

**OPEN ACCESS:
“A CONSOMMER AVEC MODÉRATION”**

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Abstract. There is increasing pressure on academics and researchers to publish the results of their investigations in open access journals. Indeed, some funding agencies make open access publishing a basic requirement for funding projects, and the EU is considering taking firm steps in this direction. I argue that astronomy is already one of the most open of disciplines, and that access – both to the general public (in terms of a significantly growing outreach effort) and to developing countries (through efforts to provide computing facilities and Internet access, as well as schemes to provide research centres of limited resources with journals) – is becoming more and more open in a genuine and lasting way. I further argue that sudden switches to more formal kinds of open access schemes could cause irreparable harm to astronomical publishing. Several of the most prestigious astronomical research journals (e.g. *MN*, *ApJ*, *AJ*) have for more than a century met the publishing needs of the research community and continue to adapt successfully to changing demands on the part of that community. The after-effects of abrupt changes in publishing practices – implemented through primarily political concerns – are hard to predict and could be severely damaging. I conclude that open access, in its current acceptance, should be studied with great care and with sufficient time before any consideration is given to its implementation. If forced on the publishing and research communities, open access could well result in much more limited access to properly vetted research results.

1. The Purpose of Research Publishing

In the highly charged debate over open access to research results, it is well to keep in mind at the outset that research publishing is primarily concerned with peer-to-peer communication of research findings. A peer in this sense is a person that has been trained to postgraduate (usually doctoral) level in a highly specialized branch of scholarship or research. Scientists are peers in this restricted sense only if they possess the necessary training and specialist knowledge to follow and critically assess a specific piece of research in the specialism covered by a research paper. This elementary fact of research life can often be overlooked in the more general debate over questions of political principles. Whatever the final outcome of the open access (OA) debate, it is in the interests of all concerned that the process of communicating research and scholarship results among peers remain undamaged in terms of quality and reliability. I argue here that changes in publishing business models must be made gradually, and that the stakeholders must be left to work out for themselves a set of commonly accepted business models that will ensure the evolutionary adaptation of scientific and scholarly publishing to the uncertain habitat of the Internet. I also argue that such adaptation is of necessity discipline-dependent, and that different disciplines have their separate funding and publishing circumstances, which must be respected.

2. Time for Change?

The advent of the Internet has led to a drastic change in the way that research workers access the literature of their disciplines. Visit any modern research centre and you will find the library most probably empty, except for library staff. Workers nowadays consult online literature sources that avail them of more or less instant access to peer-reviewed journal articles and electronic preprints. Trawling the literature can now be done from one's office or from a laptop while travelling. Today's research worker has come to expect instant access to the body of research literature, preferably without price barriers or other restrictions. "If it's not online, it isn't published" is now the war cry of many younger research workers who consider it unthinkable to make trips to the library to look up references; so there is now mounting pressure from the research community for barrier-free access to the literature. Even more serious is the steeply rising cost of library subscriptions to journals. Librarians are finding it more and more difficult to eke out often slim library budgets, with resulting cutbacks in journal subscriptions (the so-called "serials crisis"). New business models in publishing are now a burning issue in all academic and research disciplines, astronomy being no exception.

Enter “open access”, the notion that all barriers to instant access (especially those relating to price) should be swept away and the subscription publication model removed as quickly as possible (Suber 2004a,b, 2006). I argue here that perhaps a little more thought concerning the long-term consequences of a sudden switchover to OA might help avoid possible deleterious long-term consequences for scholarly and research publishing (see, for example, ALPSP 2005a), and that it behoves us to look with care before leaping precipitously into the brave new world of OA. According to the Association of Learned and Professional Society Publishers (ALPSP 2005a),

“Discussion of Open Access tends to be strong on rhetoric but short on facts.”

My aim here is to avoid rhetorical flourishes and set forth the such “facts” as I have been able to unearth from the Internet (the natural habitat of OA).

3. What Is Open Access?

For a brief summary of the goals of OA, see Suber (2004a); a more detailed account is given by Suber (2006). OA exists in several flavours, but Suber (2004a) offers the following umbrella definition:

“Open-access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions.”

A much fuller and complete definition was issued in the Budapest Open Access Initiative at a meeting held in Budapest in 2001 (Open Society Institute 2002):

“By ‘open access’ to this literature, we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.”

