

The Serials Crisis and Open Access

A White Paper for the Virginia Tech Commission on Research

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Introduction

This white paper offers an introduction to open access as well as a look at its current development. The open access movement is an attempt to free scholarly communication from restrictions on access, control, and cost, and to enable benefits such as data mining and increased citations. Open access has gained significant momentum through mandates from research funders and universities. While open access can be provided in parallel with traditional publishing, it is increasingly available as a publishing option.

While open access is approached here from the problem of subscription inflation, it is important to recognize that open access is not merely a library issue, but affects the availability of research to current and future students and scholars.

The Serials Crisis

The phrase “serials crisis” has been in use for more than a decade as shorthand for the rise in costs for academic journals and the inability of libraries to bring these costs under control. Price inflation for academic journals significantly exceeds the consumer price index (see graph, next page). The most recent data show that journal prices increased at an average rate of 8% in 2007.¹ Because journal subscriptions are a large part of the collections budget at academic libraries, any reduction in funding usually results in a loss of some journals. And the high rate of annual inflation means that academic library budgets must increase every year simply to keep the same resources that students and faculty need. At many academic libraries, the proportion of the budget devoted to journal subscriptions has increased,² leaving less money for purchasing monographs and other resources.

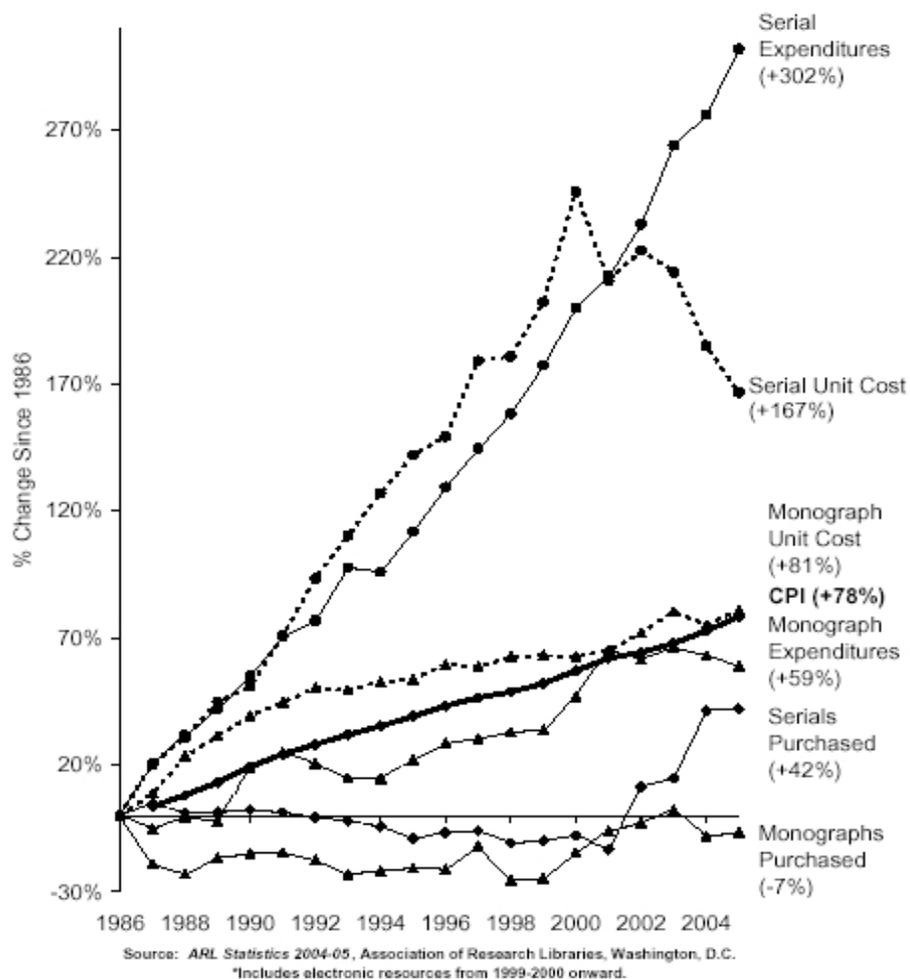
Scholarly communication is a “gift exchange culture.”³ Faculty perform research, write articles, provide peer review, and serve as editors largely without expectation of payment. Faculty publish in order to advance the state of knowledge in their field, and to meet tenure and promotion standards.⁴

Hyperinflation of journal prices has renewed criticism of publishers, who receive content, peer review, and sometimes editorial services for free:

University administrators often complain that they are paying twice to acquire publications: once for the salary of their faculty members who did the research, and a second time to buy their scholarly products back from the publishers. As long as the price for the added value was deemed reasonable, libraries and universities were willing to pay publishers their asking price for the products and services.⁵

Publishers indisputably add value to scholarly articles, from managing the publication process to offering services for search, linking, and analysis, and sometimes adding media and interactivity. While journal pricing was a problem before the electronic journal, the online environment has exacerbated the situation. Expectations of reduced costs due to the elimination of printing and distribution, estimated at 15-25%,⁶ have not been realized. The continuation of print is due to a number of factors, including the early reluctance by libraries to go online-only and the bundling of print and online by the large commercial publishers (more on this below).

Monograph and Serial Costs in ARL Libraries, 1986-2005*



Market factors

Several aspects of the academic journal marketplace make subscriptions economically unsustainable. Scholarly articles are unique and have low substitutability.⁷ Likewise, “any journal is at best an imperfect substitute for any other journal.”⁸ In other markets, substitution mechanisms keep prices competitive, but scholarly articles and journals are unlike most consumer goods. This contributes to an “inelastic demand market,”⁹ in which demand is not sensitive to price increases. Access to research is essential for faculty, who prefer it to be as comprehensive as possible, thus contributing to inelasticity. Because a 1% price increase results in 0.3% decline in subscriptions, “publishers have a strong incentive to increase prices faster than the growth rate of library budgets.”¹⁰ For-profit journals are priced 10-15 times higher than non-profit publisher titles.¹¹

Let’s be clear: we are talking about a true market failure. This is a market in which the creation of the information that publishers sell in their journals is not typically funded by them but by subsidies from someone else—be it governments, research foundations, or whatever... They make a relatively small investment and then (rationally) charge a high price for the end product.¹²

