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The scholarly communication movement: highlights and recent developments

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The scholarly communication movement: highlights and recent developments

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Abstract

Purpose – To provide an overview of the growing international movement of librarians, faculty members, and researchers who are working together to develop new methods of scholarly communication, including Open Access (OA) journals, digital e-print archives, and institutional repositories, and to press for public access to federally funded research.

Design/methodology/approach – Key elements which have created pressures for change in the scholarly communication system are reviewed: the development and expansion of the Internet and networked technologies, and rapidly increasing journal costs due to consolidation, pricing structures and title aggregating in the commercial journal publishing industry. Effects of these pressures on libraries, citing Bowdoin College as an illustrative case, and examples of OA and affordably priced journal publishing models and OA principles and infrastructure are presented.

Findings – The OA movement has gained momentum and appears to be meeting with some success, with worldwide efforts to make federally funded research available to taxpayers and the largest science, technology and medicine journal publishers revisiting pricing structures. It is predicted that commercial journals, OA journals and digital repositories will continue to co-exist as information resources for the scholarly community for the foreseeable future.

Research limitations/implications – This is not an exhaustive history, but rather a review of movement highlights, written by a steering committee member of SPARC, a major scholarly communication movement stakeholder.

Originality/value – A useful overview for librarians and researchers unfamiliar with the movement who wish to educate local faculty members about the implications for their publishing and professional activities, as well as for commercial publishers and scholarly presses interested in learning more about the movement.

Keywords Journal publishers, Publishing, Electronic publishing

Paper type General review

I. Introduction

This article reviews the key elements which have created pressures for change in the scholarly communication system: the advent and rapid expansion of the Internet and networked technologies, which have had both positive and negative effects on the system; and enormous increases in journal costs due to consolidation, pricing and title aggregation structures in the commercial journal publishing industry. These factors have created a scholarly communication "crisis". The impact of this crisis on libraries is described, using the Bowdoin College Library as an example. In response, librarians, faculty members, and researchers worldwide have become change-agents, supporting new open access (OA) mechanisms for scholarly discourse and the sharing of new research. Their OA mechanisms include OA journals, digital e-print archives, and institutional repositories. These activities comprise the OA movement, a series of events with economic and political elements, international in scope, which has important significance for the publishing industry, for how the results of research and new scholarship are being disseminated and for library collection development strategies. Examples of OA and affordably priced journal publishing models and OA principles, infrastructure and directories are presented. The OA movement has caused librarians and taxpayers to petition for easier access to federally funded research and caused commercial journal publishers to revisit pricing models. Librarians will need to continue to monitor evolving developments in the OA movement and to include OA resources in library catalogs, gateways, portals and other online research tools. It is predicted that commercial journals, OA journals and digital repositories will continue to co-exist as information resources for the scholarly community for the foreseeable future.

For the purposes of this article, "scholarly communication" refers to activity defined by the Association of College & Research Libraries as "the system through which research and other scholarly writings are created, evaluated for quality, disseminated to the scholarly community, and preserved for future use. The system includes both formal means of communication, such as publication in peer-reviewed journals, and informal channels, such as electronic listservs" (Association of College and Research Libraries, 2006). This

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article addresses issues related to the formal system of scholarly communication. "Peer-review" refers to a principal formal means of scholarly activity, employed over many decades, in which commercial publishers and small scholarly societies appoint scholars in a particular academic discipline to "referee" or evaluate the worthiness for publication and the accuracy research reported in articles submitted by peers at other universities. Publication in refereed journals not only is essential for scholarly exchanges, it also is a key requirement in the faculty tenure and promotion process at most colleges and universities.

II. The scholarly communication crisis

For over two decades, several developments have created pressures for change in the formal system of scholarly communication. First, the emergence of the Internet and networked technology have given the scholarly community the tools to bring to reality large-scale barrier- free access to research and scholarly writings, without the necessity of utilizing commercial publishers. The Internet has enabled scholars with access to a computer and the Internet to communicate worldwide the fruits of their intellectual work. Simultaneously, three additional developments in the commercial journal publishing world placed scholarly communication in a situation widely referred to as a "crisis": the consolidation of the publishing industry; the high cost of academic journals, especially in the sciences; and new journal pricing structures. This situation has decimated the buying power of libraries, eroded the promise offered by the digital revolution for broader dissemination of information, undermined librarians' efforts to fulfill the mission to make information accessible, and impeded free scholarly exchange (Create Change Overview of the Issues Web site, 2000). The promise offered by the Internet, coupled with the substantial funding pressures created by these publishing world developments, has led to the emergence of the open access or "OA" movement to create broad digital access to scholarly work, at no charge.

Publisher consolidation and resultant new pricing structures

During the last 30 to 40 years, control of scholarly communication has passed from researchers and university and society presses to the commercial publishing industry. This industry has become highly consolidated through corporate acquisitions and mergers, and the purchase of individual titles from professional and scholarly societies. The industry now is dominated by just a few international conglomerates which control a growing segment of the scholarly journal market, particularly in scientific, technical and medical disciplines, commonly referred to as "STM" fields (Create Change Overview of the Issues Web site, 2000). For example, in 2003 the huge BertelsmannSpringer scientific publishing line was sold to the investment firms that own the Kluwer Academic publishing empire and merged under the name Springer. This created a publishing dynasty poised to produce almost 1500 journals and 5000 books annually and second in size only to the giant British Dutch conglomerate Reed Elsevier whose size also is the result of mergers (Association of Research Libraries, 2003).

In 2000, Reed Elsevier increased its market dominance by acquiring the Harcourt publishing company, including Academic Press, which published 174 peer-reviewed science journals, for $4.45 billion in cash (Stoughton, 2000). Today, the firm is the leading science and medical journal publisher, issuing over 10,000 journals, books and CDs, and almost 3,000 websites and portals. Its vast holdings include LexisNexis, the online legal and news product which provides access to more than 4 billion searchable documents, including 2 billion US public records, more than 16,000 databases and over 35,000 legal, business and news sources (Reed Elsevier Products Web site, 2006). Between 1999 and 2005, the company's online revenues tripled to $3.3 billion. (Reed Elsevier, 2006)

Reed Elsevier often is credited with profoundly changing scholarly publishing by being among the first companies to use the Internet to publish their journal line. Ironically, the very same developments that enabled librarians and scholars to envision a broadly reconceived scholarly communication system of open access information resources – the appearance of the Internet and evolving networked technologies – led publishers like Reed Elsevier to create highly priced "bundles" of journal titles in both print and electronic versions, which has led to the scholarly communication crisis and contributed to development of the OA movement.

