Open Access, Publishing, and the Peer-Review Process: An overview.

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LIBR 287: The Open Movement and Libraries

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Introduction

Academic publishing is undergoing major changes as society transitions from print to electronic formats. An emergent trend for many academic journals is open access via the Internet. There are two main forms of open access: open access publishing where the articles or journal are freely available from the time of publication, and self-archiving, where authors submit a copy of their work to be made freely available on the web. This paper will discuss modern, open academic publishing systems and the changes these systems represent.

In order to begin an understanding of how academic publishing functions today, a definition of scholarly papers and academic publishing should be presented. In academic writing, a paper is an academic work that is published in a peer-reviewed journal (Angell, Strunk, and White 2000). It contains original research, data, or reviews existing material. Also called articles, such works may undergo a series of reviews, edits and re-submissions before finally being accepted or rejected for publication. The process often takes several months or in some subjects, over a year before publication. Many journals are now published in electronic form only. Major journals are now generally made available in electronic form as well as print to both individual subscribers and to libraries. Electronic versions can be made available to subscribers immediately upon publication, or even before. Delayed availability of electronic journals, allowing paid subscribers early access is another new trend in journal publishing.

What is academic publishing?

Academic publishing is a branch of publishing which distributes academic research (Spier 2002). Academic publishing describes a necessary system for academic scholars to review work and make it available to a broad audience. Academic data is published in journal article,

book or thesis form. The non-published data is referred to as grey literature (Merriam-Webster 2009). For example, thousands of scientific conferences and symposia, large and small, take place every year. Some of them publish proceedings, collections of papers presented at the meeting. Proceedings can be published as books or in special journal issues. Some conferences publish abstracts or preprints of papers to be given at an upcoming conference. Most conferences publish nothing at all. Presentations at conferences may be cited in later literature even if nothing was published. As a result, this literature can be very difficult to access. Such obfuscated sources have presented problems to research and data construction.

Most well-established academic disciplines publish their own academic journals, often published by the discipline's association or major society (i.e. American Anthropologist: The official Journal of the American Anthropological Association). Other outlets for publication such as conference proceedings can also facilitate the dissemination of data. Many academic journals are interdisciplinary and publish works from several distinct fields or subfields. The types of publications accepted as data or research vary between disciplines, as do the way each one reviews and publishes.

What is peer review?

Due to the volume of academic publishing, most depends on some form of peer review or editorial refereeing to qualify texts for publication (Spier 2002). Peer review, sometimes known as refereeing, is a way to submit an academic's scholarly work, research, or ideas to the scrutiny of others who are experts in the field. To function properly, peer review requires a community of experts in a narrowly defined field, who are somehow qualified (generally academically) and are able to perform an impartial review. Impartial reviews can often be difficult, especially in less

well-defined or inter-disciplinary fields. As a result, the contribution of an idea may never be widely appreciated among its contemporaries due to the selective nature of the system. While essential to academic quality, peer and impartial review have been widely criticized as somewhat ineffective, often slow, and misunderstood by the general public. The overall process encourages authors to meet the current standards of their discipline and prevents the dissemination of incurred data, unsupported hypothesis, poor interpretations, and personal bias. Publications that are not peer reviewed are often frowned upon by scholars and professionals.

The basic system for scholarly communication has remained unchanged for over three hundred years, with the academic journal central (Prosser 2003). However, by the early 1960s a growing concern among academics about the peer review process to continue its role as a means of communicating new research emerged. A "serials crisis" developed and a general reduction in scholarly journal subscriptions by libraries and non-libraries alike resulted. During this time, the cost of scholarly journals increased much quicker than the rate of inflation. Many libraries were soon forced to cancel subscriptions (something similar is happening today in relation to databases). A combination of the peer-review crisis, the serials crisis, and emergent technological changes have allowed a new publishing model to emerge. Sometimes referred to as open access publishing, this model was not aligned to the corporate or profit driven systems that direct traditional publishing.

What is Open Access publishing?

An open access publication is one where the author(s) and copyright holder(s) grant(s) all users a free, irrevocable, worldwide, perpetual right of access (Budapest Open Access Initiative 2002). A license to copy, use, distribute, transmit and display the work publicly is also allowed.

Finally, to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship, as well as the right to make printed copies for personal use. A complete version of the work and all supplemental materials, including a copy of the permission granted, in a standardized electronic format is deposited upon initial publication in at least one online repository. That repository should supported by either an academic institution, scholarly society, government agency, or other well-established institution that seeks to enable free and open access, unrestricted distribution, interoperability, and long-term archiving.

