scholarly societies, while 10 of the 35 new titles Sage Publications for 2002 represented 'society contracts' (according to their respective websites). Theodore Bergstrom reports that in 1960, the 300 economic journals of the time were almost entirely non-profit, while by 1980, half of the then 120 journals were published by commercial concerns, and by 2000, that proportion had risen to two-thirds of the 300 journals (2001, pp. 9-10).

³ Crossref (<http://www.crossref.org>).

considerable extension of what was available through print, not just in the convenience of not having to get up from the computer and visit the library stacks, but in the way it encourages one to trace out the flow of ideas from article to article at least within this Crossref circle of citations.

Elsevier Science Chairman Derk Haank is rightly proud of running a company that is 'making scientific information more accessible to the community at large than ever before' (Publishers' Products, 2002, p. 3).⁴ At the same time, however, the corporate incursion into academic publishing, which began some decades back, is being held responsible by the research library community for a six percent reduction in the serial holdings over the last decade due to increased costs.⁵ Recent moves to electronic editions of journal titles has only added to subscription prices (although many of these services were initially free). While corporate publishers, as well as scholarly societies, are bringing this commercial model to this new publishing medium in ways that certainly extend and improve the circulation of scholarly work, library collections continue to suffer, while those in developing countries have been decimated (with some charitable relief). The only way forward, economically, is to drop the journal's print edition, which brings me to the second model for online scholarly publishing.

The second economic model is known as 'open access' publishing, and is thoroughly digital and decidedly non-commercial. With support from grants, scholarly associations, institutional support or author fees, open access publishing utilizes the reduced costs of publishing in electronic formats alone to make journals and other online research resources free to read. In some cases, those operating open access sites do so in revolt against inflated subscription costs for journals, but more it is the work of those who simply took advantage of

⁴ It is worth noting that in 2000, Elsevier invested \$30 million in its electronic publishing activities and systems (Haank, 2001). While this may seem to speak to such online systems need for deep corporate pockets, the open source software movement stands as the greater counter-instance as its showpiece Linux proves itself a viable alternative to Microsoft windows (Lerner and Triole, in press).

⁵ See Association of Research Libraries website (<http://www.arl.org>). The economist Roger G Noll points to how reductions in journal circulation, brought about by the proliferation of titles over the last few decades competing for a limited number of readers, drive up subscription fees to cover publication costs (1996, p. 11). This creates the situation of more knowledge resulting with this commercial model in less access.' Noll also observes the cost of these increases: 'In addition, the high institutional price causes institutional libraries to be far smaller than would be socially optimal. Of course, for publications in science and engineering, this inefficiency ripples throughout the entire economy, for it means that education, applied research and development, and direct diffusion to the production of goods and services will proceed at a slower rate than otherwise would be the case' (p. 12).

this new digital delivery system to share their work in the easiest, fastest, and most open manner possible.

Every discipline now has its own open access journals, and major open access text archives are to be found in many areas, such as Project Gutenberg, a public domain archive that dates back to 1971, and Gallica put up the France's National Library. Open access indexing services are also available, including the computer corporation NEC's ResearchIndex in the sciences, the National Library of Medicine's PubMed in the life sciences, and the National Library of Education's ERIC in education.⁶

Some e-journals provide partial open access, beginning perhaps a year or more after initial publication. This typically comes from scholarly societies which are trying to protect the subscriber's exclusive privilege of access. Other journals offer open access to developing countries. The prospects of open access publishing for research has inspired the formation of a Public Library of Science, which initially called for a boycott of non-open access journals and, seeing that call do no more than gather signatures from around the world, is now seeking to publish its own open access journals. In terms of the scholarly recognition garnered by open access materials, compared to other forms, there is at least one study that finds it considerably more effective in garnering citations for the authors of peer-reviewed computer science conference papers than comparable works found only in print, (Lawrence, 2001). Further comparative studies are obviously needed and are bound to be forthcoming.

This approach to publishing has also found support from the Association of Research Libraries, through its SPARC program, and more recently, from the Budapest Open Access Initiative, sponsored by the Soros Foundation, which is offering grants to open access journal initiatives in less-developed nations.⁷ Open access journals are financed through author fees and institutional memberships ' as is the case with BioMed Central ('a new commercial publishing house designed to complement PubMed Central') which offers open access to more than 50 journals ' and through society sponsorship, as with the British Medical Association's British Medical Journal.⁸

⁶ One measure is provided by Highwire Press (operated by Stanford University Library), a leader in electronic journal publishing in sciences and medicine, as 125 of the 336 electronic journals it publishes offer free access to back issues, while 15 journals offer complete open access. The influence of greater access is being felt in the commercial sector as Elsevier's ScienceDirect now offers open access to its abstracts with full texts available through Pay per view.

⁷ The Scholarly Publishing and Academic Resources Coalition (<http://www.arl.org/sparc>) and Budapest Open Access Initiative (<http://www.soros.org/openaccess/>).

⁸ British Medical Journal (<http://bmj.com>).

The Scholarly Society

A key player in deciding which economic model will prevail may well be the non-profit scholarly association or learned society. The scholarly association has long been at the heart of academic journal publishing and it now faces a critical decision around which path to take. Although many journals operate independently of these associations, these organizations represent the vast majority of researchers, reviewers, and editors, in their efforts to advance the state of scholarship and research. While many scholarly associations have turned their journals over to commercial publishers, a small, but still significant, number of associations are offering complete or partial open access to their publications.⁹ Either way, these associations are faced with a challenge in maintaining their membership rolls at a time of declining memberships across the society, with journal subscriptions a principal benefit of membership (Putman, 1999). In thinking about how they can increase their impact on their own discipline as well as on the larger community, I want to review the economic arguments here for considering open access publishing as a positive prospect for increasing the contribution and quality of research and scholarship.