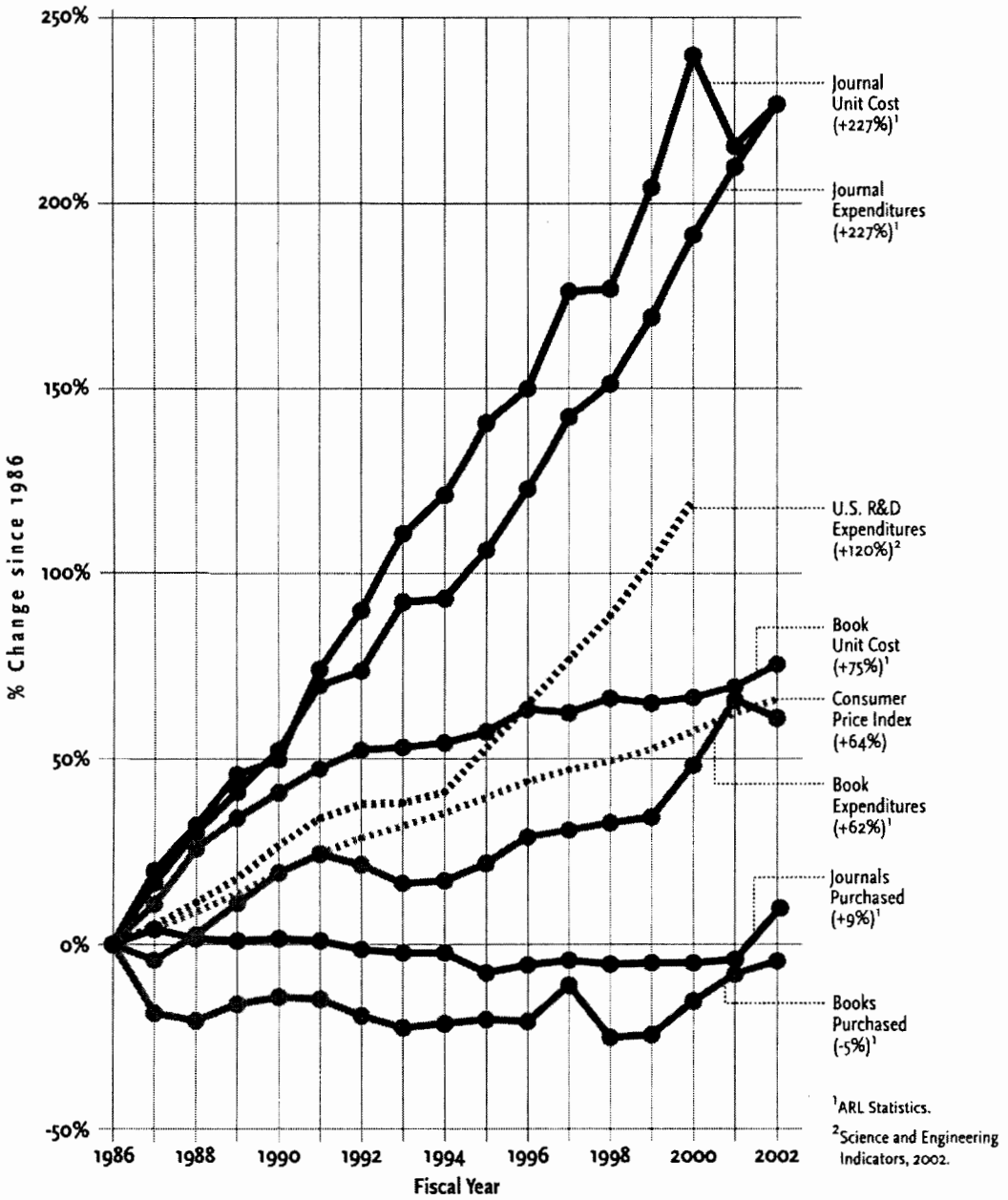
With so much power concentrated in the two top journal publishers, research libraries increasingly found themselves reeling from soaring journal prices. For rather than seek economies of scale to bring down subscription prices, profit-driven commercial publishing empires with responsibilities to shareholders have been setting high prices for academic journals in both print and electronic formats. Prices, particularly for STM journals, have risen at double-digit rates in some years, well above the general inflation rate in the economy and also above the rate of increase to library budgets. The extraordinary rises in book and journal costs between 1986 and 2002, with journal prices rising 227 percent and book prices rising 75 percent compared to the rise in the consumer price index (CPI) of 64 percent over the same period is shown in a chart produced by Create Change (Figures 1 and 2). The result is "the average North American research library has had to cut journal acquisitions by more than 6 percent since 1986, and book acquisitions have been cut by 26 percent" (Create Change Overview of the Issues Web site, 2000).

The effects of the scholarly communication crisis on Bowdoin College

These national pricing trends and consequences have been reflected in the changing materials expenditure and acquisition patterns at the Bowdoin College Library. Between 1995 and 2005, prices of the library's ten most expensive science journals rose 140 percent, while the materials budget grew by only 21 percent. In 2005, the 10 most expensive journals received by the library, all in science fields, cost a total of $ 99,361. The ten least expensive cost $102 combined; all are in the humanities.

Bowdoin librarians, like those throughout the US and abroad, have employed a variety of strategies to cope with spiraling journal price increases, including negotiating more advantageous serial prices and services from vendors. Paper

Figure 1 Book and journal costs, 1986-2002, from Create Change brochure



Notes: North American Research Libraries.
http://www.createchange.org/archive/resources/CreateChange2003.pdf

and microform journals which are duplicated online have been cancelled, as licensing permits, if the material is appropriate and if the electronic publisher responsibly archives the backfiles. And the library is joining Portico, the archiving service for scholarly, peer-reviewed electronic journals, to ensure future access should publishers cease titles or be unable to provide accessibility. In addition, Bowdoin is expanding resource-sharing initiatives. Members of the 25-year old Colby Bates and Bowdoin (CBB) college consortium have formed the new NExpress collaborative with Northeastern University, Wellesley and Williams College to expedite patron-initiated interlibrary loans of monographs and electronically-delivered journal articles. And CBB is establishing a shared collection development plan to eliminate unnecessary duplication of materials and purchase more unique titles. These are prudent measures which should be pursued, regardless of budget constraints.

The Bowdoin Library also has been forced to cancel journal subscriptions and reduce the book acquisition rate to support increasingly expensive journals and acquire electronic databases. Between fiscal years 1993-1994 and 2004-2005, journal subscriptions as a percentage of total material expenditures jumped from 42 percent to 53 percent, while book expenditures declined from 46 percent to 27 percent. In

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Figure 2 Book and journal costs, 1986-2002, from Create Change brochure

Notes: http://www.createchange.org/resources/CreateChange2003.pdf
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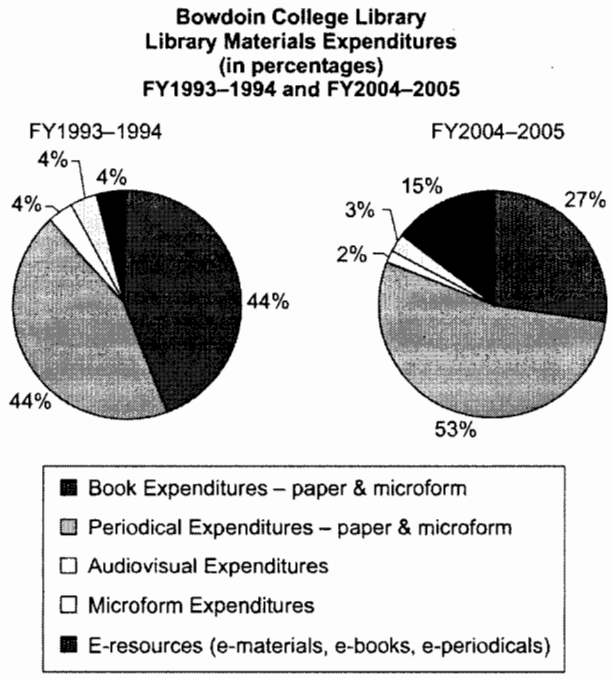
February 2005, at the start of the second semester, the Library had to inform faculty members that the year's book money was totally expended (Figure 3).

In 1993-1994, the Bowdoin Library purchased 9,657 books and subscribed to 2,049 paper journals. By 2004-2005, due to rising journal prices, the Library's paper journal collection was 13 percent smaller and book buying also had dropped by 13 percent. Both factors greatly affect faculty in non-science fields, where there is much heavier reliance on monographs. The Library spent $612,019 more for journals than it had 11 years earlier, but received 247 fewer paper journal titles. While 150 databases and several thousand online journal titles had been added, broadening access to materials for some disciplines, the costs for these digital resources cut deeply into the monographic budget.

Figure 3 Bowdoin College library materials expenditures 1993-1994 and 2004-2005



An additional cause of the crisis: publisher "bundling" of journal titles

In addition to paying increasingly higher prices for journals, Bowdoin and other libraries have been forced by powerful publishers to spend budget dollars on some electronic journals titles it had no interest in buying. This is due to the final development affecting scholarly communication, to be discussed here: the "bundling" of dozens or even hundreds of electronic journal titles into aggregated products with complex, convoluted pricing schemes, instead of selling

separate titles. Libraries thus are forced to spend more money and for titles they don't want. Librarians have dubbed such offers "The Big Deal." Some aggregation price schemes lock libraries into three-year contracts with guaranteed caps on price increases and libraries also must agree not to cancel a single title in the bundle during the contract period.