The scholarly journal marketplace has consolidated in recent years. Three companies dominate: Elsevier, Springer, and Wiley. Elsevier is the dominant force in science, technology, and medical (STM) publishing, with three times the market share of its closest competitor.¹³ Commercial publishers have established considerable monopoly power, playing a role in 60% of all peer-reviewed journals, owning 45% and publishing 17% on behalf of non-profit organizations.¹⁴ In STM, seven major commercial publishers account for 30% of peer-reviewed titles but 60% of the market's revenue.¹⁵ In February of 2007, Wiley acquired Blackwell and the merged companies now publish about 1,250 scholarly journals and hundreds of scholarly books per year.¹⁶ These mergers often result in higher prices. Journals published by Pergamon rose 27% in price after Elsevier bought the company, and after law publishers West and Thomson merged, prices rose 30%.¹⁷ Due to their market dominance and pricing practices, commercial publishers are receiving more scrutiny than ever before. Ivy Anderson, director of collections at the California Digital Library, "examined UC-affiliated authorship in Elsevier journals, and concluded that 2.2% of journal articles were authored by members of the UC community. From this, Anderson calculated that Elsevier's UC-related revenue amounted to \$31 million, including \$9.8 million in profit."¹⁸

The segmented nature of the scholarly communications marketplace exacerbates the power of the largest publishing entities to exploit highly resilient niche "monopolies". When a journal is firmly established, there are no substitutes for it. For example, the owner of a prestigious journal title is in a position to attract the best papers and then to charge monopoly rents for access to that research. Due to faculty influence, libraries feel tremendous pressure to continue subscribing to top tier journals regardless of prices. One might argue that authors should stop submitting papers to these journals, but their incentives (i.e. the criteria on which their tenure and promotion are based) dictate otherwise. As more scholarship migrates to the largest publishers, these niche monopolies are likely to be consolidated, reinforcing their power relative to libraries.¹⁹

Commercial publishers bundle subscriptions together in a practice often referred to as the "Big Deal." Bundling refers to selling print and online versions together, as well as grouping many titles in a package, regardless of format.²⁰ Libraries are prevented or effectively discouraged from making individual selections due to pricing differentials. Contracts cover multiple years, lock in annual price increases, and do not allow refunds for cancellations.²¹ Sometimes the same journals are included in multiple contracts, so libraries end up paying for duplicates.²² While some say that the "Big Deal" is not sustainable and is at a crisis point,²³ others argue that it has widened access, reduced the average cost per subscription and per article download, and will likely remain the dominant business model for the foreseeable future.²⁴ Many libraries have responded in kind by licensing content through consortia.

Each "Big Deal" negotiation between the publisher and a library or consortia is based on individual characteristics,²⁵ and the contract includes a non-disclosure clause. Academic libraries do not know what other libraries are paying for the resource, which effectively weakens their negotiation powers.²⁶ However, a group of researchers has recently succeeded in using open records laws to gain access to many of these agreements, and analysis is forthcoming.²⁷ Early reports are that libraries are sometimes paying vastly different sums for identical content.

Faculty and students are usually unaware of journal costs,²⁸ and are insulated from them by the library. The economist Mark McCabe described this situation:

One distinctive aspect of this market is that end users do not pay for the material they use since the actual purchases are mediated by the libraries. This means that the principals (the professors, the scientists, the researchers of a particular institution) ask their agent (the library) to buy whatever they need, and the agent has no way of enforcing price discipline on the users. So there is a disconnect.²⁹

The proliferation of academic journals contributes to rising costs. Since 1983, the number of published articles has doubled, as has the number of academic journals.³⁰ The annual rate of growth of published articles is estimated at approximately 3%,³¹ or 2.5 million articles per year, published in 25,000 journals.³² Top science and medical journals report a doubling of submissions in recent years.³³ About 100 new peer-reviewed journals are started annually, most of them by commercial publishers.³⁴

Control over scholarship

Control over content is a long-standing problem in scholarly publishing. Many decry the copyright monopoly of publishers due to the permissions needed for class use, and in some cases, faculty need permission to use their own research when teaching.³⁵ Author rights and fair use are becoming serious issues as the trend of stronger copyright law and its enforcement continues.³⁶ A survey of faculty in the University of California system found that the large majority ceded copyright to their articles, while 7% modified publishing contracts and 4% refused to accept contract terms:

UC faculty appear to believe that nearly all published materials eventually appear online through the efforts of publishers or aggregators, and are accessible to almost anyone on the Internet. Such is not the case, however, as many published materials are legally accessible only by subscription or with the explicit author/institutional act of alternative or supplementary dissemination.³⁷

Questions of control will likely grow more frequent as younger faculty are hired:

... the current generation of students has grown up with a variety of forms of file and content sharing, legal and otherwise. This generation greets with dumbfounded mystification the explanation of how researchers perform research, write an article, make the figures, and then are not permitted to do as they please with the final product.³⁸

The “Big Deal” plays a role here as well. Bundling replaces subscriptions with contracts, and because contract law can exclude fair use, publishers are able to determine the use of content.³⁹ Now that much of scholarly publishing occurs in the online environment, there are concerns that the Digital Millennium Copyright Act of 1998 (DMCA) will further benefit commercial interests, since it has even stronger protections for digital media.⁴⁰ The DMCA “gives rights holders the exclusive right to control any computer-mediated use of their works, and captures in its regulatory scope all uses that were once excluded from control in prior media.”⁴¹

Libraries cite numerous other issues with the current state of affairs in the electronic environment. Many publishers limit the number of concurrent users as well as disallow off-campus use, walk-in use, and interlibrary loan.⁴² Some publishers have implemented Digital Rights Management (DRM) policies, preventing downloads and charging per view rather than at a flat rate.⁴³ Because many electronic resources are leased rather than purchased, there is concern about archiving.⁴⁴ Course packs require copyright fees. Since universities pay the salaries of their faculty authors and for journal subscriptions, they could end up paying two or three times for the use of the material when they pay copyright fees.⁴⁵ For all of these reasons, universities are not always receiving the full value of their purchase.⁴⁶