Open access journals would give free and unrestricted digital access to all primary literature published by the journal (Suber 2009a). Publishable material is given by scholars without expectation of payment with the hope it is distributed as widely as possible. Making it available on the open internet distributes it to millions of people worldwide who have access. Giving interested people access accelerates research, enriches education, shares learning among rich and poor nations, and enhances return on investment in research. The ability for researchers to access all of the relevant information they need will increase the ability of research to be effective.

As an example of the current trend toward Open access, the Association of Research Libraries (ARL) has recommended open access to quality information in support of learning and scholarship. Members of the research and academic communities must be educated about open access and its potential. The ARL encourages library staff, campus administrators, university counsels, faculty, and policymakers to discuss and criticize open access and how its application in research institutions will effect the dissemination and use of information.

History of academic publishing, peer review, and open access.

Perhaps the earliest example of academic publishing in the western world is the Proceedings of meetings of the Royal Society, which were first published in the 1600s (Spier 2002). The act of publishing academic inquiry was controversial for a number of reasons. The Church, the politics of the academy, and governments all influenced academic publishing. New discoveries were often obfuscated, giving authorship to the discoverer, but remaining indecipherable for anyone not schooled in the discipline's jargon. The method did not facilitate much collaboration. 92% of instances of simultaneous discovery in the 17th century ended in dispute (Merton and Sztompka 1996). The number of disputes dropped to 72% in the 18th century, by the late 19th century 59%, and by the first half of the 20th century 33% (*ibid*). Arguing over who owned the research, or who was given credit, contributed to poorly constructed theory and slowed the scientific process.

Perhaps because of the early problems of research dissemination and crediting, and certainly reflective of the academic process, publishing in major academic journal began to be reviewed by academics in the publishing societies/associations. One of the first documented descriptions of a peer-review process was written by Ishap bin Ali Al Rahwi (CE 854–931) of Al Raha, Syria in a book called *Ethics of the Physician* (Spier 2002). This work, and its later editions, argues it is the duty of a visiting physician to make duplicate notes of the condition of the patient on each visit. When treatment of the patient had concluded, the notes of the physician were examined by a local council of physicians, who would decided whether the physician had performed according to the present day standards. On precedent then, the resulting research could be compared, and the practicing physician could be held liable.

After Guttenberg invented the printing press, what was published could now be mass distributed. Authorities began to regulate what was set before the public. Copernicus (1473-1543) was allowed his heliocentric revolutionary ideas because he was a Canon of the Frombork Cathedral in Poland. Still, his work was only published on the last day of his life and was later declared to be heretical. Servetus (1509–1553), was burned at the stake because he suggested that blood passed from the right side of the heart to the left through the lungs (Spier 2002). Galileo (1564–1642) after his famous publication *Dialogue Concerning the Two Chief World Systems*, was confined to his home and forced to withdraw his support for the Copernican theory.

A general method for assessment of new research was developed by Francis Bacon (1561–1626) in *Novum Organum*. This work, published in 1620, inspired some to engage in an informal pattern of meetings to discuss and debate their opinions on science. In 1645, a group of English scholars formed a semi-official society of science. By 1662, they had a Royal Charter of Incorporation and, on the issuance of a second Royal Charter, this body became the Royal Society of London for improving Natural Knowledge. By 1665, the Society had it own journal, Philosophical Transactions, edited by Henry Oldenburg. In the beginning, what was published in the journal was decided by the editor and his immediate staff. Materials sent to the Society for publication were subject to inspection by a select group of members who were knowledgeable in such matters, and whose recommendation to the editor was influential in the future progress of that manuscript. For the next hundred years this patriarchal method of review continued. It was not until 1731 and *Medical Essays and Observations*, a publication of the Royal Society of Edinburgh, where process used by the Royal Society of Edinburgh bears more resemblance to the commonly understood standards of peer review. In 1752, the Society took over the editorial responsibility for the production of the journal Philosophical Transactions. Peer review gradually

become a standard feature of medical sciences but did not penetrate widely into other sciences and academics until the 20th Century. By the middle of the 1900s, it became a regular institution across most university campuses. In essence, the publication of scholarly materials was maintained and reviewed by the academy.

This model remained unchanged for over three hundred years, with the journal playing a central role (Prosser 2003). Since the educational and theoretical revolts of the 1950s and 1960 there has been growing concern as journal prices have increased and access to the journals has decreased. Public funding for academic research has been shrinking for decades. Universities and other research organizations have partnered with industry to generate income from the knowledge their students and faculty create. The result was a commercialization of the research process overall. Profit driven systems collide with the idea that freely shared information-made available in the public domain instead of privatized by industry-in turn creates new knowledge that spurs new research and discovery. This system threatens science and peer-review of knowledge. Science not only produces data and research, but is dependent on both to survive and evolve.

