

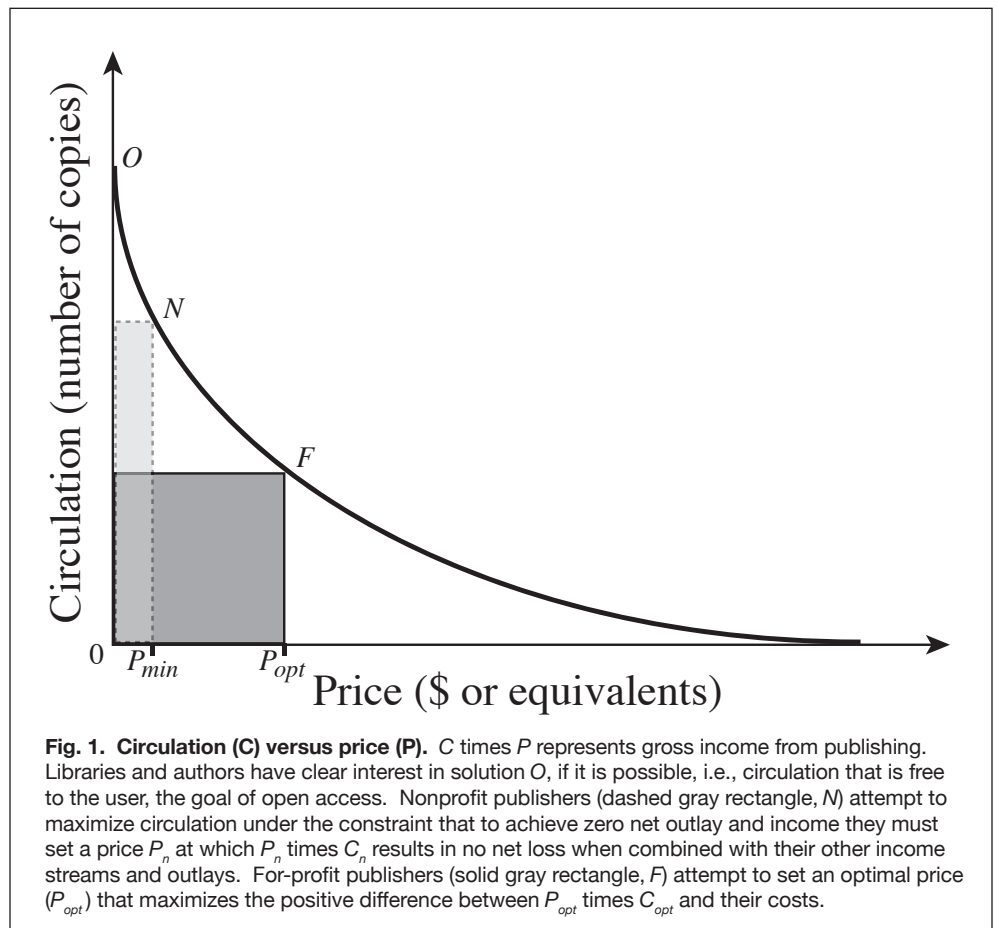
CHARTING A COURSE THROUGH THE RIPTIDES, CROSS CURRENTS, AND UNDERTOWS OF SCIENTIFIC JOURNAL PUBLISHING

Peter A. Jumars, School of Marine Sciences, University of Maine, Orono, ME 04469-5706

THE PAST

Holding meetings of members who shared common scientific interests was the *raison d'être* of the first scientific societies. Publishing of scientific journals to distribute original findings to members and to a broader audience typically followed within a decade or so of society founding. Reviewed, authoritative, more objective journal papers replaced more variable and biased individual letters to interested colleagues. By authoritative, I do not refer to scientific authority (for which there should be little respect if our profession works as advertised) but to an agreed upon, "official" version of record that reviewers have checked for methodology and potential reproducibility based on the description provided by the author. Archiving of an official version provides the foundation on which new science is built.

The history of scholarly societies that produced the first scientific content of journals is fascinating and indistinct from the general pursuit of scholarship. A general trend in the earliest journals was a decreasing fraction of content devoted to religious topics and an increasing fraction devoted to secular, scientific content, the balance attending to historical and literary issues. Based on its predecessor in Naples, *Academia Secretorum Naturae* (founded 1560), the *Accademia dei Lincei* was founded in Rome in 1603. The lynx for which it was named was iconic of the observational acuity needed in science and of a fascination with diversity in biological form and function. The society is reputed to have published its proceedings *Acta Lynceorum* (1609), arguably the first scientific journal publication (Ornstein 1928). Kronick



(1976), however, questions whether this poorly documented publication meets reasonable criteria for a journal. Galileo was a prominent member and author in the society during his disputes with the Catholic Church, though his more important findings were published in monograph form by the society.

