

# Whither Journals?

Rob Kirby

Institutions and governments are increasingly promoting open access for papers in mathematics (and other disciplines). A number of universities, including Harvard,<sup>1</sup> Kansas,<sup>2</sup> MIT,<sup>3</sup> Duke,<sup>4</sup> and Princeton,<sup>5</sup> have established policies for their faculties, which are essentially this:

*Each faculty member will grant to the university permission (i.e., a license) to make his or her scholarly article open access and to allow anyone else to do the same (provided that the article is not sold for a profit). The faculty member will provide to the university an electronic copy of the final version. The faculty member may opt out upon written request.*

In November 2011, UC Berkeley announced that it would help make papers by its faculty open access in two cases. If the paper is published in an open-access journal, UCB will subsidize the cost to the author by up to US\$3,000, with a US\$6,000 limit per year. If the paper is published in a normal subscription-based open-access journal, UCB will pay up to US\$1,500 to make the paper open access immediately.

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*Rob Kirby is professor of mathematics at the University of California, Berkeley. His email address is kirby@math.berkeley.edu.*

<sup>1</sup> 2008, [osc.hul.harvard.edu/hfaspolicy](http://osc.hul.harvard.edu/hfaspolicy).

<sup>2</sup> 2008, [kuscholarworks.ku.edu/dspace](http://kuscholarworks.ku.edu/dspace).

<sup>3</sup> 2009, [dspace.mit.edu](http://dspace.mit.edu).

<sup>4</sup> 2010, [library.duke.edu/dukespace/index.html](http://library.duke.edu/dukespace/index.html).

<sup>5</sup> 2011, [princeton.edu/dof/policies/publ/fac/open-access-policy/](http://princeton.edu/dof/policies/publ/fac/open-access-policy/).

*Members of the Editorial Board for Scripta Manent are: Jon Borwein, Thierry Bouche, John Ewing, Andrew Odlyzko, Ann Okerson.*

DOI: <http://dx.doi.org/10.1090/noti897>

Berkeley is part of the Compact for Open-Access Publishing Equity,<sup>6</sup> which pledges that each of the undersigned universities commits to the timely establishment of durable mechanisms for underwriting reasonable publication charges for articles written by its faculty and published in fee-based open-access journals and for which other institutions would not be expected to provide funds. The signatories include Cornell, Dartmouth, Harvard, MIT, Ottawa, Columbia, Michigan, Barcelona, Duke, Calgary, and Simon Fraser. Not all have established a mechanism for underwriting yet, and not all will contribute to fees at a non-open-access journal.

These initiatives are important first steps in reclaiming more control over the dissemination of our published research.

Publication fees at open-access journals vary widely. The Public Library of Science (PLOS) charges over US\$2,000 per article. The *Proceedings of the National Academy of Sciences* charges the authors (mathematicians are often not charged) US\$70 per page, and this covers very roughly half the cost of the journal, the rest coming from subscriptions. Authors may choose to make the paper open access immediately upon publication for a surcharge of US\$1,275.

Some subscription-based math journals will make a paper open access in return for a fee. For example, journals of the London Mathematical Society make their papers open access for the first six months after publication, and then the papers go behind a subscription wall. An author may make a paper open-access permanently for a fee of US\$3,050. There also exist open access math journals with either no fees or low fees.

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<sup>6</sup> <http://www.oacompact.org/>.

Mathematicians have been relatively quiet bystanders in this movement, which has been led by universities and broader agencies. Yet math, as always, is rather different from other subjects; e.g., we use  $\text{\TeX}$  and often produce papers ready to be printed or posted at the arXiv.

This article will discuss the economics of publishing, both traditional and open access, and will suggest (at the end) a way in which mathematicians might help lead the transition to open-access journals.

A little-noticed fact is that the average professor at a top-fifty mathematics department in the U.S. publishes around twenty-five pages per year in math journals (not proceedings or books). The reader can determine, as I did, the number for his/her department by picking a year, say 2006, and counting pages in papers in that year that were reviewed on MathSciNet. Of course, this number can vary widely for different professors, from zero to hundreds.

It is reasonable to think that at least US\$25,000 of a professor's salary goes to research (the rest to teaching and service to the department, the campus, and the math community). Thus his or her university spends US\$1,000 per page to fund this research. As the goals of a university are to create and disseminate knowledge, it would seem reasonable for it to spend at the very least 5 percent to 10 percent of this money to make the research open access, freely available to the world. Indeed, Berkeley has offered to spend as much as US\$6,000 for those twenty-five pages, which is 24 percent of the hypothesized US\$25,000 for the research.

The amount that a U.S. library spends on math journals at a top-fifty school varies considerably by the size and wealth of the school, but US\$300,000 at a large state university is not uncommon. If that money were spent instead on open access for, say, sixty research mathematicians, it would allow US\$5,000 per person.

On the other hand, what should it cost to run an open-access e-only math journal? Existing journals have widely varying incomes, measured in dollars per page (calculated by dividing the subscription price by the average number of pages published in a given year). The AMS journals—JAMS, PAMS, TAMS—charge approximately twenty-five cents/page and have close to one thousand subscriptions, so their income per page is in the ballpark of US\$250 per page.

A decade ago when bundles of journals were less common and data was easier to find, *Inventiones Mathematicae* charged over a dollar per page and had over six hundred subscriptions, for an income of over US\$600/page. It seems likely that this income has not decreased over time. Some Springer journals make less than *Inventiones*, some more, but their average is still well above AMS

journals. I believe that journals owned by other big commercial publishers are in the same range, although there are some exceptionally profitable commercial journals such as *Communications in Pure and Applied Mathematics*, a Wiley journal, whose income a decade ago was around US\$900/page. Ulf Rehmann's website<sup>7</sup> contains a great deal of information about prices.