It well to remember that the scholarly journal, a relatively late starter in print culture, began in association with the formation of scientific associations. To take the British example, Henry Oldenburg, Corresponding Secretary of the Royal Society, launched, at his own expense, the first academic journal in the English language, the *Philosophical Transactions of the Royal Society*, in 1665. In serving as Corresponding Secretary during the Society's earliest years in London, Oldenburg wondered whether having so much scientific information restricted to the circulation of letters among scientists was good for the current state of knowledge, even as Oldenburg worked hard to increase that circle of correspondents and the critical regard paid to the new ideas they introduced. So he turned to the newly developed form of the periodical. While it may have been some two hundred years after print technology had first been introduced by Gutenberg (itself a lesson for those impatient with the pace of change), it was only a few decades after King Charles I officially opened the royal postal service to the public in 1635, with the founding of the Letter Office of England and

⁹ For example, the American Education Research Association (<http://www.aera.net>) offers complete open access to its monthly *Educational Researcher* and to none of its other journals; the National Council of Teachers of English (<http://www.ncte.org>) provides access to *Research in the Teaching of English*, *College English*, and its other journals, one year after publication; and the Institute of Physics (<http://iop.org>) provides the first 30 days after publication of free access to its 36 journals.

Scotland and the appointment of a Postmaster General for Foreign Parts. The enabling technology in this case was public access to an international postal system and concurrently the emergence of a periodical literature, both of which contributed greatly to the quality of public knowledge. Although Oldenburg was unable to make a financial go of the Transactions, the Royal Society picked up the publishing of the journal, after it had lapsed for a few years, as it was clear that this open and public scrutiny of science only augmented the quality of the science, while expanding the interest in and support for it.¹⁰

Although the publishing of research largely fell to researchers, there were rare exceptions, such as with the chartering of the American Historical Association by Congress in 1889, when provision was made for both free office space and the costs of publishing its annual reports (Coats, 1975, p. 1701). Far more commonly, scholarly societies have financed their journals by a combination of membership fees and library subscriptions. In investigating this issue of open access publishing, I have been advised more than once that the revenue from journal subscriptions are a financial mainstay of the association. Many associations have ridden the growth in higher education and library budgets to a publishing surplus; they have found their place as publishers within what has been estimated to be a \$8 billion worldwide. How is it, then, that I can ask that these associations to give serious consideration to open access publishing, as both a membership service and a contribution to a greater public good? It is not enough to hold up the sterling instances of the British Medical Association or American Educational Research Association. The case needs to be based on a growing awareness of the options available to scholarly associations amid shifting political economy of scholarly publishing.

It is true that there are still many faculty members who prefer their journals in print form, just as many take pleasure from seeing their articles published on good stock in well-bound volumes, as well as having office bookshelves in color coordinated journal sets that serve as standing monument to an academic career. And if the system could sustain multiple publishing formats of the highest quality for these relatively small-run journals, this would not be such a bad thing with one format for rapid searching and linking, one for comfortable after-dinner reading on the porch. Yet current redundancies in services have contributed to what is an untenable and unsustainable financial

¹⁰ The Royal Society currently publishes Transactions A and B, as well as Proceedings A and B, with a total annual subscription fee of approximately \$5,000 for both print and online versions. The Society does provide open access to issues between 1997 and those published at least two years ago, while the complete archive, from 1665-1996, is available to institutions through subscription to JSTOR.

Table 1. Annual publications costs and revenues of a selection of American scholarly associations, in 1999 or 2000

Scholarly Association	Member-ship	Total Revenue	A. Publication Revenue ^a	B. Royalties	C. Publication Costs	D. Revenue over Costs
Academy of Political Science † *	10,000	679,894	12,128	16,434	265,878	(237,316)
African Studies Association	1,600	482,482	41,676	0	429,131	(287,455)
American Anthropological Association † *	6,000	4,680,764	637,950	6,679	790,133	(145,504)
American Astronomical Society *	2,400	8,255,845	6,055,176 ‡	0	5,834,020	221,156
American Educational Research Association † *	28,300	5,462,350	591,011	27,744	823,538	(204,783)
American Economic Association *	18,000	4,501,541	1,685,640	0	3,974,715	(2,289,075)
American Fed. for Medical Research	3,500	904,399	73,084 ‡	70,139	231,401	(88,178)
American Historical Association *	7,000	3,377,258	721,115	22,464	1,059,900	(316,321)
American Political Science Association	10,500	5,994,628	126,740	119,906	853,206	(606,560)
American Psychological Society † *	8,300	2,248,227	211,648 ‡	0	328,765	(117,117)
American Society for Cell Biology *	4,400	4,718,681	1,228,161 ‡	121,767	1,195,934	153,994
Am. Soc. for Information Science *	3,300	1,111,006	153,314 ‡	0	213,923	(60,609)
American Soc. of Human Genetics	2,700	3,203,602	1,251,617 ‡	66,831	1,120,170	198,278
American Studies Association *	3,300	653,727	194,683 ‡	691	201,262	(5,888)
Cognitive Science Society † *	1,200	109,687	3,496	1,892	83,152 ^b	(77,764)
History of Science Society †	3,000 ^c	99,825	201,500 ‡	0	141,007	60,493
Inter. Assoc. for Feminist Econ. †	500	0	0 ‡	6,872	71,718	(64,846)
Linguistic Society of America *	7,000	709,520	5,319	29,801	228,526	(193,406)
Microscopy Society of America †	700	1,058,897	74,187 ‡	0	94,314	(20,127)
National Reading Conference	1,000	302,964	76,809	29,888	84,557	22,140
Radiation Research Society † *	1,100	919,855	497,085	0	347,595	149,490
Averages	5,878	2,362,777	659,159	24,815	874,897	(190,924)

Note: Data drawn from Internal Revenue Service Form 990 for 1999 or 2000, available from Guidestar.org. Membership numbers are an approximation based on total membership dues divided by individual member fee levels (not shown).