In a meeting held at Bethesda in 2003, a statement was issued that offered more detailed specifications on how open access was to be implemented:

“A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in a suitable standard electronic format is deposited immediately upon initial publication in at least one online

repository that is supported by an academic institution, scholarly society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving (for the biomedical sciences, PubMed Central is such a repository).”

The Bethesda definition was reinforced in the Berlin Declaration (Max-Planck-Gesellschaft 2003), in which it was made clear that OA should cover:

“Original scientific research results, raw data and metadata, source materials, digital representations of pictorial and graphical materials and scholarly multimedia material.”

The Budapest, Bethesda and Berlin definitions have now become known jointly as the “BBB definition” of OA (Suber 2004c) and this is the definition that I shall use in the following discussion.

4. How OA Works

OA operates through two broad channels: OA archives (or repositories) and OA journals. These two modes are also colourfully termed by OA adherents the “green road” (OA archiving) and “golden road” (OA publishing).

4.1. OA ARCHIVES

In this – milder – version of OA, authors self-archive their articles or place them on external repositories. To be fully OA-compliant, a repository must conform to the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH)¹, which sets out the criteria for repository interoperability.

4.2. OA JOURNALS

The goal of gold road OA (OA journals) is to ensure free online availability of duly peer-reviewed research articles. The expenses are identical in kind to those of non-OA journals but costs are met in ways that do not constitute a price barrier to the reader. In other words, the subscription-based model is replaced by an author-pays or other model that enables the publisher to provide free access to the article without financial loss.

4.3. CREATIVE COMMONS AND OTHER LICENCES

An essential leg on which OA rests is freedom from most copyright and other licensing restrictions. This is achieved in practice by placing the work in the public domain or through the copyright holder’s permitting legitimate uses

¹For an explanation of OAI-PMH, see <http://www.openarchives.org/pmh/>.

of the work. Certain copyright restrictions, such as the right to recognition of authorship, the right to prevent altered versions of the work from being published by others and (in some cases) the right to prevent commercial reuse by others, are perfectly OA-compliant.

Creative Commons licenses² are a useful way to comply with OA requirements and consent to OA use of the work.

5. Support for OA

The OA lobby has successfully drawn support from political, funding and research institutions worldwide, including the United Nations and the Organisation for Economic Co-operation and Development (OECD).

5.1. UNITED NATIONS

UN Resolution 56/183 (United Nations 2002) recommended the holding of the World Summit on the Information Society³ (WSIS) in two phases. The first meeting was held at Geneva, 10-12 December 2003 and the second at Tunis, 16-18 November 2005. In the Geneva Declaration of Principles⁴ support for OA is stated unequivocally:

“We strive to promote universal access with equal opportunities for all to scientific knowledge and the creation and dissemination of scientific and technical information, including open access initiatives for scientific publishing.”

The Geneva meeting Plan of Action⁵ sought to

“Encourage initiatives to facilitate access, including free and affordable access to open access journals and books, and open archives for scientific information.”

5.2. OECD COMMITTEE FOR SCIENTIFIC AND TECHNOLOGICAL POLICY

Annex 1 (‘Declaration on access to research data from public funding’) of the OECD document ‘Science, Technology and Innovation for the 21st Century. Meeting of the OECD Committee for Scientific and Technological Policy at Ministerial Level, 29-30 January 2004 - Final Communiqué’ (OECD 2004) takes a firm and unequivocal stance on open access to research data. It is perhaps useful to draw a distinction between research

²Consult http://en.wikipedia.org/wiki/Creative_Commons_License for a clear explanation of Creative Commons and other licences.

³<http://www.itu.int/wsis/index.html>

⁴<http://www.itu.int/wsis/docs/geneva/official/dop.html>

⁵<http://www.itu.int/wsis/docs/geneva/official/poa.html>

data and results. In a large number of scientific papers, the data tend not to be reported but only the results derived from them. In astronomy, international observatories tend to make raw observational data available to the public after a fairly limited proprietary period (necessary to enable the observers to derive full benefit, in the form of published articles, from having planned and executed the observations). When the proprietary period is over, the data are fair game for all other astronomers. The research community now expects databases of all kinds to be readily accessible and directly referenceable from within an online published article. The distinction between such databases and the articles themselves, however, is worth making; publishers are not usually involved in the maintenance of data repositories, so the financial implications are quite different for data on the one hand and (published) results on the other. The OECD declaration should not be seen as an explicit statement of support for OA publishing since it specifies data and not results. Suber (2006) cites the declaration as support for OA, but that support is at best implicit and at worst vague with regard to the publishing of results.