Barriers to access beyond the library

Barriers of price and permissions prevent the spread of information in a number of situations. For example, professors often need permission to use articles in their classes, sometimes even their own articles;⁴⁷ students who become used to easy access to scholarship find that access gone upon graduation;⁴⁸ citizens researching medical conditions find themselves walled off from research their taxes

may have funded; and scholars in the developing world find themselves unable to fully participate in or benefit from research.⁴⁹ While some publishers provide free or discounted access in developing countries, not all publishers participate, and countries like India are left out.⁵⁰

Restrictions on access result in numerous work-arounds. Scholarly articles are illegally posted and downloaded on file-sharing websites just like popular music. Requests on a medical article-sharing site were fulfilled about 83% of the time.⁵¹ Recently, an online business began renting access to individual articles, offering a variety of payment plans.⁵² Many publishers charge to download individual articles, with fees often around \$30. For years, authors have mailed or e-mailed their articles to colleagues who requested them due to lack of access. A recent survey of biologists in India revealed that 84% had contacted an author, or a friend with better access, in a three-month period.⁵³ But requests are not always successful, and responding to them is time consuming for authors.

Open Access

While there are a number of ways to define open access, the simplest definition is that it means “digital, online, free of charge, and free of most copyright and licensing restrictions.”⁵⁴ Open access removes barriers of price and permissions, which enables numerous additional benefits.

Benefits of openness

Open science is based on the premise that scholarly information is a public good.⁵⁵ In addition, fundamental access to information has an ethical dimension, and enhances justice and human development.⁵⁶ While some see open access as a threat to the scholarly communications system they have always known and are comfortable with, others view it as a return to the traditional values of open scholarship.⁵⁷

Scholarship is a cumulative process, and its success depends on wide and rapid dissemination of new knowledge so that findings can be discarded if they are unreliable or built on if they are confirmed. Society overall benefits from the open exchange of ideas within the scholarly community. This notion of ‘open science’ arises early in Western thought, dating back to Saint Augustine in the fourth and fifth centuries...⁵⁸

The citation advantage enjoyed by open access articles is well documented.⁵⁹ One study found that open access articles receive twice as many citations as articles behind pay barriers, and the advantage is sustained over time.⁶⁰ Some are more skeptical, attributing the results to “early view effect” (open access articles were online earlier) and selection bias (better articles, or better authors giving them open access).⁶¹ But the vast majority of studies show that open access results in more citations and possibly greater article impact, which in turn can affect tenure and promotion decisions. This comparative advantage will disappear as open access advances,⁶² though all articles will then benefit from increased circulation.

Open access also enables data mining. Open access is likely necessary (but not sufficient) for large-scale computation of the scholarly literature, though it will not help with the vast corpus of past literature behind permissions barriers.⁶³

There is more to open access than just free access. True open access permits any 3rd party to aggregate and data-mine the articles, themselves treated as computable objects, linkable and interoperable with associated databases.⁶⁴

The benefits of openness for data sets are well established:

The success of the genome project, which is generally considered to be one of the great scientific achievements of recent times, is due in no small part to the fact that the world's entire library of published DNA sequences has been an open-access public resource for the past 20 years. If the sequences could be obtained only in the way that traditionally published work can be obtained, that is, one article at a time under conditions set by the publisher, there would be no genome project.⁶⁵

Data sets are increasingly listed as scholarly publications and cited in articles,⁶⁶ and due to the explosion of data-driven research, better linkages to and from datasets are needed.⁶⁷ Openness is necessary for research integrity, so data can be examined and verified.⁶⁸ Access to the widest number of articles increases the effectiveness of plagiarism detection software.⁶⁹ Open data enables unforeseen uses, often interdisciplinary in nature.⁷⁰ A recent study confirmed this in a comparison of academic papers on genetically engineered mice, in which open data not only resulted in more downstream research, but more diversity in research approaches.⁷¹ Generating additional research can have positive economic effects, in addition to improved returns on research and development inputs.⁷²

Two roads to open access

Authors can provide open access to their publications in two ways. First, self-archiving (sometimes referred to as “green” open access) is article deposit in a disciplinary or institutional archive. While posting an article to the author's web site also provides access, it is problematic for preservation, metadata, and linking. Second, authors may choose to publish in open access journals (sometimes referred to as “gold” open access). Open access journals do not charge subscription fees, and publish issues online for all to read. In addition, some subscription journals offer open access for individual articles for a fee, paid by the author or a surrogate. This method, called hybrid open access, results in online journals that have some articles freely available while others are behind a subscription barrier.

Self-archiving

Self-archiving provides access to articles accepted for publication, which shortens the time lag from research to dissemination.⁷³ Most commercial publishers now permit archiving by authors.⁷⁴ However, permissions don't result in access, because that depends on the individual efforts of authors, and the rate of voluntary self-archiving is currently only 15%.⁷⁵ Lack of a central place to find archived articles is being addressed by the rise of more disciplinary archives as well as aggregated metadata from the Open Archives Initiative.⁷⁶

Faculty in some fields deposit articles and keep up with new research through disciplinary archives. The first was arXiv, started by Paul Ginsparg in August 1991 for physics and since expanded to other fields.⁷⁷ Numerous in the sciences, where quick dissemination of results is important, disciplinary archives have also been started in the social sciences, but are less numerous in the humanities.⁷⁸ Researchers continue to publish in parallel with deposit, so this practice does not ameliorate the serials crisis, but provides all the other benefits of open access. Self-archiving of articles in astronomy, some branches of physics, and a few other specialized fields approaches 100%. Yet physics journals, for example, have not suffered from subscription cancellations.⁷⁹ Some journals use embargoes (sometimes called delayed open access) of 6 to 12 months in order to protect subscriptions.