^a. Publication Revenue does not include membership dues, while Total Revenue does.

^b. Combines journal and conference expenses.

^c. Includes institution and individual memberships.

† Data is from year 2000 IRS Form 900; all other associations have data drawn from 1999 IRS Form 900.

* Association's journal(s) available online through the University of British Columbia Library.

‡ Association's journal(s) published by university press or commercial publisher.

burden on the research libraries. The print version of the journal possesses an increasingly symbolic role, as researchers more often turn to the ready search and access of online editions without having to leave their computer screen.

Scholarly Publishing's Redundant Economies

The American Astronomical Society publishes three journals which, taken together, contribute \$5,834,020 in revenue to this non-profit society's total budget of \$8,255,845 for 1999 (see Table 1). The Society's two principal journals the *Astronomical Journal* and the *Astrophysical Journal* are published by the University of Chicago Press, while the Society itself publishes the *Bulletin of the American Astronomical Society*.¹¹ A membership in the AAS costs \$110 annually, and while that does provide a free copy of *Physics Today* and a number of newsletters, it offers no more than a greatly reduced rate of \$50 for electronic access to the two journals and bulletin.¹² In this transition period of overlapping publishing media, the AAS's journals demonstrate scholarship's double economy, by appearing in print and electronic formats, as well as in proprietary and open access forms.

Consider, for example, David Rusin's paper, 'The Expected Properties of Dark Lenses,' in a recent issue of the *Astrophysics Journal*. He submitted it to the journal in November, 2001, and on having it accepted in February, 2002, he then posted a copy to arXiv.org, E-Print Service. After taking the paper through the editorial process with *Astrophysics Journal*, which was to publish the paper in June, he then updated the arXiv.org version, on May 2 with the comment: 'Final version, minor corrections, 18 pages, ApJ June 20 2002.' What this meant was that the paper was simultaneously available in both the University of Chicago Press' *Astrophysics Journal* (in both print and electronic forms) and in the arXiv.org's E-Print Service. Further complicating this doubling up of scholarly publishing, a member of the AAS would have access to Rusin's article through their reduced membership rate as well as through the university library's subscription.

¹¹ The *Astronomical Journal* annual subscription fee is \$440 for both print and electronic versions, with electronic version alone is \$350, while and the thrice-monthly *Astrophysical Journal* has an annual subscription fee of \$1,525 for paper and electronic versions, with an additional \$250 for its Supplement Series.

¹² One serious limitation of print journals becomes apparent when you consider that for research libraries in Africa, for example, the airfreight charges for American Astronomical Society journals is more than double the cost of a subscription.) The Society does have a 'journal donation' program, in which members offer complete sets of the journals, covering various years, for the cost of shipping.

Nor does that exhaust the current redundancies within scholarly publishing economies. The scholarly index is not less critical to research, and it also has its duplications. On the open access side, Rusin's 'The Expected Properties of Dark Lenses' is indexed by arXiv.org, which provides the full text, and it has been indexed with abstract only in the NASA Astrophysics Data System (which sends readers to the University of Chicago's site for the Astrophysics Journal). It has yet to be included in NEC ResearchIndex, although other Rusin papers are included in this open access citation index, nor has it yet found its way into the principal proprietary citation index, namely, ISI's Web of Science, which also holds other works by Rusin.¹³ A place in both indexes, then, is likely for Rusin's article on dark lenses.

At a number of levels, then, scholarly publishing is suffering the move into a new world of digital publishing, with the sciences in the lead in both the commercial and open access development of electronic journals (and it would be hard to show this sort of duplication in the social sciences, outside of economics, perhaps). Some would hold that market forces will provide the driving evolutionary force for the future of scholarly publishing. Yet that hardly means sitting back and waiting for 'nature' to take its course. Certainly, far more than financial incentives are at stake in knowledge's vital need for circulation, exchange, and challenge within scholarship, as well as in knowledge's no less critical role as a public good. The commercial and open access journal publishing models are already affecting each other, rather than operating as two independent or competing choices. It may appear that the American Astronomical Society has decided on a commercial electronic publishing strategy with the University of Chicago Press. But the commercial model has obviously been compromised by the presence of open access publishing, suggesting that the Society's members and subscribers are paying for an exclusive service, even

¹³ ResearchIndex does have the distinct advantage over the Web of Science of being (a) free, largely as a result of its experimental status with the NEC Research Institute and its 'autonomous' ability to find and parse scientific articles on the web ' while the Web of Science may be one of most expensive serial acquisitions a library makes well into 6 figures ' (b) improving on citation indexing by providing a 100 words of context for each citation of a give paper such as Rusin's, as well as a similar context for each citation that he makes in his papers, and (c) providing access to the paper itself (Lawrence, Giles, Bollacker, 1999). Still, the automated processing of papers is by no means a reliable process compared to the handcrafted work of the Web of Science, and bibliographic information is often missing from the ResearchIndex while its collection is restricted to posted papers in certain formats. On the other hand, exclusions from the Web of Science, which rightly prides itself on its correcting the large number of errors in people's reference lists, are based on its highly selective processing of 8,600 journals, taking only 10-12% of the 2000 or so that apply each year for indexing, according to its website (<http://www.isinet.com/isi/hot/essays/selectionofmaterialforcoverage/199701.html>).

as its member-contributors have decided, in some instance, that it is in their best interest to provide the broadest possible access to their work.¹⁴

