

Open Sesame? Increasing Access to Medical Literature

ABBREVIATIONS. STM, scientific, technical, and medical; PLoS, Public Library of Science; AAP, American Academy of Pediatrics.

Over the past few years there has been a growing concern within the world's scientific communities about access to scientific, technical, and medical (STM) literature. This concern has given rise to a movement within scientific and medical circles known as the "open-access" movement. Over the last 12 months, this concern has leapt from the acid-free pages of the world's STM journals to the newsprint of the mainstream media. Articles on the subject have appeared in *The Washington Post*, *The Boston Globe*, *The Guardian*, the *San Francisco Chronicle*, and *The Chronicle of Higher Education*, among other prominent media sources.¹⁻⁵ Many of these articles have painted open-access advocates as something akin to Ali Baba standing before the locked portal of a cave in which the highwaymen of publishing have stashed the plundered treasure of the scientific world.⁶ All one needs to do is chant the magic words and the portal will open wide. Although this makes for dramatic storytelling, the reality is far more complex.

WHAT IS OPEN ACCESS?

Broadly defined, open access simply means that content is freely available on the World Wide Web without the need of a subscription or payment. It gets more complicated when one asks which content is freely available and when. For example, the *Journal of Biological Chemistry* makes preprints of accepted articles freely available on its Web site shortly after acceptance. To view the final revised, copy-edited, full-featured article, however, one must have a subscription. Is this an open-access journal? Many journals, including *Pediatrics* and the *Journal of Biological Chemistry*, make all content freely accessible after a certain period of time, usually ranging from 6 months to 2 years. Are these open-access journals? The answer varies depending on whom one asks.

Another component sometimes included in definitions of open access is the copyright designation of the published content. Signatories of the 2001 Budapest Open Access Initiative, for example, advocate not only for free access to literature, but the right of users to:

...read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the Internet itself. The only constraint on reproduction and distribution, and the only role

for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.⁷

In other words, some advocates of open access prescribe that scientific articles should be published either as works in the public domain or as works in which the author, while retaining the copyright, grants a free license to anyone who wishes to use it for any purpose, including commercial uses.

BACKGROUND

The open-access movement emerged in the late 1990s as a response to 2 phenomena: the maturation of electronic journals and the rising specter of the serials crisis. Although manifest in various forms since the 1960s, an explosion of electronic journals occurred in the late 1990s as the spindles of the World Wide Web reached into the laboratories, clinics, offices, and homes of a critical mass of scientific and medical professionals.⁸ Journals such as *Pediatrics*, which launched its electronic edition in 1997, even began to publish articles exclusive to the electronic medium. Electronic-only journals, including *NeoReviews*, also began to proliferate. Now that it was technically possible to beam a vast number of the world's scientific publications to any computer connected to the Internet, a number of people began to wonder whether it might be economically feasible to do so.

The "serials crisis" is the term used to describe the growing inability of library budgets at many organizations to keep pace with the rising costs of journal subscriptions. Subscription prices, especially for institutional subscribers, have been rising steadily for decades. There are several reasons for this increase in journal costs, the most prominent being the increase in the volume of articles published per journal. The size of the average journal more than doubled in the 20 years from 1975 to 1995, a trend that seems to be continuing, if not accelerating, in the 21st century.⁹ *Pediatrics*, for example, published 1551 editorial pages in 1975, 2120 editorial pages in 1995, and 4467 editorial pages in 2003. A second reason is that journal publishers have made large investments in developing and maintaining electronic journals, and the burden of these costs has been passed along in subscription prices. A third factor is the historic decline in the number of personal subscriptions for most journals as scientists rely increasingly on their institutions for journal access.^{8,9} The cost of this subscription erosion is largely borne by institutional subscribers. A fourth factor is the dramatic increase in the number of commercially published journals. Before 1945, nearly all journals published in the United States were published by societies. Today, nearly 40% of US journals are published by commercial publishers.⁹ A recent study published in the *Proceedings of the National Academy of Sciences* illustrates the fact that commercially published journals tend to have significantly higher subscription rates (especially for institutions) than journals published by societies and university presses.¹⁰

Although it was hoped that the advent of electronic publication would reduce subscription prices,

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this did not happen. Small publishers struggled to cope with the costs of maintaining print while simultaneously developing electronic journals, and many large commercial publishers viewed savings gleaned from the economies of scale found in their electronic publication systems as a way to increase profit margins rather than as a way to reduce subscription prices. By the late 1990s, as the slide in the stock market wreaked havoc with institutional endowments, even prominent university libraries were forced to start canceling subscriptions. As scientists and physicians watched this happen, some began to ask if publication models with no costs to readers might be feasible.