Many years after Internet publishing first required publishers to make capital investments to support the transition to digital production, prices continue to rise and publishers have yet to stop scrambling to develop appropriate price structures for libraries. Instead, universities are forced to purchase the reports of research produced on their own campuses at extraordinarily high prices. While commercial and non-profit publishers alike must recover their costs, not only have commercial publishers been generating astoundingly high profits, they have not paid a cent to faculty authors. Often they charge authors page and color charges in order to publish their articles. Furthermore, commercial publishers usually demand that authors sign agreements transferring all their copyrights exclusively to the publishers, thus abrogating any future control over public distribution of their work, such as posting research on publicly available websites and archives.

These pricing practices and use restrictions have eroded scholarly communication by leaving libraries unable to keep pace with the increasing amount and costs of scholarly materials and prohibiting scholars from freely sharing their research (Create Change Overview of the Issues Web site, 2000). It became clear to all involved that a major paradigm-shift and monumental publishing market corrections were needed. The consequence was that librarians and others became change-agents in a series of enterprises that comprise what has become an international movement to create broader access to scholarship.

III. The open access movement

The centerpiece mechanism of worldwide efforts to broaden access to published research and other scholarly writings is "open access" (OA) publishing. "OA literature is digital, online, free of charge, and free of most copyright and licensing restrictions. What makes it possible is the internet and the consent of the author or copyright-holder ... OA is entirely compatible with peer review, and all the major OA initiatives for scientific and scholarly literature insist on its importance" (Suber, 2004c). There are two principal means of OA publishing: OA journals and digital e-print archives and institutional repositories.

SPARC: One of the earliest and most significant efforts to advance the OA movement occurred in 1998 with the establishment of "SPARC", the Scholarly Publishing and Academic Resources Coalition www.arl.org/sparc (Figures 4 and 5).

Founded under the aegis of the Association of Research Libraries, SPARC is an alliance of nearly 300 institutions in North America, Europe, Asia, and Australia working to correct market dysfunctions in the scholarly publishing system, by serving as a catalyst to promote change. (Association of Research Libraries, 2006b) One major thrust of SPARC activities is to incubate publishing models and business initiatives that take advantage of networked information systems to benefit open scholarly exchange. SPARC supports publisher partners "who are committed to fair pricing, the ethical use of scholarly resources, and intellectual property management policies that emphasize broad and easy distribution of material" (Association of Research Libraries, 2006a). SPARC is successfully helping develop and support lower-cost journals that are alternatives to expensive commercial journals, particularly STM fields, and increase the presence of the non-profit sector in scholarly publishing activity. SPARC also offers advisory services to smaller publishers, such as scholarly associations. SPARC has 25 publisher partners today (Association of Research Libraries, 2005a, b). Several are described here.

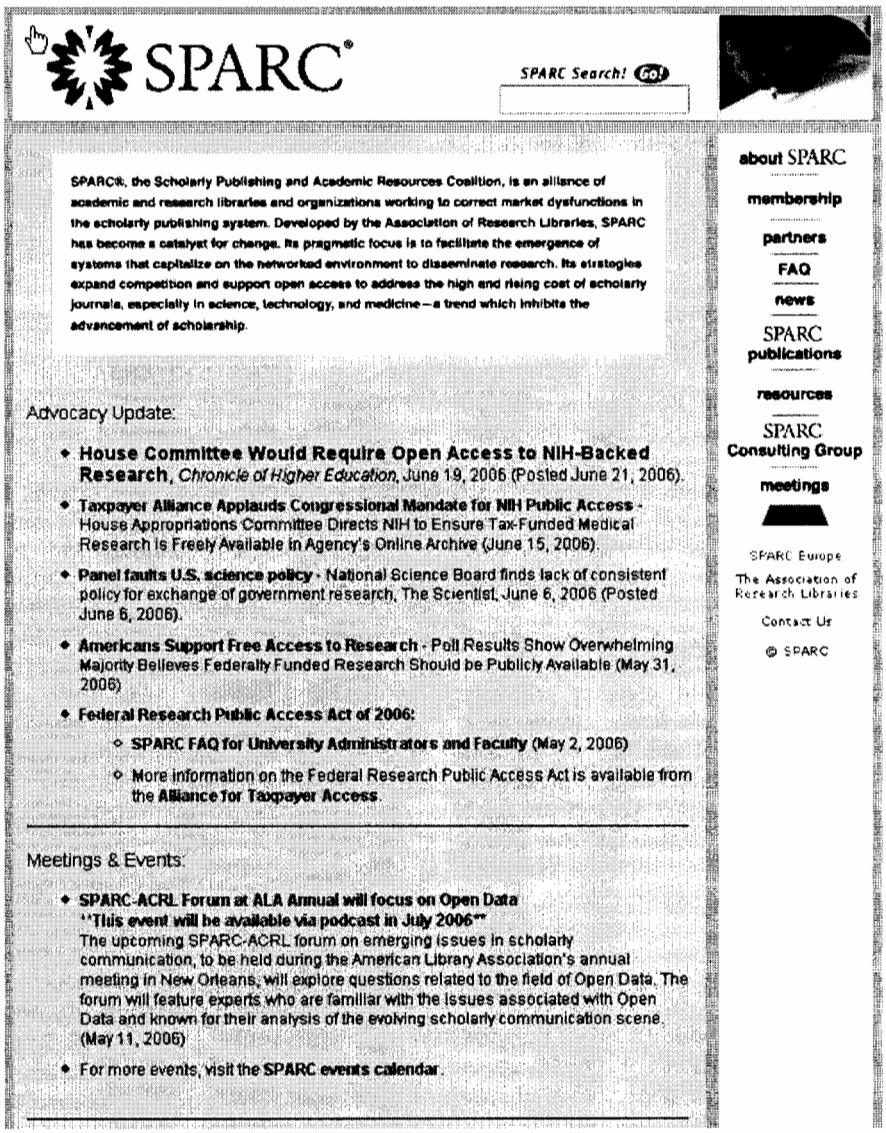
Create change: In addition to incubating alternative publishing models, SPARC focuses on advocacy and education. The Create Change organization www.createchange.org/home.html was established by SPARC, the Association of College and Research Libraries, and the Association of Research Libraries, to call attention to the scholarly communication crisis and offer librarians, faculty members and administrators toolkits and brochures presenting specific step-by-step strategies to launch OA advocacy programs. Recommended actions include: publishing in OA journals; serving on editorial boards or review panels for OA journals; influencing publishers to adopt reasonable pricing structures; encouraging professional societies to discontinue selling publications to commercial publishers in favor of creating alternative competing, peer-reviewed journals; and promoting changes in the peer-review system such as recognizing quality vs. quantity and electronic publication as criteria for tenure and promotion. (Create Change Introduction to Links and Tools Web site) (Figures 6 and 7).

Many faculty members fear that publications in OA journals will not be recognized as evidence of serious scholarship for tenure and promotion. In a discussion of the economic crisis in scholarly publishing, Cathy N. Davidson, a vice-provost and professor of English at Duke University stated in The Chronicle of Higher Education: "A book and several refereed articles have been the price of admission to tenure in the humanities and social sciences for decades. It is impossible to change the standard of excellence in a profession as hierarchical and decentralized as ours overnight" (Davidson, 2003). The number of peer-reviewed open access journals is growing, as are profession and discipline-based online communities. A large challenge to OA advocates is to identify ways to raise awareness and encourage dialogue in the academy by both scholars and the administrators who sit on tenure review teams of the need to consider as acceptable evidence of serious scholarly activity digital publishing venues such as OA journal publishing, and establishing discipline-based and professional listservs and blogs.

Open access and reasonably priced journals

The Public Library of Science (PLoS) (www.plos.org) has received significant media attention and high use by scientists. PLoS "is a nonprofit scientific publishing venture that provides scientists with high-quality, high-profile journals in which to publish their work, while making the full contents open access. Everything is immediately available online

Figure 4 SPARC homepage (part one)



Note: http://www.arl.org/sparc

without cost to anyone, anywhere ... subject only to the condition that the original authorship is properly attributed. Copyright is retained by the author ... " (SPARC, 2005). PLoS publishes six journals. In 2005, PLoS Biology received a preliminary ISI Impact Factor of 13.9, the highest ranking for a general biology journal (About PLoS Biology, 2006) (see Figures 8 and 9).