Scholarly Associations at the Crossroads

The open access model of scholarly publishing not only poses a serious challenge to the commercial publishers of academic journals. It would also appear to threaten the economic viability of the scholarly association. After all, the principal benefit of membership may well be the free or deeply discounted subscription, while selling subscriptions to research libraries and other institutions is a considerable and steady source of income for the associations. How, then, could open access publishing be a viable resolution of the double jeopardy that scholarly associations now face within this mixed economy in which authors need to publish in these journals, while seeking to make their work as freely available as possible? When the incentive for authors is to have the widest possible readership ' for building reputations, collecting citations, and testing idea ' how is it construed in the best interests of researchers to restrict access, if only for a year, to protect the exclusive privilege of subscription access that is largely available at any rate through the university library. A journal's high price, after all, has not proven to be a factor in its prestige, at least according Bergstrom's work with corporate and non-profit publishers of economic journals (2001). But then how is it a service to those members to keep the research from those who do not have access to a good research library?

One approach to thinking through the economics of scholarly association publishing is to examine the current publishing revenues and costs of the scholarly associations. To do this I have assembled this financial information for twenty U. S. scholarly associations, distributed across a range of disciplines, utilizing their recent tax forms which are available on the Web, supplemented by email correspondence with the financial officers of a number of associations (Table 1).¹⁵ Publishing revenues and costs, as reported in the tax forms, are not

¹⁴ While I am dealing here with the academic journal and scholarly association, for reflections on the impact of the commercial model on university presses and the open access prospects of faculty depositing their work in their respective libraries, instead of 'making public goods function in a commercial marketplace,' see Litchfield (2002).

¹⁵ The best source of financial data for American non-profit organizations, such as scholarly associations, is GuideStar which is run by Philanthropic Research Inc., whose mission is 'to revolutionize philanthropy and nonprofit practice with information.' It provides a scanned version of the Internal Revenue Form 990 (Return of Organization Exempt from Income Tax), a form that declares itself 'open to public inspection,' that must be filed by non-profit organizations

restricted to journals, but can include the sale of books and other materials. From the journal side of things, the costs include, as John J. Siegfried, Secretary-Treasurer of the American Economic Association, explained in an email to me, support of the editors, the editorial offices, copy-editing, composition, printing, and distribution. For those associations which turn to commercial publishers to produce their journals, there are a variety of arrangements which constitute publishing costs.

For example, the International Association for Feminist Economics has a contract with Taylor and Francis to publish *Feminist Economics*, in which the publisher charges the Association their 'publishing costs' minus 25 percent in return for the Association's endorsement and editing of the journal. The American Psychological Society, on the other hand, pays Blackwell a flat fee of \$20 per member for the publication of their two principal journals: *Psychological Science* and *Current Directions in Psychological Science*. Given a membership of approximately 8,300, the American Psychological Association pays Blackwell roughly \$166,000 annually (which amounts to roughly half the Publications Costs claimed on the Association's IRS Form 900).¹⁶ The sale of institutional subscriptions reduces the costs of the journals, in effect, for the association's members. The libraries, in effect, subsidize the member's purchase of the journal, even as the libraries provide members with access to the journals.

Within this complicated publishing context, the leading scholars of this process Carol Tenopir and Donald W. King (2001) have found that the reading habits of researchers have changed over the last few years. Scientists now do a third of their reading in electronic form, drawing on a broader range of journals than a decade ago, when they might typically read through a single journal. This online search and browse method also prevailed in the survey of a thousand plus scholars by the Association of Learned and Scholarly Publishers, just as it found that these scholars wanted journals to be free in the future (ALPSP, 2002a). Perhaps most significantly, Tenopir and King report that 'the average number of personal subscriptions per scientist has roughly halved over 20 years' (2001). But then some 40 years ago, it is worth noting, Fritz Machlup found that the number

with a revenue of over \$25,000. I did not include societies which have a large professional or non-academic components to their membership and mandate, such as the American Chemical Society, which has a revenue that exceeds \$300 million.

¹⁶ Elsevier charges the Cognitive Science Society \$36 per member for the journal *Cognitive Science* (which otherwise goes for \$140 for individual and \$335 for institutional subscriptions), while Kluwer charges \$50 per member to the Association for Computing in the Humanities for their journal, *Computing and the Humanities* (with annual subscriptions otherwise \$167 for individuals and \$411 for institutions).

of individual subscriptions had declined between 1966 to 1977 in five out of the six journals in science and technology he was examining, with the decline in institutional subscriptions going down for all six journals (1977, p. 224). Marchlup goes on to observe that the revenue from this non-institutional subscriptions did not decline, but actually rose between 76 and 167 percent due to price increases. Keeping in mind that from a researcher-as-author perspective, increased readership trumps increased revenue, none of this bodes well for the scholarly associations and their claims of member benefits. It also speaks to cracks in the journal system's reliance on a bundling of loosely related articles in a format that originally lent itself to the economics of periodicals.¹⁷

A member's journal subscription has always been a limited benefit, as the association's journal is also commonly available in the member's university library, a point compounded by the home and office desktop delivery of the library's electronic journals. The University of British Columbia Library, for example, provides me with online access to journals from 13 of 20 scholarly societies in Table 1, and that number will only increase. Although most associations will continue to publish print versions of their main journals for some time, in my opinion, it is only a matter of time, given the greater ease of searching, the completeness of archives, the cheaper costs' advantages for both libraries and researchers' before this dual publication mode no longer makes any sense.

