The Criteria for Open Access

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Abstract

Each proposal for Open Access (OA) has its unique combination of features; each argument for or against OA focuses on particular features or criteria. This article is intended to discuss these criteria, both individually and also as each of them contributes to the different proposals for OA. Evaluation of the proposals themselves is not attempted. This discussion is intended to be of value to the supporters of OA, in choosing which plan to adopt, and to those opposed to OA, in showing where the weaknesses do and do not lie. In other words, this article intends to improve the level of factual understanding in the ongoing discussions.

The Criteria for Open Access

This article will discuss in turn each of the possible features that might characterize forms of OA, and that might be potential factors in judging the desirability of such plans. It does not intend to evaluate the overall merit of any plan. (1) No matter how balanced I intend the discussion to be, it is inevitable that all readers will consider me to show a degree of prejudice against their various positions. I do have a strong wish for OA, and therefore wish for a feasible OA plan, but this does not imply a preference about what OA plan ought to be adopted, or even the certainty that one is truly feasible. (2)

The supporters of any specific OA plan have an inherent advantage in that they need only demonstrate the value and practicality of that one plan. Those arguing against OA need first to demonstrate the unavoidable and fatal faults in every one of the individual proposals, and then induce that any similar plan would necessarily be equally bad.

I am not going to present my own definition of OA (Open Access). There are altogether too many, (3) each sensitive to the special purposes of the defining group. Instead, I take what might be called the OA Anonymous approach: Anything is Open Access if someone says it is.

Basically, OA is about access to scholarly publications in the sciences, social sciences, and applied sciences. This article first considers the manner of the access, the types of material accessed, and the basic forms of OA. Then it presents the other variables: the version that one has access to, the manner in which the material is physically and intellectually organized, the way material is to be identified and delivered, who precisely has access, the implications for copyright, the effect on peer review, the guarantees for authenticity and preservation, the manner in which the access is financed and administered, the effects on other components of the system, such as publishers, universities, and libraries, and, finally, the way the plan is intended to be brought about.

Manner of Access

The typical manner of access is electronic access over the Web to HTML or PDF versions, with publication in other formats considered as optional and subsidiary. The entire OA concept depends upon the very low incremental cost for additional users of electronic material delivered over the Internet, whereas printed material must have an incremental cost for each copy printed. (This can be a small cost if we are talking about millions of copies, but we are not.) The financing of OA is always computed on the basis of electronic-only publication. To this calculation can be added the cost of the production of a small number of printed copies, either from specialized PDF or as short-run printing of the electronic version. These versions can be sold conventionally by subscription to those who wish the print for intensive reading of key journals, those requiring print for taxation or regulatory purposes, and those maintaining print archival backup as a supplement to electronic archiving. Before the development of electronic distribution, there were proposals for the distribution of materials in other manners. These generally involved the distribution of individual articles in paper or microform, or the distribution of a totally comprehensive periodical in large numbers. (4)

A decreasing number of locations remain without suitable access to the Internet, but these areas almost always have even worse access to printed publications. Facilities for electronic access are likely to improve long before those for print.

Type of Material

"Scholarly publications" cover a very wide range and can be taken to mean all scientific material, or only journal articles, or only those journal articles that are primary research reports. The concept is often

extended to include material that is technically "unpublished," such as preprints or working drafts or primary data. It excludes material from which authors expect direct monetary profit, such as textbooks or popularizations. It recognizes that authors eventually expect some form of psychological or monetary compensation, such as the increased prestige among their colleagues, the satisfaction at the diffusion of their ideas, and the possibility of hiring, promotion, or tenure.

The basic material covered is primary journal articles, defined as those in which original experiments, discoveries, or calculations are presented. Their publication is described in detail elsewhere, (5) but what follows is an outline of steps at which some of the controversies of OA occur. Typically, such articles are peer-reviewed before publication by two or three other scholars in the field. The reviewers generally recommend either rejection, or acceptance with alterations; the process of making the alterations is brokered by the editor. There are variations, and for some journals, the editor or editorial board alone decides. The end result of peer review is the author's accepted final draft.

The journal editor is generally compensated, at least for expenses. The peer reviewers are generally not directly compensated. (6) The peer-reviewed author's accepted final draft is checked before printing by copyeditors, who are usually paid staff or outside service providers. The author does not usually see the revisions at this stage. The costs associated with these inherently human and non-automated processes are always present, even if not paid in money. However, these costs are dependent only on the size of the journal, the production quality, and the number of articles reviewed (both those accepted and the usually greater number not accepted)--not upon the number of users. A difference exists between the facilities needed for large and small systems, but the effect is small compared to the production for print.