In the last few years, many universities have begun digital archives, often called institutional repositories, to host faculty papers as well as various online projects. Virtually all major research libraries now host an

institutional repository. However, most repositories have not met with success. Dependence on voluntary submissions, not to mention still-developing software, has meant that many repositories host relatively few items.⁸⁰ Repositories offer significant advantages over faculty web pages for hosting articles, including the provision of metadata, indexing, and preservation, and universities have an opportunity to showcase their research outputs.⁸¹

It is sometimes difficult to determine the status of archived articles, because faculty often fail to identify the version, and do not replace earlier versions with a final version.⁸² Multiple versions online concurrently complicates the scholarly record, though recommended terminology should help clarify manuscript status.⁸³ Many researchers will read an author-posted version of an article and then cite the published version, which may not be accessible to them.⁸⁴ Most faculty already use search engines to find articles, leading one researcher to comment that there is currently a far greater demand for open access scholarship than is currently being met by self-archiving.⁸⁵

Open access journals

Open access journals differ from traditional academic journals only in making their contents freely available to all online, usually without any embargo period. The publication process, including submission, peer review, editing, and publication, is otherwise identical. The Directory of Open Access Journals⁸⁶ provides a central location for searching peer-reviewed journals in various fields, and now includes over 4,400 titles. Currently only 2% of all articles are published in open access journals.⁸⁷

The influence of journal prestige on tenure and promotion committees, and therefore on faculty authors, is cited as a disincentive to publish in open access journals, most of which are recent in origin.⁸⁸

By rewarding faculty who win a journal's imprimatur, mindful of the journal's prestige but heedless of its access policies, universities [and funders] shift bargaining power from authors to publishers of high-prestige journals. They give publishers less incentive to modify their standard contracts and authors greater incentive to sign whatever publishers put in front of them.⁸⁹

In addition, the exclusion effect of the “big deals” makes market entry more difficult for all new journals, whether open access or not.⁹⁰

Business models

The most active debate about open access journals concerns their business models. At the moment, it remains to be seen whether a dominant business model for open access journals will emerge. Author fees, grants, membership subscriptions, sponsorship/advertising, commercial reprints, classified advertising, print subscriptions, subsidy or support in kind from the host organization, and charges for value added content are among open access journal sources of support.⁹¹ The author fee, sometimes called the article processing charge (APC), causes the most concern for faculty. However, only about 27% of open-access journals charge fees,⁹² and fees can be included in grants from funding agencies such as the National Institutes of Health (NIH) and National Science Foundation (NSF). Fees tend to be found in disciplines with the most grant support.⁹³ But author fees are rising, leading some to speculate that this model may not solve the journal affordability problem.⁹⁴ Recently a study was begun to investigate the possibility of fees upon article submission rather than on acceptance.⁹⁵

While there were early criticisms from publishers that ability to pay author fees may influence an article's acceptance,⁹⁶ journals using this model keep evaluation and payment functions separate. Many journals requiring an author fee offer waivers. While waivers can help the 25% of authors from developing countries,⁹⁷ the lost fees affect journal sustainability. Waiver data are scarce, but Oxford University Press

reports a rate of 6-7%.⁹⁸ Institutional memberships can be used to cover or reduce author fees with some journals,⁹⁹ although Yale cancelled its membership with BioMed Central when the cost rose to \$30,000 per year.¹⁰⁰

Many faculty in the humanities and social sciences do not have grants, and even in the sciences, research funding varies greatly. For this reason, some universities have created funds for faculty without grants who wish to publish in a journal charging author fees. The potential for transitioning subscription costs to funds for author fees is in dispute. The costs and benefits of subscriptions as compared to open access models are difficult to determine since they charge in very different ways.¹⁰¹

Although about 30 journals have switched from the subscription model to open access,¹⁰² none of significance have done so, and there are few if any examples of cost recovery. While BioMed Central (now part of Springer) and Hindawi are said to be financially successful, and PLoS is reported to break even soon, data is lacking, and no dominant business model has emerged. It seems unlikely that one model will serve as a panacea.

Hybrid open access allows subscription journals to experiment with a potential transition to open access without substantial change to their business model.¹⁰³ About 75% of subscription journals charge author fees for open access, while only 27% of open access journals do.¹⁰⁴ Less than 1% of all articles published are hybrid open access.¹⁰⁵ Hybrid journals haven't reduced subscription costs for libraries,¹⁰⁶ and concerns have been raised that publishers are simply using open access fees as an additional revenue stream.¹⁰⁷ However, two journals recently announced lower subscription prices as a result of authors taking the open access option.¹⁰⁸

Some speculate that various open access activities could force publishers to moderate their prices. Self-archiving is cited as one of these, but so far there is little evidence that subscriptions have been affected.¹⁰⁹ Some open access journal income models introduce market dynamics that could moderate prices systemically.¹¹⁰ There is speculation that enough self-archiving mandates could reduce prices in the long term, but so far there is no evidence that any form of open access will reduce the costs of scholarly communication.¹¹¹ However, some say that even in the absence of cost savings, the advantages of open access are sufficient to advocate for a transition. For them, the primary issue is access to research, not solving problems of journal economics.

Disciplinary differences can affect receptiveness to open access. Some faculty in the humanities view open access as a STM issue, but as journal costs take up a greater proportion of library budgets, resources important to the humanities can be eliminated. Monograph purchases have been reduced, resulting in greater financial pressures on university presses and more difficulty in publishing dissertations.¹¹² Less expensive journals, often in the humanities, may be at risk.¹¹³ Dramatic increases in interlibrary loan in recent years¹¹⁴ may reflect less access to humanities resources. Perhaps because articles in the humanities tend to retain their currency, many publishers oppose self-archiving, though some journals are beginning to offer open access publication.¹¹⁵

Open access misconceptions

Because open access is relatively new, dynamic, and varied in implementation, it has often been misinterpreted. Many faculty fear for peer review and don't trust open access.¹¹⁶ But as Peter Suber puts it, "the goal is to remove access barriers, not quality filters."¹¹⁷ Self-archived articles have been peer-reviewed elsewhere, or are undergoing peer review, and all titles in the Directory of Open Access Journals have some form of peer review. Faculty also are concerned about rights infringement, as well as the time and difficulty of self-archiving.¹¹⁸ Yet faculty have control over their own articles through author addenda or alternative licensing such as Creative Commons.¹¹⁹ The time and difficulty of self-

archiving is minimal¹²⁰ and some universities provide this service to faculty.¹²¹ Open access applies to unpaid, scholarly, royalty-free works—primarily the research articles that faculty write for the advancement of knowledge and to meet tenure and promotion requirements. Income-generating works such as textbooks, patents, or other significant intellectual property are not affected. Peter Suber provides a comprehensive guide to open access misunderstandings in an issue of the *Open Access Newsletter*.¹²²