BioMed Central (www.biomedcentral.com/) is "an independent publishing house committed to providing immediate open access to peer-reviewed biomedical research" (What is BioMed Central? Web site, 2006). It offers a portfolio of 158 journals, ranging from general interest titles such as *Journal of Biology* to highly specialized titles serving specific disciplines. BioMed Central can afford to offer this journal line at no charge because instead of charging high library subscription fees, most of the journals assess a flat article-processing fee for each accepted manuscript. The article-processing charges pay for posting on the World Wide Web, preparing articles for online publication, and securing inclusion in the NIH OA PubMed science citation database after publication. The BioMed Center Board of Trustees represents some of the most highly regarded scientists and researchers in the world, including the Provost of Harvard University, the President of Rockefeller University, and Nobel Prize winner Harold Varmus, President of the Memorial Sloan-Kettering Cancer Center (What is BioMed Central? Web site, 2006) and (BioMed Central Board of Trustees, 2006).

BioOne (www.bioone.org/perlserv/?request = index-html). is a digital aggregation of the hyperlinked full texts of dozens of leading bioscience research journals. It was founded in 1999 by collaboration of five organizations including the American Institute of Biological Sciences (AIBS). Previously most of the journals were available only in printed form,

Figure 5 SPARC homepage (part two)

Notes: http://www.arl.org/sparc
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because they are published by very small societies with volunteer staffs that lack the expertise and/or finances to publish online. Eventually, the collection will include over 200 bioscience titles (BioOne Frequently Asked Questions Web site). BioOne is not an OA project. Rather, it was designed to be an affordable access project, because the societies were not ready to make such a major transition. BioOne does support a small number of OA titles on the site, but the collection is under moderately priced subscription access control (Figures 10 and 11).

Stanford Encyclopedia of Philosophy: While the majority of SPARC publishing partners are in STM fields, SPARC's reach is extending to humanities fields. A successful example is the Stanford Encyclopedia of Philosophy or SEP (http://plato.stanford.edu/). This "digital-only" open access reference source offers entries in 35 subject areas, including philosophy of science, aesthetics, history of ideas, feminism, ethics and logic. SEP is produced on yet another alternative funding model: Stanford University secured initial funding of $500,000 from the National Endowment for the Humanities, contingent on raising $1.5 million in matching monies from member libraries of three partner library organizations: SOLINET, ICOLC, and SPARC. Over $1 million has been committed to date by libraries worldwide. (Stanford Encyclopedia of Philosophy Fundraising and Support Web site)In 2005 SEP was cited for "Best Content" in the Charleston Advisor Reader's Choice Awards (Zalta, 2006).

Digital archives and institutional repositories

E-print archives and institutional digital repositories are additional alternative formal communication systems, which have become established research tools for scholars across the disciplines. Each mechanism enables authors to "self-archive" their publications by depositing digital documents to publicly accessible Web sites. Digital archives and repositories developed in the 1990s from recognition by scientists, scholars and librarians of the potential of the Internet to enhance scholarly exchange and from the need to counter the diminishing access to research reports caused by high journal pricing.

"E-prints" are "electronic versions of research papers or similar research output. They may be 'pre-prints' of unrefereed papers or 'post-prints' of refereed ones. They may also include journal articles, chapters from scholarly books, conference papers, or any form of research output such as technical reports" (Pinfield, 2003) as cited in (Correia and Jose, 2005). An e-print archive or repository is simply an online repository of publicly accessible research materials. The term 'repository' is preferred by most archivists, since curatorship and preservation are not the main functions of

Figure 6 Create Change homepage

Note: http://www.createchange.org/

such archives" (Pinfield and James, 2003) as cited in (Correia and Jose, 2005).

arXiv.org: Physicists were the first group of scholars to establish an online archive of literature with arXiv.org (www.arxiv.org), launched at Los Alamos, New Mexico in 1991 and now housed and managed by Cornell University. The arXiv e-print service offers articles in the fields of physics, mathematics, computer science, and quantitative biology (arxiv.org Web site) and (Yiotis, 2005a).

In addition to posting articles to e-print archives, growing numbers of faculty members are utilizing institutional repositories established by their universities to make scholarship universally accessible. Clifford A. Lynch, Executive Director of CNI, the Coalition for Networked Information, defines a university-based institutional repository as "a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. It is most essentially an organizational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organization and access or distribution" (Lynch, 2003) as cited in (DSpace Federation, 2006a).

DSpace (www.dspace.org/) is one of the earliest and most widely used digital repository tools. Developed at M.I.T., in collaboration with Hewlett-Packard and with support from the Andrew Mellon Foundation, "the

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Figure 7 Create Change homepage

Notes: http://www.createchange.org/home.html
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DSpace digital repository system captures, stores, indexes, preserves, and distributes digital research material ... " (DSpace Federation, 2006b). The DSpace open source platform, which is customizable to local needs, accepts all forms of digital materials including text, images, video and audio files, web pages, and reformatted library collections (DSpace Federation). Using DSpace, librarians, technology staff and/or faculty can establish a learning object repository and/or an online archive to disseminate and preserve long-term the intellectual work of the community, such as pre-prints or published papers, and student theses or multi-media projects. Repositories provide official documentation of activities of the life of the institution, including records of events and performances, and are used to archive data that supports peer-reviewed faculty articles (DSpace Federation).

They also serve as a home for new electronic publications, without a commercial publisher or a scholarly society serving as middle-agent. Several commercial products perform the same function as DSpace, offering digital asset management services to institutions with technical staffs too small to utilize the DSpace platform on their own.

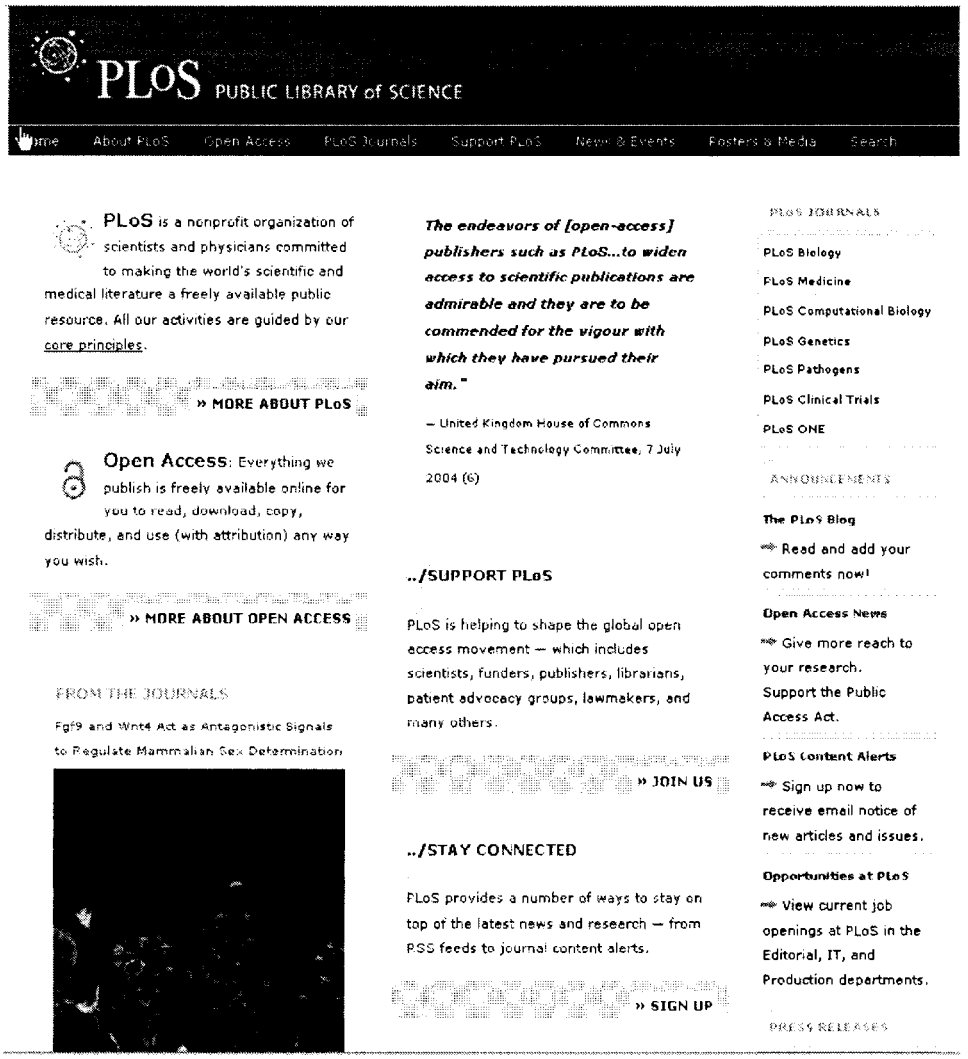
IV. Open access principles, infrastructure and directories

