

## OPEN ACCESS: A CURRENT PERSPECTIVE

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The open access logo on the left was originally designed by the Public Library of Science. An alternative logo design (below) can be found at [open-access.net](http://open-access.net). While no official logo exists, organizations are free to select the logo style that best supports their visual language.



### INTRODUCTION

Open access (OA) means different things to different people. To some, OA means immediate access to scientific content in its final form on the publisher's website when published. This is Gold OA, made possible when the author or the author's institution pays the publisher an article processing charge (APC). A "lesser" version is Green OA, wherein no fee is paid and the posted work is either the peer-reviewed, accepted manuscript or the published article after an embargo period (typically 6 months or more). The term *public access* is used in the US for free access to publications, reports, and data of federal government-funded research. A recent flurry of activity suggests that, at least in some countries and subject areas, OA is set to become a reality. In this short review, we outline the current state of OA and what it will mean for authors and for nonprofit/learned society publishers.

### WHERE IS OA WORK PUBLISHED?

An OA work can be made available in a number of places: the publisher's website, full-text online databases (e.g. GeoScienceWorld), an institutional repository or archive (Harvard's DASH repository, DSpace @ MIT, USGS Publications Warehouse), a central repository (Europe's OpenAIRE, PubMed-biomedical sciences, arXiv.org-physics), the author's personal website, or discussion forums (e-mail lists, blogs, wikis, file-sharing networks). The publisher can be the "self-publishing" author; one of the traditional society, university, or commercial publishers; or a start-up OA publisher, such as PLOS (Public Library of Science), eLife, Copernicus

Publications, Bentham Science Publishers, or MDPI. Peer review of these OA publications ranges from the traditional concept, to moderated or endorsement (arXiv.org), to open peer commentary with non-anonymous commentaries and author's reply published with the paper, to none whatsoever. Copyright laws apply to OA publications.

### HISTORY

Open access in its current guise first appeared more than a decade ago. It was made feasible when we acquired the ability to deliver scientific publications electronically, eliminating the expense of producing, delivering, and archiving print copies. Other drivers for OA are the increasing cost of journal subscriptions at a time when library budgets are static or being cut, while significant profits are being made by commercial scientific, technical, and medical (STM) publishers. Profits as a percentage of revenue for large, commercial STM publishers in 2010 or early 2011 are of the order of 32% to 42% of income (Taylor 2012). A related driver is the fact that publishers often acquire the copyright of the works. The largest publishers of STM journals are commercial publishers, and the income generated by the publication and sale of STM content is significant. Nonprofit STM organizations account for a relatively small proportion of the overall monies paid for journals, but the significant difference is that any surpluses generated from their publishing activities are returned to the science, in the form of lower publication costs, subsidized memberships, conferences, student grants, and general support for scientific activity. Anecdotally, >75% of the operating surplus of nonprofit scientific organizations comes from their publishing activity.

### FINANCIAL MODELS FOR PUBLISHING

For many decades, journal finances worked on a simple, single-journal subscription model. A subscriber (institutional or individual) pays a yearly fee to the publisher and in return receives copies of all material published in that journal for that year. This traditional subscriber- or reader-pays model still exists, but it is now one among many ways to support publishing or to access published works. The models we see today are:

- **Author-pays** – The author, or his or her grant, contract, funder, or institution, pays an article processing charge and, in return, the author's article is immediately made available to all readers without cost. (See a list, compiled by the University of California, Berkeley, Library Collections, of APC fees charged by some of the main commercial publishers at [www.lib.berkeley.edu/scholarlycommunication/oa\\_fees.html](http://www.lib.berkeley.edu/scholarlycommunication/oa_fees.html).)
- **Hybrid journals** – These are journals with some OA articles, while other articles, for which an APC has not been paid, remain

behind the subscription barrier. For some journals, for example, *American Mineralogist* and *Clays and Clay Minerals*, the APC is used to reduce the subscription rate. Over time, if the proportion of authors willing to pay increases, the subscription price decreases, and eventually the entire journal becomes Gold open access.