Once the scholarly association drops its paper edition, the primary advantage of a membership subscription evaporates, at least for those with access to the online resources of a research library. Membership in scholarly societies is going to have to be about something else besides subscription benefits to scholarly journals. Although associations may be tempted to deploy artificial schemes that ensure that the library's electronic copy does not replace the

¹⁷ While Pieter Bolman, Director of STM Relations at Elsevier Science, may contend that 'the prevailing view is now that peer review is rather meaningless without the context of a journal,' it is hard to understand why, when reviewers, who have always worked with individual articles, and readers are increasingly doing so, that the journal is the necessary or even best vehicle for scholarly communication (Bolman, 2002, p. 3). Bolman's more substantial point in his critique of arXiv.org-type self-archiving, that a scientific article is like a 'sworn statement' or 'affidavit' that 'cannot be withdrawn and for which the author has to accept responsibility for any errors it contains,' speaks as much to the scholarly society's role as to the publisher's, insofar as this affidavit approach requires an 'independent third party, which is responsible for maintaining its [the article] integrity, apart from making it available to the public in its most appropriate form,' as he goes on to say, conveniently dropping any notion that the journal is required for this sort of publication, 'i.e., on commonly accessible platforms, with linking and searching facilities that enable users to make optimal use for it' (p. 3).

member's copy ' by limiting the number of users of an electronic edition at any one time, as some publishers do ' my hope is that the associations will see the advantages of providing open access to their journals, not just for those scholars with access to substantial research libraries but to readers on a global basis.

The key argument for making the leap to open access is that the association publishes the journals as a service to a membership which constitutes the journals writers, editors, reviewers and readers. By increasing readership, through open access publishing, the association increases that service, especially if supported by improved online indexing services. Increased readership is in both the scholarly and financial interest of the researcher, in a way that keeping up the association's revenue or membership levels is not. That is, of course, because the authors have no direct financial interest, in the materials being published. They have signed their copyright over to the association or to the commercial publisher, which have contrary interests in restricting access at least as it can drive revenues up.

As the subscription advantage of membership has already begun to disappear with the availability of the library's online copy, I ask that scholarly associations recognize the writing on the screen. The commercial model has been undermined by open access resources in ways that serve authors better. So why not take advantage of the new technologies to reduce publishing costs and utilize 'open source' software development to reduce software costs in order to offer their authors a wider readership and a greater contribution to the public good on a global scale? I fully recognize that there is a danger here, namely, that members may decide, when membership renewal time rolls around for them, to leave it up to their colleagues to finance this altruistic gesture of open access by sustaining the organization, while they ride for free.

This can be countered, to some degree, by other membership benefits (and revenue streams) such as the scholarly conference. Some associations require contributors to their journals to be members. Membership and participation in a scholarly society also speaks, however, to faculty establishing a professional community service and leadership component to their careers. The Stanford e-journal user survey, eJUS_t (2002), with over 10,000 participants, found that the 'most popular reason for joining societies was to support the society's mission, but the second and the third most frequent motivations given were economic benefits'receiving journals free or discounted with memberships and attending conferences at a reduced rate.'

Joining an association is also about building connections and points of collaboration. While the associations are unlikely to increase membership fees to cover the loss of publishing revenues and memberships, it may be possible for the scholarly associations to maintain current fee structures (currently between

\$60-200), on the grounds that the association represents the discipline's future through its journals and conferences, and that' this new approach will only increase readership and contributions by serving a larger community in, for example, the developing countries.

In looking at the financial picture for this sample of associations, on average the associations brought in \$659,159 in publication revenue (which does not include membership fees), with a range that extends from the Cognitive Science Society's \$3,496 to the American Astronomical Society's \$6.1 million (Table 1). These two extremes make it clear that membership numbers are not related to financial state, when one compares the CSS's 1,200 members to the AAS's 2,400 members. What matters for revenue, obviously, is the selling of subscriptions, with the charges running much higher than membership fees. The AAS would appear to be serving ' the 36 issues a year of the *Astrophysics Journal*, along with *Supplement*, and quarterly *Astronomical Journal* ' an author- and reader-ship that extends well beyond its membership. It might be construed as a publishing enterprise in partnership with the University of Chicago Press, at least in contrast to, say, the American Educational Research Association, with 26,000 members and \$1.7 million in publication revenue from its four quarterly and one monthly journals. These associations, then, have very different relations to market and membership, making it hard to come up with a single economic analysis of the contrast between commercial and open access models. Still, the figures provide some sense of the money at issue.

At first blush, open access publishing would seem to eliminate the scholarly association's publication revenue. In doing away with subscription fees, the association must turn to other sources, as well as enacting considerable costs savings. One way of thinking about this loss of publication revenue is to look at making it up in cuts in publication costs. If a \$100 is lost in subscription revenues with open access publishing and as much is cut from publication costs or made from a different source, the net effect is no change to in the association's resources. As it turns out, the average publication costs is \$874,897 (including newsletters, brochures, etc., as well as the journal), while the average publishing revenue recouped by the associations is \$659,159. That is, publication costs exceed revenue from subscriptions for the 20 associations considered here by, on average, \$190,924. And while six of the associations did realize a profit (from subscription fees and royalties alone) from this commercial model in 1999 or 2000, this was not the case for 70 percent of the associations for whom subscription revenues did not catch up with costs.¹⁸ That publication costs

¹⁸ It is worth noting that the American Astronomical Society's clears \$221,156 in subscription revenue above its publications costs, which is the largest 'profit' among the sample of associations

typically exceed subscription revenue does not represent a loss, per se, as the association's membership fees more than make up the difference in most cases.

