

**The Open Access model of research publishing**  
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## **Abstract**

*New models of research publication have been developing in recent years. Examples include the open access journal model (such as BioMed Central (BMC)) and Public Library of Science (PLoS)), and growth in number and content of institutional and subject based repositories.*

*Open access publishing, in particular, has made spectacular inroads over the past 12 months. The paper will discuss features of open access journal publishing, the benefits they offer to academic institutions and the responses from the publishing, library and academic communities.*

## **Trends and issues**

Given the complexities, uncertainties, and fast pace of change, it is difficult to provide a succinct overview of current trends and initiatives about open access journal publishing. This paper is intended to provide a state of play, rather than a comprehensive coverage. Examples discussed are not meant to be exhaustive but, rather, represent a snapshot from a number of different perspectives.

## **Definition of Open Access**

The definition of open access used in this paper is one based on those of Bethesda, Berlin and Budapest. The two basic principles are that information is available immediately free online and that readers are granted permission for all legitimate scholarly use. Open access articles are those which anyone, anywhere, can download, distribute and reuse freely as long as the articles are properly cited.<sup>1</sup>

## **Open access publishing and self-archiving**

There are two major ways of delivering open access, and they differ in their costs and funding models. They are complementary, not competing, initiatives.

(1) Open access *archives* or *repositories* make their contents freely available to users around the world through use of the Open Archives Initiative Protocol for Metadata Harvesting. Archives may contain the research output and teaching resources of institutions, such as universities and laboratories, or disciplines, such as physics and economics.

(2) Open access *journals*.<sup>2</sup> These are an alternative to subscription-based titles, being freely accessible to anyone with an Internet connection.

This article will be concentrating on open access journals.

## **Costs of scholarly journals**

Over the past few decades, prices of scholarly journals have risen at a rate unmatched by library funding. Mergers and market concentration within the publishing industry are leading to fewer, bigger publishers, with higher prices for their journals<sup>3</sup> (CURL 2004). The mounting financial pressure on libraries' budgets has meant that even wealthy university libraries have been facing continuing cancellation exercises, limiting access to required scholarly resources, leading to a reduction of scholarly content available to their academics and students. Big deal schemes, while offering some advantages to the library and researcher, seriously inhibit the library's ability to manage and develop its collections to fit the changing academic interests of its users (CURL 2004). Librarians and

academics have become involved in negotiating for better deals with publishers, while also considering other models for the dissemination of scholarly work. HighWire Press, Project Muse, SPARC, and the Public Library of Science are a few notable examples.

Under the traditional publication model, governments, funding agencies, universities and other organisations pay for the costs of research, including dissemination of results. They also fund access to research results via subscriptions to scholarly journals. In an open access system, these same parties would pay, but they would get far more for their money.<sup>4</sup> Costs of publication entirely eliminated by the open access model are print distribution and subscription management, as there is no need to lock readers out.

As Peter Suber, a research professor at Earlham College and a noted supporter of open access, states, “No serious OA advocate ever said that providing OA was without expense. The question is whether there are better ways to cover those expenses than by charging readers or their libraries for access” (Suber 2004b).

### ***Models of Open Access***

#### **Author pays**

Since publishing is accepted as an integral part of the research process, an alternative to the traditional subscription based model is to consider the significant but relatively small costs of open access publication as a legitimate cost of doing research, like presenting a poster or talking at a scientific meeting.<sup>5</sup> In this open access model, funders, authors and institutions provide additional funds for the dissemination of research results through publication.

Author charges are not a feature introduced by the open access movement. It is common in the biomedical field, for example, for authors to pay some page charges even in commercial journals, and often significant charges to subsidise the cost of colour figures.<sup>6</sup>

One consideration to minimise the disincentive effect of author charges is to consider a submission fee and a publication fee. This would discourage unrealistic submissions and reflect the true cost of publication for any successful article. Sometimes handling submissions which are rejected takes more editorial time than handling successful submissions.

#### **Institutional subsidies**

Some publishers have introduced institutional memberships as a funding option. BioMed Central and PLoS are well known examples, but the Proceedings of the National Academy of Sciences (PNAS) has added an Institutional Open Access Membership into its institutional site licence conditions.<sup>7</sup> Likewise Oxford University Press is offering the option of institutional memberships for *Nucleic Acids Research (NAR)* whereby all academic staff in an institution may publish at no charge if they belong to an institution which has taken out a membership subscription.<sup>8</sup>

#### **Grants**

Funding agencies such as the Wellcome Trust have begun to require publication in open access journals as a condition of funding.<sup>9</sup> The Trust is also discussing with the US National Library of Medicine the possibility of establishing a European version of PubMed Central.<sup>10</sup> A similar policy has been adopted by the Howard Hughes Medical Institute, the largest private sponsor of biomedical research in the US. Other major institutional sponsors of biomedical research are considering similar policies.<sup>11</sup>

## Examples of models of open access

### BioMed Central (BMC)

Open access publishing is not incompatible with a commercial model. BioMed Central, for example, is a UK based for profit open access publisher, offering all the services associated with a traditional publisher, for example peer-review and marketing and promotional activities (Rowlands 2004, p. 21). It recovers costs through author charges, some advertising, and institutional support from universities and foundations. Its business model is still evolving through gathering input from the research community.

Over 400 institutions and consortia have become BMC members. This includes prestigious institutions such as Max Planck, Harvard, Princeton, and a number of library consortia, such as OhioLINK, the Joint Information Systems Committee (JISC) in the UK and the Council of Australian University Librarians (CAUL) in Australia. Finland became the first country to make a nationwide commitment to open access, when all universities, polytechnics and research institutes became BMC members. Finland was followed by Norway, which, on 1<sup>st</sup> October 2004 made a nationwide commitment to open access for the biomedical research it funds by making all universities, polytechnics, research institutes and hospitals in Norway BioMed central members (Baynes 2004).