Compared to the *Gesta Lynceorum*, a better documented journal followed on 5 January 1665 as the *Journal des Sçavans*, which started as a one-person effort (Denis de Sallo), changed hands after criticism from the Catholic Church and may have splintered into multiple titles (Kronick 1976). Publication was suspended for a time around the revolution, and was restarted as primarily a literary journal because all the fields of scholarship no longer traveled together. It came under direct control of a learned society (l'Académie des Inscriptions et Belles-Lettres) only in 1903 (Ornstein 1928).

Because they have been published more reliably (with a pause between volumes 12 and 13) since inception in March 1665, the *Philosophical Transactions of the Royal Society of London* are often cited as the first scientific journal publication. The society, however, did not become the official publisher until 1750 (Kronick 1976). Also contrary to extensive lore, scientific societies have not been responsible for the majority of scientific journal titles produced at any one time after about 1700, but they have clearly produced some of the most durable and widely cited ones (Kronick 1976). Publications by government agencies and diverse institutions (e.g., museums) were common and have become rarer, whereas publications by for-profit corporations have occupied an increasing fraction of the rapidly growing list of journals. An excellent, comprehensive history of scientific societies that lays out this chronology and much more is presented by the University of Waterloo Library (<http://www.scholarly-societies.org>).

Scientific societies' members talked to each other about recent results and published them when they passed the scrutiny of peer review. The intention was to distribute new findings as broadly as possible to parties with capabilities and interests in understanding them. Initially supported by member dues, costs of publication shifted gradually to institutional subscribers, with members paying something closer to the incremental cost of producing an additional copy. This shift was gradual, and the reasoning fairly simple. Institutions purchased subscriptions to allow multiple-user access, explicitly including non-members; societies set prices at a small multiple of member subscription costs. This publishing model of scientific societies remained remarkably stable until about 1970; price disparity between nonprofit and commercial journals was noticeable up to that time, but unremarkable. A substantial number of the most prominent commercial journals date back to this time. The profit motive then clearly took hold with a vengeance, however, and the rate of increase in both number and cost per citation of commercial journals accelerated. A crisis had arrived by about 1990 that is still with us: few libraries can afford subscriptions to all the significant titles in the fields of science represented at their institutions. A notable set of metrics pinpoints the source of the crisis. On average, commercial presses charge institutional subscribers 5 to 10 times more per page and 10 to 20 times more per citation than do nonprofit publishers (T.C. Bergstrom 2001).

Cost was not the only crisis. Scholars trying to keep up with all the work in one or two areas suddenly found it much more difficult because of the higher exponent in the rate of increase of published manuscripts, and abstract databases were the initial solution. Space to house paper became a serious library problem.

These two flow-rate crises, the first of money and the second of information volume, collided with the nascent internet, which to many promised a solution to both problems: easy search with universal access and cheap production. The open-access movement was born. At the risk of extreme oversimplification, open access aims to maximize use by eliminating cost to the user; nonprofit publication aims to maximize use under the constraint of recovering cost of publication; and, for-profit publication aims to maximize profit (Fig. 1). For several reasons, I plot this figure with ordinate and abscissa reversed from common practice in econometric modeling (e.g., C.T. and T.C. Bergstrom 2006). Contrary to the hopes and best intentions of open-access advocates, the real price of producing the average ten-page scientific article does not vary too far from U.S. \$2,000. The price is mostly for review, editing, and compositing, which are all done electronically. Therefore, there is little, if any, difference in those costs for electronic versus print publication. Societies measure their production costs and adjust subscriber charges accordingly. The bulk of publication expenses are first-copy costs, so I use price as the independent variable. (Note the contrast with manufactured goods wherein per-item costs often can be reduced dramatically by economies of scale, and it can be argued that number of copies drives costs as well as *vice versa*.)