University Support for Open Access

In 2005, the NIH asked its grant recipients to voluntarily self-archive their articles, within 12 months of journal acceptance, to PubMed Central¹²³ in order to provide public access to taxpayer-funded research. Resulting rates of deposit were less than 5%. As noted above, requests for voluntary archiving tend to be ignored, just as publisher permissions do not lead to self-archiving. In early 2008, archiving became mandatory, and deposits skyrocketed.¹²⁴ This funder mandate was soon joined by a faculty self-mandate at Harvard University's Faculty of Arts and Sciences.¹²⁵ The two mandates are the most significant developments in the history of the open access movement, and have begun a wave of similar actions. At this writing, mandates worldwide have risen to 42 by funders, 50 by institutions, and 14 by departments.¹²⁶ In 2009, Kansas University became the first large public institution to implement a mandate.¹²⁷ It is widely believed that the NSF is considering a mandate.¹²⁸ If passed, the Federal Research Public Access Act of 2009 would extend the mandate to all government agencies with extramural research budgets of \$100 million or more, and shorten the embargo period to 6 months.¹²⁹

Several proposed university mandates will likely continue open access momentum. After the failure of voluntary archiving, mandates are viewed by many as the only way to alter established habits and inertia.¹³⁰ "Mandate" is something of a misnomer, because the majority are faculty self-mandates, and because virtually all contain a waiver. At some universities, open access is piecemeal, because faculty are self-mandating at the department or college level. Due to low faculty awareness of open access, outreach and numerous conversations are necessary.¹³¹ The presence of a waiver and flexibility regarding disciplinary differences are important, as is the emphasis on self-archiving as opposed to publishing in open access journals.

While open access policies at universities differ, Harvard's grants the university a non-exclusive license, requires opt out rather than an opt in, and has no embargo.¹³² Waivers are automatic, but must be applied for to the dean.¹³³ Harvard created an Office of Scholarly Communication to coordinate open access policy, which required funding from the provost's office.¹³⁴ At the University of Liège, the mandate is stronger, because faculty publications must be in the institutional repository in order to receive consideration for tenure and promotion.¹³⁵

Faculty are being encouraged to use grants for publication fees, publish in open access journals, use alternative licensing (such as Creative Commons) or use author addenda to retain rights, and refuse to publish in, edit, or serve on editorial boards of journals with "predatory" pricing. Managers of institutional repositories are also urging faculty to retain a copy of all publication contracts, in order to determine future archiving permissions.

A few universities, including the University of California-Berkeley, the University of North Carolina, and the University of Tennessee, have created funds to cover publication fees.¹³⁶ Faculty without grant funding who wish to publish in a fee-charging open access or hybrid journal can apply. So far the funds appear to be benefiting faculty at lower rank, as well as those in their first year, postdocs, and even graduate students. Universities have also demonstrated support for open access by joining groups such as the Compact for Open-Access Publishing Equity,¹³⁷ becoming a member of the Directory of Open Access

Journals, and by hosting open access journals. Universities have started institutional repositories for faculty articles, revised tenure and promotion guidelines to encourage openness, and rejected the “Big Deal” contracts of large publishers.

Conclusion

A transformation of scholarly communication is underway. While the number of funders and universities implementing mandates is currently a tiny minority of the total, open access is generating significant momentum, and some feel that it is inevitable. The values represented by open access receive strong support, but implementing a new system of dissemination presents numerous challenges.

Faculty have the power to determine the conditions under which their articles are published. Actions can include mandating article archiving at the university, college, or department level, retaining rights through the use of author addenda or alternative licensing, and publishing in open access journals.

To support faculty engagement in open access, universities can create open access funds and ensure alignment of tenure and promotion requirements. Services to save faculty time can include streamlined deposit of articles into digital archives, handling copyright and licensing issues, submitting articles to additional sites if requested, monitoring embargo periods, and generating statistics. Closer relationships between libraries and offices overseeing research and grants may be necessary. Universities are beginning to renew the dissemination function as central to their mission.

Open access and subscription journals currently coexist, and will likely do so for years to come. Solving problems of journal economics may take many more years. The primary motivation for open access is providing fundamental access to research.

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References

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- ¹ Mike Furlough, "Journal economics: a turning point," Scholarly Communication Toolkit (January 6, 2009), <http://www.acrl.ala.org/scholcomm/node/9>.
- ² Research Information Network, "Scholarly books and journals at risk: responding to the challenges of a changing economy," (March 2009), <http://www.rin.ac.uk/system/files/attachments/sarah/Scholarly-books-journals-risk-briefing.pdf>.
- ³ Christine L. Borgman, *Scholarship in the digital age: information, infrastructure, and the Internet* (Cambridge, Mass.: The MIT Press, 2007), 56.
- ⁴ Alma Swan, "The culture of open access: researchers' views and responses," in *Open access: key strategic, technical and economic aspects*, ed. Neil Jacobs (Oxford: Chandos Publishing, 2006), <http://eprints.ecs.soton.ac.uk/12428/1/asj7.pdf>.
- ⁵ Borgman, *Scholarship in the digital age*, 111-112.
- ⁶ National Academies, *Electronic scientific, technical, and medical journal publishing and its implications: report of a symposium* (Washington, D.C. : The National Academies Press, 2004), 14. <http://www.nap.edu/catalog/10969.html>.
- ⁷ Lisa Richmond, "The dark side of online journals: commercial publishers dominate online scholarly journal production," *Z Magazine* (June 2009), <http://www.zmag.org/zmag/viewArticlePrint/21606>.
- ⁸ Mark J. McCabe, "The impact of publisher mergers on journal prices: theory and evidence," *The Serials Librarian* 40:1/2 (2001): 157-166.
- ⁹ Furlough, "Journal economics"; Richmond, "The dark side of online journals."
- ¹⁰ McCabe, "The impact of publisher mergers on journal prices."
- ¹¹ Carl T. Bergstrom and Theodore C. Bergstrom, "The economics of ecology journals," *Frontiers in Ecology and the Environment* 4:9 (2006): p. 488-495. <http://www.econ.ucsb.edu/~tedb/Journals/EcologyJournals.pdf>
- ¹² Richard Poynder, "A true market failure: professor Mark McCabe talks about problems in the STM publishing industry," *Information Today* 19:11 (2002).
- ¹³ Furlough, "Journal economics."
- ¹⁴ Raym Crow, "Publishing cooperatives: an alternative for non-profit publishers," *First Monday* 11: 9 (September 2006), <http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1396/1314>.
- ¹⁵ Ibid.
- ¹⁶ Laura Brown, Rebecca Griffiths, and Matthew Rascoff, "University publishing in a digital age," *Ithaka report* (July 26, 2007), <http://www.ithaka.org/ithaka-s-r/strategy/Ithaka%20University%20Publishing%20Report.pdf>.
- ¹⁷ Richmond, "The dark side of online journals."
- ¹⁸ Josh Hadro, "ALA 2009: Academic libraries urged to consider maverick models of publishing," *Library Journal* (July 16, 2009), <http://www.libraryjournal.com/article/CA6671431.html>.
- ¹⁹ Brown, Griffiths, and Rascoff, "University publishing in a digital age."
- ²⁰ Aaron S. Edlin and Daniel L. Rubinfeld, "Exclusion or efficient pricing: the big deal bundling of academic journals," *Antitrust Law Journal* 72:1 (2004), 119-157.
- ²¹ Ibid.
- ²² Borgman, *Scholarship in the digital age*, 112.
- ²³ Mike Rossner, "A challenge to Goliath," *The Journal of Experimental Medicine* 206:5 (2009), 971. <http://www.jem.org/cgi/doi/10.1084/jem.20090836>
- ²⁴ Mark Ware and Michael Mabe, "The STM report: an overview of scientific and scholarly journals publishing," STM: International Association of Scientific, Technical and Medical Publishers (2009), http://www.stm-assoc.org/2009_10_13_MWC_STM_Report.pdf
- ²⁵ Edlin and Rubinfeld, "Exclusion or efficient pricing."