Yet what this finding points to is that associations may be able to make up for the loss of subscription revenues, in an open access model, by reducing their publication costs by an amount equal to this loss of revenue. This would have the net effect of leaving the association with the same bottom line as before. For the six associations, in this sample, whose subscription revenues actually exceed their publications costs, as well as for the Microscopy Society of America and American Studies Association, where the shortfall in revenue over costs is too slight even for electronic publication, the challenge of going open access is that much greater. And while the argument for going open access will never be strictly economic, there additional sources of financial support that can be tapped with open access publishing, which I will introduce shortly, but first let me consider the case for reducing publishing costs.

The Economic Viability of Open Access

The starting premise is that the journal's print edition goes the way of the illuminated manuscript (with perhaps not the same increase in art-house auction value). With the print edition gone, the scholarly associations will eliminate related printing, distribution, photocopying, postage, courier, and subscription management costs (Table 2).¹⁹ Further savings may be achieved through reduced journal management costs, achieved through the use of open source online management systems which, for example, automate much of the correspondence, while enabling the editor to personalize the standard emails.²⁰ And while larger

considered here (explained in part, perhaps, by membership fees not including free subscriptions). The Radiation Research Society does even better however, by making a 43 percent profit on its \$347,595 investment in publishing its monthly Radiation Research (annual subscription \$615), while the History of Science Society has a 42 percent return on its two quarterlies, Isis (annual subscription \$201) and Osiris (annual subscription \$50.50) published through the University of Chicago Press.

¹⁹ Annual postage costs of the Journal of the American College of Cardiology, for example, have been estimated at \$60,000-\$70,000 (Milstein, 2002), while a publisher's rough estimate of administration costs of a single paper have been put at \$500-\$1000 (Doyle, 2001 cited by Arms, 2002).

²⁰ Commercial versions of this software, at a cost of typically \$5,000 to \$20,000, with processing fees, generally \$12 to \$50 a manuscript, are being used by 30 per cent of journal publishers by one estimate (Milstein, 2002). Among open source management system for publishing peer reviewed e-journals, the Public Knowledge Project (<http://pkp.ubc.ca>), with which I work, freely distributes Open Journal Systems.

scholarly associations already have sufficient technical support and infrastructure in place to run e-journals with few additional costs, there is a move afoot for the libraries to take on this work as part of an 'institutional repository' initiative (Crow, 2002). The library, after all, has much to gain from open access publishing and the Association of Research Libraries have been active in supporting alternative publishing models.²¹

The recent 'institutional repositories' initiative of ARL's SPARC is directed at developing 'digital collections capturing and preserving the intellectual output of a single or multi-university community' that 'will form part of a global system of distributed, interoperable repositories that provides the foundation for a new disaggregated model of scholarly publishing' (Crow, 2002, pp. 4, 6). The proposal observes that 'library programs and budgets will have to shift to support faculty open access publishing activities in order for the library to remain relevant to this significant constituency,' and that this is 'a natural extension of academic institutions' responsibility as generators of primary research seeking to preserve and leverage their constituents' intellectual assets' (p. 20).²² The onus, however, is on the scholarly societies to reach out to the ARL and the libraries in asserting the disciplinary leadership for strong editorial and review services that could be distributed among these repositories.

As for the heavy development costs of new publishing systems and structures, the U.S. National Science Foundation already has a record of supporting the development of digital libraries, perhaps most notably in joining with the Department of Energy, and Los Alamos National Laboratory to provide \$300,000 annually to initially support arXiv.org (Kling, Spector, and McKim, 2002). The NSF has been further encouraged by the American Association for the Advancement of Science to 'fund experiments intended to bolster alternative

²¹ The 121 member libraries of the ARL currently spend \$500 million annually on journal subscriptions, and the savings realized from a group such as this directly supporting a journal versus individual members subscribing to it, include costs associated printing and distribution, as well as the library's serial transaction, circulation, and storage costs. Whether the ARL could afford to carry the weight, as principle users of the journal, and allow the rest of the world open access has more to do with a moral appeal to closing access gaps than straight cost-benefit analysis. On circulation and storage costs, see Bowen (1995), while Kevin M. Guthrie (2001), president of JSTOR, comparison of costs for holding and providing access to 7,700 journals breaks down to a one-time costs of \$125,000 (library open stacks), \$31,000 (library remote storage), and \$25,000 (online JSTOR), with annual access costs \$65,000 (open stack), \$22,000 (remote storage) and \$4,000 (JSTOR), based on the JSTOR fee structure for medium-size institutions.

²² As to the cost of institutional repositories, the current answer is consistent with estimates in this entire area: 'Practically speaking, both development and operating costs can range from virtually no incremental costs (for institutions that reallocate resources) to hundreds of thousands of dollars (for institutions recognizing incremental systems and staff resources)' (Crow, 2002, p. 28).

Table 2. Savings with automated e-journal management systems, compared to traditional print journals

Stage	Agent	Automated and Assisted Journal Management	Savings
Submission	Author	a) Online upload in variety of formats, including 'camera-ready' tables and figures, as well as room for appendices, data, instruments, etc. b) Templates to assist authors indexing their papers by asking them to provide appropriate metadata	Clerical time, copying, postage, courier,
Submission	Editor	a) Author notified of receipt of submission b) Queuing for review	stationery, editor time
Peer Review	Editor	a) Maintain list of reviewers, interests, record b) Contact selected reviewers with abstracts d) Provide access to paper, and reminders e) Tracking review progress (viewable by author)	
Peer Review	Reviewer	Management of review comments and marked copy	
Editor Review	Editor	Author notification, with reviews (complete or excerpts) and judgment	
Revisions	Editor	a) Ready back and forth with manuscript b) Re-circulate paper to reviewers, if needed	
Editing	Copyeditor Proofreader	a) Editor and author ready access to manuscript, re queries b) Preparation of manuscript for publishing	
Layout	Editor	Revert to commercial software, such as MS Word, to convert word processed document to HTML. Including text, footnotes, references, appendices	Printing services, time
Publishing	Editor	a) Ability to include and order articles b) Volume and number assignment	
Distribution	Editor	Automated, email notification of contents for readers	Postage, packaging, time
Indexing	Author / Reader	a) Automated harvesting of each article's author-fed metadata by Open Archives Initiative engine creating a distributed global index. b) Citation indexes and tracking with hyperlinking of citations to sources and of article to materials in related databases, using metadata ^a	Indexing services (purchased separately by library), time
Interchange	Readers Authors	Posting of comments (with editor as moderator) for continuing open peer review, as well as online forum for continuing exchange on range of themes	Not otherwise available
Archiving	Host library and/or PKP	Server maintenance and backup, software upgrading/migration	Cataloguing storage