- **Online journal aggregates or databases of full-text articles** – This is the "Big Deal," an online aggregation of journals bundled as a one-price, one-size-fits-all package of a commercial publisher's journals. The Big Deal means that journals of the largest commercial publishers are more widely available than journals of small, nonprofit publishers. GeoScienceWorld was created to compete with the Big Deal and make society publications more accessible to the wider community, with features that a society publisher could not economically justify for its journals.
- **Gateways** – These are collections of links to publishers' full-text content. The gateway does not host the full text but includes header information about the work, that is, information about the abstract, author, article title, references, etc. An example of a gateway is an abstracting and indexing service like GeoRef.
- **Document delivery or pay-per-view** – This model exists in a number of forms, such as the new service MinPubs.org, where you can purchase print and electronic versions of *Elements* and other publications.
- **Institutional membership discounts** – Institutions that make significant use of open access sites, such as BioMed Central, arXiv.org, and PLOS, may make "volunteer" payments based on the amount of uploading and downloading by their institutions. The net result sounds very much like an "OA subscription."
- **Non-journal revenue** – In this model, publishers support OA from revenue streams other than from journals. These include advertising, secondary rights or copyright licensing, back-issue access, sponsorship of journal issues by third parties, society dues, and grants.
- **Bulk publishing** – This is an author-pays, OA publishing model but with minimal or no peer review as a cost- and time-saving measure.

A significant financial uncertainty in OA publishing is the cost of archiving and migrating electronic files to ever-changing new formats and platforms. In the future, it is expected that the archiving and migrating function will be carried out largely by the publisher. This aspect of OA is rarely discussed, and it is likely to be an ongoing publisher's expense that many overlook.

### RECENT ACTIVITY IN OA

Strong lobbying by the OA community has achieved some success, as detailed below.

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## United Kingdom

In June 2012, the British government published the "Report of the Working Group on Expanding Access to Published Research Findings" (the Finch report: [www.researchinfonet.org/publish/finch/wg](http://www.researchinfonet.org/publish/finch/wg)). The main points of the report are:

- The main vehicle for the publication of research, especially when it is publicly funded, should be OA or hybrid journals funded by article processing charges.
- All public sector bodies funding research should establish more effective and flexible arrangements to meet the costs of publishing in OA and hybrid journals.
- Support for OA publication should be accompanied by minimal restrictions on rights of use and reuse, especially for noncommercial purposes.
- Universities, funders, publishers, and learned societies should continue to work together to promote further experimentation in OA publishing of scholarly monographs.
- Universities, publishers, and learned societies should work together on subscription pricing while taking into account the financial implications.
- Representative bodies in the public and private sectors should work together with publishers, learned societies, libraries, and other stakeholders to consider the terms and costs of licences.
- Funds should be found to extend current licensing arrangements to cover all institutions in the higher education (HE) and health sectors.
- Infrastructure for subject and institutional repositories should be strengthened further.
- The "Green" access/embargo model should be kept under review to avoid risk to valuable journals that are not funded in the main by APCs.
- The report's best estimate is that the new policy would require an additional expenditure of £50–60 million per annum by the HE sector. There would be a one-off £5 million in transition costs.

Research Councils UK (RCUK), which distributes academic funding for the government, has begun publishing its implementation policy (Guinnessy 2012). The RCUK will provide block grants to universities which, in turn, will pass the money, up to \$10,000 per article, on to researchers. A statement on 15 February 2013 by the House of Lords has been critical of several aspects of the implementation of the RCUK's OA policy and calls for an early review. The RCUK position looks increasingly isolated in terms of favoring Gold rather than Green open access (see below), and the UK House of Lords is critical of the RCUK policy on this point.

## European Union

The European Commissioner for Research, Innovation and Science, Máire Geoghegan-Quinn, met with key stakeholder groups in September 2012 to discuss open access to

scientific information produced in Europe. Commissioner Geoghegan-Quinn stated that "open access is about giving European taxpayers a better return on their €87 billion annual public investment in research and development." The commissioner met with traditional publishers, OA publishers (represented by the Open Access Scholarly Publishers Association), the OA community (Scholarly Publishing and Academic Resources Coalition), and research funders and others (Wellcome, DFG, and Knowledge Exchange).

The European Commission (EC) has asked members, as part of its Horizon 2020 research program, to consider making 60% of European publicly funded research OA by 2016 (Guinnessy 2012). The EC's Horizon 2020 yet-to-be approved guidelines allow authors to submit to any OA journal and recommend that all physical sciences and engineering papers be available at no charge after six months.

The European Organization for Nuclear Research has as its goal to make nearly all papers in high-energy particle physics OA. They hope to achieve this by having libraries redirect money otherwise spent on subscriptions to SCOAP3 (Sponsoring Consortium for Open Access Publishing in Particle Physics). SCOAP3 is an international group of funding agencies, laboratories, and libraries that have committed to support the transition of 12 journals to OA by paying the APC.