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- ²⁶ Richmond, "The dark side of online journals."
- ²⁷ Ted Bergstrom, "Big Deal contract project," (2009), <http://www.econ.ucsb.edu/~tedb/Journals/BundleContracts.html>
- ²⁸ Richmond, "The dark side of online journals."
- ²⁹ Poynder, "A true market failure."
- ³⁰ Nawin Gupta et al., "Shifting costs in the journal publishing world," *The Serials Librarian* 56:1 (2009), 95-100.
- ³¹ Research Information Network, "Scholarly books and journals at risk."
- ³² Andrew Odlyzko, "Economic costs of toll access," in *Open access: key strategic, technical and economic aspects*, ed. Neil Jacobs (Oxford: Chandos Publishing, 2006).
- ³³ A. McCook, "Is peer review broken?," *Scientist* 20:2 (2006), 26.
- ³⁴ Lee C. Van Orsdel and Kathleen Born, "Reality bites: periodicals price survey 2009," *Library Journal* (April 15, 2009), <http://www.libraryjournal.com/article/CA6651248.html>.
- ³⁵ Art Jahnke and Jessica Ullian, "University Council approves open access plan," *BU Today* (February 17, 2009), <http://www.bu.edu/today/node/8320>.
- ³⁶ Tim Hackman, "What's the opposite of a pyrrhic victory? Lessons learned from an open access defeat," *C&RL News* 70:8 (October 2009), <http://www.ala.org/ala/mgrps/divs/acrl/publications/crlnews/2009/oct/pyrrhicvict.cfm> ; K.A. Wallace, "Marketing ideas," *Science Progress* (April 10, 2008), <http://www.scienceprogress.org/2008/04/marketing-ideas/print>
- ³⁷ University of California, "Faculty attitudes and behaviors regarding scholarly communication: survey findings from the University of California," (August 2007), <http://osc.universityofcalifornia.edu/responses/materials/OSC-survey-full-20070828.pdf>
- ³⁸ Paul Ginsparg, "Next-generation implications of open access," *CTWatch Quarterly* 3: 3 (August 2007), 11-18, <http://www.ctwatch.org/quarterly/articles/2007/08/next-generation-implications-of-open-access/index.html>
- ³⁹ Richmond, "The dark side of online journals."
- ⁴⁰ Wallace, "Marketing ideas."
- ⁴¹ Yochai Benkler, *The wealth of networks: how social production transforms markets and freedom* (New Haven, Conn.: Yale University Press, 2006), 440.
- ⁴² Judith M. Panitch and Sarah Michalak, "The serials crisis: a white paper for the UNC-Chapel Hill Scholarly Communications Convocation," (January 2005), <http://www.unc.edu/scholcomdig/whitepapers/panitch-michalak.html>
- ⁴³ Larry Thompson, "SAE and Digital Rights (Mis)management, or, how to marginalize your product, alienate your customers, and jeopardize your future (in three easy steps)," (poster presented at the annual conference of ASEE, Pittsburgh, 2008).
- ⁴⁴ National Academies, *Electronic scientific, technical, and medical journal publishing and its implications*, 44.
- ⁴⁵ Wallace, "Marketing ideas."
- ⁴⁶ Panitch and Michalak, "The serials crisis."
- ⁴⁷ Jahnke and Ullian, "University Council approves open access plan."
- ⁴⁸ Borgman, *Scholarship in the digital age*, 3.
- ⁴⁹ Raym Crow, "Income models for open access: an overview of current practice," (2009), http://www.arl.org/sparc/bm~doc/incomemodels_v1.pdf
- ⁵⁰ Patrick Gaulé, "Access to scientific literature in India," *Journal of the American Society for Information Science and Technology*, 60:12 (2009), 2548-2553, <http://dx.doi.org/10.1002/asi.21195>.