When only electronic versions are produced, the material is usually converted into the publisher's PDF, and added to the journal's Article Database. The cost of operating such a database depends primarily upon the size of the journal, and only to a slight extent upon the number of readers. When both print and

electronic versions are produced, usually a common XML version is prepared. From this version comes the HTML and PDF versions for online distribution, and PDF for printing. Producing print adds the cost both of the preparation of the final version for printing, (which is independent of the size of the edition) and the cost for printing and distribution of each copy (which does depend on the size of the edition).

Secondary material, such as editorials and review articles in academic journals, are sometimes OA and sometimes not. News items, explanations or summaries of current work, and announcements are usually written by paid writers, at least for major publications. Paid writers expect to be actually paid in money, and most earn their primary income from this source. Major review articles are usually arranged in advance, and some relatively small monetary compensation is often provided--probably nobody makes a living writing review articles alone. Book reviewers are generally compensated by getting to keep the book they review. Although they could sell these books, probably nobody makes a full living in this way either. Some of the ethical arguments that call for the public to have access to publicly supported research do not necessarily apply to review articles, and neither do some of the economic reasons. A research article (and thus the single journal in which it is published) is inherently a monopoly--no other article can be substituted. That is not usually the case with reviews, where there may be a number of equivalents covering the same material. The users, however, often do not make this distinction and expect them all to be OA.

Some journals contain advertisements, and their treatment under OA varies. Some textbooks and similar items are available as OA, with or without a paid equivalent. Also common is OA availability for older editions, often developed and maintained on a voluntary basis. Some electronic publications carry material that is not in the printed versions. The continuing *Nature Web Focus* on OA is one example, and supplementary data is another. It is customary to have OA to this material even when the base journal is non-OA. The spread of OA has reached beyond the sciences. Scholarly book publishing in the

humanities has similar problems, and the distribution of primary data in the humanities is now often organized at least partially as OA. (7)

Basic Alternatives

As a preliminary classification for discussion, let us consider that there are basically two pure forms for OA and one combined form. The most direct form is a journal comprised entirely of OA articles, generally called an Open Access Journal (OAJ) --sometimes called "Gold OA." Publication is generally paid for by fees collected from the authors or sponsors, or by direct subsidy from some agency. Many of what were once called e-journals, produced only electronically, fall into this class. Many have extremely low associated costs and are often produced by volunteers. If the print version of an OA Journal is produced, the publisher typically requires a paid subscription. There are variants in which only the primary article content is OA, and the secondary or editorial content is available only for payment. There are also variants where only those articles are OA for which the authors specifically pay a voluntary fee. There is also a variant in which all the journal material is OA, but only after an embargo period of several months to several years, and a further variation in which there is an embargo period unless the author pays a special fee. For each variant, some consider the journals OA, and some do not.

The other pure form is for articles to be published in a database, completely independent of journals. The nature and stability of such databases vary. The extent to which they carry out the conventional peer-review and copy-editing functions of journals vary, but probably none of them yet do so to the same extent as a good journal. Few meet the preservation specifications that would usually be considered archival. The relationship of the articles in this database to the same material published as journal articles varies. As there is currently no standard term, it will be called an "Article Database." (8)

A frequently mentioned combined form is for materials to be published in conventional journals, but for the authors to additionally post some version of the articles in an OA database. (This is sometimes called "Green OA.") The location and nature of these databases vary greatly.

Versions of Material

In some forms of OA, the access is to the full published article as such. This would always be the case for OA Journals. The author might possibly place a preliminary version or a manuscript on his/her own server, but there will be one final authentic version. If the journal is published in print as well as OA, it was formerly normal for the print version to be the version of record; currently, the electronic version is often the one of record.

If the material appears only on a database, the final version on the database is obviously the version of record. Some databases also retain all preliminary versions; the manner and extent of access to them varies. The author may choose to have his manuscript reviewed by his colleagues, he may also choose to have it professionally edited. There probably are not yet databases that themselves carry out the functions of review and editing as fully as would a good journal.