The Open Society Institute: The OA movement gained strength at a meeting of the Open Society Institute in Budapest in December 2001, which culminated in the issuance of the "Budapest Open Access Initiative" (BOAI) available at: www.soros.org/openaccess/index.shtml. As of April 2006, the Initiative had been signed by 4392 individuals and organizations around the globe, representing researchers, universities, laboratories, libraries, foundations, journals, publishers, and learned societies, all part of an international effort committed to making research articles in all disciplines available online at no charge (Budapest Open Access Initiative Web site).

OAI Metadata Harvesting Protocol: The scholarly articles and research reports posted to digital archives and repositories became easily searchable to scholars world wide when the Open Archives Initiative (OAI) met in 1999 to develop the necessary technical framework. The OAI Metadata Harvesting Protocol enables interoperability among e-print archives and repositories so that "...all can be harvested, integrated, navigated, and searched seamlessly as if they were in one global archive" (Yiotis, 2005b).

Collection Building
Volume 25 · Number 4 · 2006 · 108–128

Figure 8 PLoS homepage (part one)



Note: http://www.plos.org

Creative Commons: Authors and artists interested in open access distribution of their works frequently are concerned about retention of copyright. Support is available at the Creative Commons website (http://creativecommons.org/). This non-profit organization was founded in 2001 with advice of intellectual property and cyberlaw specialists to provide flexible copyright licenses for authors, artists and educators at no charge. Licenses are offered for such creative works as various forms of writing, films, photographs, websites, music and courseware (see Figures 12 and 13):

> We work to offer creators a best-of-both-worlds way to protect their works while encouraging certain uses of them – to declare "some rights reserved" ... that helps people dedicate their creative works to the public domain – or retain their copyright while licensing them as free for certain uses, on certain conditions .... Our aim is not only to increase the sum of raw source material online, but also to make access to that material cheaper and easier. To this end, we have also developed metadata that can be used to associate creative works with their public domain or license status in a machine-readable way ... (Creative Commons About Us Web site).

E-Publications and Blogs: Three excellent ways to keep up with open access developments are SPARC E-News (www.arl.org/sparc/pubs/enews/index.html), the SPARC Open Access Newsletter (www.earlham.edu/~peters/fos/index.htm), which is edited by Peter Suber, Research Professor of philosophy at Earlham College in Indiana, and Suber's Open Access News Blog (www.earlham.edu/~peters/fos/fosblog.html).

The Directory of Open Access Journals: "DOAJ" (www.doaj.org/), yet another SPARC partner, provides a list of full text, quality controlled journals, in all scholarly and scientific disciplines and in all languages, at no charge. It is maintained by the Lund University Libraries. Currently 2,184 journals are listed. 596 journals are searchable at the article level and 93,158 articles are included. (DOAJ: Directory of Open Access Journals Web site) (Figures 14 and 15).

Figure 9 PLoS homepage (part two)

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V. Recent gains in the open access movement

The Open Access movement has been gaining strength in the last few years. Consider this evidence:

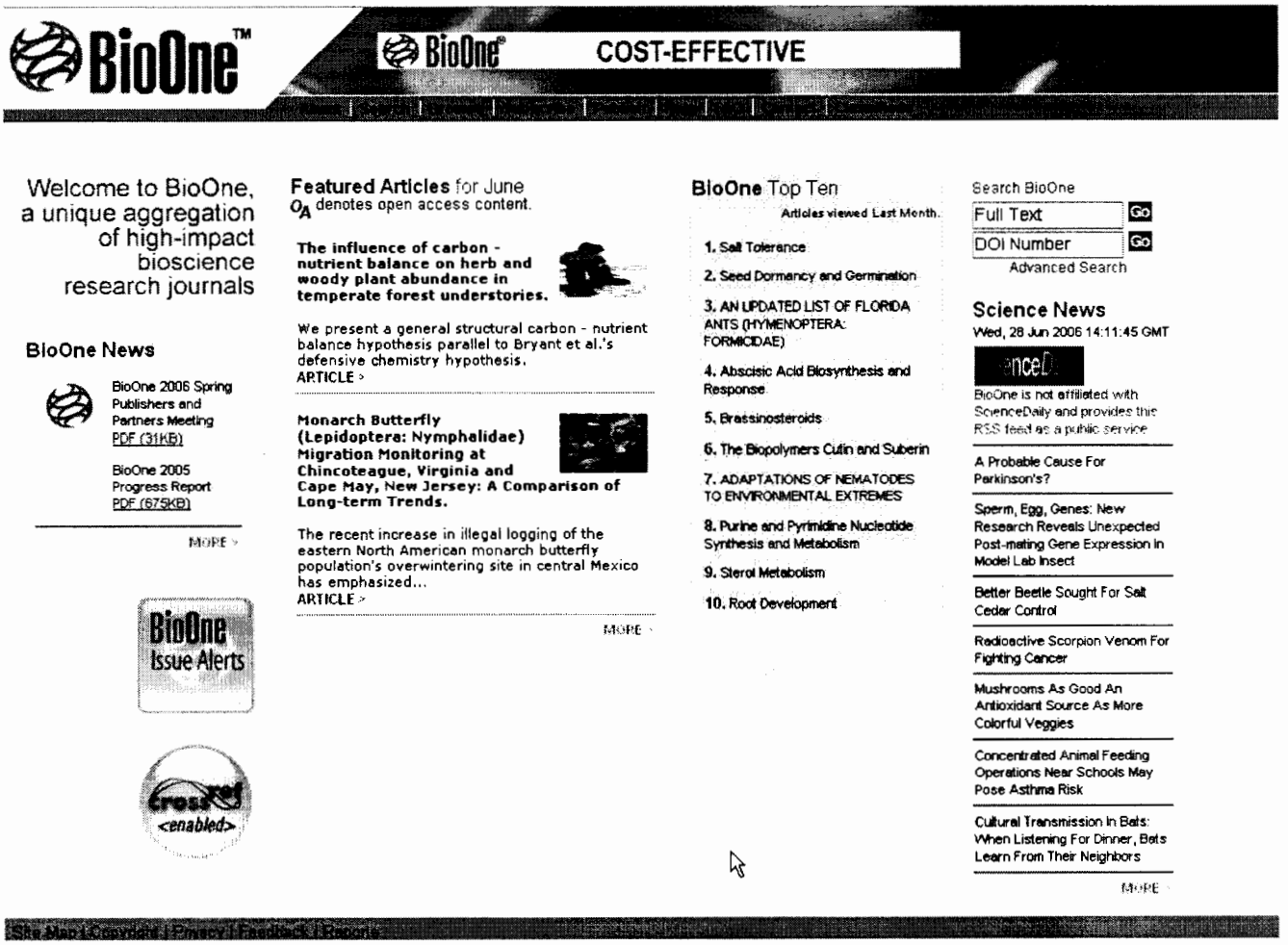
Government-supported research increasingly is being viewed as a public commodity

There is a growing international movement to make the results of government sponsored research available to all taxpayers. Efforts in the United States:

ATA: In 2004, a coalition including patient groups, physicians, researchers, educational institutions, and publishers formed the Alliance for Taxpayer Access www.taxpayeraccess.org/index.html. The library community and SPARC were instrumental in establishing ATA. ATA supports open access to taxpayer-funded research as "an essential, inseparable component of our nation's investment in science ... [to]stimulate further discovery and innovation ... [and] advance the translation of this knowledge into public benefits ... " (ATA: The Alliance for Taxpayer Access Web site) (Figures 16 and 17).

