On the Same Page

Open Access Publishing:
Part 1 — Historical Background

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There was a time when I subscribed to the print version of 10 academic journals. Two were in general medicine (*Journal of the American Medical Association* and *New England Journal of Medicine*), two were in my specialty field (*Obstetrics and Gynecology* and *American Journal of Obstetrics and Gynecology*) and the others were related to my subspecialty of reproductive endocrinology (*Human Reproduction, Fertility and Sterility, Journal of Clinical Endocrinology and Metabolism*, etc.). After a few years, these journals had taken up all of the shelf space in my office and at home. I began to bind the journals, in part to wrap around me a security blanket of knowledge, and in part to organize the mess that became of these piles of journals.

In the course of my research during that time, if I came across an article in a journal to which I did not subscribe, I walked to the library and retrieved the article from the displays of current journal displays or from the stacks, and made a photocopy.

Currently, I don't subscribe to any print journals. And I don't physically visit the library. I receive, electronically, a listing of articles from each issue of the journals in which I am interested, and read those articles in which I am interested from a pdf file, which I can download if I wish. Literature searches through PubMed and downloads are a snap. What a wonderful and efficient process!

With all of the focus on the rising costs of research and education, you might think that the electronic library is a prime example of how digital technology has not only improved productivity but lowered costs. Since the entire process of journal article submission, peer review and publication is done electronically, shouldn't the production and distribution costs be much lower and shouldn't market forces therefore reduce the price to libraries and scientists?

The short answer is "No, although costs are lower, prices are higher."

This two-part issue of *On the Same Page* explains this paradox and introduces Provost Glover's pilot program in which faculty at UF who publish in online journals can defray their costs of publication from a central university pool.

Consider the journal *Cell*. It is a prestigious journal, published 26 times per year and containing about 300 research papers. Could you guess its annual cost to the University of Florida library, as one subscriber among thousands around the world? Would you have guessed $18,021? And this isn't our most expensive journal. That dubious distinction belongs to *Brain Research*. Its annual subscription cost per library is $23,101.

According to the Association of Research Libraries, expenditures on journals ("serials") among its 123 members increased by 374 percent between 1986 and 2008, a period during which the number of serials purchased increased by only 63 percent and the consumer price index increased by only 101 percent. Between 2000, which was about the time that electronic publishing began to take hold, and 2008, median expenditures on serials in ARL libraries increased from $4.4 million to $7.1 million. So much for reduced pricing. Thus, biomedical research, which is funded largely by governments, universities and charitable foundations, has been available only at higher and higher cost to potential users.

Ironically, the shift to reading research articles from a pdf file rather than from a print journal has only exacerbated the cost problem. Libraries can't simply cancel the print version in favor of online only. Current publisher pricing models involve site licenses, with charges based on institutional FTEs rather than the price of the print journal. For example, in 2003, we paid an annual fee of $365 for both print and online versions of *JAMA*. In 2004, the pricing model changed to one based on the number of full-time medical school teaching faculty. For the same content and the same format, the charge became $12,105. This scenario has been repeated over and over for virtually all journals.

There are many who ask: "Taxpayers have already paid for this research — why should they pay for it again to view the results?" The National Institutes of Health, for example, pays $30 billion annually for biomedical research that winds up being reported in about 60,000 papers, which publishers then copyright and sell back to universities and research institutions at a premium. This double payment makes scientific publishing a highly lucrative business, worth about $7 billion a year. In 2008, market leader Reed Elsevier reported an annual profit of about $750 million. The United Kingdom's leading biomedical research charity, the Wellcome Trust, inferred that "the publishing of scientific research does not operate in the interests of scientists and the public, but is instead dominated by a commercial market intent on improving its market position."

Are we naïve to think that scientific publishing should be done in the public interest? Is it, indeed, a public good? In economics, a public good is one that is hard or even impossible to produce for private profit, because the market fails to account for its large beneficial externalities. More specifically, a public good possesses two properties: First, its benefits fail to exhibit consumption scarcity: that is, once it has been produced, everyone can benefit from it without diminishing others' enjoyment. And second, it is non-excludable — once it has been created, it is very difficult to impossible to prevent access to the good.

Clearly, scientific publishing embodies the first property of a public good. But publishers have demonstrated that it does not possess the second property, as access to scientific information has been compromised by requiring transfer of the copyright from the authors, thereby allowing publishers to retain exclusive distribution rights. Authors who want to use the results of their research in future publications, even a figure or a table, must ask permission to do so. In effect, the publishers have voided the second property

of a public good as applied to scientific publishing by creating a monopoly over its distribution: authors transfer copyright and libraries have little choice but to subscribe.