5.3. EUROPEAN COMMISSION

On 15 February 2007, following the European Commission's 'Study on the economic and technical evolution of the scientific publication markets in Europe (Dewatripont et al. 2006), a petition⁶ was presented to Janez Potočnik, EC Commissioner for Science and Research, enjoining the European Commission to back open access. The signatories, more than 20,000 in total (25,585 on 4 June 2007), included some weighty institutions, including The European Research Council, the German Research Council, the Swedish Research Council, the UK Medical Research Council, the Wellcome Trust, CERN, CNRS, the Max Planck Society, the Royal Swedish Academy of Sciences, the Royal Netherlands Academy for Arts and Sciences and the Hungarian Academy of Sciences (Joint Information Systems Committee 2007). The petition called for the EC to implement all the recommendations of its study, placing particular emphasis on the immediate implementation of the first recommendation:

“RECOMMENDATION A1.

Guarantee public access to publicly-funded research results shortly after publication.”

The EC, however, was cautious (Enserink 2007) and wanted sufficient time to study the objections of the publishing industry, which sees its interests potentially damaged by the precipitous implementation of OA, in

⁶The petition is available at <http://www.ec-petition.eu/> .

particular by the stipulation that research articles be made freely available after a maximum period of six months. Another objection by the publishers to enforced OA is that the author-pays model is too new and untried for it to be sensibly compared to established business models.

5.4. THE WELLCOME TRUST

The Wellcome Trust is a proactive supporter of OA and states its views on access barriers quite explicitly (Wellcome Trust 2007):

“The Wellcome Trust has a fundamental interest in ensuring that the availability and accessibility of this material is not adversely affected by the copyright, marketing and distribution strategies used by publishers (whether commercial, not-for-profit or academic).”

Indeed, it regards such support as ‘a fundamental part of its charitable mission and a public benefit to be encouraged wherever possible.’ It lays down specific guidelines to authors that encourage them to retain copyright where possible, making their publications free to the public (the Trust provides funds for author-pay publications), and to deposit their publications on online repositories (such as PubMed Central) within a maximum term of six months after publication (Wellcome Trust 2005). The Trust specifically forbids authors to publish in journals that do not allow the posting of published articles on online repositories for periods exceeding six months.

6. Publishers and Learned Societies vs OA

Academic publishers have responded to the demand for OA in various ways. Here, I shall look at the responses of Wiley-Blackwell, EDP, Elsevier, Institute of Physics Publishing and Springer – all major players in the publishing of astronomical journals.

6.1. WILEY-BLACKWELL

This company, publishers of the journals *Monthly Notices of the Royal Astronomical Society* and *Geophysical Journal International*, operates a limited OA model, which it calls *Online Open*. This system offers authors a choice of paying a publication fee to allow readers free access to their articles. Wiley-Blackwell’s copyright assignment policy also allows authors to self-archive the final version of their papers on the authors’ own or their institutions’ websites. Free back files are available for articles in past issues of certain journals, and there is free or low-cost access to the poorest countries in the developing world. The company’s declared policy (Blackwell 2006) on OA states that it will support those OA models that ensure the maintenance of high standards in academic publishing.

6.2. EDP SCIENCES

EDP Sciences, which publishes *Astronomy and Astrophysics*, offers free access to articles in some of its journals (not including *A&A*) for an author fee (currently 450 euros in the case of *EPJ Applied Physics*). The company regards this as a tentative first step towards full open access dependent on community support (EDP Sciences, n.d.).

6.3. ELSEVIER

Elsevier (Peek 2007) allows authors to self-archive versions of their articles published in Elsevier journals, provided that the archived articles are not downloaded from Elsevier's ScienceDirect system (see Elsevier 2007 for a brochure on ScienceDirect), although the published version may be used to update the author's own pre-publication version. Authors may not archive their articles to external repositories. The company is against author payment for free access to articles for several reasons (discussed below), including what it perceives as the possible undermining of public trust in the publication process (Elsevier 2004).

6.4. INSTITUTE OF PHYSICS PUBLISHING

IoP journal articles are freely available from the date of being posted on the IoP website, the cost being met through an author-pays model (IoP 2006). The Institute publishes three OA journals: *New Journal of Physics*, *Journal of Physics: Conference Series* and *Environmental Research Letters*. It has also recently taken over from The University of Chicago Press the publication of the research journals of the American Astronomical Society.