Does circulation depend on price? Non-proprietary data to test the argument that circulation depends on price are surprisingly scarce, but most librarians know that there are journals that they cannot afford. Perhaps most relevant to ASLO of the data supporting this relationship are contained in the analysis of the OCLC WorldCat interlibrary loan database (<http://www.oclc.org>) by C.T. and T.C. Bergstrom (2006) in their summary of the economics of ecology journals. They found the number of institutional subscribers to be predicted reasonably well by $e^{(4.41 - 0.64 \ln P)}$, where P is the mean journal price in U.S. dollars per recent citation. Despite extensive scatter, these data document clear price elasticity, a decrease in circulation with increase in cost. Indeed from the raw data that C.T. and T.C. Bergstrom (2006, their Fig. 5) portray, no ecology journal is held by more than 180 libraries until its price falls below \$1.50 per recent citation. (For details of the calculations, consult the original article.)

THE EARLY SEARCH FOR SOLUTIONS

Feeling the pain of stretched library budgets and seeking a financial model that would continue to bring in the funds needed to support a journal, Thomas J. Walker came up with a model, now known as hybrid open access (of a journal issue or volume divided paper by paper between open and closed access) or the Walker-Prosser model (Prosser 2003). It was first applied to journals published by the Entomological Association of America. Authors were charged a fee to make their papers freely accessible by internet directly through the journal and immediately upon publication. One of the nagging issues of this model is the disadvantages it gives to circulation of authors who are un-

able to pay. ASLO nevertheless was a very early adopter in the interest of gaining experience with any and all reasonable means of recovering true costs of publication in a very unpredictable publishing climate. Hybrid open access was first made widely known by Walker (2001) in June; the ASLO Board approved application to *L&O* in August after Walker's (2001) publication, explicitly for its November issue (Vol 46). The Chief and Managing Editors of *L&O* decided also to offer open access retroactively to authors back to Vol 44, however, and the earliest to take advantage of the offer appeared in Vol 44(2).

Hybrid open access can be used to reduce cost to subscribers. PLoS (Public Library of Science), one of the most strident proponents of gold open access, has moved quietly to include this author-pays model to try to help stanch its continuing flow of red ink. Incidentally, PLoS charges something close to the true cost of publication, well above ASLO's current charges for author-pays open access (known at ASLO as Free-Access Publication or FAP). ASLO has deliberately titrated its FAP costs to avoid abrupt and disorienting policy changes. Gold open access is the holy grail in which users have free access to all content of a journal immediately upon its publication and in perpetuity. Nowhere to be found, however, is a publicly revealed, successful financial model for open access that can be emulated by all society journals to make them freely available upon first issue to any and all users. Like cold fusion, it would be wonderful, but is it possible?

Green open access refers to a large and heterogeneous set of models, but one that in principle also provides users with rapid, free access to published journal articles. ASLO journals are green in addition to allowing authors to expedite the process through FAP. In green open access, authors are free to self-archive, i.e., to post copies of their reprints at their own web sites and at institutional repositories. (Beware that some definitions of green open access require posting of preprints and (or) reprints in an institutional archive.) The self-archived material can be used for any legal, non profit purpose without requesting permission. Advantages for all sorts of scholarly work, including last-minute preparation for class, are tremendous. In addition, fully green journals like ASLO's provide all users open access in perpetuity to archived journal "volumes" once an embargo period (also known as a moving wall) of a journal-specific duration has passed. Typical journal embargo periods vary from one to three years. Several attempts have been made to impose open access to government-funded research within a fixed interval, typically six months to one year. Some of these attempts have produced strange bedfellows among strong lobbies with clearly divergent motivations, e.g., "big pharma" and library coalitions. In the U.S. on 26 December 2007, President Bush signed into U.S. law the Consolidated Appropriations Act of 2008 (H.R. 2764) that contains an insertion requiring PubMed Central posting of NIH-funded research articles within one year of their journal publication. Please note that this sort of requirement is already accommodated under ASLO's open access policy. ASLO's policy (<http://aslo.org/openaccess.html>) is also fully compliant with both the Budapest Open Access Initiative (<http://www.soros.org/openaccess/read.shtml>) and the Berlin declaration (<http://oa.mpg.de/openaccess-berlin/berlindeclaration.html>).