^a In development, see Public Knowledge Project (Willinsky and Wolfson, 2001), NEC's ResearchIndex (Lawrence, Giles and Bollacker, 1999), Citebase (Harnard, 2002), and BibP (Cameron and Tatu, 2000).

models of licensing and publication' with a goal of promoting 'wide access to and the preservation of scientific information in a cost-effective way' (Frankel, 2002, p. 25).

Would all of this ' from automated systems to funding and institutional support ' reduce an association's publication costs for the journals by 80 percent? One difficulty in answering this question is that journal publishing costs has

been notoriously difficult to calculate in any consistent way, and the estimates that can be found vary wildly.²³ Tenopir and King, for example, point out that electronic publishing, up to this point, has not meant a great saving for journals: 'Electronic access avoids these costs [or printing and distribution], but has a substantial additional fixed cost ' putting up full text on the web, staffing, software and other technology issues including design, functionality, searchability and speed' (2001). The difference, however, between specific print and electronic costs, which Tenopir and King point out, is that the printing and distribution costs are on a fixed, per item, basis, while software design and functionality, are within the open source software model, distributed and absorbed by the developers.

Given that the authors, reviewers, and editors already donate their time, and that universities contribute overhead, and add to the prospects of utilizing open source publishing software and library support for technical infrastructure, the principal fixed costs for publishing a journal remain copyediting and proof-reading (though these tasks are also done at some journals by the editors), which may amount to \$15,000-20,000 annually.²⁴ It may seem odd, and perhaps plain amateurish, to reduce the publishing enterprise to a series of editors running their journals from networked computers, whether in their office or in an airport kiosk. Yet one needs to factor in the prior investment in time and money that editors, authors, and reviewers ' as well as the universities that employ them ' have made in acquiring the basic skills, software and hardware that are required to run these systems (basically made up of word-processing, web-browsing, and emailing).

Beyond the cost-cutting and library support, a third approach to open access economics is provided by BioMed Central, which is able to offer open access to more than 50 e-journals by relying on author fees (\$500 for accepted articles), while also offering institutional memberships which cover the fees for

²³ On the range of estimated costs for e-journal publishing: (1) Gene Glass, editor of the on-line Education Review and the Education Policy Analysis Archives, estimated in an email to me in February 2001 that his publishing costs as "zero, nada, no budget, no grad assistant, no secretary"; (2) Ginsparg (2001) estimates that his arXiv.org's costs for authors self-archiving their work at roughly \$1-5 a paper, (3) the Chicago Journal of Theoretical Computer Science budgets \$2,070 per article, (Fisher, 1999), (4) King and Tenopir (1998) put the cost of electronic publishing is \$368 per page or about \$175,000 per year for an e-journal; and (5) the Electronic Publishing Committee (2000) at Cornell University estimated that it would cost \$2,700,000 to establish an electronic publishing program.

²⁴ For the average journal volume, consisting of 4 to 6 numbers and 1000 pages annually, copyediting costs (\$5-10 a page of manuscript) would be in the area of \$12,000 with proofreading costs (\$3 a page of galleys) of perhaps \$3,000.

the members institution's authors and provides support for publication. The 28 institutional members that currently belong to BioMed Central, which include Harvard, Columbia, and the World Health Organization, pay between \$1500 to something beyond \$7,500 annually, depending on the size of the organization. With author fees and institutional memberships, as well as website advertisement, the cost of running the journal is shifted to the individuals and institutions that utilize it to publish, or promote, their work.²⁵ While advertising revenue may be not viable for many disciplines, the author fee system needs to be considered, then, while allowing for exemptions based, for example, on developing nation status, as well as access to institutional or grant support, which can vary by discipline and type of institution. It remains among the most direct and efficient means of economic support, one that can be carefully calibrated to the needs of the journal to then offer authors what they desire, namely the widest possible readership.

Now BioMed Central has developed its own management and publishing software, as well as maintaining its own technical infrastructure and support, albeit a cost borne by the 50 journal titles. I am suggesting this expenses can be further reduced through open source systems of ongoing software development, accompanied by a similar consolidation of publishing activities among scholarly associations, with related collections or portals in the area of 50-100 journals ' perhaps with associated conference papers, forums and other association services ' which would still allowing for intellectual autonomy across a wide range of related divisions represented by ostensible 'journal' titles and editorships.²⁶ The distributed basis of networking allows local control and global integration, with shared resources and common standards that enable users to move seamlessly among sources.

Forming a consortia of open access publications around a single disciplinary focus (made up, say, of scholarly associations and independents journals) also makes forming a partnerships with an organization like the

²⁵ In terms of revenue, a typical BioMed Central journal publishes roughly 40-50 articles a year, generating \$20,000-25,000 in author fees, which is similar to the open access New Journal of Physics which also charges \$500 per article and has 17 societies supporting it. Advertising rates at BioMed Central run from \$5 a 'clickthrough' (for every time someone clicks on an ad) to 'supersize ads' that cost \$100 per thousand impressions, which could amounts to more than million dollars a year in revenue, given the site's million viewings a month.