The NIH Public Access Policy: ATA helped spur passage of the NIH Public Access Policy which became effective May 2, 2005. The policy strongly encourages NIH-funded investigators to voluntarily deposit reports of research findings to PubMed Central (PMC) (www.pubmedcentral.nih.gov/), the NIH OA digital repository of full-text, peer-reviewed biomedical journals, within twelve months of publication in other research journals. (National Institutes of Health: Office of Extramural Research, 2005) SPARC, the library community and ATA had lobbied to make the postings to PMC a funding requirement to be made within six months of other publication. In a six-month progress report to Congress on the implementation, NIH had little success to report: less than four percent of NIH-funded manuscripts had been deposited into PubMed Central. The report repeats recommendations of the NIH Public Access Working Group in fall 2005 that for the policy to be effective, it must be made

Figure 10 BioOne web site homepage



Note: http://www.bioone.org

mandatory and the embargo period should be shortened to six months (National Institutes of Health (NIH), 2006).

The Cures bill: In December 2005, Senators Joe Lieberman and Thad Cochran introduced the "Cures" bill, a bipartisan effort to expedite development of new therapies and cures for life-threatening diseases. The bill requires free public access to articles stemming from research funded by agencies of the Department of Health and Human Services (DHHS), including NIH, the Centers for Disease Control and Prevention, and the Agency for Healthcare Research and Quality, through PubMed Central (ATA: The Alliance for Taxpayer Access, 2005) and (Association of Research Libraries, 2006c). The bill goes further than the NIH policy, by requiring (vs. encouraging) deposit of research articles in PubMed and by reducing the embargo period following publication in a peer-reviewed journal from six to four months. (Albanese, 2006) and (Association of Research Libraries, 2006c).

The "Cornyn-Lieberman Bill": The bi-partisan Federal Research Public Access Act (FRPAA) of 2006, introduced by Senators John Cornyn (Republican, Texas) and Joseph I. Lieberman (Democrat, Connecticut) in terms similar to those of the Cures Bill, requires free public access within six months, not 12, after publication in a peer-reviewed journal, to the results of research funded by all 11 federal agencies that provide at least $100 million in outside funding each year. This includes the department of Homeland Security, the Environmental Protection Agency, NASA and the National Science Foundation. The bill was introduced on the first anniversary of the adoption of the NIH Public Access Policy. Applauding the legislation, Heather Joseph remarked, " 'Expanded access to research really will help accelerate innovation and discovery' ... But Patricia S. Schroeder, president and chief executive of the Association of American Publishers, promised a fight. 'It is frustrating that we can't seem to get across to people how expensive it is to do the peer review, edit these articles and put them into a form everyone can understand'" (Weiss, 2006).

There have been similar efforts in other countries to provide OA access to the results of government-sponsored research:

The British House of Commons: In 2004, the British House of Commons Science and Technology Committee (STC) held public hearings into the effects of rising scientific publication costs on libraries. Their findings supported taxpayer access to

Figure 11 BioOne web site homepage

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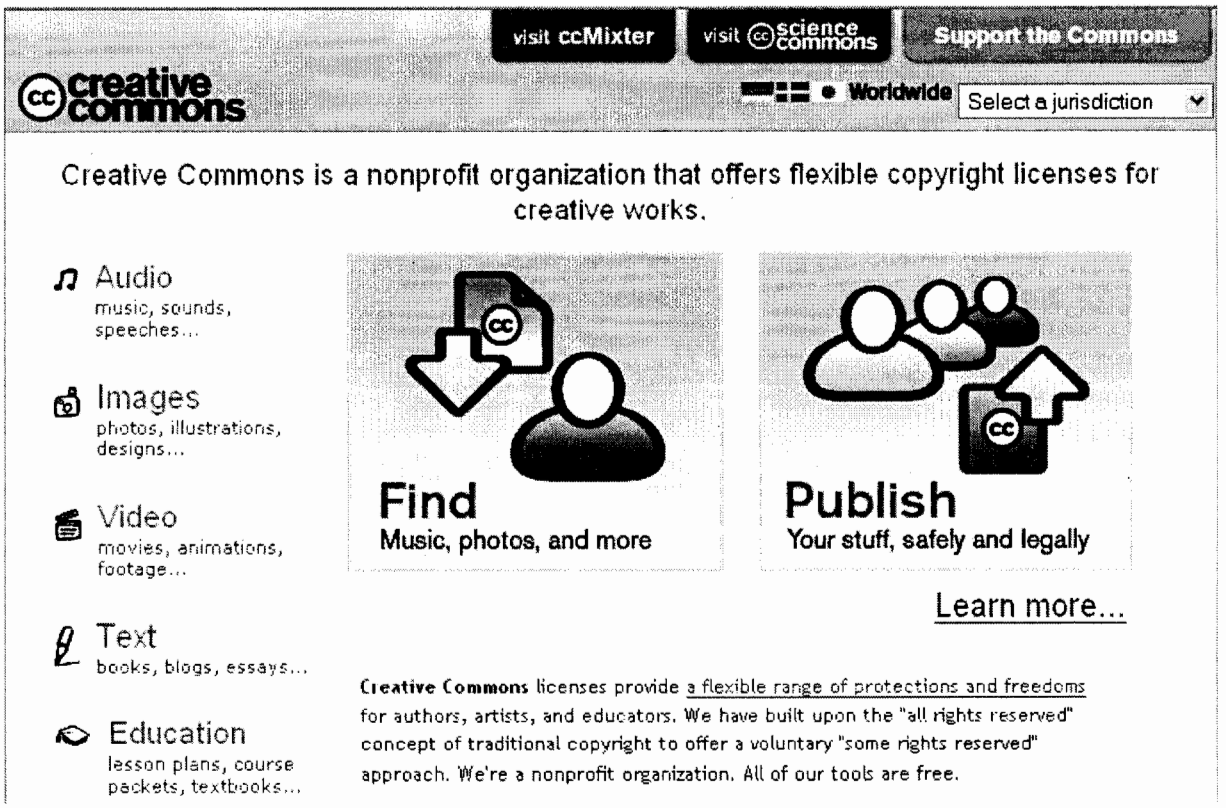
UK publicly funded research through copyright retention by authors and article postings in open access repositories. While the British government dismissed the committee's work, in December 2005, over a year later, the new STC chair said he was "staggered by the level of interest and the intensity of feeling on the subject" (Albanese, 2006). It seems likely the British Parliament will review the report again.

The Wellcome Trust: Wellcome Trust, one of the world's largest sources of biomedical research funding, announced in October 2005 that all grantees must deposit reports of research results to PubMed Central no later than six months after formal publication. Wellcome Trust will award additional funding to cover author page processing charges levied by such open access publishers as PLoS and BioMed Central (Association of Research Libraries, 2005b).

The German Research Foundation, DFG: In spring 2006, the Deutsche Forschungsgemeinschaft (German Research Foundation, DFG) began requiring grantees to provide open access to DFG-funded research either through deposit in discipline-specific or institutional electronic repositories following conventional publication, or through publication in a peer-reviewed open access journal (Suber, 2006b),

The European Commission report on STM publishing and OA in Europe: The key recommendation in this report, issued in spring 2006, is for guaranteed public access to publicly-funded research results, shortly after publication, as a condition for funding. Peter Suber commented: "This is big. If the EC adopts the recommendation, it would mark the largest victory to date for the worldwide OA movement ... It should trigger the adoption of more OA policies at the national level across Europe, to match those already in force in Finland and Germany ... It should give all governments inside and outside Europe the courage to defend the public interest by providing public access to publicly-funded research, rather than compromising it in order to benefit a private industry." Also significant is the call for a " 'level-

Figure 12 Creative Commons homepage (part one)



Note: http://www.creativecommons.org

playing field'" between OA and non-OA business models to "allow for experimentation and competition between various possible business models" (Suber, 2006a).

