Commentary
Open access matters for researchers

Should you, as a scientist, care about federally mandated free public access to journal articles and data? You should if you value the work of your scientific society. You should if you care about the sustainability and integrity of scholarly communication.

Open access entered a new phase in the summer of 2014 with the release by the US Department of Energy of its public access plan in July and the opening of its PAGES (Public Access Gateway for Energy and Science) portal system in August (see PHYSICS TODAY, October 2014, page 29). DOE is the first of 20 agencies that will issue new mandates pursuant to a 22 February 2013 memorandum from the Office of Science and Technology Policy regarding increased public access to the results of federally funded scientific research.

For work done and written up under DOE grants received on or after 1 October 2014, PAGES will include each paper's metadata—title, authors, journal issue—and abstract and will link to a full-text PDF. That PDF will either be on the publisher's website or on PAGES or at a grantee's institution. The full text of the papers must be freely available 12 months from publication date.

To a reader, free access to journal articles after 12 months sounds great. But as an author, you will have no say about anyone's access to your paper, even if it is only partially based on grant data, or is one for which you already submitted the required grant report to the funding agency, or is a paper written on the author's own time. And authors will have to make sure that the journal they want to publish with can and will support the DOE policy.

Letters and commentary are encouraged and should be sent by email to ptletters@aip.org (using your surname as the Subject line), or by standard mail to Letters, PHYSICS TODAY, American Center for Physics, One Physics Ellipse, College Park, MD 20740-3842. Please include your name, work affiliation, mailing address, email address, and daytime phone number on your letter and attachments. You can also contact us online at http://contact.physicstoday.org. We reserve the right to edit submissions.

Arguments that government-financed research be made available at no charge within a year are overly simplistic. Clearly, publishing a journal is not free. It requires hardware, software, management of the peer-review process, editorial work, maintenance of the database over decades, and printing the product. The real question is, Who pays?

- Authors, either personally or through their institution or the grants in question.
- Users, whether libraries, companies, or individuals.
- A third party, such as government (that is, taxpayers) or donors.

If costs are not addressed, the continued existence of the system of scholarly communication on which science depends is at risk.

A related concern is that free access could have serious consequences for US scientific societies. A significant fraction of the literature is published by nonprofit science and mathematics societies; some have been doing so for at least 100 years. Journals are a core society activity and are critical to robust research. Pricing by the societies is a fraction of that by for-profit publishers. Many of the society-published journals are the most respected in their disciplines. And societies give net publication revenues back to science in the form of value-added services, including scholarly meetings with aid to student attendees, career mentoring, science courses and seminars, educational resources, honors and awards, public information, and outreach activities. The societies have a special place in maintaining a vigorous scientific enterprise. If open access is not done carefully, some societies may not survive, and with their demise, essential services supporting the science enterprise, well beyond scientific communication, will be lost.

Scientific societies clearly do not oppose enhanced access. They have worked for decades providing programs for young scientists and developing countries, eliminating page charges, developing hybrid journals, and so forth. However, usage half-lives of journal papers—the median time frame for an article to reach half its lifetime downloads—are not the same across all disciplines. Much open-access experience has been in the health sciences. Biomedical papers have a demonstrably shorter half-life than other areas of science and engineering. For most other disciplines, a base embargo—the period after publication for which a paper is only available by subscription—of 12 months is not adequate. A 24-month embargo is much more realistic; it would help ensure journal viability and thus the financial health of scientific societies.

Journal publication is not simply putting material in a database. Those of us who review papers for journals know the difference between a submitted paper and one that is published. An author submits or subscribes to particular journals because they capture the key papers in his or her discipline. Also, writers of scientific papers understand the essential work of the editor and the editorial board in shaping the journal, its scope, and therefore its value to the scientific community.

Is the solution to simply place a paper in a repository, whether an agency's, a university consortium's, or a single institution's? Where is the editor? Where is peer review? In the future, are we simply to search for papers in repositories?