BMC is compliant with the Open Archives Initiative Metadata Harvesting Protocol, which sets the standards for exposing the metadata that describe digital content and make it accessible for automatic retrieval (Schlimgen 2004).

### Public Library of Science (PLoS)

PLoS is an example of a not for profit open access publisher. Funded by a \$US9 million grant from the Gordon and Betty Moore Foundation, it was created in December 2002. PLoS journals aim to compete with top journals such as *Nature*.

PLoS author charges cover value added professional services of editing, refereeing, and marketing. PLoS's sources of revenue include institutional membership. Institutions which have undertaken to support PLoS include University of California, Cornell, University of Texas and University of Virginia. The OhioLINK consortium funds half of the publication fee for academics within their member institutions.<sup>12</sup>

Unlike BMC, PLoS is starting off small, but its first open access journal, *PLoS Biology*, launched in October 2003, was so popular that it received more than 500,000 hits in a matter of hours, bringing the server down temporarily. McVeigh comments that, as of September 2004, the ISI citation databases had indexed over 400 citations to this title, which ISI considers an exceptional performance (McVeigh 2004). *PLoS Medicine* launched its inaugural issue on 19<sup>th</sup> October 2004. See <<http://www.plos.org/>>.

PLoS, like PMC, is compliant with the Open Archives Initiative Metadata Harvesting Protocol (Swan 2004).

### Government investigations and initiatives

The UK, US and EU are all investigating models for publishing scholarly research results.

In 2004, the Science and Technology Committee in the UK conducted an inquiry into scientific publications. Its brief was to investigate "access to journals within the scientific community, with particular reference to price and availability". It was also requested to examine the impact that the current trend towards electronic publishing may have on the integrity of journals and the scientific

process. The brief may be found at [http://www.parliament.uk/parliamentary\\_committees/science\\_and\\_technology\\_committee/scitech111203a.cfm](http://www.parliament.uk/parliamentary_committees/science_and_technology_committee/scitech111203a.cfm). The report was released in July 2004 and may be found in its entirety at <http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/399/39902.htm>. The Committee concluded that the current model for scientific publishing is unsatisfactory and that the author-pays publishing model could be viable. One of its key recommendations is that the Research Councils each establish a fund to which their funded researchers can apply should they wish to pay to publish. The Committee noted concerns raised by scholarly societies. The Committee has no legislative authority: its recommendations are purely advisory. To the disappointment of the Committee, the Government response, when it was released in November 2004, rejected its recommendations.<sup>13</sup>

In September 2004, the National Institutes of Health (NIH) released a draft plan for open access for materials from NIH-funded research no later than six months after publication in a research journal. This is accessible at <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-04-064.html>. Peter Suber has provided a useful FAQ site at <http://www.earlham.edu/~peters/fos/nihfaq.htm> and an update in the SPARC Open access newsletter issue 78 available at <http://www.earlham.edu/~peters/fos/newsletter/10-02-04.htm>. The NIH has published its own fact sheet on open access publishing, available at [http://www.nih.gov/about/publicaccess/publicaccess\\_factsheet.htm](http://www.nih.gov/about/publicaccess/publicaccess_factsheet.htm). Not to be outdone, the Association of Research Libraries has likewise produced a FAQ site at <http://www.arl.org/info/openaccess/ARLFAQ.html>. Walt Crawford also provides a neat encapsulation in his November issue of *Cites and Insights* (Crawford 2004a). The US Congress affirmed its support for this proposal in November 2004.

The European Commission on 15<sup>th</sup> June 2004 launched a study on the economic and technical evolution of the scientific publication markets in Europe, the results of which will be available in 2005. Like its UK counterpart, the study will examine issues concerning pricing of and access to scientific publications, keeping in mind authors' rights and publishers' interest in protecting their profits. For details see the press release at <http://europa.eu.int/comm/research/press/2004/pr1506en.cfm>. Since 41% of scientific papers originate in Europe, compared with 31% in America, the results of this study could have a major influence on the publishing industry (Scientific publishing 2004).

### **Open access in the news**

Publicity about open access initiatives from the mainstream news media indicates that the issue of access to research material is now considered of general news interest. Columns range from simple reporting to evaluative comments. Fels,<sup>14</sup> for example, writing in the *Melbourne Age* on August 7, 2004, remarks that it is time that the Australian government changed its funding criteria and approach, to encourage researchers to publish their work in ways that ensure it is accessible to all (Fels 2004).

### **Library bodies**

The library world has, unsurprisingly, been supportive of moves towards open access publishing. In February 2004, prior to the release of the UK report, IFLA (International Federation of Library Associations) released a Statement on Open Access <http://www.ifla.org/V/cdoc/open-access04.html>. SPARC (Scholarly and Academic Resources Coalition), established in the late 'nineties in response to the continuing escalation of serials prices [www.arl.org/sparc](http://www.arl.org/sparc), and SPARC Europe [www.sparceurope.org](http://www.sparceurope.org), are now in partnership with a number of open access journal publishers, such as BioMed Central, Economics Bulletin, Documenta Mathematica, Journal of Machine Learning Research, and PLoS. SPARC and Public Knowledge <http://www.publicknowledge.org/take-action/open-access-action/> have each created action pages to assist U.S. citizens to register their support for the open access initiative recommended by the House

Appropriations Committee. ACRL (Association of College and Research Libraries), through the Open Access Working Group (an alliance of several library associations and other groups that favor open access), will be working to gain endorsement of the proposal in the Senate (Choice 2004).