In May 2000, the first of these models, called BioMed Central (not to be confused with the similarly named PubMed Central, an "open archive" hosted by the National Library of Medicine), appeared. Launched by the for-profit United Kingdom-based Current Science Group, BioMed Central consists largely of a constellation of quasi journal electronic publications. These publications are peer reviewed but they do not undergo a process of editorial revision and are not copy edited. More recently, BioMed Central has added several full-service journals, the most prominent being the *Journal of Biology*. Articles published by BioMed Central are freely available on the Web. To fund their publications, BioMed Central charges authors anywhere from \$525 (for most publications) to \$1500 (for the *Journal of Biology*) per article for publication. This has become known as the "author-pays" model of open access. Organizations, such as universities, may also purchase a "membership" to BioMed central that allows an unlimited number of articles from authors affiliated with that institution to publish with BioMed Central without having to pay individual publication fees.

In October 2003, armed with a \$9 million grant from the Gordon and Betty Moore Foundation, the San Francisco-based Public Library of Science (PLOS) launched the journal *PLoS Biology*. Unlike most of the offerings from BioMed Central, *PLoS Biology* is a true journal, with copy editing, peer review, and an editor-guided revision process. Although a print version is available for a subscription fee, the electronic edition of the journal is freely accessible on the Web. Similar to BioMed Central's *Journal of Biology*, PLOS assesses a publication fee of \$1500 per published article. Both BioMed Central and PLOS employ licensing arrangements that permit journal users to utilize the content of the journal in nearly any way they wish without charge.

Although PLOS does publish a journal (and has plans to launch a second journal, *PLoS Medicine*, later this year), it is, more broadly, an open-access advocacy organization. It is the aim of PLOS not simply to go about publishing journals by using this author-pays open-access model but to bring about a sea change in the scientific community, moving all STM journals to adopt the PLOS model (or something very similar). To this end, PLOS approached Representative Martin Sabo (D-Minnesota) last year, urging him to introduce legislation mandating that "any work

produced pursuant to scientific research substantially funded by the Federal Government" be published without copyright protection.¹¹ Titled the Public Access to Science Act, the result of this legislation, if passed, would be to motivate journals to move toward an author-pays model of open access. Because traditional sources of journal revenue (eg, royalties, reprints, and even, potentially, subscriptions) would be sharply curtailed, most journals would have few other options.

Although the Public Access to Science Act is unlikely to pass through Congress, it is likely that this is only the first legislative salvo in what could turn out to be a lengthy campaign.

THE DC PRINCIPLES

The discussion of open access has become increasingly polarized over the last year, with proponents advocating for changing the entire scientific publishing system to an author-pays open-access model and opponents supporting the traditional subscription-access system. It is in this environment that the Washington DC Principles for Free Access to Science (DC Principles) were formulated in hope of providing some middle ground.¹² These principles were drafted by a group of not-for-profit publishers (including the American Academy of Pediatrics [AAP]) who are committed to increasing access to scientific literature but who do not believe this author-pays model of open access is the only (or the best) method of accomplishing this aim.

For many years these not-for-profit publishers have been quietly pursuing initiatives aimed at increasing access to scientific literature. These initiatives include making abstracts of all articles freely available on the Internet (both on their individual Web sites and in major indexing databases) so that information can be located quickly. They include making the full text of all articles freely available online either immediately or within months after publication, depending on each publisher's business and publishing requirements. They include an agreement between these and many other not-for-profit publishers to provide toll-free links to cited references. And they include providing free online access to individuals and institutions in low-income countries. Furthermore, as not-for-profit publishers, any surplus revenue gleaned from journal publishing is reinvested in the direct support of scientific, educational, and public health initiatives around the globe.

The aim of the DC Principles is to raise awareness of the fact that many not-for-profit publishers have been providing free access to scientific literature for some time through publishing models that are both responsible and sustainable. Although these efforts may not meet the strictest definitions of open access, they nonetheless stand in support of the notion that the scientific record is a resource that should be available to as many people as possible. As custodians of this resource, these not-for-profit publishers recognize their responsibility to engage in sustainable publication models that will continue to support the world's increasingly prolific scientific output

while minimizing barriers for both readers and contributors.

THE AAP, *Pediatrics*, AND THE ELECTRONIC PAGES

As a signatory, the AAP supports the aims and practices outlined in the DC Principles. The AAP makes abstracts freely available for all its journals both on the journal Web sites and in major indices such as PubMed. All the AAP's journals, as well as the electronic edition of the Red Book, are freely accessible on the Web for institutions and individuals in more than 120 low-income nations around the world.¹³ Toll-free links are provided to thousands of cited articles in hundreds of journals, just a click away from the reference lists of the AAP's journals.

The AAP has also hosted its own open-access experiment since 1997: the *Pediatrics* Electronic Pages.¹⁴ For more than 7 years this electronic-only section of the journal has provided articles that are freely accessible on the Web immediately on publication with no fees for authors. These articles undergo the same rigorous peer review and editing as printed *Pediatrics* articles and are typeset so that Adobe PDF copies can be easily downloaded and printed from a desktop computer. The decision as to which articles to place in the Electronic Pages has always been made by the editor, who usually selects articles of particular international interest or interdisciplinary articles that warrant the attention of readers beyond the journal's subscription base. Beginning in July 2004, however, *Pediatrics* will allow the authors of any accepted manuscript to elect to have their article published in the Electronic Pages. Their article will be freely accessible on the journal's Web site immediately upon publication and they will pay no author fees.