## United States

The United States National Library of Medicine at the US National Institutes of Health (NIH) has been the leader in public access in the US with PubMed. This free database of references and abstracts on life sciences and biomedical topics has >22 million records going back to 1809; 12.38 million of these articles are listed with their abstracts, and 12.81 million articles have links to full texts (3.54 million of these are available full-text for free to any user). About 500,000 new records are added each year. Several funding organizations, including the NIH, the Howard Hughes Medical Institute, the Wellcome Trust, and the UK Medical Research Council, mandate that authors they support deposit published articles into PubMed and that articles be made available to the public either 6 or 12 months after publication.

The US National Science Foundation has voiced support for the concept of open access, saying it is developing a strategy. The US Department of Energy (DOE) has its *Information Bridge*, which provides free public access to over 303,000 full-text documents and bibliographic citations of DOE research-report literature. The United States Geological Survey's *Publications Warehouse* gives free access to >100,000 publications from its >100-year history.

On 22 February 2013, the White House Office of Science and Technology Policy (OSTP) directed federal agencies with budgets in excess of \$100 million per year in research and development spending to develop plans in six months to make the published results of federally funded

research freely available to the public within one year of publication, and required researchers to better account for and manage the digital data resulting from federally funded scientific research (OSTP 2013). The final peer-reviewed manuscript or the final published document is to be made public. It appears that the likely embargo period for green access will be set at 12 months, though the wording appears to allow challenges from subject areas where this might be damaging to stakeholders. The details of how this will work will be better known after OSTP has reviewed the various agencies' plans.

OSTP incorporated much of the Fair Access to Science and Technology Research Act (FASTR), introduced on 14 February 2013 in both the US Senate and the House of Representatives, cosponsored in the Senate by Sens. John Cornyn (R-TX) and Ron Wyden (D-OR) and in the House of Representatives by Reps. Mike Doyle (D-PA), Kevin Yoder (R-KS), and Zoe Lofgren (D-CA). The statute would require federal agencies to make federally funded research available for free online access by the general public no later than six months after publication in a peer-reviewed journal. The public access version need not be the published version, but can be the manuscript version accepted for publication after peer review.

## China

Over the past 10 years, many western publishers have reported a dramatic increase in the numbers of papers submitted by Chinese authors—up to 40% of all articles submitted is a commonly mentioned statistic. Decisions made in China about OA will clearly have a major impact on journal finances for many publishers. In 2003, China signed the Berlin declaration, an early statement of intent for the OA movement. A cursory review of a large body of literature about OA in China suggests that the Chinese are inclined to take an "internal" view of OA. The vast and rapid increase in the number of submissions by Chinese authors to many journals was seen as a way of increasing the visibility of the work by Chinese researchers. Many in China, however, view the profits made by commercial publishers from work supported by the Chinese state as a problem, and the movement seems to be encouraging efforts to support indigenous OA repositories and journals. Not unlike the rest of the world, there does not appear to be new money available to pay APC fees.

## Australia/Asia

The Australian National Health and Medical Research Council (NHMRC) has adopted a Green OA policy. All recipients of NHMRC grants are required to post a copy of their research articles on one of the 40+ Australian universities' institutional repositories within 12 months of publication. The version of the article submitted must comply with individual journal/publisher requirements. NHMRC grants can only be used for the research activity and not for additional infrastructure costs, which currently excludes publication fees.

## Japan

Japan will actively encourage researchers and their institutions to pay for OA publication of their research. It is not clear at present how prescriptive this will be, or which funding agencies will lead this change.

## Germany

In August 2012, six Helmholtz centers announced an agreement with Copernicus Publications (<http://publications.copernicus.org/home.html>), the largest OA publisher of geoscience literature, with 28 peer-reviewed journals. Publication fees will be billed centrally to Helmholtz and not to the author.

## HOW CAN OA BE MADE TO WORK?

Authors want their work to be widely available. A learned society's purpose is to promote scientific discourse and accelerate the pace of discovery by wide dissemination of its publications. OA is an ideal mechanism for meeting both goals. The current movement to mandate depositing of primary data used in research will accelerate expectation of OA articles. The desire, rationale, technology, and infrastructure are in place for OA; so why is OA not the dominant publishing model?