The Special Libraries Association (SLA) has released a Statement Regarding Open Access in which the SLA board notes that it “encourages ongoing exploration of viable means to expand the availability of scientific and scholarly research.”<sup>15</sup> The Medical Library Association expressed its support in its Statement on Open Access at <[http://www.mlanet.org/government/info\\_access/openaccess\\_statement.html](http://www.mlanet.org/government/info_access/openaccess_statement.html)>.

In other actions, SPARC has spearheaded the Alliance for Taxpayer Access, which is a “diverse and growing alliance of organizations representing taxpayers, patients, physicians, researchers, and institutions that support open public access to taxpayer-funded research.” For details and a current list of participating institutions see <<http://www.arl.org/ata/>>. In addition, SPARC has published a background document entitled *The Case for Open Access to Taxpayer-funded Research* <[http://www.arl.org/sparc/taxpayer/taxpayer\\_access.pdf](http://www.arl.org/sparc/taxpayer/taxpayer_access.pdf)>.

The ACRL<<http://www.ala.org/acrl>> has written to both the NIH and the US Congress in support of open access reforms. In addition, it has joined the Alliance for Taxpayer Access. The Association of Research Libraries (ARL) has also come out in support of the NIH proposal.<sup>16</sup>

Prior to the UK report’s publication JISC had already provided £150,000 seed money to institutions including the Institute of Physics Publishing, the Journal of Experimental Botany at Lancaster University, the International Union of Crystallography and the US-based Public Library of Science (PLoS). JISC is offering a further £150,000 and will be accepting proposals for consideration until the early northern autumn. JISC welcomed the UK report and was pleased to note the extensive coverage in the mainstream press <[http://www.jisc.ac.uk/index.cfm?name=open\\_access\\_a\\_world\\_issue\\_news\\_210704](http://www.jisc.ac.uk/index.cfm?name=open_access_a_world_issue_news_210704)>. For details, see <[http://www.jisc.ac.uk/index.cfm?name=news\\_select\\_committee\\_report](http://www.jisc.ac.uk/index.cfm?name=news_select_committee_report)>.

Other library bodies in the UK and Canada, for example, have formally declared their commitment to open access.<sup>17</sup>

Peter Suber has provided a useful summary on both the UK and the US reports in the *SPARC Open Access Newsletter*, issue 76, August 2004, available at <<http://www.earlham.edu/~peters/fos/newsletter/08-02-04.htm>>.

Individual libraries such as Yale and Lehigh have established websites with information about open access publishing for their academic staff and students.<sup>18</sup> Cornell has compiled a report for its Library Management Team, providing information on what open access means, its costs and benefits for Cornell and making recommendations (Davis 2004).

### **Responses of academics and academic organizations**

Academic institutions’ responses to open access initiatives are largely supportive. For example, in Australia, the Group of Eight<sup>19</sup> vice-chancellors’ statement on open access to scholarly information records their commitment to open access initiatives that will enhance global access to scholarly information for the public good. Still in Australia, the National Scholarly Communications Forum supports moves to open access such as open access journals and institutional repositories. See <<http://www.humanities.org.au/NSCF/NSCF%20Outcomes%20Final.pdf>>.

Researchers in the UK at the University of Southampton's School of Electronics and Computer Science have welcomed the conclusions of the UK inquiry which, if implemented, would improve the visibility and impact of UK research.

The Genetic Alliance, a coalition of 600 member organisations that advocate for patient families across America, is supportive of the US committee's recommendations <<http://www.geneticalliance.org/openaccess.asp>>. Twenty five Nobel Prize winners released an open letter to the US Congress dated August 26, 2004, expressing their support.<sup>20</sup>

The Council of the National Academy of Sciences supported the NIH policy in a statement dated 16 September 2004, as it believes the benefits to science worldwide and to the general public are significant. The URL is <<http://www4.nationalacademies.org/news.nsf/isbn/s09162004?OpenDocument>>. The American Association of Universities also endorsed the plan with its statement available at <<http://www.aau.edu/issues/NIHPubAccProp.pdf>>. The US Chamber of Commerce has likewise indicated its support at <<http://www.uschamber.com/press/releases/2004/september/04-121.htm>>.

The Association of Independent Research Institutes has endorsed the NIH proposal. See the post on ScholCOMM@ala.org dated 31 October 2004 and the Charleston Advisor gave an award to the NIH in recognition of its initiative (Machovec 2004).

Some researchers in the scholarly community have raised concerns over support for open access journals by government and charitable institutions. They have argued that government grants may be awarded in an attempt to push a line, or could be withdrawn rather than support research the funder disagreed with. Government grants could be sensitive to changing political conditions. This argument, however, applies equally to the existing models of publication as governments fund much university and institutional research. The same arguments can apply to research supported by charitable foundations.

### **Publishers' responses**

Walt Crawford comments that open access publishing "must be perturbing the STM oligarchy a *lot* otherwise they wouldn't be so busy spreading misinformation about it" (Crawford 2004). Some publishers antagonistic to the aims of open access raise doubts about the quality of open access articles and stress the risks to the whole scholarly publishing enterprise involved in the open access model. Others contend that lack of funds would inhibit publishers from spending to enhance functionality and innovation. Smaller publishers, operating on very limited surpluses, tend to be the most cautious (Key Perspectives 2004).

Others have made an energetic case for the value that they add to the scholarly communication process. The open access content is limited to research articles in any case. There is scope for commercial access to value-added features such as reviews, letters, editorials, etc. A developing trend in publishing is the hybrid approach whereby publishers are offering authors a choice between the traditional model and an option to pay to provide open access articles to readers.