In addition to the content in the Electronic Pages, all policy statements, clinical reports, clinical practice guidelines, and technical reports of the Academy are made freely available the moment they are published. Furthermore, beginning in July 2004, access to all articles published in *Pediatrics* will be free 1 year after publication. Although we would like to make all articles freely accessible on the Internet from the moment of publication, it is not economically feasible to do so at this point in time. After carefully evaluating the author-pays model of open access, the AAP decided to maintain *Pediatrics'* current publishing model for the time being. The AAP's concerns regarding author-pays models revolve mainly around the following issues:

1. Journals using author-pays models rely on a limited number of revenue sources. *Pediatrics'* current publishing model distributes the costs of publication across many different constituents. The journal receives revenue from membership dues, non-member subscriptions, advertising, royalties, reprint sales, and pay-per-view (single-article) access sales. This model is fiscally sound, allowing the journal to weather even dramatic economic fluctuations without jeopardizing publication or creating a fiscal liability for the AAP.

This publishing model also allows *Pediatrics* to keep subscription rates low, because the journal's

income is augmented through other sources. Because of this, *Pediatrics* is purchased by thousands of libraries around the world where it is available to those without individual subscriptions. For those without access to a library who need access immediately (and who do not live in low-income nations) online access for a 30-day period, to either a single article or the entire journal, is available for a nominal fee. Free access for everyone is available 1 year after an article's publication.

In a strict open-access model, it would not be possible to collect income from reprint sales, royalties, or subscriptions (except for print delivery). The income generated from these sources would have to be recovered through one of the few revenue streams available to open-access publishers: authors.

2. An author-pays model is fiscally untenable for *Pediatrics*. PLoS charges authors \$1500 per article for publication. Although this substantial fee is beyond the means of many authors, it represents only a fraction of the true cost of publication. PLoS is able to subsidize author fees with grant funding that is not available to all organizations. Estimates of the true cost of publication range from \$2500 to \$8000 per article for selective journals with acceptance rates below 20% (*Pediatrics'* acceptance rate is currently around 20%).^{9,15,16}

We do not think it is reasonable to expect authors to pay thousands of dollars to publish an article at this point in time. This model may be feasible for archive journals with high acceptance rates or for research journals with a majority of contributors at large research institutions. It is not feasible for a selective journal such as *Pediatrics*, which publishes many clinical articles and case studies submitted by authors at smaller institutions and private practices. Furthermore, nearly one third of the articles published in *Pediatrics* are submitted by authors outside the United States where often even less funding is available. It is true that both PLoS and BioMed Central accept articles without levying publication fees when authors cannot afford to pay them. However, without substantial subsidization this simply means that publication fees for paying authors become higher still.

In addition, the AAP, unlike PLoS or BioMed Central, is a professional society. As the official journal of the AAP, a large proportion of *Pediatrics'* authors are AAP members. It would not be reasonable to expect members to pay thousands of dollars to publish an article in their own society journal!

3. Author-pays models shift the role of journals. In addition to being fiscally untenable without substantial grant funding, there are other concerns raised by an author-pays publication model. As the principle source of journal income shifts from readers to authors, the journal's primary customer would shift as well. The most important service that *Pediatrics* provides to readers is that of filtering. Journals do not publish every article they receive, often turning away articles that are scien-

tifically sound because they are not deemed interesting to the journal's readership. In an author-pays system, it is inevitable that journals (even selective journals) will begin to accept more articles. Although it is not likely that journal editors would cross ethical lines by publishing articles deemed scientifically unfit by peer reviewers, it is quite likely (and could even become fiscally necessary) that journals would begin publishing articles that are topically unfit for the journal's readership. At this point, journals would be in danger of outgrowing their bindings, ceasing to be effective filtering services, thus abandoning one of their fundamental roles.

CONCLUSIONS

Disseminating literature related to the health care of children and adolescents is part of the core educational mission of the AAP. The wider this literature is disseminated, the greater the opportunity for positive outcomes in treating children around the world.

However, the AAP must balance these aims against the fiscal responsibility inherent in maintaining a publishing program. Furthermore, we must consider the resources available to journal contributors.

Since 1997 *Pediatrics* has been engaged in its own form of open-access publishing. Today every article published in the journal is freely accessible on the Web, many of them immediately on publication. By keeping some articles under access control for 1 year, we are able to continue to sell subscriptions to professionals, and their institutions, who want immediate access to the entire journal. This allows *Pediatrics* to publish articles free of author fees.

If at some point in the future sufficient funds for author fees become available to the majority of *Pediatrics* contributors, the AAP will reconsider the author-pays model of open access. In the meantime, we will strive to increase access to *Pediatrics* and the rest of the AAP's journals within our existing paradigm.

There is, however, room for more than one pub-

lishing model in the world. We welcome the contributions of BioMed Central and PLoS to scientific publishing and wish them success with their endeavors. However, the scientific publishing landscape cannot change overnight. New funding mechanisms must be found in order for these publishing models to become sustainable on a larger scale. Only time will tell if open access will be an open sesame for journal literature or only so much hocus-pocus.

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