²⁶ BioMed Central also represents a transition away from the very journal format for bundling articles. Although the site is organized around 'journal titles,' they amount to, in effect, generic topic divisions for the intersecting interests of biology and medicine, with BioMed Central, itself, acting as the organizing unit of continuous, rather than bundled, publication.

Association of Research Libraries that much easier.²⁷ The libraries have found the consortia an effective response to corporate concentration in academic publishing which is, itself, driven in part by the expense of providing web access and the value of integrating a good number of titles into a single system. The scholarly societies need to realize that this global communication system thrives on economic alliance and association, no less so for the public sector than for the private.

Conclusion

Open access publishing for e-journals is within the reach for scholarly associations, whether through the savings realized by dropping the print editions, direct forms of support provided by research libraries, charging author fees and institutional memberships, or a combination of all three. While open access is an economically viable alternative to the commercial route, the scholarly associations will still have substantial issues to work out, in dropping print versions, curbing the loss of membership, and settling contractual obligations to corporate and university presses. Still, if the scholarly associations are going to be able to make informed, if not enlightened, decisions, then these economic aspects need to be explored on an association by association basis, as do questions of intellectual quality, faculty members' careers, and responsibilities for contributing to a global public good. The associations need to understand the economic redundancies and general undermining of the commercial model already well underway. Compromises between the commercial and open access models may seem to resolve some of the redundancies. It is, after all, still open access if the journal archives are opened 6 months or a year after initial publication, or if open access is granted to developing countries.

Yet serious thought has to be given to nature of the privilege of exclusive access afforded by subscription which is being protected by this process. Scholarly associations need to consider that the general decline in faculty member subscriptions will be exacerbated by the greater access afforded by the digital editions provided by their research library, especially as those editions are integrated in larger systems of sophisticated access. By trying to protect the subscription privilege, if only with a six-month to a year lag time between subscription copy and open access, the associations are, in effect, doing a

²⁷ The importance of enabling independent journals, by keeping entry barriers low for new publications of scholarly quality has been identified by the American Association for the Advancement of Science report on scholarly publishing (Frankel, 2002, p. 7).

disservice service to their authors and editors and reviewers by further postponing widest possible publication, and giving their members a dubious privilege that has already had its exclusivity seriously compromised.

During this transition period of dual print and electronic publication ' which makes open access far more difficult to sustain ' the scholarly associations need to rethink their role and services, rather than holding on as long as possible to a publishing model whose time may well be passing. This is the time to bring the scholarly and economic, the ethical and intellectual, aspects before the membership, as the change in publishing mediums could well alter the nature of the scholarly association. Just as the individual subscription is a declining incentive, so many associations may need to think beyond the membership model and see themselves sustained by the services they provide through conference fees, author fees, and related benefits. BioMed Central has 50,000 registered users, which is perhaps a new model of membership and association forming around the sharing of knowledge, albeit without financial contribution. Another way forward, I am suggesting, is for the associations work in greater partnership together, to build a critical mass for electronic publishing, as well as for garnering support from the institutions which their disciplinary leadership and marshalling of intellectual resources ' whether through journals, conference, or other means ' so directly supports, namely, the universities and their research libraries. There is a need for disciplinary leadership around issues of access and ownership, not only in publishing, but in the sharing of data sets and related research databases to strengthen the quality of research and encourage the scientifically productive notion of an information commons against increasing efforts to privatize data (Reichman and Uhler, 2001).

The one alternative the associations are embracing which is moving their journals out of the non-profit sector and into the stable of corporate publishers, may well improve the quality of electronic access, as corporate publishers lead the way in bundled, integrated, and indexed journal systems. Yet this current advantage is already being challenged by open access disciplinary systems such as arXiv.org E-Print Archives in physics and RePEc in economics, always with the advantage of ultimately offering wider readership. Still much needs to be done on extending such projects as the Open Archives Initiative or ResearchIndex into global and universal standards for open access. And while those instances in which developing nations have been granted free access to electronic editions represents a triumph of technology, economy, and social conscience for the commercial model that was not even conceivable with print, there is reason, as well, to make this global public good accessible to curious and inquiring minds everywhere. Or as the American Association for the Advancement of Science would remind us, 'users' of scientific research include

'historians and philosophers, editors, consultants, students and educators, journalists, consumer advocacy groups, government regulators and policy makers, and members of legal community, as well as that diverse group we refer to as 'the general reader'' (Frankel, 2002, p. 8).

Fritz Machlup noted at one point, in his economic inquiries into scholarly publishing, that 'in a wide sense of the phrase, any activity is 'economically viable,' if its product is promoted to the ranks of public good and its cost is borne largely out of public funds, such as an actual or potential tax revenues' (1977, p. 217). Scholarly inquiry is economically viable, in the first instance, as it has been promoted as a public good ' with its cost is largely borne by public funds ' but then scholarly publishing is no less viable for the same reason, as colleagues edit, review, join in non-profit societies, to further the very work of that inquiry, with public support. With so much of the scholarly activity publicly supported, it is only natural to ask whether there is not now a way to publish this research so that it is open and fully out there as a global public good. Certainly, with print, there was reason enough to make readers and libraries pay for elaborately published volumes, prepared in specialized print shops, intended to stand as a permanent record of scholarly contribution. Now scholarly associations need to ask, whether this new publishing medium, already integral to the scholarly process at every stage, can extend and advance the circulation and exchange of knowledge by a considerable step. The associations need to add to their agendas the question of why open access publishing is not now viable, that this public good that we work so hard to produce can be made, through these new technologies, unequivocally part of the public sphere.'

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