The publishing community emphasises that editorial processes provide an essential service to the research community. Members point to their experience and expertise in managing the process, including peer review procedures, and rights and permissions administration. They stress that such services are labour-intensive and costly and that, even if delayed, free access could impair their ability to support these operations.

Springer is an example of a commercial publisher hedging its bets by establishing what it calls its Open Choice journals. These will contain a mixture of author pays and traditional subscription-based articles. Springer plans to evaluate journal subscription prices on a yearly basis, based on a number of factors, including the amount of subscription-model content being published. Springer Open Choice articles will always be clearly identified. See Springer Open Choice for Libraries at

<<http://www.springeronline.com/sgw/cda/frontpage/0,11855,1-40359-12-115391-0,00.html>>. This enables authors to work within the existing journal infrastructure if they so choose.

Springer suspects that there is little interest in OA, and open choice is a pragmatic attempt to uncover the level of interest (Pickering 2004) but by early October 2004 there was already at least one article published this way, in the journal *Experiments in Fluids*.

Other publishers of 'traditional' journals have expressed interest in making their publications open access, but are concerned about creating a viable business model. Some publishers are taking transitional steps towards open access, such as Company of Biologists,<sup>21</sup> and BMJ.<sup>22</sup> This gradual migration represents a stable, sustainable movement towards open access.

Elsevier's Director of Corporate Relations, Eric Sobotta, while welcoming the UK report, doubted that the government would implement and fund the recommendations. Elsevier claims that a move to author pays would be costly to the UK because UK researchers publish more than they read. Elsevier also claims that open access poses a threat to the quality of academic research, opening the way to bias and vanity publishing, producing questionable research that may undermine public trust in science (Elsevier 2004). Elsevier has, however, conceded that it is in the public interest to provide open access, as reported by Peter Suber in the *SPARC Open Access Newsletter* of 2 October 2004 at <<http://www.earlham.edu/~peters/fos/newsletter/10-02-04.htm#nih>>. Elsevier's response to the NIH proposal may be viewed at <[http://www.elsevier.com/authored\\_news/corporate/images/NIH.pdf](http://www.elsevier.com/authored_news/corporate/images/NIH.pdf)>.

Elsevier has been criticised by academics and librarians.

"Elsevier doesn't write a single article," said Dr. Lawrence H. Pitts, a neurosurgeon at the University of California at San Francisco and chairman of the faculty senate of the 10-campus system. "Faculty write the articles for them, faculty review the articles for them and faculty mostly edit the journals for them, and then we get to buy the journals back from a company that makes a very large profit." (Burdman 2004)

Nature Publishing Group has reacted in a number of ways. One way has been by hosting an online debate over several months. See <<http://www.nature.com/nature/focus/accessdebate/>>. It has also experimented with various models for journal access, the most interesting being the launch of an author pays model of OA in conjunction with EMBO (European Molecular Biology Organization). The journal is *Molecular Systems Biology*, a peer-reviewed, online only title to be launched in the northern Spring of 2005. See <<http://www.macmillan.com/07092004emboandnpg.asp>> for details.

### **Open access publisher reactions**

Public Library of Science (PloS) called for making all research, not just NIH funded research, publicly available via PubMed Central after six months of publication. In July 2003, PLoS even launched a television advertisement touting free access to publicly funded-research. The committee's support and other recent endorsements of open-access publishing "amount to a stinging rebuke of the prevailing subscription-based publishing system," according to a statement released by Public Library of Science. "Open access is the only acceptable outcome"(Rovner 2004). The *Charleston Advisor* gave an award to PLoS for its high quality open access journals (Machovec 2004).

In response to the recent recommendations by the US Congressional committee, Jan Velterop, CEO of open access publisher BioMed Central, called it the "clearest political signal yet that open access to the research literature is to be regarded of great benefit to science and society."

BioMed Central has produced a website in which it refutes perceived myths about open access publishing. For example, many commercial publishers claim that there is no proper peer review in

open access. This is disputed by open access publishers and researchers. "All the material we publish is peer-reviewed to at least the same standards as it is for all the thousands of journals published by the traditional science publishers" says Jan Velterop, publisher of BioMed Central. "Nobody can publish just because they can pay." Lower scientific and ethical standards would be bad business, because such circumstances would serve to create throwaway journals.

## Scholarly societies

Scholarly society publishers are cautious about embracing open access publishing models because they perceive that their financial viability is threatened. If the journal content were provided free of charge, there would be little incentive to pay for membership. Learned societies support other activities such as conferences, grants and newsletters from the profits of their publications. They argue that their long term sustainability would suffer. The scholarly societies jointly organised as the DC Principles Signatories responded to the NIH proposal with a letter stating their support for public access to scientific literature, but expressing concerns also (Frank 2004). On the other hand, scholarly societies' journals can gain in reputation from the increased impact and international exposure that is a natural consequence of open access. And because of their potential worldwide readership, they may find they attract more advertising revenue than the subscription based titles.

Barbara Meredith, vice president of Professional and Scholarly Publishing at the Association of American Publishers (AAP), noted that the AAP does not oppose open access, but does oppose the government's decision to interfere with the free market by deciding how research should be published (Rovner 2004). The AAP is lobbying the US Senate to gather support for its views. Several publishers jointly signed and sent a letter to the NIH explaining their objections. The letter can be found at <[http://www.pspcentral.org/publications/grassroots\\_email.doc](http://www.pspcentral.org/publications/grassroots_email.doc)>.

Robert D. Bovenschulte, president of the American Chemical Society's Publications Division, says, "We see no compelling case to abandon our traditional subscription model for a risky, untried model, which could put our journal publishing program in jeopardy." The open-access model also could jeopardise ACS programs that are supported by publishing revenues (Rovner 2004).