The mixed form ("Green OA") where the material is published in a journal, and also in some version in a database, is characterized by a very wide range of database versions and locations. The preferred term for such databases seems to be "Repositories"; one located in individual academic institutions is called an "Institutional Repository" (IR). (Alternate names and potential locations are discussed below.) Permission to use such a repository is the prerogative of the publisher as holder of the copyright; the decision to actually use the IR is up to the author. (9)

Most, but not all, publishers permit the author to place the submitted manuscript (generally called a preprint) in such a repository. Some journals, particularly medical journals, which have long had a rule (10) against disclosure in advance of publication, do not permit the posting of preprints in any form. A few journals themselves now provide the pre-publication versions as OA, but not the published articles. Thus, we have the paradox that such papers are more readily available before publication than after. This changes the usual purpose of publishing, the dissemination of information, into the reverse, restricting its dissemination. (11)

After publication, the items are called "postprints," by analogy with the printed copies of separate articles sold to the author for distribution among colleagues and known as reprints. The type of postprint varies. In terms of accuracy, the most desirable is the postprint when the publisher sends the author a copy of the PDF as published (this is still rare). Very close to it is that which allows the author to scan a printed copy of the article, convert it into PDF, and post it. (Explicit publisher approval of this is rare, but it may be granted implicitly as a byproduct of the wording of their permission clause.) Another good way is for the author to have permission to receive an HTML version from the publisher and then post it. (There do not seem to be any deliberately intended instances of this.)

What publishers most frequently now explicitly permit is the posting of the author's approved peer-reviewed manuscript. Such posting may be permitted only for the uncorrected pre-copyedited form as sent to the publisher, or the author may be permitted to correct it to match the final wording of the copy-edited article as it appears in the journal. Sometimes, such posting may be permitted only for the author's approved peer-reviewed but uncorrected pre-copy-edited form, with a separate list of "corrigenda" to conform it to the published version. Some OA advocates have claimed that the author always has the right -- regardless of publisher permission -- to post after publication the un-peer-reviewed preprint with a separate list of "corrigenda" to adjust it to the peer-review and the copy-editing. (12)

The use of any of these methods is often called "self-archiving," meaning the responsibility of the individual. There is the possibility of confusion here because "archiving" otherwise means a much higher level of stability and permanence than is intended by these plans. It is not known at the time of writing the extent of the difference between postprints and published manuscripts, or the degree to which the permission to correct the postprint is used. The practicality and desirability of using these postprints will obviously depend on such information. The coordination of access to the various versions will be discussed later.

Physical Organization of the Material

When electronic journals, either conventional or OA Journals, are obtained from a publisher, the publisher now is usually responsible for maintaining the database. (Alternatively, a large consortium undertakes the maintenance of the server for its members.) The publisher's responsibility is ensured by contractual provisions for mirrored servers and for backup "dark archives" deposited in national or other large-scale facilities to be used only in case of failure of the regular service. (13)

When material is provided from another source than a publisher in the usual sense, there are many possibilities for archiving and organizing. The master database may be maintained at a national facility, either for normal use, as in the National Institutes of Health (NIH) proposal, or as backup for those authors not covered by an Institutional Repository (IR), as in the United Kingdom. At a slightly less comprehensive level, the database might be the responsibility of one or more inter-library cooperatives, such as OCLC. The next level down is the maintaining of such databases by an academic society for its own discipline, or by a discipline-based cooperative: they normally emulate the first and best, *arXiv*. (14).

As most subjects do not yet have such archives, the use of IRs (15) is widely advocated. This requires each university to set up a Repository containing a database where researchers from the institution can deposit the preprints or postprints of their published papers. Many publishers accept posting in an IR; fewer permit use of an archive run by a discipline or outside organization. We have little experience with the stability and quality of IRs for this purpose. (16)

In the absence of IRs, many university departments have their own repositories. Departmental repositories rarely have stable funding or organization. These could be upgraded, but except in unusual circumstances it would be more effective to organize an IR. In the absence of anything better, many individual researchers maintain copies of some form of their publications on personal Web pages. These are subject to all the vicissitudes of academic life; their continuance after the change of affiliation, retirement, or death of the author is totally unclear. Many publishers who do not permit postprints in an IR do permit them on individual pages; there remain publishers, some of the highest quality, who permit postprints only on pages not accessible outside the university, or who do not permit even that.