6.5. SPRINGER

Springer Open Choice (Springer 2004a) is an author-pays system offering full open access for an "article processing charge". Authors paying this fee are not required to transfer copyright to Springer. Springer Open Choice exists side by side with the standard subscription model. The cost per article is USD 3000 (excluding VAT for those authors paying in euros). The Springer Open Choice License is compatible with the OA Creative Commons Attribution Licence).

6.6. NATURE

This journal, apart from publishing often highly cited research articles, also performs a magazine-type function in providing exhaustive news and views coverage, which sets it apart from other, more strictly research-based,

journals. It has a high prestige cachet and is consequently heavily oversubscribed in terms of articles submitted, reporting an acceptance-to-rejection ratio of 1:10 (Nature 2004a). *Nature* is a staunch supporter of the traditional subscription-based business model on the grounds of protecting ‘the integrity and neutrality of the selection process in the dissemination of research articles’ (Nature 2004a) and for what it perceives as the exorbitant cost to authors (it estimates 10-30,000 GBP per article) of adopting an author-pays system.

6.7. AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The AAAS, publisher of *Science*, maintains the traditional subscription model. It co-sponsored – along with the Association of Learned and Professional Society Publishers (ALPSP), High Wire Press and the Association of American Medical Colleges (AAMC) – the ALPSP’s report ‘The facts about Open Access’ (ALPSP 2005a,b), which concluded that it is too soon to determine whether full OA offers viable publishing models in the long term, and that peer review and copy-editing might suffer as a consequence of the full implementation of OA.

6.8. ROYAL ASTRONOMICAL SOCIETY

The RAS operates on the basic principle that there should be no price barriers between *authors* and journals, the cost of reader access being met by subscription. There are hence no page charges, the cost of publication being met by library and individual subscriptions. In its response to the EC’s ‘Study on the economic and technical evolution of the scientific publication markets in Europe’, the Society stresses that quality is the main driver in scientific journals. However, even though the RAS chooses the subscription model for its journals, it nevertheless goes quite some way to conform to OA demands in modifying its copyright licensing agreements to allow storage of pre- and post-prints on online repositories and by allowing the archiving of tables from *MN* in the CDS’s VizieR Catalogue Service. Like *Nature*, it is concerned at the possible weakening of the peer review system by the author-pays model. It also feels that the impact of repositories on the subscription model has not yet been satisfactorily dealt with. In contrast with the Wellcome Trust⁷, the RAS urges the EU to encourage the research it funds to be reported in high-quality prestigious journals.

⁷The Wellcome Trust’s position statement on OA ‘affirms the principle that it is the intrinsic merit of the work, and not the title of the journal in which an author’s work is published, that should be considered in making funding decisions and awarding grants’ (Wellcome Trust 2007).

7. Open Questions on Open Access

According to Suber (2006),

“OA is compatible with copyright, peer review, revenue (even profit), print, preservation, prestige, career-advancement, indexing, and other features and supportive services associated with conventional scholarly literature.”

These are substantial claims and need to be vigorously cross-examined since adoption of OA in the forms recommended by its proponents would have consequences entailing possibly irreversible effects on current publishing models and on the future of the academic publishing world in general. In this article, I concentrate mainly on the two most detailed studies made so far, the ALPSP’s ‘The facts about Open Access’ (ALPSP 2005a,b) and the EC’s ‘Study on the economic and technical evolution of the scientific publication markets in Europe’ (Dewatripont et al. 2006). I shall discuss the effects of OA publishing on peer review, and the estimated costs and financial sustainability of OA journals vis-à-vis other publishing models. I shall also briefly consider the move to online-only publication of journals and how this can often affect accessibility in a negative way.

7.1. LONG-TERM SUSTAINABILITY OF JOURNALS

The main aim of research journals is to serve as a medium for the transmission of research results in the form of articles, letters and research notes, but those who publish journals also have a duty to their authors and readers to remain sufficiently solvent to ensure their continued existence and to obtain through some means sufficient funds to maintain standards of quality and adapt to technological and cultural change. In short, journal publishers must ensure the long-term sustainability of their product. The ALPSP (2005a) report found that 10% of its survey emails to target Open Access journals listed in the *Directory of Open Access Journals* were undeliverable, with 4% of the journals having no contact details at all. These figures indicate a certain fragility of some Open Access journals and suggest the wisdom of introducing OA gently and without coercion.