The ACRL Scholarly Communication Initiative: Increasing numbers of libraries began to develop scholarly communication programs and appoint scholarly communication officers after the Association of College and Research Libraries (ACRL) issued "Principles and Strategies for the Reform of Scholarly Communication" and launched a Scholarly Communications Initiative in 2003. (Association of College and Research Libraries, 2006) Principles underlying system reform are articulated, such as fair and reasonable prices for scholarly information, quality assurance in publishing through peer review, and preservation of scholarly information for long-term future use. The document also presents 18 strategies libraries and scholars may pursue to effect system reform.

University Libraries Are Refusing the "Big Deal": In late 2003, major research university libraries began to take formal actions against high journal prices and several faculty senates publicly denounced STM journal publisher pricing. The list included Harvard, Cornell, Stanford, Berkeley, the University of California system, Duke and M.I.T.; each spends several hundred thousand or even $1M annually on Elsevier and other STM titles. At the time, Suber viewed these actions as a tipping point:

> ... they accompanied these decisions with public statements denouncing publisher pricing practices as unsustainable and inconsistent with the mission of science and scholarship ... These actions show anger, not just businesslike responses to hard bargaining...They show a crisis at elite research universities with large budgets. From this we must infer graver and more widespread problems at less affluent institutions, even if they are less visible, and a large impediment to science itself represented by the access barriers growing at every level of higher education! (Suber, 2004b)

What comes to mind is the movie *Network* where people stick their heads out windows and shout "I'm fed up and I'm not going to take it anymore." Librarians were heartened by these actions, but did Reed Elsevier notice? In January 2004, the *Wall Street Journal* reported:

> ... media analysts are increasingly troubled by the threat that free online scientific research could pose to Reed's pricing power as ScienceDirect contracts come up for renewal. Reed's share price outperformed most media stocks in 2002 in large part on the strength of ScienceDirect; in 2003, Reed's share price fell more than 12 percent." (Goldsmith, 2004) Elsevier's finance director " ... dismissed talk of new threats to its science-journal model as a 'lot of noise.' He said the company's subscription model continues to serve the scientific community 'very, very well ... We will continue to engage in the debate' over open access and other publishing methods ... Reed's commercial model 'as it stands has a lot of legitimacy.' (Goldsmith, 2004).

Two weeks later, *The Chronicle of Higher Education* ran a full-length article on OA: "Free subscription journals may loosen commercial publishers' stranglehold on scientific research, but skeptics say they're no panacea." However, John E. Cox, publishing-industry consultant, observed, "The open-access method of distributing scientific journals is the most articulate and serious threat to the conventional publishing model that we've seen" (Guterman, 2004).

Figure 13 Creative Commons homepage (part two)

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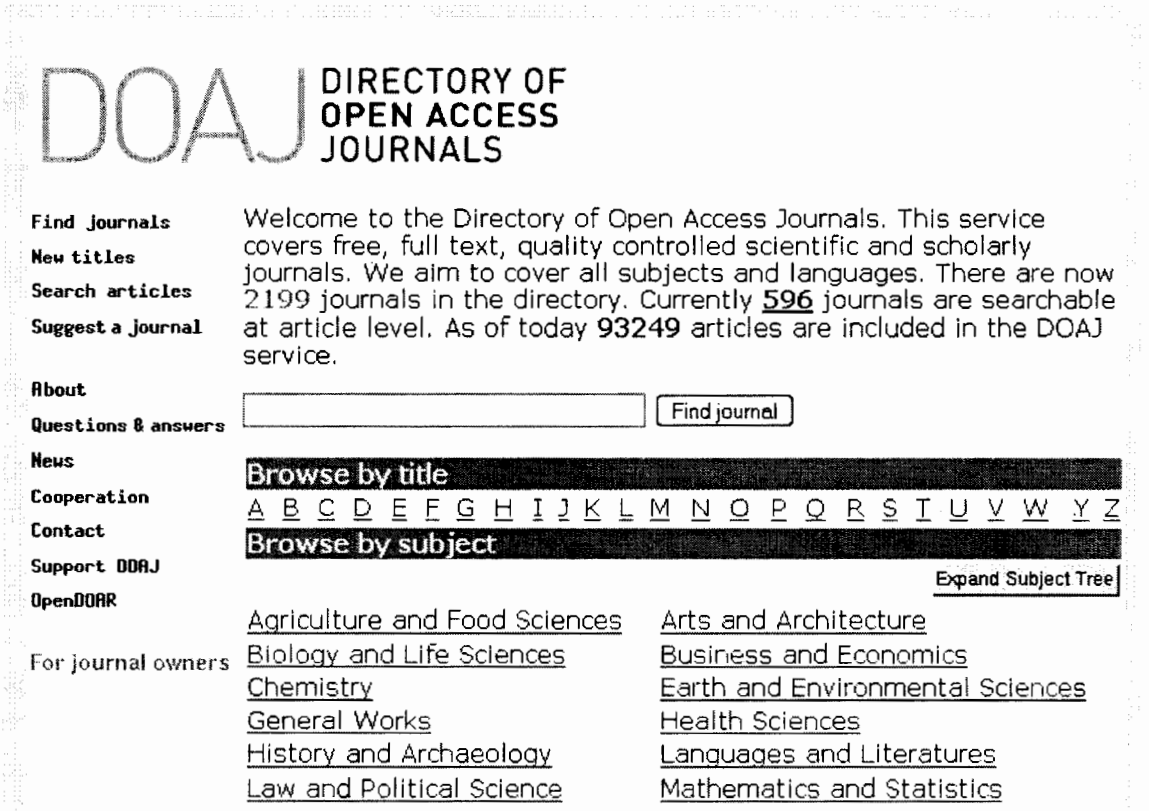
STM publishers are reassessing pricing models: the "Big Deal" era may be over

The two largest STM publishers have begun to do more than notice the OA movement; each is exploring, albeit in tiny steps, how to integrate OA elements into their publishing models. In August 2004, Springer, the second largest science journal publisher after Elsevier, introduced its Open Choice program offering free online access by the article if authors or their funding agencies choose to pay a $3,000 processing fee. Springer will raise or lower its journal prices based on the level of non-open content published in the last year. Suber and others criticized this model, because Springer still holds article copyright, only allowing authors to deposit copies in institutional repositories (Suber, 2004a).

A year later, Springer created the new position of "Director of Open Access", appointing Jan Velterop, former publisher of BioMed Central, the first and largest OA publisher. Suber responded: "I believe that Springer is just the first of the large commercial publishers to see that it makes good sense to do more for OA, perhaps even to plan for a transition to OA ... Support for OA by major institutions is irreversible and growing rapidly. It's not just a threat to the old business model; it's an opportunity for new business. Springer wants to explore these opportunities, which is smart" (Suber, 2005b). Around the same time, Elsevier announced free electronic access to all issues back to 1995 of the journal, *Information and Computation*, for one year, including downloading for individual use. Suber noted that Elsevier has supported OA archiving while holding a "hostile" attitude towards OA journals. He interprets this move as an effort by the I&C to learn whether its price has denied access to potential readers, by monitoring traffic during the trial online period: "I&C is not an OA journal, this experiment does not make it one ...

Figure 14 DOAJ website (part one)



Note: http://www.doaj.org/

Nevertheless this is an experiment that takes Elsevier well beyond its past support for OA archiving" (Suber, 2005a).