OA publishing lacks a demonstrated and sustainable business model. Few believe they should be the ones to pay, and few have sufficient resources to do so. Much OA thinking is based on the current experiences of the biomedical field, a well-funded discipline where researchers expect instant access to the latest research and papers are considered no longer relevant after weeks to months—hardly a situation describing the Earth sciences. The situation is made worse by the current global financial situation. Still, there appears to be tacit acknowledgment that OA is here to stay. Commercial publishers are no longer resisting, but rather are finding ways to show that they are on board with OA and to make it profitable. Do nonprofit/learned society publishers need to do likewise? In a word, yes, but in a way that preserves quality and financial viability. There may be enough money currently in the journal-support system, combined with cost savings, to make OA journals economically sustainable using an author-pays model.

UK university libraries spend about £200 million per year on journal subscriptions. In the US, expenditures for current electronic serial subscriptions by academic/college and university libraries alone is ~\$1.0 billion (NCES 2012). If an author's organization or funding source mandates open access publishing, it makes sense that they provide the money for APC. But will universities and their libraries be willing or able to transfer some or all of these subscription funds or money spent to archive and house print journals to pay author fees? Will research funding agencies and researchers designate a sufficient portion of their grants and contracts to pay author fees? Both authors and nonprofit/learned society publishers must publicize the need to redirect money no longer spent on subscriptions.

## Problems with the APC Model

There could be unintended consequences to author-pays OA: the search for the best publishing deal as a cost-saving measure, resulting in a competitive race to the bottom; dictates from institutions as to where to publish; rationing by universities of the number of author publications; journal selection by authors applying their limited funds only to journals with high impact factors, resulting in the squeezing out of other publishers; and excessive fees charged to faculty needing to publish in certain places to advance their careers. For publishers, maintaining scientific quality might conflict with the pressure to accept and publish papers faster and in greater numbers to prevent possible loss of journal income.

Other revenue sources to support OA seem unlikely. Publications such as *Elements*, with above-average advertising support, are the exception. It is unlikely that other *Elements*-family journals could attract paid advertising or sponsorship in more than minor amounts. It is difficult to imagine the rationale one could use to sell secondary rights, copyright licensing, or back-issue access to publications that are open access. Using other society programs or dues to support publications merely shifts the financial burden to perhaps other underfunded programs. Private and government agencies like to fund "new" things, not support long-term projects. It is significant that PLOS was launched with grants totaling US\$13 million but with the expectation that it become self-sustaining. The three nongovernment organizations funding the eLife start-up have the same expectation.

## Change in Editorial Standards to Reduce Editorial Costs

According to its newest peer-review form, *PLOS One* instructs its reviewers to evaluate submissions not on the basis of their perceived importance or significant advance to the field, but rather by determining if the reported study has been performed correctly and if the data support the conclusions (Pattinson 2012). The reviewers are also asked whether the submission adheres to data-sharing standards and if the manuscript is written in intelligible standard English. With these criteria, *PLOS One* hopes to reduce the burden on reviewers and decrease time in review, and therefore costs (Butler 2008).

## Migrating to OA via Hybrid Journals

For nonprofit/learned society publishers, the prudent approach to OA appears to be a gradual one: either an embargo period of Green OA or hybrid journals. An embargo period allows for a period of paid access, so that the publisher can still sell subscriptions and recover costs before the content is made OA. The often-stated 6–12 months, based on the biomedical experience, appears too short for the Earth sciences, where the half-life, or median age, of the articles that are cited in a year can approach ten years. A hybrid journal may be a better way to transform a current subscription-based journal into an OA one. Authors are given a choice as to

whether or not they are willing to pay a publication charge. If they are, the paper is made open access on publication. If they are unable to pay, the paper is only made available to subscribers. A hybrid journal is the way to solve the problem of authors without research funding, authors whose original research grant has lapsed or did not include an allowance for APC, or coauthors from countries or with funding sources with differing mandates. As the proportion of authors willing to pay increases, the publisher can begin to reduce the subscription price. Eventually, if OA becomes the norm, the entire journal becomes open access.

To meet the requirements of funding agencies, many journal copyright policies now allow authors, even in the absence of paid APCs, to post their accepted manuscript on their personal websites, in their institution's repository, or in an approved repository.

Within the *Elements* family, several journals, including *American Mineralogist*, *Clays and Clay Minerals*, *Clay Minerals*, *Elements*, and *Mineralogical Magazine*, are hybrid journals. If you are required to publish in an OA journal, you ought to consider these and similar journals. A directory of open access journals can be found in the online Directory of Open Access Journals (<http://www.doaj.org/>).

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