Traditionally, financial sustainability has been guaranteed through library and private subscriptions. Indeed, both commercial and learned-society journals still flourish using this business model although there are signs that commercial publishers in particular will soon need to make considerable changes to their business models in order to accommodate the limited funds available to libraries in meeting the price hiking of recent years. High-pressure OA lobbying, however, has brought about a welcome challenge to this cosy model, but how valid are the models proposed by OA supporters? The picture painted by the ALPSP (2005a) report suggests

that the history of OA in practice is a chequered one: 41% of full open access journals ran at a deficit, with 24% breaking even and 35% making a profit. Replies to the ALPSP survey from the Association of American Medical Colleges (AAMC) and High Wire Press (HW) indicated that of their member journals, run with a range of business and access models, 81% reported profits and only 10% ran at a deficit (the HW sample consisted entirely of delayed open access journals). It is well to remember that any journal, if it is to have a hope of adapting to economic and technological change, must do more than break even; it must, in fact, make a profit so that there are funds available to enable the journal to adapt to the market. Relying on grants and aid from funding agencies is a policy fraught with risk.

While the delayed open access journals in the AAMC and HW samples were concerned with problems related to the logistics of technological change (e.g. loss of advertising revenue and subscriptions when changing over to online-only publishing, evolving new business models, website quality, etc.), the concerns of the full open access journals were of a more basic nature (e.g. attracting quality submissions from authors, obtaining grants and government funding, increasing readership). There were also operational issues of concern regarding archiving, editorial matters, finance for editorial staff, accountancy, production, the mechanics of peer review online, finding reviewers and workload distribution. The report draws attention to naïve responses by ‘a number of full open access journals’ when questioned about which business model they had adopted, such responses including, ‘We have no business model’ and ‘What do you mean by business model?’ The success of any journal requires more considered responses regarding business models.

7.2. PEER REVIEW

Above the demand for the public dissemination of information must always be the requirement that that information be accurate and trustworthy. With all its faults, the present blind peer-review system used by the best journals ensures reasonably well that a paper will receive fair assessment regarding its worthiness for publication. Peer review using external referees is time-consuming and expensive to carry out. Although referees are unpaid, there are still the costs of running an administrative system to contact authors and referees and to keep careful track of papers and referees’ reports. Relying on in-house volunteer refereeing, however expert the referees, would be regarded with deep suspicion within the astronomical research community, so money cannot be saved in this area, whatever the business model adopted by the journal. According to the ALPSP (2005a)

report, all the journals surveyed (both OA and non-OA) exercised some form of peer review. The report states, although not conclusively, that the common perception that peer review is less rigorous in OA journals is possibly caused by the British Medical Council's practice of using only in-house refereeing. The proportion of OA journals in the *Directory of Open Access Journals* adopting this practice is 28.2%, this figure falling to 1.9% when BMC journals are excluded. Hence, it could be argued that, excluding the BMC journals, there are relatively few OA journals that practise solely in-house peer reviewing. However, the figures for peer review need closer inspection. The ALPSP's report also give percentages for OA journals that adopt an external peer review system only (31.1%, falling to 15.1% when BMC journals are excluded) and for those that operate a mixture of in-house and external review (37.3%, rising to 77.4% when BMC journals are excluded). In other words, if exclusively external peer review is regarded as the best means of ensuring high quality and impartiality, then only a third of OA journals meet this criterion.

The Royal Astronomical Society, in its response to the EC study of scientific publications markets in Europe (Dewatripont et al. 2006), considered peer review as 'the key driver of the market in scientific journals' (RAS 2006). The main concern of the RAS with respect to OA is the economic pressure on it to decrease their investment in sustaining the peer-review process at its current high level of quality in the face of reduced subscriptions as readers resort to public repositories for access to research articles (unlike the AAS journals, the *MN* does not levy page charges to authors and so cannot absorb the cost of full OA through raising these charges). It urges further public debate before any decision is taken by the EC to implement the recommendations of the Dewatripont et al. (2006) report. Similar fears concerning the integrity of the peer review process are expressed by Elsevier (2004):

"This critical control measure [peer review] would be removed in a system where the author – or indeed his/her sponsoring institution – pays. Because the number of articles published will drive revenues, Open Access publishers will continually be under pressure to increase output, potentially at the expense of quality."