The IEE has expressed grave reservations regarding the Science and Technology Committee's call for scientific publishers to move to an open-access publishing model in its report 'Scientific Publications: Free for all?'. For details see <<http://www.iee.org/News/PressRel/z21jul2004.cfm>>.

Further lukewarm, or even icy, reactions came from the Society for Microbiology,<sup>23</sup> the American Physical Society<sup>24</sup> and the American Society of Hematology.<sup>25</sup> Paul W. Kincade, president of the Federation of American Societies of Experimental Biology, told *The Scientist* that he resented the "coercion."

Blackwell Publishing will experiment with the open access author-pays model in spite of the perceived criticisms, such as access limitations for authors from poorer countries and organisations, and the doubts over maintaining standards of peer review. Campbell (President of Blackwell Publishing) commented that it may be particularly challenging for Blackwell to switch to a more open-access model because it is a publisher for scholarly societies, which often attract members by providing low-cost access to journals and, therefore, fear free access could discourage membership. "Any system of publishing must avoid financially damaging these organizations" [scientific societies] says John Enderby, vice president of the Royal Society, which publishes several journals (Clery 2004).

The American Physiological Society is likewise experimenting with a partial open access model. Authors who submit articles to *Physiological Genomics* can choose to pay a \$US1500 fee and their articles will be available from the first date of publication. If they choose not to pay the author fee, the article is available only via subscription, or after a 12 month embargo. According to Crawford, only

10% of authors had agreed to pay the fee by November 2004 (Crawford 2004a). This approach has been criticised by supporters of open access as being confusing and frustrating for readers <<http://www.the-aps.org/publications/pg/interest.htm>>.

In a press release dated 15<sup>th</sup> November 2004, the American Institute of Physics announced it is trialling an open-access publishing option for authors contributing to three of its journals.<sup>26</sup>

The Council of the Institute of Mathematical Statistics has decided to deposit all the articles from its four journals into *arXiv*, noting that it wishes to support a policy of open access to its publications.<sup>27</sup>

Oxford University Press is another subscription-based publisher experimenting with open access. Authors will pay to have their papers published in *Nucleic Acids Research (NAR)*<sup>28</sup> so that they are freely available online immediately upon publication. NAR is also offering a model where buying institutional memberships will lower the cost of author charges. The NAR model thus relies on a mix of author charges, institutional memberships and print subscriptions. OUP has also experimented with the creation of an entirely new, open access journal, *Evidence-based Complementary and Alternative Medicine*.

Cambridge University Press is dipping a toe in the water with its decision to make newly published articles in a newly established journal, *Neuron Glia Biology*,<sup>29</sup> openly accessible for a period of between six and twelve months. It will be interesting to see how long this continues, as the title is listed as fee based not open access in the CUP list of journals.

The Entomological Society of America was the first to sell open access by the article. It began doing this four years ago, and it has thrived. The American Society of Limnology and Oceanography was the next to adopt this model. It started in 2001 and by 2003 66% of its authors were buying open access for their articles. ASLO has found that articles published in open access in 2003 were downloaded 2.8 times more often than subscription articles – see <<http://aslo.org/lo/information/freeaccess.html>>. The Max Planck Society will encourage its scientists and scholars to publish in open access journals and will take these into account in tenure and evaluation. Evaluation of research is to be based on the intrinsic value and quality of a publication, not the reputation and formal impact factor of the journal in which it is published.

An editorial in the *New England Journal of Medicine* not only endorsed the key aspects of the NIH proposal, but in fact supported open access for all research articles, whether funded by the NIH or not. See <<http://content.nejm.org/cgi/content/short/351/13/1343>>.

### **Tertiary publisher responses**

Open access journals are now included in *ulrichsweb.com*. To connect users to these new resources, Bowker has added a "Click for Open Access" button on full citation screens that gives users one-click access directly to that publication's full-text content on the Web.

ISI are not only incorporating open access journals where applicable into *Web of Science*, including links to full text articles cited, but is working with NEC Citeseer to create a web citation index which will measure the citation impact of online scholarship. This is expected to launch in early 2005. Citeseer itself has recently become OAI compliant.

In July 2004, Swets Information Services announced that BioMed Central's Open Access journals will be included in SwetsWise Online Content.

In November 2004, in cooperation with the National Biological Information Infrastructure (NBII) and other US government bodies, CSA expects to launch *Sustainability Science: Practice & Policy*, a peer-

reviewed e-journal aimed at users researching sustainable environmental policies. <<http://ejournal.nbii.org/about/about.html>>. CSA will not be charging authors to publish their work and there will be no subscription or viewing charge (Chillingworth 2004a).

### **Academics and open access**

Researchers have a number of factors that they take into account when they are determining journal choice. Those factors vary in significance between disciplines. Journal quality and prestige, circulation, and impact are all incentives for authors to submit their work to a particular title. This should cause no problem for open access publishers, as open access journals can be as prestigious as any conventional journals. Speed of refereeing and publishing, and coverage by abstracting and indexing tools, are also indicators that researchers consider (Rowlands 2004, p.10).

### **Wide circulation**

A surprising number of OA converts - I am one - did not go beyond understanding to enthusiasm until they provided OA to their own writings and saw for themselves, sometimes suddenly, the signs of rising impact. There is a discernible increase in e-mail from serious readers, inclusions in course syllabi, links from on-line indices, invitations to important conferences and citations in other publications. When you experience this in your own case, although anecdotal it is compelling. When you hear it from a trusted colleague, it is persuasive. OA is about barrier-free sharing of research results with colleagues worldwide. This enlarges our audience and increases our impact. (Suber 2004b)

For many academic authors, the widest dissemination possible is desired. Open access journals have a wider circulation than any conventional journals. So authors are assured that their work is disseminated to the widest possible audience, given that there are no barriers to reading their work. This is accentuated by authors being free to reproduce and distribute their work, for example by placing it on their institutions' websites. Steven Lawrence has documented what many suspected, that providing open access increases citation impact (Lawrence 2001). Lawrence's study was limited in its scope, which covered conference papers in computer science, but Antelman has likewise concluded from a broader study that freely available articles do have a greater research impact, and that authors in diverse disciplines are accepting the open access model (Antelman 2004).

