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The Science Journal Crisis

Disappearing Articles, Skyrocketing Costs, and Open Access

The first scientific journals were printed in the seventeenth century, and the subsequent development of institutionalized scientific communication has been a major factor in the success of modern science and technology.

But today, scientific journals are in crisis. Specialization has led to an explosion in the number of journals, and prices have skyrocketed. This has been good news for publishers—science and technology journals have a mammoth annual revenue of $9 billion, according to one estimate—but libraries have had trouble keeping pace. Most journals cost a few hundred or a few thousand dollars, but an annual subscription to some of the more expensive science journals costs between $15,000 and $20,000. Even universities blessed to have growing acquisitions budgets have found that the rising cost of scholarly journals has meant a reduction in real purchasing

power. Many libraries have had to cut their subscriptions to hundreds of titles, and strictly limit new subscriptions.

Meanwhile, scientists and students have found that electronic journals can make research immensely easier: articles are faster to find, simpler to search, and accessible anywhere. But e-journals pose peculiar new problems of their own, because digital technology makes it possible to fiddle with history in ways that paper never allowed. Some publishers have removed certain articles from their digital databases because of plagiarism, copyright infringement, or even political sentiments. In the last three years, for instance, Elsevier Science has removed dozens of articles from its ScienceDirect database. In one case, an article by a Greek engineer was deleted because it allegedly plagiarized work from German professors; in another case, a genetics paper was taken down because it said that Palestinians live in "concentration camps."

According to the *Chronicle of Higher Education*, which broke the story earlier this year, these digital deletions have librarians and scholars "fuming": they fear that "holes in databases could leave researchers ignorant of why certain articles were considered questionable—and may even lead to poor medical treatments and faulty scientific research. And, scholars ask, shouldn't researchers be warned about authors who plagiarize, or commit scientific fraud or misconduct?"

It is worth noting that scientific journals aren't the only publications with gaps in their digital archives. In 2001, the Supreme Court decided that the work of freelance writers, photographers, and artists couldn't be electronically reproduced without their permission. As a result, untold thousands of articles and pictures were expunged from databases like LexisNexis. Publications like the *New York Times*—which removed 115,000 articles written by 27,000 authors—chose to take down the content rather than track down and pay the creators.

The digital disappearing act isn't limited to specific articles: entire databases could vanish. According to the website of "Create Change"—a librarian-sponsored effort to "reclaim scholarly communication"—when libraries subscribe to an electronic journal, they "do not own the product; they merely have access to it. They are dependent on the licensor for delivery, and, in many cases, they retain nothing if an electronic resource is canceled or discontinued." If a subscription to a print periodical ends, the subscriber still has all the old copies; if an e-subscription expires, or if a journal is sold to another publisher, nothing is left behind.

Some critics think the cure for the woes of modern science journals is to be found in the "open access" movement, which holds that scientific research should be freely available online to everybody. The supporters of open access had their first success in October, with the launching of the first journal published by the Public Library of Science (PLoS), an organization founded three years ago to support "free and unrestricted access to the scientific literature." According to the group's founders, "Our aim is to catalyze a revolution in scientific publishing by providing a compelling demonstration of the value and feasibility of open-access publication. If we succeed, everyone who has access to a computer and an Internet connection will be a keystroke away from our living treasury of scientific and medical knowledge. This online public library of science will form a valuable resource for science educa-

tion, lead to more informed healthcare decisions by doctors and patients, level the playing field for scientists in smaller or less wealthy institutions, and ensure that no one will be unable to read an important paper just because his or her institution does not subscribe to a particular journal."

Their first publication is *PLoS Biology*, to be followed next year by *PLoS Medicine*, and future titles as success warrants. Although it's possible to get printed copies of the new journal, the PLoS project emphasizes digital publication. As the group's founders put it in the inaugural editorial of *PLoS Biology*, "Freeing the information in the scientific literature from the fixed sequence of pages and the arbitrary boundaries drawn by journals or publishers—the electronic vestiges of paper publication—opens up myriad new possibilities for navigating, integrating, 'mining,' annotating, and mapping connections in the high-dimensional space of scientific knowledge."

The PLoS business model is a new one: Since PLoS journals won't make money through subscriptions, authors who hope to have their work published in a PLoS journal will pay a flat fee of $1,500. That cost apparently hasn't dissuaded potential contributors; the first issue of *PLoS Biology* is full of articles of a quality comparable to any established print journal.

But the creation of these journals is just a first step; many supporters of the open access movement want to see the online publication of all research that's underwritten by the government—after all, they reason, the U.S. government spends untold billions of dollars every year supporting scientific and medical research, so why shouldn't the results of that research be freely available to taxpayers? In June, Rep. Martin Sabo, a Democrat from Minnesota, introduced a bill that would deny copyright protection to any research "substantially funded" by the federal government. Sabo's "Public Access to Science Act" does not seem to have much of a future: it has only found three cosponsors, all Democrats, and it's languishing untouched in a subcommittee. But its very existence is an indication of the growing attraction of the open access movement in an age when we've become accustomed to instant information, freely available.