The spread of the internet in the 1990s resulted in some improvements in the cost of, and access to, academic publications, with readers being able to view digital reproductions virtually. As noted above, for-profit site licenses and consortia deals allowed the fundamental problem to remain. The rate of increase in cost for electronic access continues to be greater than the increase in university budgets. The open internet has changed this economic and political power structure. Authors can now publish their work in an online format without restriction. A key to this development is the ability to copy and distribute electronic data at very little cost. Such authorship has allowed a new dissemination model to emerge. The modern open access

movement traces its history to the 1960s (Suber 2009b). The first online-only, free-access journals began appearing in the late 1980s. The a few early journals were Bryn Mawr Classical Review, Postmodern Culture and Psycoloquy. An early book publisher to provide open access was the National Academies Press, publisher for the National Academy of Sciences, Institute of Medicine, and other arms of the National Academies.

The first free scientific online archive was arXiv.org (*ibid*). Started in 1991, it was initially a "prepublished" service for physicists. Self-archiving has since become the norm in physics, with some sub-areas of physics having a 100% self-archiving rate. arXiv now includes papers from related disciplines, such as computer science and mathematics, but computer scientists mostly self-archive on their own websites. The two major physics publishers (American Physical Society and Institute of Physics Publishing) have reported that arXiv has had no effect on journal subscriptions in physics.

In 1997, the U.S. National Library of Medicine (NLM) made Medline, a comprehensive index to medical literature freely available in the form of PubMed (Suber 2009b). Usage increased over hundredfold when it became available free, suggesting that usage was impacted by lack of access. While indexes such as these are not the main focus of the open access movement, Medline and services modeled after it have opened up research to the general public on a grand level.

In 1998, the American Scientist Open Access Forum was launched (*ibid*). The Journal of Medical Internet Research (JMIR), one of the first Open Access journals in medicine, was developed in 1998 and first published in 1999. In 2001, 34,000 scholars around the world signed "An Open Letter to Scientific Publishers". This letter argued for "the establishment of an online

public library that would provide the full contents of the published record of research and scholarly discourse in medicine and the life sciences in a freely accessible, fully searchable, interlinked form". Signers also pledged not to publish in non-open access journals. This contributed to the establishment of the Public Library of Science (PLoS), an advocacy organization pushing for open access publishing across science (Suber 2009b). PLoS competes with commercial publishers and other open access journals.

The first major international statement on open access was the Budapest Open Access Initiative (Budapest Open Access Initiative 2003). Launched by the Open Society Institute in 2002, this helped developed open access. Two further statements followed: the Bethesda Statement on Open Access Publishing in June 2003 and the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities in October 2003. In 2003, the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities was drafted and the World Summit on the Information Society included open access in its Declaration of Principles and Plan of Action. In 2006, a Federal Research Public Access Act was introduced in US Congress. Since 2003, efforts have been focused on open access mandating by the funders of research such as: governments, research funding agencies, and universities (Suber 2009a). Such efforts have been challenged by the established publishing industry. Many countries, funders, universities and other organizations have now made commitments to open access and are in the process of reviewing their policies and procedures.

It is now possible to publish a scholarly article and also make it instantly accessible anywhere in the world where there are computers and Internet connections. The fixed cost of producing the article and the minimal cost of online distribution have coupled with the spread of the Internet and the ability to copy and distribute electronic data at almost no cost to promote

arguments for open access. Open access can develop new publishing mediums, new data aggregates, new communication patterns, and promote efficiency in the delivery of research.

Pros of Open access

Many scientists have argued that all scientific research should be freely and immediately available online (Tamber et al. 2003). In today's information environment, the four-centuries-old publishing model based on user fees now hinders communication. Clinicians and researchers having limited access to peer-reviewed research articles makes it difficult to know of and build on research that has already been conducted and reported. This is central to rapid and efficient progress in science.

There are several problems inherent in charging users. Up to 30% of publishers' revenue today is used to employ staff and systems to assess current and future subscribers (*ibid*). Those costs are passed onto the scientific community as part of subscription charges. For-profit publishers have a monopoly on academic publishing which has enabled publishers to increase subscription costs exponentially.

Arguments for open access to peer-reviewed research are especially strong in clinical medicine, in part due to the emergence of evidence based research. It should be noted that clinical research is often conducted on members of the public, performed by clinicians trained with public money, hosted in public institutions, and often funded by public money. Yet, the results are often not publicly available.