The results of a UK journal author survey reveal that the principle of providing free access for all readers was an important factor for publishing in open access journals (Key Perspectives 2004). Likewise, in a survey by Ithaka of US college and university academic staff presented to the CNI (Coalition for Networked Information) Spring 2004 meeting; the characteristic that received the most votes – from 87% of respondents - was wide circulation (Schonfeld 2004).

Some authors choose open access because they consider that it means a return to the core values of scholarship – the free exchange of scholarly information, contributing to the advancement of scholarly endeavour and maximising the impact of research effort (Key Perspectives 2004).

As readers scholars want free and ready access to the literature they need to keep up with their field. Unrestricted access to scientific data, such as genetic and molecular information, has already revolutionised life science research over recent years, and has sparked new fields such as genomics. Since the most exciting research issues tend to lie at the interface between disciplines, open access publishing provides the necessary environment for discovery of new research results. Members of the Science Advisory Board participated in a poll asking what makes searching the scientific and medical literature frustrating, and almost 80% of the 1,4000 respondents indicated that limited access to full text was the most annoying feature (Science Advisory Board 2004).

For some authors in highly specialised disciplines, however, the most highly rated factor is access to a highly targeted, peer group of experts. They are not necessarily interested in a large readership (Rowlands 2004).

### **Quality control**

Peer review is a vital part of scholarly communication, but the essential role that scholarly journals play in editing and quality control of research articles is independent of the delivery method and the way costs are recovered.<sup>30</sup> If standards drop the value of the journal diminishes both for authors and readers. Open access and subscription based journals experience the same pressures to maintain and raise standards to retain their prestige in the research community.

### **Impact factors**

Authors have little incentive to submit their work to new journals that have neither an impact factor nor an established reputation. This particularly affects open access journals, as they are the new kids on the block. But, according to a study published by ISI,<sup>31</sup> open access journals adhere to high publishing standards, are peer reviewed and are cited at a level that indicates they compete favorably with similar journals in their field. The chief difference between these and other journals covered by ISI is that the entire content of the open access journal is available without cost to the user. The aim of ISI's selection process is to provide access to the most important and influential scholarly journals. As of October 2004, *Web of Science* indexes 239 open access titles which are having an increasing impact in the world of scientific research.<sup>32</sup> Though small in comparison to the total number of journals indexed in *Web of Science*, (8,700) the number is significant in terms of the progress made by the open access movement (Testa 2004) and represents roughly 20 percent of all open access journals (McVeigh 2004). The Thomson ISI editorial staff review nearly 2,000 journals annually, but only 10-12% of the evaluated journals are accepted (McVeigh 2004).

### **Use for undergraduate teaching**

Freely available databases such as NCBI and open access journals have created an environment that is improving undergraduate education by introducing undergraduates to research and critical reading and examination of documents and data. This provides long term benefits in creating research-trained students and is independent of the financial status of the institution.

### **Open Access models of copyright<sup>33</sup>**

Rowland's survey indicated that most scientific authors publish for prestige not money (Rowlands p. 14). Authors' views "may be characterised as a mixture of indifference, ignorance... and principled resentment aimed primarily at commercial publishers" (Rowlands 2004 p. 15).

As Walt Crawford says, copyright is a red herring to the open access debate (Crawford 2004b). Information can be copyrighted and still available on an open access basis. Open access does not require the abolition, reform or infringement of copyright: it works with the copyright holder's consent (Suber OA overview).

### **Archiving**

Scientists and academics consider archiving of digital information in a safe, permanent and easily retrievable medium to be very important.<sup>34</sup> Both open access journal publishers and their subscription-based alternatives are confronted with the same problems. Not all scholarly journal publishers consider archiving part of their remit, but many open access journal publishers are taking steps to ensure the long-term preservation of their articles.

Both BioMed Central and the Public Library of Science deposit the full text of their published articles in public access archives such as the National Library of Medicine's PubMed Central (PMC). This guarantees permanent preservation and free accessibility, so that the content remains available even if the original publisher fails, is bought out, or changes its access policies. There are also other possible archives for electronic journals, for example, the University of Potsdam, INIST in France, and the National Library of the Netherlands' e\_depot.

## **Conclusion**

Scientific and scholarly publishing is evolving along two distinct paths: one in which large multinational commercial publishers are increasing their dominance,<sup>35</sup> and the other in which a variety of open access initiatives are being tested in the marketplace.

It appears unlikely that open access will become the dominant model of scholarly publishing in the foreseeable future,<sup>36</sup> but non-profit professional societies and research organisations as well as for-profit companies will continue to experiment with different business and access models. Some publishers are converting subscription-based journals to an open access model. Yet others are offering open access content in subscription-based journals and some are offering free content after a specified period of time. Entirely open access journals continue to be launched. All these journals need to accommodate the needs of scholars within discrete disciplines, as there is no single 'academic community' but multiple communities with differing scholarly cultures and different levels of investment in or disaffection with the existing system of scholarly communication. There are indications over the past few years that flexibility is increasing as participants in the scholarly communication environment experiment and communicate with each other.

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<sup>1</sup> See <<http://www.earlham.edu/~peters/fos/bethesda.htm>>, <<http://www.soros.org/openaccess/read.shtml>> and <<http://www.zim.mpg.de/openaccess-berlin/berlindeclaration.html>>.