In an interview, one of the creators of Public Library of Science (PloS — more on this in Part 2), Michael B. Eisen, Ph.D., suggests the following analogy: Imagine the process of conducting research and creating a journal manuscript as one that is akin to the gestation of a baby. In this analogy, the technical service needed to deliver the baby, i.e., an obstetrician, is akin to the service a publisher provides. Now suppose, says Eisen, that the parents sign over ownership of the baby to the obstetrician. The physician who delivers the baby now owns the baby, but is willing to accept payment from the couple to gain access to the baby. This is clearly "insane," says Eisen, but it is analogous, in his opinion, to scientific publishing.

Of course, not all publishers should be tarred with the same brush. In particular, it is important to distinguish between the commercial publishers and the professional society publishers. In this category are societies (and their journals) like the American Society for Microbiology (*Journal of Virology*), the American Society for Biochemistry and Molecular Biology (*Journal of Biological Chemistry*), the National Academy of Sciences (*PNAS*), the American Academy of Pediatrics (*Pediatrics*), the American College of Obstetrics and Gynecology (*Obstetrics & Gynecology*), the American College of Physicians (*Annals of Internal Medicine*) and so on. The latter have a more complex relationship with their authors (and scientific membership). Their publishing-related profits are generally more modest, and often underwrite other scientific endeavors. Society publishers are also more inclined than are commercial publishers to allow public access to research articles after an initial embargo period of six to 12 months. However, they (like the commercial publishers) do not allow authors to retain copyright.

Why do faculty publish their papers in journals without being paid as authors, and in fact hand over the copyright to the journal publisher? Why do they serve as reviewers for such journals, also unpaid? A little history may help: The father of the modern peer-reviewed journal was *Philosophical Transactions of the Royal Society of London*, which debuted in 1665. Prior to *Phil Trans*, there had been no public registry of discoveries, according to science historian Jean-Claude Guédon, a professor at the University of Montreal. Fights broke out over who "owned" a discovery. *Phil Trans* not only broadcast new discoveries, but kept intellectual turf battles out of the public eye. And it established itself as "the arbiter of innovations," Guédon wrote in the October 2001 Association of Research Libraries newsletter: "The multiplication of printed copies and their dissemination throughout Europe ensured the validity of the claim. ... Through peer review, it could confer a form of intellectual nobility upon individuals. Thus was established the game of science, whereby giving away what one had discovered was paradoxically the best way to ensure one's intellectual ownership of it. ... A complex mix of excellence and elitism ensued that has accompanied science ever since." Over time, the link between publishing and career success solidified — hence the axiom "publish or perish." Through the years, some journals developed better reputations than others, and publishing in the high-impact journals promised more prestigious and lucrative career rewards.

The problem with that system, in Eisen's view, is that scholars believe they got tenure or a great job because they had a paper in *Nature* or *Science*. They got those positions, he says, because they did great science, and great science will "rise to the top" regardless of whether it's published in *Nature* or, well, *PLoS Biology*. But persuading colleagues on that point is a hard sell. "The idea that you have to publish your papers in the 'best' journal in order to advance your career or get tenure is deeply entrenched in the scientific community," Eisen says.

In truth, this is more than an idea — it is still reality in many cases despite improvement in the impact factor and reputation of some open access journals. Senior faculty are often reluctant to recommend that a junior faculty member with a hot manuscript publish it in an open access journal rather than the well-known, high-impact journals. And this is for very practical reasons — not only is publication in such journals viewed as reflecting a peer-reviewed judgment that the science is of the highest caliber, but it will bring great visibility to the scientist and the lab and carry considerable weight with the promotion and tenure committee.

Thus, faculty in research universities like the University of Florida produce knowledge but then hand over the responsibility for its distribution to outside entities, often with commercial interests. This is not new: Scientific authors have always signed over copyright privileges, outside commercial publishers have always had a mission of shareholder return that is often not in alignment with the missions of universities, and learned societies have always used revenues from publishing to support professional societies. The reasons for the recent flurry of activity in open access publishing and publicly available data repositories, in my opinion, relate to the dramatic increase in charges and profit levels realized by publishers in recent years, inflexibility in the bundling of electronic and print journals, and restrictions in long-term access to digital material, all against a general trend in support of transparency and accountability in research data generated by public funds.

So much for the history of how we have arrived at this point. In Part 2, we'll examine the promise of scientific publishing reform, and how the University of Florida is helping its faculty participate.

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