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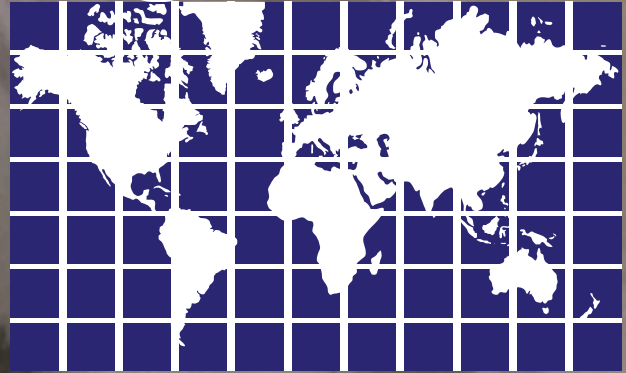
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Academic Publishing and the Challenge of Open Access

by NICHOLAS KEVLAHAN

The past two years have seen a remarkable revolution in academic publishing. This revolution was sparked on January 21, 2012 when University of Cambridge Fields Medalist Tim Gowers declared on his blog that he would “refuse to have anything to do with Elsevier journals from now on.” This declaration led directly to the the “Cost of Knowledge” boycott that has attracted over 14,000 signatures (including 3914 mathematicians and computer scientists). It led indirectly to Elsevier withdrawing its support for the Research Works Act in the USA (which would have banned Open Access mandates, like that of the NIH) and to the UK government deciding that government funded research should be published in a freely accessible form. The EU has also adopted an Open Access requirement for EU funded research, and the Canadian tri-councils are currently formulating a Canadian Open Access policy.

This is not the first time academics have rebelled against the harm done to our community by commercial publishers of journals. An even larger petition thirteen years ago led to the formation of the highly successful Open Access PLOS (public library of science) journals. Mathematicians and computer scientists have often been at the vanguard of the fight against abusive practices by commercial publishers (e.g. the mass resignations of the editorial boards of *Topology* in 2006 and *K-theory* in 2007 and the campaign by Donald Knuth, the developer of $\text{T}_{\text{E}}\text{X}$). However, previous rebellions failed to change the fundamental structure of academic publishing: the business model of most journals still requires restricting access to published research to those readers whose institutions have paid subscription charges.

Why are things changing now?

Until about 20 years ago academic publishers and researchers enjoyed a mutually beneficial relationship. Researchers needed publishers to communicate their research results to a wide audience, since this communication relied on printing and distributing physical journals. Every stage was expensive and required expert skills: typesetting (especially mathematical) was a time-consuming job that could be done only by experts, printing and binding were expensive and incurred a cost for each copy printed, and shipping vast amounts of paper around the world was the only way to disseminate the final papers. Academic libraries handled the costs of archiving, and researchers themselves handled editing (apart from some minor copy editing) and peer review and provided the content. Researchers donated editing, refereeing and the manuscript itself as a service to the community. Authors often transferred copyright to the publishers to make it easier to produce collected works, or to simplify requests to reprint parts of papers. As a token of appre-

ciation most good journals would provide a few dozen high quality reprints for the authors to distribute as they wished.

As in most areas, computers and the internet have democratized academic communication. Academics no longer need publishers to make their work widely available, and the internet and electronic typesetting programs (like the freely available $\text{T}_{\text{E}}\text{X}$ system used by almost all mathematical publishers) mean that authors themselves now do much of the “penalty” technical typesetting. Repositories like the arXiv and HAL in France allow researchers to archive their own work and make it instantly available to anyone in the world free of charge. The peer review system has been simplified by using email and peer review management systems (like the open source PKP Journal management systems).

However, at the same time as the cost of managing, producing and distributing journals has plummeted, the costs of subscriptions to university libraries and page charges to authors have skyrocketed to the point that the chief librarian at Harvard declared recently the costs are now unsustainable.

Profits margins at the four biggest academic publishers are commonly above 40%, making academic publishing the most profitable industry around. Academic publishing is the only industry where automation and outsourcing work (to the customers!) has led to much higher prices and very little innovation. Most academic journals are basically electronic versions of the old paper journals with a few hyperlinks added. As Tim Gowers and many other academics have realized, the current system is one where commercial publishers are parasitic on the academic community. Publishers use the brand names of the journals they control to convince researchers to donate their research and time, and they then put this research behind a paywall and sell it back to the same community of researchers who donated their time and content in the first place. Elsevier, in particular, has claimed that it “owns” the research published in its journals and that researchers “work” for Elsevier.