University-based nonprofit journals often have lower income. For example, *Annals of Math.* charges from ten to twenty cents per page depending on how many pages they publish in a given year; it has over nine hundred subscriptions, for income between US\$90 and US\$180 per page. The difference between *Annals* and the AMS journals is mostly due to overhead at AMS and perhaps a bit of profit to subsidize other AMS activities. Many other university-based math journals have income in the US\$100 to US\$200 range. Journals belonging to Mathematical Sciences Publishers (the author's (nonprofit) company) have incomes around US\$40 per page and exist due to great efficiency and volunteer labor.

It appears then that a university-based (no overhead), e-only (no printing costs), open-access (no costs for maintaining subscriptions), nonprofit journal could exist on income well under US\$100/page, perhaps even as low as US\$50/page. Or perhaps even lower. An e-journal could arrange refereeing and establish a reputation for math quality (two very important aspects of a journal) and, with enough volunteer work, exist without any money changing hands. The *Electronic Journal of Combinatorics* is a good example. To save money on infrastructure, an e-journal could create some cover pages and become an overlay of the arXiv, which would host all versions, including the final version, of a paper.

Now let's look at papers from the reader's point of view. We like a paper with well-drawn figures, well-laid-out equations and diagrams, good line and page breaks, good internal and external linking, good spelling and grammar; most of all we want clear, understandable writing. Some authors submit a  $\text{\TeX}$  file with all these characteristics, with little editing needed, but other submissions are a mess. The variation is huge.

Thus copy editing—the process for turning a mess into a clear, readable paper—can be very costly, and it is no surprise that many journals do rather little of it, while others are quite conscientious. It makes sense for a paper of high mathematical quality and wide readership to be very carefully copyedited, with attention paid to the clarity of the introduction and main theorems. Authors and referees should of course ensure correctness and some readability, but referees rarely

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<sup>7</sup>[http://www.mathematik.uni-bielefeld.de/~rehmann/BIB/AMS/Price\\\_per\\\_page.html](http://www.mathematik.uni-bielefeld.de/~rehmann/BIB/AMS/Price\_per\_page.html).

engage in a back-and-forth dialog with the author to further improve the writing. Thus the absolute need for good copy editors.

As the quality of a paper and hence the number of readers declines, one would expect a concomitant decline in copy editing so as to reduce the cost of publication. Thus it is not the individual reader but rather the number of readers that indicates how much copy editing is economical for a given paper.

Times are tough at universities around the world, and it behooves us mathematicians to promote an efficient system whereby libraries pay publication costs directly and we publish in e-only open-access math journals, saving print and subscription costs and cutting out the profits to the big commercial publishers. But how do we transition to this model?

Existing journals can start by offering to make an article open access immediately at a modest cost per page of under US\$50 to authors at institutions that subscribe (more otherwise) and, as subscriptions drop (and print runs drop), adjust the price per page so as to at least break even. But I believe that to really move forward, new open-access journals are needed. Here is a possible plan.

As the economists would say, a *signal* is needed, in the sense that a candidate for election needs to raise a significant amount of money in order to be taken seriously by the media and public. I would like to see a million-dollar endowment, with an income of US\$30,000 per year. With that support, one would hope to recruit excellent editors (e.g., ICM speakers) for three journals called, let's say, *X, a Journal of Mathematics*, and similarly *Y, a Journal of Mathematics*, and *Z, a Journal of Mathematics*, i.e., XJM, YJM, and ZJM. XJM would be for papers of broadest interest, YJM less so, and ZJM more specialized. Or they might correspond to A+, A, and A- papers, which, as in a typical calculus course, would correspond to roughly the best 20 percent to 25 percent of papers in reputable math journals. (Papers "graded" C or lower could appear in journals in which no money changes hands and only volunteer work is done; B papers would fall somewhere in between.) The US\$30,000 would go towards the website, editorial software, and a bit of marketing, with the remaining money subsidizing copy editing; it is the *signal* which I believe is most important.

I'd suggest that XJM be subdivided into the same sections as the ICM. Each section would have a chief editor and as many other editors as needed, so that no one editor has to handle more than, say, five papers per year in his/her specialty. There is always overlap between sections, and there should be editors who belong to "adjacent" sections. Furthermore, I would recommend a system such as that used at MSP journals, e.g., *Geometry and Topology*, where an editor gets a referee's re-

port and then either recommends acceptance or rejection to the rest of the editors in that section. The other editors have a few weeks to weigh in, and two editors must second a paper for final acceptance (a recommendation to reject needs no further seconding). With this system, editors form a community to discuss papers and maintain uniformly high standards.<sup>8</sup>

I believe both the money and the editors are necessary. Who is willing to step up to the plate?!

Update: Since this article was written in fall 2011, Cambridge University Press has "stepped up to the plate," and announced a pair of open access journals, *Forum of Mathematics, Pi* (<http://journals.cambridge.org/FMP>) and *Forum of Mathematics, Sigma* (<http://journals.cambridge.org/FMS>). These are to be supported by publication charges, called "Article Processing Charges" or APCs, but CUP is going to subsidize the charges for three years. The journals are intended to act as proof of concept for high-quality, scalable, sustainable open-access publishing in mathematics. They are also intended to establish important basic principles. In particular, the editorial decisions on acceptance and rejection of a paper are to be completely independent of whether an author can arrange payment. I will be the managing editor of the journals.

—RK

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<sup>8</sup>This system has worked well at G&T for fifteen years, but it depends on having very high-quality papers so that editors and referees are relatively happy to deal with them.