-
- ⁵¹ Ken Masters, "Opening the non-open access medical journals: Internet-based sharing of journal articles on a medical web site," *The Internet Journal of Medical Informatics* 5: 1 (2009), http://www.ispub.com/journal/the_internet_journal_of_medical_informatics/volume_5_number_1_52/article/opening-the-non-open-access-medical-journals-internet-based-sharing-of-journal-articles-on-a-medical-web-site.html
- ⁵² Frederic Lardinois, "Netflix for researchers: Deep Dyve launches rental service for research articles," *ReadWriteWeb* (October 27, 2009), http://www.readriteweb.com/archives/netflix_for_researchers_deep_dyve_launches_rental_service_for_articles.php
- ⁵³ Gaulé, "Access to scientific literature in India," 2552.
- ⁵⁴ Peter Suber, "Open access overview," (2007), <http://www.earlham.edu/~peters/fos/overview.htm>
- ⁵⁵ Borgman, *Scholarship in the digital age*, 35.
- ⁵⁶ Panitch and Michalak, "The serials crisis" ; Benkler, *The wealth of networks*, 13.
- ⁵⁷ Borgman, *Scholarship in the digital age*, 36 ; John Willinsky, *The access principle: the case for open access to research and scholarship* (Cambridge, Mass.: The MIT Press, 2006). <http://mitpress.mit.edu/catalog/item/ebook.asp?type=2&tid=10611>
- ⁵⁸ Borgman, *Scholarship in the digital age*, 35.
- ⁵⁹ G. Eysenbach, "Citation advantage of open access articles," *PLoS Biology* 4:5 (2006), e157, <http://dx.doi.org/10.1371/journal.pbio.0040157> ; a bibliography of open access citation studies is available at <http://opcit.eprints.org/oacitation-biblio.html>.
- ⁶⁰ Michael Kurtz and Tim Brody, "The impact loss to authors and research," in *Open access: key strategic, technical and economic aspects*, ed. Neil Jacobs (Oxford: Chandos Publishing, 2006).
- ⁶¹ Ware and Mabe, "The STM report."
- ⁶² Ginsparg, "Next-generation implications of open access" ; Willinsky, *The access principle*, 23.
- ⁶³ Clifford Lynch, "Open computation: beyond human reader-centric views of scholarly literatures," in *Open access: key strategic, technical and economic aspects*, ed. Neil Jacobs (Oxford: Chandos Publishing, 2006).
- ⁶⁴ Ginsparg, "Next-generation implications of open access."
- ⁶⁵ National Academies, *Electronic scientific, technical, and medical journal publishing and its implications*, 30.
- ⁶⁶ Borgman, *Scholarship in the digital age*, 8.
- ⁶⁷ Ware and Mabe, "The STM report."
- ⁶⁸ National Academies, *Ensuring the integrity, accessibility, and stewardship of research data in the digital age* (Washington, D.C.: The National Academies Press, 2009), <http://www.nap.edu/catalog/12615.html>
- ⁶⁹ Arthur Sale, "Researchers and institutional repositories," in *Open access: key strategic, technical and economic aspects*, ed. Neil Jacobs (Oxford: Chandos Publishing, 2006). <http://eprints.utas.edu.au/257/1/Chapter.pdf>
- ⁷⁰ National Academies, *Ensuring the integrity, accessibility, and stewardship of research data in the digital age*.
- ⁷¹ Fiona Murray et al., "Of mice and academics: examining the effect of openness on innovation," National Bureau of Economic Research, NBER working paper 14819 (2009), <http://www.nber.org/papers/w14819.pdf>
- ⁷² John Houghton and Peter Sheehan, "The economic impact of enhanced access to research findings," Centre for Strategic Economic Studies, Victoria University, CSES working paper no. 23 (July 2006), <http://www.cfses.com/documents/wp23.pdf>
- ⁷³ Borgman, *Scholarship in the digital age*, 51 ; Eysenbach, "Citation advantage of open access articles."

- ⁷⁴ Richard Poynder, “Compact for Open-access Publishing Equity: mistaking intent for action?,” (September 26, 2009), <http://poynder.blogspot.com/2009/09/compact-for-open-access-publishing.html> ; Peter Suber, *SPARC Open Access Newsletter* 128 (December 2, 2008), <http://www.earlham.edu/~peters/fos/newsletter/12-02-08.htm>
- ⁷⁵ Borgman, *Scholarship in the digital age*, 102 ; Poynder, “Compact for Open-access Publishing Equity.”
- ⁷⁶ OAIster, <http://www.oclc.org/oaister/about/default.htm>.
- ⁷⁷ Ginsparg, “Next-generation implications of open access” ; see <http://www.arxiv.org>.
- ⁷⁸ See a list of disciplinary repositories at http://oad.simmons.edu/oadwiki/Disciplinary_repositories.
- ⁷⁹ Zoe Corbyn and Matthew Reisz, “Learning to share,” *Times Higher Education* (November 12, 2009), <http://www.timeshighereducation.co.uk/story.asp?sectioncode=26&storycode=409049&c=2>
- ⁸⁰ Dorothea Salo, “Innkeeper at the Roach Motel,” *Library Trends* 57:2 (Fall 2008), <http://minds.wisconsin.edu/handle/1793/22088>
- ⁸¹ Ware and Mabe, “The STM report” ; Denise Troll Covey, “Self-archiving journal articles: a case study of faculty practice and missed opportunity,” *portal: Libraries and the Academy* 9:2 (2009), 249.
- ⁸² Troll Covey, “Self-archiving journal articles,” 238, 249.
- ⁸³ National Information Standards Organization, “Journal Article Versions (JAV): Recommendations of the NISO/ALPSP JAV Technical Working Group,” (April 2008), <http://www.niso.org/publications/rp/RP-8-2008.pdf>
- ⁸⁴ Borgman, *Scholarship in the digital age*, 104.
- ⁸⁵ Kristin Antelman, “Self-archiving practice and the influence of publisher policies in the social sciences,” *Learned Publishing* 19:2 (April 2006), 85-95. http://www.lib.ncsu.edu/staff/kaantelm/antelman_self-archiving.pdf
- ⁸⁶ See <http://www.doaj.org>.
- ⁸⁷ Ware and Mabe, “The STM report.”
- ⁸⁸ Benkler, *The wealth of networks*, 324 ; Borgman, *Scholarship in the digital age*, 72 ; University of California, “Faculty attitudes and behaviors regarding scholarly communication.”
- ⁸⁹ Peter Suber, *SPARC Open Access Newsletter* 105 (January 2, 2007), <http://www.earlham.edu/~peters/fos/newsletter/01-02-07.htm>
- ⁹⁰ Edlin and Rubinfeld, “Exclusion or efficient pricing.”
- ⁹¹ Ware and Mabe, “The STM report.”
- ⁹² Stuart Shieber, “What percentage of open-access journals charge publication fees?,” (May 29, 2009), <http://blogs.law.harvard.edu/pamphlet/2009/05/29/what-percentage-of-open-access-journals-charge-publication-fees/>
- ⁹³ Stuart Shieber, “Equity for open-access journal publishing,” *PLoS Biology* 7:8 (August 2009), <http://dx.doi.org/10.1371/journal.pbio.1000165>
- ⁹⁴ Poynder, “Compact for Open-access Publishing Equity.”
- ⁹⁵ Mark Ware, “Open access submission fees,” (November 4, 2009), <http://mrkwr.wordpress.com/2009/11/04/open-access-submission-fees/>
- ⁹⁶ National Academies, *Electronic scientific, technical, and medical journal publishing and its implications*, 28.
- ⁹⁷ Ware and Mabe, “The STM report.”
- ⁹⁸ Ibid.
- ⁹⁹ e.g. PLoS, <http://www.plos.org/support/instmembership.html>.
- ¹⁰⁰ Richard Poynder, “Open access: whom would you back?,” (March 10, 2009), http://www.richardpoynder.co.uk/whom_would_you_back.pdf
- ¹⁰¹ Jonas Holmstrom, “The cost per article reading of open access articles,” *D-Lib Magazine* 10:1 (January 2004), <http://www.dlib.org/dlib/january04/holmstrom/01holmstrom.html>.
- ¹⁰² Committee for Economic Development, “Harnessing openness to improve research, teaching and learning in higher education,” (September 22, 2009), http://www.arl.org/sparc/bm~doc/dcc_opennessedu_10-19.pdf