The journal *Nature*, which prides itself on its exceptionally rigorous standards of acceptance of papers echoes this sentiment and further stresses the adverse effect that the imposition of an author-pay business model would have on very high impact research journals (Nature 2004a; see next subsection).

7.3. THE COST

No serious proponent of OA would claim that OA is cost-free. The argument concerns whether OA will result in cost reductions, cost transfer, or cost increases. All publishers – whether commercial or non-profit – are well advised to turn at least some small profit so that at least part of the gains may be ploughed back into the journals to help them remain solvent and capable of meeting the rising costs of production, inflation, etc. There are some remarkable instances of woolly-mindedness over finance in the discussion of OA; for example, the ALPSP (2005a) reports that 40 per cent of OA journals do not cover their costs, and that – astonishingly – many OA publishers do not rank financial sustainability among their priorities.

While it is true that in STM authors do not receive pay for providing articles for publication, there are nevertheless a whole series of processes that need to be carried out if the raw manuscript is to be converted into a scientifically sound, readable article. Peer review, as discussed in the preceding subsection, is an expensive item if it is performed by external referees (as the astronomical community demands that it be), but added to this are the conversion of authors' \LaTeX files into an acceptable markup language (XML has become the norm for this) for print and online versions of the journal. The conversion is not purely mechanical and requires a heavy manual input on the part of compositors. Most practising astronomers these days are non-anglophone (Mahoney 2000), so many manuscripts need quite heavy copy-editing⁸, which is a job for trained personnel and is costly. Figures and tables are the biggest headache for copy-editors and the problems arising can be very time-consuming (and therefore expensive). It can take as much as seven hours for a professional copy-editor to get a raw manuscript into shape (Nature 2004b). In recent years production has become extremely complex since journals now have to appear in print and online, each medium involving different processes. Finally, journals have to be delivered to their subscribers; hence, distribution is yet a further financial burden on the publisher (see Nature 2004b for an extensive list of “added value” tasks provided by publishers). All of this is seen by both commercial publishers and learned societies as added value that must be paid for through some sort of revenue. Commercial publishers have traditionally relied on subscription fees and advertising revenue to cover their costs. Some learned societies (the RAS being a noteworthy exception) exact page charges. Open access journals rely either on author payments or funding.

⁸In fact, MSS drafted in poor English are usually returned to the authors, who are often recommended to get a native English speaker to carry out the task of Englishing the text, but even well-written MSS still need to be parsed character by character by a trained copy-editor to ensure that the text is of publishable quality.

The author-pays model, as one of the preferred cost-defraying methods of OA, has a number of problems that have not yet been fully addressed (Warlock 2004). Where exactly is the money to come from to pay for it – from grants, the library budget, the research budget, or subscriptions (in the case of learned societies)? It is hard to imagine that researchers would be willing to pay yet more in page charges to meet the costs transferred from subscription fees unless they were to receive an increase in their research grants to meet the added cost. Alternatively, highly productive researchers could publish fewer papers, not a realistic proposition in today's research world! Library budgets would need to be adjusted (probably upwards) on a proportionate basis if author payments were gradually to supplant subscriptions. If the number of paying authors rises through time, possibly eventually replacing subscriptions altogether, what assurance is there that a) this would not lead to further price-hiking on the part of publishers⁹ and b) that funding agencies would continue to fund this method of payment? Would highly productive research centres be effectively forced to subsidize the less productive centres (in principle, there is one fee for all with the current subscription model)? In its comments on the ECs study of STM publishing, Elsevier (2004) saw UK researchers as being penalized by the author-pays model since they produce 5% of the articles published worldwide while the UK spends 3.3% of the world total in subscriptions. According to Elsevier, if the UK were to adopt an author-pays model, it would have to pay 30-50% more in publisher fees. A further objection to the author-pays model by *Nature* concerns very high prestige journals that bear a heavy peer-review burden owing to the large number of submitted articles that are rejected. For *Nature*, the acceptance-to-rejection ratio is 1:10. An author pays system – given what *Nature* envisages as the large loss in advertising revenue due to adopting such a model and the high cost of processing rejected articles – would mean a hefty bill of 10,000-30,000 GBP per paper accepted, to high a price to pay, in that journal's opinion.