Intellectual Organization

There need be no similarity between the manner in which papers are physically deposited in a repository and the way the user sees them. The papers in a large journal database are not part of a volume or issue but are considered as individual, and numbered in sequence. It is perfectly possible for such a database to have an interface that organizes selected papers in the manner of a conventional electronic journal; this is called an "overlay journal." Such journals could be run essentially like conventional journals, taking on the responsibility of peer-review, copy editing, and other aspects of publishing. An overlay journal would consist of the papers in the database that have been submitted to it and have been found to

meet its standards. Its value would depend, as for any journal, upon the quality of the peer review; individuals or even institutions might subscribe to such a selection. (17)

The papers in a conventionally financed electronic journal need not be arranged like those in the paper equivalent. Some, like *Physical Review*, are already arranged as a database. They are referred to by number. A physical volume or issue of the print is not a true entity but merely a container consisting of a certain number of items. Its publisher takes advantage of this manner of organization to publish electronically special topics overlay journals. The publisher calls these "virtual journals." They contain articles selected not merely from the different lettered sections, but from the publications of other organizations as well. (18)

Identification of Material

Many OA Journals are indexed in the same indexing sources as conventional publications. In addition, the contents of these journals and the OA articles from Article Databases or IRs (and author Web pages) are visible to the standard Web search tools. Indeed, a customary method of finding an OA version of an article is to search in Google either by the first few words of the title, or by author and title word, or by author and affiliation. (19)

Better identification of OA material requires more specialized devices than just the Web search engines. Since the material will generally be dispersed over many databases or repositories, a unified searching facility is necessary. For repositories conforming to the OAI (Open Archives Initiative) metadata specification, the material will be seen by engines like *OAIster*, the best known example. (20)

There are special dedicated finding engines available or in development. Citation indexes are particularly relevant, as the material generally lacks controlled subject metadata. Some OA titles are covered by conventional citation indexes.(21) Specialized ones, such as *Citebase* (22) and *CiteSeer* (23), are in development. Even independent of special indexing, it has been shown that exposure on the Web greatly increases the visibility of articles. This applies even to their citation frequency by other published articles, which implies that not just undergraduate but published researchers rely very heavily on the Web, or even on the Web alone (24).

Coordination of access to the various versions remains a problem. Just as a user searching for a journal or journal article wants to find the publisher's version if owned by the library, rather than the version of an aggregator like ProQuest or EBSCO, so the user searching for the author's OA version of an article would prefer to find the best version. Once more, specialized linking devices are in development. The value of these will be greatly increased if all scholarly material becomes OA, either as OA Journals or coordinated databases. The key factor, as always in information searching, is consistent metadata (25).

Delivery of the Material

Delivery is not a trivial issue. It includes such concerns as access by those with various disabilities or using other languages, or in areas with poor Internet connections. It includes facilities for multiple browsers and operating systems. It includes the ability to facilitate input into the system as well as output.

The ability to both save and print is required. Color is a minor difficulty, which still must be readable as black-and-white printouts. More difficult is high-resolution images, which often must be separate files shown as links in the article. Even more difficult are articles in which multimedia is used. The most

difficult situation involves a connection to a live database or experiment, to external programs, or to data for user manipulation. In some of these cases, the only solution may be to designate both an archivable fixed version, and a version for user interaction. The ability to link is always expected now, and it is necessary to have all links durable. Several methods for this are possible, and presumably a standard will develop. These considerations are mentioned because most OA models (as well as much paid access) often lack some of these facilities. Will there be improved standards for documents the author "self-archives"?

Users of Open Access

Advocates of OA have varying views of its principal intent--to aid the authors by making their work more visible, to aid the users by making their sources more accessible, and to aid the libraries by making the publications more affordable. The primary users in mind are the authors themselves for their research, students learning to do research, researchers outside the field of specialization of the available library facilities, and these wanting access to previously relatively inaccessible material in subjects like law and medicine. Even given fully adequate facilities, OA in some forms is expected to simplify the often complicated process of actually gaining access to what is owned.

Use of OA in public facilities by those outside of major academic institutions, both the already computer-literate portion and the ones who have not reached that point, depends on several factors: computer availability, computer literacy, the knowledge of how to use search engines effectively, the expectation of privacy, and the absence of censorship. The first three factors require a reorientation of public information services, both in the provision of access and in the teaching and personal assistance to use it. Librarians face major rethinking of how library service is to be provided. The standards of both

information and reference services will be greater. The public, seeing so many documents available, will now expect to have access to any document whatsoever. Thus for OA to fully meet all the expectations, it must reach 100% for both current and historical material. It will need to move beyond its concentration on scientific journal articles, but no one intends it to replace commercial publishing in general.