A few months later, in spring 2006, Elsevier went a step further, announcing it is collaborating with major research libraries and revisiting its pricing structures. The result could be a return to title by title subscriptions linked to comprehensive archive databases. Elsevier senior vice president Karen Hunter " ... believes that the information and publishing sector is in a period of unprecedented uncertainty. 'How we make relevant information available and make a business case is not clear,' ... She sees libraries developing new federated search services to locate information from a wide range of databases from different publishers. 'They are the middle ground ... They understand the needs of their campus'" (Chillingworth, 2006). This could signal the crumbling of "The Big Deal" era, as publishers begin to acknowledge the need to collaborate with librarians.

The Peer Review Process is Being Called into Question: Recent discoveries of fraudulent research reports are placing the peer-review system under growing scrutiny, and giving a boost to moves to make publicly financed research openly available. In May, Lawrence K. Altman, M.D. of the *New York Times* reported:

Virtually every major scientific and medical journal has been humbled recently by publishing findings that are later discredited ... even the system's most ardent supporters acknowledge that peer review does not eliminate mediocre and inferior papers and has never passed the very test for which it is used. Studies have found that journals publish findings based on sloppy statistics. If peer review were a drug, it would never be marketed, say critics, including journal editors (Altman, 2006).

Peer reviewers' evaluations usually are based solely on information submitted by the authors, not on examinations of researchers' notebooks or efforts to duplicate research results. Altman attributes the complexity of the publishing system for this lack of sufficient review of research reports prior to publication. Economic pressures, and fears of creating conflicts with authors and peer-reviewers, and of alienating authors who could withhold the manuscripts that are the economic backbone of the journals lead journal publishers to routinely refrain from checking into authors' findings. Altman found that "Fraud is a substantial problem, and the attitude toward it has changed little over the years ... A few journals that not long ago measured profits in the tens of thousands of dollars a year now make millions, according to at least three editors who agreed to discuss finances only if granted anonymity ... Any influential system that profits from taxpayer-financed research should be held publicly accountable for how the revenues are spent" (Altman, 2006).

VI. Conclusion: for-profit publishing vs open access: new models continue to evolve

The scholarly communication crisis continues, as libraries struggle to keep up with price increases which outpace the rate of budget increases and publishers continue to sell

Figure 15 DOAJ website (part two)

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journals in ways that benefit corporate stock holders rather than the scholarly community. As discussed in this article, the OA movement, which emerged in response both to the promise offered by the development of the Internet and to spiraling journal prices, has made significant progress and has irrevocably changed the scholarly communication system. However, there is growing acknowledgement of the complexity of factors involved and the need for a variety of alternative models. As Suber explains, "OA literature is not free to produce, even if it is less expensive to produce than conventionally published literature. The question is not whether scholarly literature can be made costless, but whether there are better ways to pay the bills than by charging readers and creating access barriers. Business models for paying the bills depend on how OA is delivered" (Suber, 2004c).

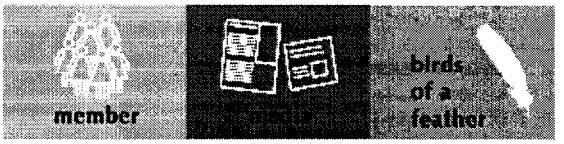
Charles A. Schwartz, Associate Director of Collection Management, Florida International University, believes that OA may be a turning point for the scholarly communication system, but not through a scholars' revolution against commercial publishers and not because it presents a less costly alternative system " ... no one in thirty years has devised a generally viable reform proposal ... What remains to be seen are the ways the movement adjusts to the differing business interests, publishing norms, and professional cultures of the stakeholder groups" (Schwartz, 2005).

Indeed, open access has yet to prove to be a stable economic model for many scholarly societies. A survey conducted by the Association of Learned and Professional Society Publishers (ALPSP) which represents 317 members in 34 countries presents "for the first time, a substantial body of data about different forms of Open Access publishing, and

Figure 16 Alliance for taxpayer access (part one)

THE ALLIANCE FOR TAXPAYER ACCESS

ATa



Action

Watch for opportunities or recent progress involving:

- U.S. Congress
- NIH
- ATA
- You

News

These sources will keep you updated on the latest developments related to taxpayer access:

- SPARC Open Access Newsletter
- Open Access News blog

A diverse and growing alliance of organizations representing taxpayers, patients, physicians, researchers, and institutions that support open public access to taxpayer-funded research.

Statement of Principles:

1. American taxpayers are entitled to open access on the Internet to the peer-reviewed scientific articles on research funded by the U.S. Government.
2. Widespread access to the information contained in these articles is an essential, inseparable component of our nation's investment in science.
3. This and other scientific information should be shared in cost-effective ways that take advantage of the Internet, stimulate further discovery and innovation, and advance the translation of this knowledge into public

What is "Taxpayer Access"?

Access to scientific and medical publications has lagged behind the wide reach of the Internet into U.S. homes and institutions. Subscription barriers limit U.S. taxpayer access to research that has been paid for with public funds.

Taxpayer access removes these barriers by making the peer-reviewed results of taxpayer-funded research available online, and for no extra charge to the American public.

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a baseline of comparison with traditional subscription publishing" according to Sally Morris, ALPSP chief executive. Among the findings: over 41 percent of open access journals are reporting shortfalls while 24 percent are breaking even. And author charges (for page, color or reprints) are more common among subscription journals than open access titles (Information Today, 2005). Morris recommends that societies consider a hybrid form of open access where authors have a choice of paying author fees and that publishers delay open access for one or two years. She is concerned that open access will leave many small society publishers who traditionally have tried to employ fair journal pricing structures, facing vulnerable financial futures, since much of their revenues comes from journal subscriptions. (Brynko, 2006)

New SPARC Executive Director, Heather Joseph already is addressing such apprehensions: "SPARC will "continue to listen closely and respond to concerns coming from our membership and the scholarly community as a whole ... " (Joseph, 2006). SPARC is exploring the application of the economic principles of cooperatives to the publishing arena " ... to help build a foundation that can leverage a strength-in-numbers approach ... "(Joseph, 2006).

Schwartz remarks, "We have a conundrum. The open-access movement cannot be expected to address the whole series of factors underlying prolongation of inflation since the 1970s ... The tight relationship between open-access publishing and print-subscription revenue streams has been overlooked or ignored ... " Each discipline will have to create business models that suit individual disciplinary and professional cultures, which are financially viable (Schwartz, 2005).

Joseph agrees:

> While the issue of journal pricing was the wake-up call that brought many SPARC supporters to the table, it is vitally important for us to try to understand the broader context in which these pricing trends are occurring, as well as their wider consequences. ... We ... recognize that change will play out differently in individual disciplines of scholarship, and that, in some areas, the interests of the community may be best served in the near term by affordable subscription-supported publishing solutions (Joseph, 2006).

Undoubtedly, commercial publishing and open access initiatives will continue to co-exist while new discipline-specific alternative scholarly communication models continue to emerge. Few OA proponents would disagree that the large publishing conglomerates will continue to enjoy advantages of considerable financial resources and established reputation not to mention a significant market reach which continues to be fueled by an established tenure and promotion system in which faculty members face the "publish or perish" edict. However, the growing numbers of new institutional repositories, of new journals listed in DOAJ, continued international taxpayer pressures for access to government-funded research, the appearance of "scholarly communication officer" positions on research library staffs, and the recent explorations by the largest STM journal publishers of new

Figure 17 Alliance for taxpayer access (part two)

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publishing models, all offer considerable evidence that the scholarly communication system has been permanently "opened up" and that "The Big Deal" era may be ending.

Schwartz predicts: "The subtleties and complications of open access for the scholarly communication system will take years to emerge." (Schwartz, 2005) As the system evolves, librarians will continue to include OA resources in various digital media formats into library catalogs, gateways and portals and online research tools and to work with technologists and scholars to establish institutional repositories. Technology developers will continue to design the infrastructure to make it easier for scholars to locate OA resources through Google as well as library interfaces. Collection librarians need to continue to keep abreast of OA developments, integrating OA materials into the universe of resources offered to support the scholarly community, make optimal use of continually emerging technologies to expand access to information resources, and to serve as change-agents in the efforts to hold down the price of commercially published scholarly journals.

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