THE TURBULENT PRESENT

A bold, new experiment has recently been announced that may make gold open access available to consortia of established, top-tier journals within some fields. Not surprisingly, it has started in high-energy particle physics. Known as SCOAP3 (for Sponsoring Consortium for Open Access Publishing in Particle Physics (<http://www.scoap3.org/>)), this consortium aims initially at five core journals and two with partial particle physics content. The funding model it is developing proposes to have libraries and funding bodies contribute directly to the consortium, which will use the funds to pay the fixed costs of publication, in particular for peer review, and in return will convert these journals to gold open access. Journals involved include titles published by the American Physical Society, Springer, and Elsevier. Notably, the plan requires both unbundling and negotiated pricing of the named journals, which other approaches have generally failed to achieve. (Bundling is the common practice of commercial publishers who require institutional subscribers to take and pay for all their titles in a given field of science or lose access to even past volumes.) Several European agencies and libraries have already committed to the consortium's plan if it continues to be suitably negotiated and is broadly funded. Will this experiment succeed, and could ASLO join an analogous consortium for aquatic science publishing?

Particle physics has a strong tradition of preprint exchange and self-archiving to the point that it is all but universal. It is also worth asking, however, what form of open access information scientists use. Substantially earlier than even particle physicists, information scientists self-archived at ftp sites. Since 1997 they have used information technology to harvest self-archived reprints in a project called CiteSeer, (<http://citeseer.ist.psu.edu/>), whose scope has continued to expand. A new beta version, CiteSeerX (<http://cs1.ist.psu.edu:8080/acksearch/>), is focused on metadata of acknowledgments.

Dramatic increases in search efficiency have solved my personal crisis in publication volume in terms of easily finding articles, if not of having time to read them, and the freely available forms of these new search methods are clearly synergistic with both green and gold open access. The mining approach (albeit without the formal repository) is now available freely to nearly everyone and all fields of scholarship in the form of Google Scholar (<http://scholar.google.com/>), and value may be added at a price by using meta-searches such as those provided by MetaLib (<http://exlibrisgroup.com/category/MetaLibOverview>) and Scopus (<http://www.scopus.com/>). Finding relevant articles that match complex sets of search terms has become far easier than evaluating their quality. Nevertheless I find that I lose less time in culling poorly quality-controlled material than I did in the bad old days of visually scanning whole issues of paper journals that had (and for the most part still have) erratic review standards. For rapid and accurate search I find Google Scholar's utility to be steadily increasing and already to match or exceed that of traditional databases such as the Food and Agriculture Organization of the United Nations' Aquatic Sciences and Fisheries Abstracts (ASFA) and Thomson Scientific's Web of Science, although each still uncovers some unique references that the others miss, a *de facto* endorsement for meta-searches.

Several recent studies document the efficacy of Google Scholar (Neuhaus et al. 2006; Parker 2006; Walters 2007).

Changing user habits, such as mine, threaten existing economic models for journals and scientific societies. And the well-known law of unintended consequences attends all manner of publishing initiatives. The seriousness of the threats is exceedingly difficult to predict. Societies and commercial publishers aggressively seek ways to add value that will ensure user loyalty, for example, by cross-referencing. I don't know about other users, but the value to me of cross-referencing is falling as search engines improve. Coalitions of discipline-specific journals have produced cross-referenced electronic bundles, e.g., BioOne (<http://www.bioone.org/>) and GeoScienceWorld (<http://www.geoscienceworld.org/>). These coalitions probably help ensure institutional subscribers for the lesser-known journals that they contain, but joiners run the risk of losing subscribers to their individual journals. ASLO was very early to go electronic in publishing and in digitizing its past volumes and so did not stand to gain substantially from the help that such organizations provide in producing and maintaining digital archives for library access. The ASLO Board found the economics of joining such aggregations questionable and so did not join.

The Association of Research Libraries (ARL, <http://www.arl.org/>), particularly through its Scholarly Publishing and Academic Resources Coalition (SPARC, <http://www.arl.org/sparc/>), is a respected voice in the analysis of and organized reaction to market trends—from the librarian's point of view. In a recent paper, Johnson and Luther (2007) concluded that the clear user preference for electronic formats will soon tip publishing dramatically toward e-only offerings. Somewhat unexpectedly, they reported that only approximately 60% of the universe of some 20,000 active, peer-reviewed journals are now available in electronic form. In 2002, only 5% were e-only. By 2006, 37% were. Surprisingly stable at about 1/3 of the total offerings over that period were journals in both print and electronic form. This stability hides the fact that many societies have “flipped” their pricing to make the print copy the more expensive option. This flipping reflects market forces; it is ever more expensive to deal with the mechanics of printing, warehousing and mailing, and in this case the price per copy can increase substantially for shrinking print runs. Members given the choice increasingly prefer electronic access to paper, but societies are reluctant to drop print for fear of losing members who strongly prefer this traditional medium. Perhaps the advent of flexible and waterproof electronic copy in the next year or two will be the final tipping point, when e-journals at long last attain ease of use in the water closet. Libraries, however, have been even slower than members to move to electronic-only access. I sincerely doubt that the economic benefits that Johnson and Luther (2007) anticipated will or can be realized in subscriber fees. ASLO and other societies have been trimming paper costs along with paper subscriptions. Small, asynchronous (among journals) library savings from society switching to e-only can do little more than damp inflation.