<sup>2</sup> A list of open access journals can be found at <<http://www.doaj.org>>. DOAJ is maintained by Lund University Libraries and sponsored by the Open Society Institute and SPARC. The directory covers all OA scientific journals that use an appropriate quality control system.

<sup>3</sup> Five publishers now produce around 37% of the roughly 8,000 scientific journals rated as worthy of citation analysis by ISI. See Memorandum from the Chartered Institute of Library and Information Professionals (CILIP) <<http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/399/399we136.htm>>.

<sup>4</sup> A report published in April 2004 by the Wellcome Trust, entitled *Costs and Business Models in Scientific Research Publishing*, states that the OA model is both economically viable and capable of guaranteeing high quality research. Making scientific information freely available on the Internet could cut publishing costs by as much as 30% without lowering publication standards. This has been disputed, but even if the system ends up costing the same amount that is spent in total now, the value of the unfettered access and accelerated innovation would be worth it.

<sup>5</sup> This cost is estimated at between 1 and 2% of research costs (based on an analysis by the Wellcome Trust).

<sup>6</sup> In the *EMBO Journal*, authors are allowed 6 pages of text free, but are then charged \$US200 per page beyond that. Most authors pay over US\$800 in excess page fees.

American Geophysical Union journals mostly have charges for colour plates. The ACM has started to ask for page charges: Authors' institutions or corporations are requested to honour a page charge of \$US60.00 per printed page or part thereof, to help defray the cost of publication. Page charges apply to *all* contributions. Payment of page charges is not a condition of publication; editorial acceptance of a paper is unaffected by payment or nonpayment. See <<http://www.acm.org/jacm/Accepted.html>>. In case you think the author charges are restricted to society publishers, the cost of including a single colour figure in an article in *Cel.*, a highly prestigious journal published by a commercial Elsevier, is \$US1,000. (See <[www.cell.com/misc/page?page=authors](http://www.cell.com/misc/page?page=authors)>.)

<sup>7</sup> Starting in 2005, each PNAS Institutional Site License will automatically include an institutional membership discount, whereby affiliated academic staff will receive a 25% discount off the open access fee.

<sup>8</sup> The URL for the site with this information is <<http://www3.oup.co.uk/nar/special/14/default.html#overview>>.

<sup>9</sup> See <<http://www.wellcome.ac.uk/en/1/awtvispolpub.html>>.

<sup>10</sup> See [http://www.wellcome.ac.uk/doc\\_WTX022826.html](http://www.wellcome.ac.uk/doc_WTX022826.html).

<sup>11</sup> Here are further examples of institutions financially supporting open access publications:

- Canadian Institutes of Health Research
- Cancer Research UK
- Deutsche Forschungsgemeinschaft (German Academic Research Council)
- Fonds zur Forderung der wissenschaftlichen Forschung (Austrian Science Foundation)
- Health Research Board
- International Human Frontier Science Program Organization
- Israel Science Foundation
- National Health Service (UK)
- National Institutes of Health (USA)
- National Science Foundation (USA)
- Rockefeller Foundation
- Swiss National Science Foundation

In addition, the Medical Research Council in the UK expects article processing charges to be payable via institutional funds to which it contributes (OSI/JISC Journal Author Survey).

<sup>12</sup> See <<http://www.charlestonco.com/pressrm/viewPR.cfm?id=621>>.

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<sup>13</sup> See <<http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/1200/120002.htm>>.

<sup>14</sup> Professor Allan Fels, the former chairman of the Australian Competition and Consumer Commission, is Dean of the Australia and New Zealand School of Government.

<<http://www.sla.org/content/SLA/advocacy/OpenAccess.cfm>>.

<sup>15</sup> URL is <<http://www.arl.org/info/publicaccess/ltnihcomment.html>>.

<sup>16</sup> Scotland initially produced a Draft Declaration by the Scottish Science Information Strategy Working Group on Open Access. This lost its draft status on 11<sup>th</sup> October 2004

<<http://scuri.ac.uk/WG/SSISWGOA/declaration.htm>>.

In Canada, the Canadian Association of Research Libraries (CARL) <<http://www.carl-abrc.ca/>> has written a Brief to the Social Sciences and Humanities Research Council of Canada, June 29, 2004 <<http://www.carl-abrc.ca/projects/sshrc/transformation-brief.pdf>> which recommends ways in which the Council can promote new and more effective forms of scholarly communication <<http://www.eprints.org/signup/signup.php>>.

The British Columbia Library Association formally declared its commitment to open access in its Resolution on Open Access <<http://www.bcla.bc.ca/>>. Reported at <<https://mx2.arl.org/Lists/SPARC-OAForum/Message/811.html>>. A similar resolution will go to the Canadian Library Association at the 2005 AGM. The Library Association of Alberta is making all except the current issue of its Letter of the LAA freely available to all. See <[http://www.laa.ab.ca/news/letter\\_of\\_laa.cfm](http://www.laa.ab.ca/news/letter_of_laa.cfm)> for its Resolution on Open Access.

<sup>17</sup> See <<http://www.library.yale.edu/science/oa.html>> and

<<http://www.lehigh.edu/library/guides/Openaccessresources.htm>>. Faculty Council of Indiana University at Bloomington <<http://www.indiana.edu/~bfc/docs/AY04/circulars/B39-2004.htm>>, Johns Hopkins University <<http://www.library.jhu.edu/rsd/whatsnew/spring2004.pdf>> and four Minnesota private colleges <<http://www.carleton.edu/campus/library/scidirectpress.html>> (Carleton, Gustavus Adolphus, Macalester, and St. Olaf) have demonstrated their support for open access by inviting institutional authors to consider publishing alternatives to traditional subscription based journals, assuring them that this would not hamper their professional advancement.