Alternative models whereby authors retain copyright and are charged for publication have developed. BioMed Central provides biomedical research online at no charge to subscribers, but charges the author $500 per article (Tamber et al. 2003). The Public Library of

Science Biology (PLoS Biology) charges authors $1,500 per article to cover costs. In 2006, most of the worldwide research output, totaling about 2,500,000 articles per year, were published in 24,000 peer-reviewed research journals (Tamber et al 2003). Of those, less than 5% are currently open-access journals. As I have noted before, anything that blocks access to research findings goes against the interests of research, researchers, their employers, their funders, and public taxes that often fund the funders.

Cons of Open Access

The open-access model is not without its critics. Brian D. Crawford, PhD, vice president and publishing director of John Wiley and Sons Ltd. notes in the November 2003 issue of The Lancet that many important questions must be answered before the existing scientific and medical journal publishing system is thrown out (Crawford 2003). The primary weakness in open-access models is, they are based on authors paying for publication. This means authors must either pay directly or through sponsorship from institutions or interested third parties. As a result, science will either have a less effective filter, or will require the introduction of new post-publication review systems. Business models put forward to support authors are experimental and have not shown to be sustainable.

Some critics, such as Michael J. Held, executive director of the Rockefeller University Press, argue open access is an attempt to take away freedom to choose publishers, forcing all authors and publishers into their open access publishing model (Held 2003). As the model is unproven and may well be unsustainable, Held and others postulate this is an irresponsible act because the open access model shifts the supplier of capital from the reader to the author. This could result in barriers to publishing because of prohibitively high author fees. Many also point

out the current author fees (at BioMed Central and PLoS) are based on what authors might be willing to pay than on what is needed to sustain an ongoing business. Howard Garrison, PhD, director of the Office of Public Affairs for the Federation of American Societies for Experimental Biology (FASEB) notes "It is very dangerous to have all scientific publication controlled by a single editorial view or funding source" (Horton 2003).

Conclusion

Scientific research should be freely accessible to all. Free access can be a public good. Much research is publicly funded and involves members of the public as participants. Authors and peer reviewers are willing to provide their work free of charge. The cost of peer review and dissemination can, and should be, covered in ways that do not limit access to information and so do not hinder scientific communication. Funding agencies, academic institutions, promotion and tenure committees, and authors can all work to promote open access. Funding agencies and institutions can encourage their researchers to publish in open-access journals. They can also explore a range of ways of shifting budgets away from journal subscriptions, including allowing processing and subscription charges to be payable from grants. Academic committees can encourage their members to self-review, and can give credit for open-access publication.

Society as a whole can benefit from an expanded and accelerated research cycle. Research can advance more effectively because researchers have immediate access to all the findings they need. The visibility, usage and impact of researchers' own findings increases with open access. The ability to find, access and use the findings of others will always improve science. Universities benefit from their researchers' conclusions, and increased returns to the funders promotes more funding. For instructors, open access means no restrictions on providing

articles for teaching purposes. Publishers benefit from the wider dissemination, greater visibility and higher journal citation impact factor of their articles. Open access will promote collaboration, transparency, and will generate better scientific research.

References

Angell, R., William, S., and White, E.,B., (2000). *The Elements of Style, Fourth Edition*. Allyn & Bacon

Budapest Open Access Initiative. (2002). http://www.soros.org/openaccess/read.shtml

Crawford, B. (2003). Open-access publishing: where is the value?. *The Lancet*. 362(9395): p. 1578-1580.
http://search.ebscohost.com.libaccess.sjlibrary.org

gray literature. (2009). In Merriam-Webster Online Dictionary.
http://www.merriam-webster.com/dictionary/gray literature

Horton, R,. (2003). Commentary. *The Lancet*. Vol. 362(9395): p.1510-1512.

Merton, R. K., and Sztompka, P. (1996). On social structure and science
: the heritage of sociology. Chicago: Univ. of Chicago Press.

Michael J Held (2003). Proposed legislation supports an untested publishing model.

The Journal of Cell Biology. Vol. 162 (2): 171–172.

Prosser, D., (2003). The next information revolution: can institutional repositories and self-archiving transform scholarly communications? *IATUL Proceedings.* Vol. 13 www.iatul.org/conference/proceedings/vol13/papers/PROSSER_fulltext.pdf

Spier, R., (2002). The history of the peer-review process. *Trends in Biotechnology.* 20(8): p. 357-358.

Suber, P. (2009a). Open Access Overview: focusing on open access to peer-reviewed research articles and their preprints. http://www.earlham.edu/~peters/fos/overview.htm

(2009b). Timeline of the Open Access Movement. http://www.earlham.edu/~peters/fos/timeline.htm

Tamber, P., Godlee, F., and Newmark, P. (2003). Open access to peer-reviewed research: making it happen. *The Lancet*. 362(9395): p.1575-1577. http://search.ebscohost.com.libaccess.sjlibrary.org