One of the downside risks of using electronic media alone is the lack of any established means for anything resembling permanent archiving. As operating systems and software change, will

old pdfs remain readable? Short of flood, silverfish or fire, paper archives amazingly well and is ever easier to convert on demand to electronic format of the day, explaining many libraries' reluctance to forego paper. JSTOR (<http://www.jstor.org/>) is a nonprofit organization dedicated to providing reliable electronic archiving and broad dissemination of the titles that it archives. For small society journals without digitizing capabilities, joining JSTOR was a no-brainer. ASLO had already digitized when it joined, and the economic rationale for doing so remains highly questionable.

JSTOR-archived *L&O* is a direct competitor to ASLO-archived *L&O*. Until recently, JSTOR pdfs were not searchable, so the product was inferior to that offered by ASLO. Nevertheless, my informal survey of university libraries showed that the majority listed JSTOR in front of ASLO as a provider, and there are libraries that access *L&O* only through JSTOR despite the fact that *L&O* content is available with the same moving wall and free of charge directly from ASLO. Why? Librarians do not have time to deal with individual journals if they can deal with many at a time at reasonable cost, and JSTOR is a portal to many journals at once. Envisaged as a safe repository, a growing number of societies now suspect that falling library subscriptions for their journals are due at least in part to this alternative access to all but the most recent volumes. Indeed, the American Association for the Advancement of Science (AAAS) recently terminated its agreement with JSTOR for archival of *Science*, then entered a new and undisclosed agreement with JSTOR after loud objection from some library associations. As an experiment, take a look at how your research library lists electronic access to *L&O*, and don't be shy about complaining if ASLO is not listed as the primary source.

THE FUTURE: WHAT SHOULD SOCIETIES DO?

There is obvious benefit to conferring with other societies and seeking the best publishing model under the seeker's mission statement—and under realistic financial and governance constraints. ASLO does so through its partners in the American Institute of Biological Sciences (AIBS), the American Geological Institute (AGI) and the Council of Scientific Society Presidents (CSSP). Societies in general responded to the publishing crisis by maintaining but not expanding titles offered, and many scrutinized their costs to reassure themselves that they were not the sources of the crisis (e.g., Lewis 2001). Societies span a wide range of missions and costs, however, from the small and ultra-frugal to the large with bricks-and-mortar presence in national capitals. The question of how much of these costs should ethically be charged to institutional subscribers is a vexing one that deserves much more member and executive board attention.

Decreasing P_{min} (Fig. 1) clearly is desirable from the perspective of the goal of broad dissemination. In addition, sound economic and game theory arguments suggest that the best policy would have been, and still is, to fill the market to its carrying capacity for strong contributions with new, society-affiliated, nonprofit journals (cf. T.C. Bergstrom 2001). ASLO came to this conclusion under Bill Lewis' leadership and followed this advice at the fastest pace it felt appropriate, launching *L&O: Methods* and soon to launch a new journal at the nexus between fluid dynamics and other aquatic processes.

The library economic crisis stems in part from the unusual economics of scientific journals. Because individual papers are required to be original, unlike automobiles, a journal that is deemed “too expensive” cannot be substituted by a less expensive one. T.C. Bergstrom (U.C. Santa Barbara) has led the economic analysis of scholarly publishing and finds a prime cause of the crisis to be the for-profit, commercial publishers who operate in an increasingly monopolistic sphere (T.C. Bergstrom 2001). Weaning authors from overly expensive journals is, in game theory terms, a coordination problem (C.T. and T.C. Bergstrom 2006). One author leaving quietly does not do the trick. As a matter of self interest and public interest, scientific societies should join with library associations to make individual users, authors, and reviewers aware of the issues.