<sup>18</sup> This comprises Australia's pre-eminent research universities.

<sup>19</sup> See <<http://www.fas.org/sgp/news/2004/08/nobel082604.pdf>>.

<sup>20</sup> As a small not-for-profit publisher, the Company of Biologists relies on subscription revenue to cover its publishing costs and to fulfill its charitable remit. Nevertheless, in response to the biological community's drive for freedom of access to scientific research the Company of Biologists has announced that from January 2004 its high quality journals - *Development*, *Journal of Cell Science* and *The Journal of Experimental Biology* – are offering authors the choice to have their work published free of charge (in the usual way) or as an author-funded open access paper. Authors choosing to take advantage of the open access alternative will be charged a publication fee, which, as an introductory offer, will be heavily subsidised by The Company of Biologists <<http://www.biologists.com/web/openaccess.html>>. The Company of Biologists will offer this author-funded publication model for a trial period of one year. The traditional subscription model will operate in parallel as part of a hybrid publishing experiment. Authors will be asked to make the decision as to whether to take advantage of the open access offer when their papers are accepted. Those choosing the company's traditional free publication alternative will still benefit from no page charges, no colour charges, and free access to papers after 6 months.

<sup>21</sup> BMJ will offer all its research articles free of charge during 2005 and charge only for other kinds of journal content (editorials, reviews, letters, and so on). After one year, even the priced content will become free. <<http://bmj.bmjournals.com/aboutsite/subscriptions.shtml>>.

<sup>22</sup> Ron Fraser, General Secretary of the Society for Microbiology, says discussions among his board members had yielded little enthusiasm for an OA alternative. "Some societies are giving their authors the option as to whether they want to pay, but the uptake has not been good. When I spoke to the board about this, very few hands went up in favour".

<sup>23</sup> Martin Blume commented that when American Physical Society had page charges, authors started sending articles to other journals instead, which charged a lot more for subscriptions. But if the institutions pay the charges, they face conflicting choices, for example, either they pay the charges or they send a postdoctoral student to a conference.

<sup>24</sup> See the paper at <[http://www.hematology.org/government/policy/open\\_access.cfm?pagemode=print](http://www.hematology.org/government/policy/open_access.cfm?pagemode=print)>.

<sup>25</sup> <[http://www.aip.org/press\\_release/author\\_select.html](http://www.aip.org/press_release/author_select.html)>.

<sup>26</sup> <<http://www.imstat.org/publications/arxiv.html>>.

<sup>27</sup> NAR is a high impact journal, according to ISI Essential Science Indicators.

<sup>28</sup> <[http://titles.cambridge.org/journals/journal\\_catalogue.asp?historylinks=ALPHA&mnemonic=NGB](http://titles.cambridge.org/journals/journal_catalogue.asp?historylinks=ALPHA&mnemonic=NGB)>.

<sup>29</sup> While commercial publishers are arguing speciously that OA threatens the integrity of the peer review process, the quality of existing peer reviewed OA journals and the number of OA journals and the experiments with OA

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taking place should convince the academic community that this view is mistaken, for example, BMC, Geology and Topology. Journal of Clinical Investigation (JCI) is indexed by Web of Science and figures also in Journal Citation Reports. It has been providing free and unrestricted access to its contents since it went online in 1996. OA is supported by a mix of page charges and subscriptions from the print version, which was established in 1924. Far from being an easy way to publish, this OA journal rejects 90% of research article submissions. Author charges are waived for those unable to pay them, as is the case for many other publications.

<sup>31</sup> The Impact of Open Access Journals: a citation study.

<sup>32</sup> Four journals published by BioMed Central received their first impact factors in 2004. Respiratory Research (5.53) comes in from nowhere to immediately take second place in the respiratory field. Current Controlled Trials in Cardiovascular Medicine has an impact factor of 3.12. BMC Cell Biology (2.61) and BMC Health Services Research (0.67) also entered well. BioMed Central saw its impact factors go up across the board. BMC Cancer now has an impact factor of 1.7, while BMC Infectious Diseases (1.25) and BMC Public Health (0.93) also saw increases in their impact factors from the 2002 Journal Citation Report. Other examples of impact factor include CMAJ, which currently ranks 5<sup>th</sup> among 'general medical journals' and *New Journal of Physics* (NJP) which achieved an official ISI Impact Factor for 2003 of 2.48.

<sup>33</sup> Examples of copyright policies from open access publishers are:

1. From BMC: Authors retain copyright for their work and allow anyone to reproduce and disseminate the work, provided it is correctly cited and no errors are introduced. 2. PLoS has chosen to apply the Creative Commons Attribution License to all works it publishes. This broad license was developed to facilitate open access to, and free use of, original works of all types, and has been adopted by a growing group of authors and artists. Applying this standard license to your work will provide strong legal protection to you and those wishing to use your work, and thus ensure your right to make your work freely and openly available. Authors will retain copyright of the work. This permits unrestricted use, distribution and reproduction in any medium, provided that the original work is properly cited.

<sup>34</sup> OSI/JISC author survey noted that authors are nervous that OA article may be lost in time and a survey by Ithaka of US college and university academic staff presented to Coalition for networked Information (CNI) Spring 2004 meeting indicated that 84% of respondents said that archiving of electronic resources was very important to them. This was raised in the UK report into scientific publications also and it recommended that the British Library be funded to fulfill this function.

<sup>35</sup> For example, Elsevier and Springer, the two largest STM publishers, together control 40% of the STM journal market.

<sup>36</sup> Currently only 1,000 of 24,000 scholarly journals are open access.