The expectations of privacy and freedom from censorship have long been central concerns of the library profession. They have long been necessary concerns, and remain so. OA will inherently have the tendency to encourage anonymity as the elaborate controls necessary for the licensing requirements of paid access offer many opportunities for invasion of privacy. Fortunately, with OA material we shall need no digital rights protection mechanism, no access control. Since they will be unnecessary for financial or operational reasons, we should strongly resist any attempt to require such devices, which in an OA world could only have the functions of censorship and surveillance.

One concern with any electronic publication is the ability of the publisher to withdraw content, made possible by the relative mutability of electronic media as compared to print. This has been done for reasons of purported libel or fraud, claimed violation of copyright, or embarrassment at having published unsuitable works. (26) Since most forms of OA permit multiple copies of the published items to be digitally made by anyone desiring, these insults to the integrity of the scientific record, that could not be possible with dispersed print copies, will no longer trouble us electronically either.

The supply of scientific journals to the developing world has been assisted through a variety of publishers' individual and collective schemes for providing free or very low-cost electronic access, sometimes under national licenses. This is made possible by the almost zero incremental copy cost of electronic publishing; the publisher would receive equally little income if it did attempt to charge normal

rates. In the print period, such prices were not possible. The practical result in many areas was pirating, sometimes combined with censorship. OA in any form will provide a much simpler way.

The use of OA is also important to those who have the facilities, knowledge and the training, but have no appropriate institutional affiliation. The supply of scholarly material to those not affiliated with a major academic institution has traditionally relied on interlibrary loan or paid document delivery. The effectiveness of interlibrary loan systems varies primarily according to personal and institutional status. Most of the largest and wealthiest institutions supplement their already excellent collections with relatively rapid interlibrary loan for materials they do not own and with free or low-cost direct document delivery, especially to faculty. Users in less well-financed environments find the facilities generally slow and often requiring direct payment by the user. The inequity of inadequate library facilities extends not just to the extent of material available immediately, but also to access of material obtained from elsewhere. (27)

The representatives of a few scholarly societies in biomedicine have expressed concerns about the possible deleterious effects of exposing to the layman all the potentially special-purpose and inappropriate material found in professional journals; however, the Web holds an enormous quantity of dangerous or erroneous material, and any addition of professional content can only help.

Implications for Copyright, Other Legal Protection, and Peer Review

OA will end the present practice of requiring authors to transfer their rights to publishers. What should replace that practice is still unsettled. Simply putting the material totally in the public domain would permit misattribution and plagiarism. The simplest rule is that authors retain only the rights to "control over the integrity of their work and the right to be properly acknowledged and cited."(28) Other

standards require author permission for commercial use, and the widely-known Creative Commons licenses allow authors to choose from a bewildering variety of rights. (29) The actual management of the retained rights might be by authors, their institutions, or publishers. The existing copyright legislation provides for the balance of many academic and commercial interests; with OA, much simpler legislation might be more appropriate. We are not limited by the provisions of existing copyright laws; they are not immutable laws of nature.

Even before the concept of OA arose, considerable controversy has surrounded the general merits and deficiencies of peer review, and there have been many proposals for alternative forms. There is no reason why any possible form of OA should be incompatible with conventional peer review, any of the alternative forms of peer review, or no peer review at all. Quality control through peer review is a subject worth attention, but the relationship to OA is nonexistent.

Guarantees for Authenticity

The problem of "versioning," or the existence of multiple versions each apparently the authoritative document, has already been discussed for the relatively simple case where there are clearly versions of lower and higher quality. A problem applicable both to OA and conventional publication is that when authors revise their work, it is thought desirable both that there be stable forms of the work, and that all forms ever released to the public remain accessible. There seems no easy resolution of this impasse. When publishing was in paper only, authors corrected their mistakes either before publication or never--or at least not until a subsequent edition clearly distinguishable from other editions. Electronic publishing, whether or not OA, opens the possibility of multiple versions. The greater ease of OA, and

especially of OA preprints, potentially increases the problem. The use of OAIster and similar cross-indexing devices may be the solution.

There are multiple programs to add code to insure against tampering, to identify the time and identity of changes, to provide for multiple synchronized mirror sites and to permit access to the desired version. Librarians can rely on the computer specialists to develop and improve such devices; they will add to both function and cost. Whether earlier versions of articles known to be incorrect can be totally withdrawn is a policy dilemma discussed above in note 26. I offer no solution, but my inclination is to say "published is published." A warning or apology can easily be added.