There does not seem to be any one-size-fits-all approach to journal economics. The half-life of journal citation varies widely among fields, from the order of six months in some fields of biomedicine to over a decade in limnology and oceanography. A moving wall of six months or one year in biomedicine therefore endangers journal profitability less than it would in aquatic sciences. In a process reminiscent of biological evolution, societies large enough to support many journals intentionally diversify them to gain experience with varied models, a few of which may be best suited to the future. The American Institute of Physics (AIP) recently launched a gold open access journal in biological microfluidics to gain experience with true costs of gold open access publishing, but the AIP is meeting those costs through subscriptions of its other journals and other AIP income. Few societies have the resources and number of titles to mimic this approach, but they certainly can monitor this battle for survival of the fittest models.

Societies fear, in their most common economic models of publishing, a tipping point in mixed open access when a large majority of authors have paid for open access or in green open access when nearly all journal articles are self-archived. I think this fear is paranoia. Particle physics journals have not seen libraries drop subscriptions because reprints are self-archived. Libraries are interested in providing authoritative copies, not in the Humpty-Dumpty task of hunting down 100% of content from ephemeral urls and checking it (How?) against an official version. Choosing a moving window that is too short for the journal price point is a much more rational fear.

Scientific societies themselves are in slow-motion crisis. Most are gradually losing membership. The primary exceptions are new societies in new growth fields (e.g., various molecular specialties and forensics) that spawn small but rapidly growing journals and large societies big enough to contain and capitalize on new growth subfields (with new journals or journal sections in an expanding portfolio). ASLO again is an exception, with remarkably stable membership numbers over decades despite major changes in both international science demographics and demographics of its own members. To some extent this stability may be the result of its intermediate size in the scheme of scientific societies, but I find more likely explanation in its early and effective use of the web in publishing and its other endeavors. The crisis of Sputnik launched the last great growth spurt for science overall; perhaps the climate crisis will bring a new one.

THE FUTURE: WHAT CAN AN INDIVIDUAL DO?

Individuals are members, users, reviewers, authors, and editors. Each of those capacities involves rights, responsibilities, and choices. In this journal I am preaching to the choir of ASLO members, but there are some peculiarities worth noting in evolution of member behavior. In 1999 I gave away my 30 years of print volumes of *L&O* and switched to electronic access. Today I continue the illogical act of buying an electronic subscription to *L&O* but never using it. Instead I access the journal through my library because it is more convenient, especially when my literature search also leads to different journals from diverse publishers. There does not seem to be a way for ASLO to provide this value addition (and this may be another subtle hint of unintended consequences of JSTOR, which does provide this kind of value because it holds so many titles). Perhaps a win-win would be for members like me to donate the same amount as, or a little more than, an electronic subscription as a donation toward more open access and to personally use the tax benefits.

A fundamental question is how much members are willing to pay in volunteerism or dollars to provide a journal with open access. My informal discussions suggest that the answer varies widely, but that there is some latitude to increase dues with this end made the explicit cause. Some members want to see ASLO go for gold open access and to pare costs even more aggressively, e.g., by going to completely voluntary editing and shifting more costs from institutional subscribers to members. Doubling of dues might allow gold open access to *L&O* without sacrificing other ASLO activities. I would be willing to double my dues, but we have the old coordination problem again, and lots of variance in ability to pay doubled dues. Other members value the quality of review at *L&O* and do not want to risk its impairment through reliance on a necessarily larger and more diverse band of volunteers. A number of start-up journals have foregone traditional review altogether, posting manuscripts as they arrive, and having threaded commentary determine which are suitable for transfer to a “successfully reviewed” category of url. I can barely find time to read well-reviewed material, let alone read and provide comments on posts. Largely through the decidedly mixed blessing of the touch-tone telephone and the web, most of us take on new jobs each day, intentionally or not; for most of us, secretaries and travel agents R us, and the thought of adding one more set of voluntary and mostly thankless tasks is less than appealing to me. *Your ASLO Board, however, would benefit greatly from knowing where in this spectrum you stand.*