If the solution is open-access (free to reader) peer-reviewed journals, then who pays? One approach is author publication fees of $1500 to $3000 per paper. In disciplines in which that has not been the norm, researchers will have a hard time coming up with that amount of money. If I have 10 graduate students or postdocs, I will likely publish 10 papers per year. Publication fees would be upwards of $20 000–$30 000. Unless funding agencies increase grant size to cover publication fees, which is unlikely, I would need to reduce the number of publications or cut one or more students. Neither is positive public policy.

As for the question of whether scientists support open-access publication fees, the experience of the American Chemical Society may be instructive. Each year ACS publishes about 40 000 journal articles in 44 subscription-based journals. According to a report in the 4 November 2013 issue of *Chemical and*

Engineering News (http://cen.acs.org/articles/91/i44/ACS-Expands-Open-Access.html), authors and funding agencies paid fees for only 1% of articles to make them freely accessible. The article reported four initiatives that ACS hopes will encourage more authors to select open-access options: a new open-access journal, a daily lottery to make one article freely available, an expanded menu of author licensing options, and credit toward future open-access fees.

We need to step back and ask, Of the people who do not currently have access, what access do they need? Advocates insist on policies to ensure that all members of the public receive timely, free, online access to articles and data reporting on the results of taxpayer-supported research. But there actually is no crisis of access. Publisher bundles to libraries provide readers with access to more titles than ever before. Many subscription journals now have author-choice hybrid open-access publication models like ACS's. The number of open-access journals is increasing, as is the number of papers made freely accessible through authors' self-archiving. Various programs provide free access to back files and to papers selected by editors as having important disciplinary implications. Given the many potential audiences, who actually is underserved?

If the mandating of open access is justified, the process for offering it must be open and transparent. In my experience, most working scientists and engineers have yet to be engaged in that process. Open-access embargoes must match discipline-specific data on journal half-lives. Through an initiative called CHORUS (Clearinghouse for the Open Research of the United States), many publishers have already established a virtual, interactive private-sector repository containing the resources of publishers.

Scientific societies have a special place in maintaining a vigorous research enterprise by reinvesting publishing revenues in the science community. Well-intended plans to alter the publishing environment without considering societies will endanger this engine of scientific productivity. To avoid damage to societies and the communities they serve requires a gradual transition, a stable open-access funding stream, and recognition and valuation of scientists' intellectual investment.

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Letters

Demilitarizing weapons-grade plutonium

The news story about stockpiled weapons plutonium (PHYSICS TODAY, July 2014, page 24) was limited to federal budget expenses for demilitarization. Another part of the equation is that direct income from sales as fuel would help offset expenditures for conversion, not to mention the enormous indirect value for nuclear arms reduction and nonproliferation.

The 20-year joint US–Russia Megatons to Megawatts program for demilitarizing 500 tons of weapons-grade uranium proved at its completion in 2013 to be an on-schedule winner—in mutual arms control, economics, and nonproliferation. About 20 000 Soviet nuclear warheads were effectively converted to civilian reactor fuel that supplied half of US nuclear power plants and now produces as much as 10% of US electricity. The program readily paid for its federal budget outlays, and it reduced national and international nuclear risk—a swords-into-plowshares paradigm.

The Russian Federation is now on track to convert 34 tons of weapons plutonium into peacetime energy, as long as the US carries out a comparable inventory reduction according to a 2001 agreement between the two countries. Altogether, that would correspond to irreversible reduction of 10 000 or so nuclear weapons from the US arsenal.

On the wholesale market, 34 tons of weapons-grade plutonium might eventually fetch as much as $3 billion, equivalent to $30 billion in taxable retail sales. Even if costs for the 60%-completed South Carolina mixed-oxide (MOX) fuel facility inflate, multiple national and international benefits of plutonium conversion would outweigh the extra costs.

Moreover, the irrevocable demilitarization of weapons plutonium would reduce the risk of international proliferation and nuclear terrorism. Whether MOX is reactor grade or weapons grade, its burnup—using the processed fuel to generate electricity—adds physical, chemical, radiological, and isotopic barriers that reduce accessibility and utility. European nations have gained relevant experience in MOX burnup for both reactor- and weapons-grade plutonium. Once converted to MOX, the reactor fuel is no longer usable in nuclear weapons,