All this has been known for some time, but since researchers typically don’t pay the exorbitant subscription charges themselves, and they feel they must publish in certain high ranked journals, the system has continued long after the costs began to outweigh the benefits. Libraries must sign secrecy agreements with publishers that forbid them from telling their researchers how much they pay for journals, further reducing researchers’ ability to take cost into account.

What has changed is that the funding agencies, starting with NIH in the USA, began to realize that the results of publicly funded research should be available to the pub-

lic. They have also woken up to the fact that paying an average of about \$3000 per article directly to the shareholders of commercial publishers is not a very good use of public money! Most researchers are, quite naturally, more concerned about their careers than about accessibility or cost. But if their funding agencies require that their research results be publicly available (either in Open Access journals or in repositories like PubMedCentral), they will comply by shifting to Open Access journals. Publishers will have to adapt their business models.

The primary result of this revolution is that all published research results will be freely accessible, which is an unambiguously good thing for both researchers and the general public. The question now concerns the new business model for academic publishing.

Two models for providing Open Access currently co-exist. “Gold” Open Access means that the paper is freely accessible in the journal itself as soon as it is published. In hybrid journals Open Access and non-Open Access papers appear side by side and the publisher continues to charge (unreduced) subscription fees. In fully Open Access journals all papers are freely accessible and authors retain their copyright. “Green” open access means that the paper, after final review, is placed in a freely accessible online repository (usually after an embargo of six months to two years). Strangely, Elsevier forbids deposition of final versions of papers that appear in its journals if such deposition is mandated by the funding agency or university.

Confusingly, there is no connection between the type of journal and its business model. About 75% of non-Open Access journals charge authors fees of some sort (in addition to subscription fees to libraries), while about 65% of Open Access journals charge no fees at all (costs are covered by learned societies, scholarly communities, universities or funding agencies). It is important to remember that the choice of business model is separate from the question of whether or not a journal is Open Access.

Open Access is a hugely positive change that presents both challenges and opportunities. The challenge to the academic community is to ensure that this new system is sustainable and that quality is maintained and improved. The breakdown of the old system also provides an opportunity to develop new more effective modes of academic communication that take full advantage of the new media. It also means that we can rid ourselves of the more pernicious practices of some commercial publishers: the promotion of journal “impact factors”, coercive citation (where authors are required to cite papers from the journal to raise its impact factor), and the proliferation of new low-quality journals (both paywalled and Open Access) whose only goal is to make money for the publishers.

Academic publishing should become a service, not a product. We should choose which services are essential (e.g. archiving, editing and peer review), and who should provide them. A freer market in Open Access journals

is already driving down costs (peerJ charges just \$99 for one peer-reviewed publication per year) and it is certain that Open Access should be far cheaper to the research community than the current system.

As mathematicians and scholars we should recognize the importance of free dissemination of our research results by supporting the “Berlin Declaration on Open Access”. We should also reform our research funding, hiring, tenure and promotion processes to ensure that we evaluate the impact and research quality of papers themselves, rather than relying on flawed proxy measures like journal impact factors. And we must be sure not to penalize younger colleagues for not publishing in pay-walled journals. Counting publications (weighted by impact factors) is a lazy and ineffective way of measuring the impact and quality of research and we should not accept it.

Finally, many of us recognize that the peer review system itself is collapsing under the avalanche of papers now being produced. Peer review no longer necessarily weeds out bad research, and it often fails to recognize good innovative or interdisciplinary research. We should be exploring new ways to raise the effectiveness of research communication and ensure that our time is used most efficiently. Perversely, in the current system the worst papers often consume the most peer reviewing resources as they move down the hierarchy of journals, getting rejected repeatedly before inevitably finding a home. Rationing publication is a holdover from paper printing, and we should separate “publication” of research from “evaluation” of research. Indeed, there are good reasons to evaluate research and measure its impact *after* it is published. The new Forum of Mathematics (in Pi and Sigma flavours), the arXiv overlay [Episciences-Math](#), and the [Polymath](#) open math blog are all initiatives in this direction.

Please encourage your colleagues to publish in ways that help, rather than harm, the research community and the general public who fund our research.

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