One OA success story has been the American Society for Biochemistry and Molecular Biology's (ASBMB) *Journal of Biological Chemistry (JBC)* and *Journal of Lipid Research*, both of which are now available free online (Masters & Bond 2004). *JBC* articles are available free online from the day of acceptance for publication and all back issues of the journal (dating back to the first volume, published in 1905) are also freely available online; hence, the journal is truly OA. The ASBMB's move to OA, however, has been made at a high price (USD 700,000), but Masters & Bond stress the

⁹The Springer Open Choice scheme aims at price stability vis-à-vis the changeover to author-pays by charging libraries only for subscription-based journal content. The subscription-based content is calculated on a yearly basis and subscriptions revised accordingly (Springer 2004b).

ASBMB's financial stability. They also report that 80% of *JBC* authors preferred the adopted business model (subscriptions plus page charges to authors) over the author-pays and institution-pays models. The move to OA by ASBMB was not undertaken lightly and careful consideration was given to all the risks. Furthermore, Masters & Bond underline the importance to ASBMB of editorial independence and the maintenance of 'intellectual rigour and high editorial standards.' They defend high submission charges in preference to low charges on the grounds that lower charges would give an incentive to accept more papers, possibly of a lower standard. If authors were to pay all the costs, they say, this could also negatively affect the standard of papers accepted. They conclude that competition among business models is healthy for STM publishing.

Returning to astronomy, the AAS (owners of *AJ*, *ApJ* and *ApJLett*) envisages any added costs from possible future obligatory enforcement by federal law to adopt full OA (for example, possible loss in revenue by reducing the free online access period from the current three years to six months) as being met by an increase in its journals' page charges. *A&A* and *MN*, however, do not levy page charges so their choices in moving to full OA (if indeed it were ever desirable to do so) would be more limited. In the case of *MN*, the RAS has made it clear that it considers the author-pays model to pose a threat to editorial integrity and is unlikely to adopt that particular model.

Clearly, the options available to journals is largely discipline-dependent. The OA lobby's insistence on the one-size-fits-all solution to scholarly and research publishing is unrealistic. Each discipline must find its own set of publishing models.

8. How Open Is Access Already in Astronomy?

ADS (an online abstract and complete document delivery system) and astro-ph (an online preprint repository) are well-known free-access bibliographical repositories in astronomy. All the major astronomical journals (*A&A*, *AJ*, *ApJ*, *ApJLett* and *MN*) allow self-archiving and make all but the most recently published articles freely available to online users through ADS and operate either a pay-per-view or subscription-based policy for more recently published articles. A considerable number of commercially produced journals, including *Nature*, do not allow this option, preferring a pay-per-view or subscription-based model. ADS, with its policies of "Free Access to Metadata", "Free Access to Archival Literature" (i.e. full texts and not just abstracts) and access to large quantities of raw observational data already provides something closely approaching green road OA.

The degree of technological development and availability of funds for

research astronomy worldwide varies greatly according to what fraction of their GNP individual countries can afford to allocate to science in general and astronomy in particular. In the developing world, astronomy can be a low- or zero-priority subject. The International Astronomical Union, under its Commission 46 ('Astronomy Education and Development') has three Program Groups ('World Wide Development of Astronomy', 'Teaching Astronomy for Development' and 'Exchange of Books, Journals, Equipment, etc.') to promote the development of astronomy in the poorer countries. Given that many schools, universities and research departments might have limited or even no access to the Internet, open access of research publications, which requires wide-band Internet access to be of any use, would seem to be of little immediate concern. Without sufficient bandwidth, downloading an article takes an unacceptably long time. Printed books and journals are the only solution, at least in the short and mid-term. Hence, going online only is a luxury that is affordable only by the richer countries. Quite apart from the so far unanswered objections to online-only publishing (e.g. Mahoney 2007), "ditching" the printed journals can reasonably be seen as elitist by the developing world.

Often associated with OA is the "taxpayer argument", which basically says that all research funded by the taxpayer should be freely available to the public. As far as astronomy is concerned, public access to published research papers (dependent on publisher limitations of access to the most recently published papers) can now be had through ADS. More recent work can be accessed, again free of charge, through astro-ph. In that sense, green road OA is already in situ in astronomy. But astronomy is a fairly arcane subject to the lay reader; hence, great efforts are being made by astronomers to popularize their work. Several international meetings have now been held on astronomical outreach (e.g. Mahoney 2005; Robson & Christensen 2005). Many of the larger research centres now have public information and press officers to help transfer the scientific results of their institutions in a comprehensible form to the press and public. The International Astronomical Union's Commission 55 ('Communicating Astronomy with the Public') has also set up various working groups, one of which is looking into the possibilities of launching a journal dedicated to the communication of astronomy that will serve as platform for communicators to exchange ideas. The IAU has also adopted the Washington Charter¹⁰, a declaration urging research centres to play an active part in popularizing astronomy. Outreach can get to the taxpayer in an appealing and informative way that OA journals never will. Where outreach is insufficient, ADS and astro-ph will supply the deficiency.