Users will likely do what is easiest, and that default continues to bode well for open access. Today, I cannot tell when I search whether I mine gold or gather green. It is perfectly clear that fewer and fewer people read either paper or electronic journal “issues.” The number of “reader journals” has plummeted in science. In a search, I am more likely to turn next to a pdf in a completely different journal than to read the next in an issue. I browse down a list of search results rather than through pages or across a shelf. I do make time for all the abstracts in *L&O* and skim *Science* and *Nature*, but now reach the other journals mostly through searches. I find myself relying increasingly on books and abstracts, delving deeply into primary literature in concerted

bursts on topics of my current interest for research or teaching. Collecting bibliographies of my own on a continuing basis makes less and less sense as search capabilities improve. I physically go to libraries primarily during preparation of manuscripts and proposals, and primarily for the years and sources that are not yet digitized. Searches and meta-searches, combined with green open access, solve the bulk of my problems as a user. Unfortunately, these usage patterns do not provide much impetus for society affiliation. In the print years I bought paper issues as a member because it was more convenient to access my own when and where I wanted. I am not recommending that anyone follow my usage patterns, only to indicate that mine have changed radically in a decade and so have most. Circulation (Fig. 1) was defined at one time by paper copies of journal issues; in today's practice, pdfs of individual papers circulate, often without prominent markings of the journal from which they came. Perhaps federations of greens and golds should adopt a conspicuous logo for their pdfs to rival Elsevier's ubiquitous "Non Solus" printer's mark—that ironically dates back to the period of 1620–1680 when several loose family partnerships of Elzevirs were involved in the bookseller, printer, and publisher trades. Users hold the wild cards in the game of future publishing; the rules of the game, however, remain to be defined.

Reviewers are an interesting category of individuals. Most of us review far more often than we write. How do we learn to review? Most learn how to review in advanced graduate classes and from advisers in an apprenticeship mode. *L&O's* reviewing policies facilitate this sort of mentorship of new reviewers. Other responsible societies engage the next generation similarly. Consortia of nonprofit publishers (e.g., signers of the Washington D.C. Principles for Free Access to Science (<http://www.dcprinciples.org/>)) use this training of the next generation of scientists as a primary justification of institutional subscriber charges, and I find it a compelling one for the continuation of scientific societies. It is difficult to answer the question of why reviewers continue to review free of charge for journals that use that service to make a large profit at the expense of institutional subscribers (T.C. Bergstrom 2001). I currently decline to review for journals that my library cannot afford and give low priority to review for commercial journals unless the topic is of extreme interest to me. How do you prioritize requests for review?

Authors might appear to have little incentive to choose journals that are cost effective from a librarian's perspective. Authors have a good deal of incentive to choose high-impact journals. They may also be tempted by perquisites provided by commercial publishers to authors (e.g., free reprints or free copies of edited or authored books) but should realize that institutional subscribers are paying the costs of those apparent benefits. Many, but by no means all, of the high-impact journals are non profit society journals. Fig. 1 suggests an incentive to seek open access, and there clearly are no citations without access, but relationships between number of downloads and number of citations still appear weak and fraught with many confounding variables, as those affiliated with for-profit corporate presses are quick to point out (Craig et al. 2007). One of the clearest comparisons is between open-access and non-open-access articles in journals with hybrid open access, and there open access appears

to win (Harnad and Brody 2004). Moreover the author with rapidly self-archived preprints and reprints appears to win more citations (Craig et al. 2007) even if the reasons are not so clear.

A number of resources are available to help with selecting a journal. The most widely-known is commercial and is the impact factor (along with other metrics such as the half-life of citation) calculated by Thomson Scientific. Although its individual-author metrics are much used and bemoaned in tenure decisions, the database underlying the calculations is proprietary and has been criticized for lack of verifiability (Rossner et al. 2007). Two freely available measures of impact are provided by Eigenfactor.org at (<http://www.eigenfactor.org/>). These metrics use connectivity algorithms resembling those used to evaluate web site rankings. Before you choose a journal, evaluate the price per citation and price per article (to institutional subscribers) as well as the composite price and relative cost indices at (<http://www.journalprices.com/>). You should not be surprised to find ASLO journals scoring superlatively on all these metrics. To find peer-reviewed, gold open-access journals, one can consult the directory maintained by the Lund University Libraries (<http://www.doaj.org/>).