- ¹⁰³ e.g. Springer Open Choice, <http://www.springer.com/open+access/open+choice>.
- ¹⁰⁴ Walt Crawford, "Library access to scholarship," *Cites & Insights* 9:12 (November 2009), <http://citesandinsights.info/civ9i12.pdf>
- ¹⁰⁵ Ware and Mabe, "The STM report."
- ¹⁰⁶ Sean O'Doherty and Bob Boissy, "Is there a future for the traditional subscription-based journal?," *The Serials Librarian* 56 (2009), 155-162. <http://dx.doi.org/10.1080/03615260802678582>
- ¹⁰⁷ Wellcome Trust, "Wellcome Trust calls for greater transparency from journals on open access publishing costs," (October 19, 2009), <http://www.wellcome.ac.uk/News/Media-office/Press-releases/2009/WTX057058.htm>
- ¹⁰⁸ Nature Publishing Group, "Open access uptake prompts 9% price reduction for *The EMBO Journal* and *EMBO reports*," (November 12, 2009), http://www.nature.com/press_releases/emboopen.html.
- ¹⁰⁹ Ware and Mabe, "The STM report."
- ¹¹⁰ Crow, "Income models for open access."
- ¹¹¹ Poynder, "Compact for Open-access Publishing Equity."
- ¹¹² Robert Darnton, "Open access," in *The Case for Books: Past, Present, and Future* (New York: Public Affairs, 2009) ; Hackman, "What's the opposite of a pyrrhic victory?" ; McCabe, "The impact of publisher mergers on journal prices."
- ¹¹³ Panitch and Michalak, "The serials crisis."
- ¹¹⁴ Anne K. Beaubien, "ARL white paper on interlibrary loan," (June 2007), http://www.arl.org/bm~doc/ARL_white_paper_ILL_june07.pdf
- ¹¹⁵ Corbyn and Reisz, "Learning to share" ; e.g. Brill Open, <http://www.brill.nl/openaccess>.
- ¹¹⁶ O'Doherty and Boissy, "Is there a future for the traditional subscription-based journal?"
- ¹¹⁷ Peter Suber, "A field guide to misunderstandings about open access," *Open Access Newsletter* 132 (April 2, 2009), <http://www.earlham.edu/~peters/fos/newsletter/04-02-09.htm>.
- ¹¹⁸ Swan, "The culture of open access."
- ¹¹⁹ For addenda, see <http://scholars.sciencecommons.org>; for alternative licensing, see <http://creativecommons.org/about/licenses>.
- ¹²⁰ Time for archiving is commonly given as 10 minutes; see Swan, "The culture of open access" ; Corbyn and Reisz, "Learning to share."
- ¹²¹ Scholarly Publishing and Academic Resources Coalition, "SPARC member spotlight: testing the waters with open-access funds (University of California at Berkeley and the University of Calgary)," (2009), <http://www.arl.org/sparc/publications/articles/mp-berkeley-calgary.shtml>.
- ¹²² Suber, "A field guide to misunderstandings about open access."
- ¹²³ See <http://www.ncbi.nlm.nih.gov/pmc>.
- ¹²⁴ For deposit statistics, see <http://www.nihms.nih.gov/stats/>.
- ¹²⁵ Scholarly Publishing and Academic Resources Coalition, "Harvard University Faculty of Arts and Sciences," *SPARC Innovators* (June 2008), <http://www.arl.org/sparc/innovator/harvardfas.shtml>.
- ¹²⁶ See <http://www.eprints.org/openaccess/policysignup/>.
- ¹²⁷ See <http://www.news.ku.edu/2009/june/26/openaccess.shtml>.
- ¹²⁸ Van Orsdel and Born, "Reality bites."
- ¹²⁹ See <http://hdl.loc.gov/loc.uscongress/legislation.111s1373>.
- ¹³⁰ Stevan Harnad, "Opening access by overcoming Zeno's paralysis," in *Open access: key strategic, technical and economic aspects*, ed. Neil Jacobs (Oxford: Chandos Publishing, 2006), <http://eprints.ecs.soton.ac.uk/12094/> ; Odlyzko, "Economic costs of toll access."
- ¹³¹ Darnton, "Open access" ; Hackman, "What's the opposite of a pyrrhic victory?"
- ¹³² SPARC, "Harvard University Faculty of Arts and Sciences."
- ¹³³ Darnton, "Open access."
- ¹³⁴ SPARC, "Harvard University Faculty of Arts and Sciences."

¹³⁵ Peter Suber, “U of Liege OA mandate moves past its experimental phase,” *Open Access News* (January 3, 2009), <http://www.earlham.edu/~peters/fos/2009/01/u-of-liege-oa-mandate-now.html>.

¹³⁶ SPARC, “SPARC member spotlight.”

¹³⁷ See <http://www.oacompact.org>.