¹⁰http://www.communicatingastronomy.org/washington_charter/charter_final.html

9. Conclusions and Recommendations

The most disturbing aspect of the OA campaign is its apparent unwillingness to compromise with the publishing industry on anything at all. Publishers and learned societies that use them have simply been sidestepped by the campaigners, who have attempted – with an alarming degree of success – to avoid all argument by going straight to funding agencies at every level to apply pressure on authors to publish in OA journals. This approach is unreasonable and coercive. The entire future of STM and academic publishing is at stake, and changes in the way research articles are published must be the result of natural evolution; they should not be imposed in the manner that the Wellcome Trust, say, has imposed OA on its grantees. OA journals are a fairly recent phenomenon and have by no means demonstrated their equality with subscription-based journals in terms of quality and sustainability. No doubt, OA business models will play an increasingly important role in the STM publishing market, but they must earn their place through fair competition with existing models rather than through political manoeuvrings to extinguish their competitors. On the positive side there are signs that commercial publishers have seen the warning signs that all is not well with current subscription models and are moving tentatively towards a compromise position with the OA lobby, especially with regard to self-archiving policy. Such change takes time and both publishers and the learned societies need a period of several years to adapt their current practices to the new demands of communities they serve. The US House of Congress has for the moment shelved moves towards legislation on open access and the European Commission has decided to make further studies before taking a final decision (Enserink 2007). That is the sensible way to proceed with legislation that could have severe consequences for the publishing industry if applied precipitously. I suggest the following “roadmap” towards greater accessibility of research publications (Congress and the EC both seem to have tacitly adopted the first two steps below).

Criteria for Workable and Sustainable Publishing Models

- Existing and projected publishing models must be carefully examined for long-term feasibility and judged impartially on their merits without regard to philosophical or political considerations. Consequently,
- *The first recommendation of the EC study on scientific publication markets (‘Guarantee public access to publicly-funded research results shortly after publication’) should be the recommendation with lowest priority, and its last recommendation (urging further study) should be given maximum priority.*
- OA must evolve within the research and publishing communities rather than be imposed from above by government and funding agencies.

Those funding agencies that advocate OA should endorse it by offering author payments as required; they should never use coercion, thereby removing author choice.

- A detailed assessment of the costs of OA should be made by all publishers of research journals and debated with all stakeholders.
- A realistic assessment of the sustainability of OA journals must be made. In many cases such assessments would consist solely of projections into the future since most OA journals are of fairly recent origin and have no past record; such projections would need to be treated with due caution.
- Editorial, design and typesetting quality must be maintained at present high standards.
- Where an author-pays model is in operation, in order to maintain its moral integrity and impartiality the peer review process within a journal should involve exclusively the external scientific community and should never be done in-house. The high cost of external peer review must also be budgeted for.
- If an author-pays model is adopted, its should be established where the money will come from to pay for it. Will it come from the library or research budget, or from some other source? Realistic projections must be made on how costs will be affected if the number of articles published under an author-pays model increases to the point of supplanting subscriptions.

The OA lobby is far from having proven its case and needs to address in a serious and comprehensive manner the issues raised by the ALPSP (2005a,b) report. Commercial publishers also need to understand that they are pricing themselves beyond the reach of most library budgets. Consortia and “bundle” deals need to meet the needs of libraries in a way that they have so far failed to do. Learned societies, in contrast, have shown considerable constraint in their price increases; the tripling in subscription fees over the past decade has merely offset the costs of tripling the volume of published material. Learned society journals are often the product of more than a century (in some cases several centuries) of evolution and adaptation to the publishing needs of the scientific community. So far, they represent the best option for research centre libraries. In astronomy at least, the learned society journals provide a well-recognized imprimatur to articles accepted for publication. These journals continue to be the mainstay of astronomical research publishing, and it is to be hoped that no undue pressure will be brought to bear on them from funding agencies that could lead to their replacement by untried OA alternatives.

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