Why more authors do not self-archive is a mystery. Doing so can only increase dissemination. If journal policy is not as clear as *L&O's*, it is in the best interests of an author to submit a scholar's copyright addendum when the journal's copyright agreement is signed. A pdf version can easily be prepared online at the Science Commons web site (<http://scholars.sciencecommons.org/>). Posting a searchable pdf, rather than a pdf that is simply a binary equivalent of a bitmap, is a clear advantage. Generally within two weeks of posting, I can paste an arbitrary phrase from a self-archived document into Google Scholar and be directed straight to my post. Many scanners now can produce searchable pdfs with their bundled software. Alternatively, if you have Adobe Acrobat Professional, you can take a scanned document and under the "Document" menu choose "OCR text recognition" to produce a searchable pdf.

Individuals are also editors. ASLO has no salaried staff; all ASLO staff are paid on a contractual basis for services rendered. Some journals' chief editors receive no compensation. If you are offered an attractive salary by a commercial publisher for editing, be aware that the funds come primarily from institutional subscribers. The diversity of payment models in editing is huge. It would be very interesting to evaluate the impact of the mode and size of editor remuneration on price per article or price per citation, and ASLO journals will be competitive on both metrics. Societies also offer a wide range of training opportunities in editing, including pizza nights at ASLO meetings, where Associate Editors of *L&O* gather to discuss current issues.

I hope that at a minimum this short piece will have sensitized you to some issues and will make you think about what you value among society membership benefits and in your other individual roles. If you feel strongly that things are going well or poorly at ASLO, get yourself nominated to the Board. In addition to giving me all the "leadership" and editing experience that I could handle, ASLO helped me land my first teaching job (by networking at an ASLO meeting). I am sure that after six centuries of history, Galileo would still recognize the meet-

ing, networking and publishing functions of modern scientific societies. These society functions are much more durable than their 1 ppt and pdf incarnations and the cross currents that we feel may suggest.

ACKNOWLEDGMENTS

I thank Joan Parker, Librarian, Moss Landing Marine Laboratories, and Everett Fee, Editor in Chief, L&O, as well as John Dolan for useful revisions and additions to an earlier draft.

REFERENCES

- Craig, I., A.M. Plume, M.E. McVeigh, J. Pringle and M. Amin. 2007. Do Open Access Articles Have Greater Citation Impact? *J. Informetrics* 1: 239-248.
- Harnad, S., and T. Brody. 2004. Comparing the Impact of Open Access (OA) vs. Non-OA Articles in the Same Journals. *D-Lib Magazine* 10: (<http://www.dlib.org/dlib/june04/harnad/06harnad.html>)
- Johnson, R.K., and J. Luther. 2007. The e-only tipping point for journals. Association of Research Libraries, Washington, D.C. (http://www.arl.org/bm~doc/Electronic_Transition.pdf)
- Kronick, D.A. 1976. *A History of Scientific & Technical Periodicals: The origins and development of the scientific and technical press, 1665-1790*. 2nd ed. Scarecrow Press, Metuchen, NJ.
- Lewis, W.M. 2001. Following the ASLO money. *Limnol. Oceanogr. Bull.* 10: 44-46.
- Neuhaus, C., E. Neuhaus, A. Asher, and C. Wrede. 2006. The depth and breadth of Google Scholar: An empirical study. *Libraries and the Academy* 6: 127-141.
- Ornstein, M. 1928. *Rôle of Scientific Societies in the Seventeenth Century*. University of Chicago Press., Parker, J. 2006. Fisheries or oceanography: deconstructing the literature of fisheries oceanography. In: Anderson, K.L. & C. Thiery (eds.). 2006. *Information for Responsible Fisheries : Libraries as Mediators : Proceedings of the 31st Annual Conference*. pp. 171-177. International Association of Aquatic and Marine Science Libraries and Information Centers, Fort Pierce, FL.
- Prosser, D. 2003. From here to there: a proposed mechanism for transforming journals from closed to open access. *Learned Publishing* 16: 163-166 (<http://eprints.rclis.org/archive/00001179/>).
- Rossner, M., H. Van Epps and E. Hill. 2007. Show me the data. *J. Cell Biol.* 179: 1091-1092.
- Walters, W.H. 2007. Google Scholar coverage of a multidisciplinary field. *Information Processing and Management* 43: 1121-1132.
- Walker, T.J. 2001. Market-driven free access to journal articles. *The Scientist* 15: 43-.

Peter Jumars was Editor in Chief of L&O from 1986-1992 and oversaw the transition to Associate Editors. He was President of ASLO from 2002-2004 and is the elected Chair of the Council of Scientific Society Presidents (<http://www.cssp.us/>) in 2008.