Guarantees for Preservation

This preservation problem is not unique to OA. With electronic publication, the publishers have generally been responsible, with backup from consortia and national libraries. With OA, national libraries would have the primary responsibility, which is totally in keeping with their overall mandate. There are acknowledged organizational difficulties, and acknowledged costs, but they are not unique to OA. One basic concept is generally known as LOCKSS: Lots Of Copies Keep Stuff Safe (30). It applies to both OA and non-OA, though the freedom of OA from licensing restriction makes the establishment and organization much simpler. The name is self-explanatory and the method sufficient to maintain copies against accidental loss or local destruction. They can be protected against totalitarian developments by sufficiently wide dispersal, especially in countries with different political systems (31). A method to preserve them past the demise of technological civilization is another matter, with science fiction offering the best candidate solutions. (32)

Even for the short term, the technical concerns are complicated, but they are not specific to OA. Fortunately, these matters are considered not only by specialists in scientific journal publishing, and the

general solutions will be powerful enough for our needs as well. In the meanwhile, there is printing-on-demand and computer output microfilm.

Finance and Administration of Open Access

We are now at the true heart of the problem—finance and administration of Open Access. The money spent for scientific research comes either directly from federal and state governments, or indirectly, through the tax treatment of gifts to educational institutions and libraries and through tax credits for research in the commercial sector. Some of this money is necessarily devoted in some manner to publishing the results. Within the system, public, academic, and industrial libraries receive funds from their sponsoring agencies, which they use to provide their user communities with library materials, including scientific information. In general, they do this by paying publishers for the material. This can take many forms, such as purchasing books, purchasing subscriptions to printed journals, purchasing subscriptions to online journals, paying for the temporary use of online material, or paying for delivery of individual documents. The publishers use the money to produce and distribute the material (and, in some cases, pay significant royalties to the authors--though, as mentioned earlier, this applies to almost no scientific material). The publishers, in turn, obtain their materials from the authors, typically in exchange for the service of publishing them.

Many alternative exist for the necessary money transfers. The libraries could become publishers. maintaining Article Databases and paying the expense from the funds they would otherwise pay publishers. The universities could become publishers, again paying the expense from some of the money otherwise paid to publishers. Scientific societies already are publishers; they now charge mainly the

library and partially the author (as publication fees); they could equally well charge mainly the author. The commercial publishers could continue as now, but charge the authors instead of the libraries.

Where the charges have been shifted to the authors, it is conceivable that the authors would pay them personally. More usually they would pay them from other sources. One source is institutional funds, which might come in some part or entirely from funds now spent by the libraries, as will be discussed in more detail below. Another source is grant funds--the cost of publication would be a small portion of a typical research grant. The sponsoring agency can contribute in many fashions. It could add funds to its research grants to pay for publication, it could grant money directly to the libraries (this already happens, through the device of indirect costs paid as part of grants), or it could directly subsidize the publishers (which is perhaps more likely in the case of scientific societies than commercial publishers). The government itself might become the publisher, conceivably by sponsoring journals but more likely through the maintenance of Article Databases.

The reader will have observed that many of these mechanisms are made use of by the different plans for OA. The plan for OA Journals ("Gold OA") is a plan for publication by existing or new commercial or non-commercial publishers, with the expenses paid by the authors or authors' sponsors. The most often suggested source is existing or supplementary grants. Authors without grants would generally receive institutional or government funds; authors who might not be able to obtain such funds because of the poverty of their institution or nation would have some or all of the charges forgiven by the publisher. This plan would be somewhat less expensive than at present. It would eliminate the publishers' and also the libraries' overhead from the handling of access, licenses and subscriptions. (33) It would potentially be very much less expensive, because publishers would compete not only on the basis of quality, as at present, but also on the basis of cost.

True publishing costs are controversial. (34) A major often-overlooked factor is the percentage of rejected articles, which require peer-reviewing but pay no publication fees. (This is not a problem for models that also charge a submission fee.) In all estimates, non-commercial publishers as a general rule publish at half the cost of commercial. One non-commercial publisher, the American Physical Society, despite a high rejection rate and unimpeachable production quality, has an electronic publication cost of only $1500 per published article; remarkably, it has reduced prices for 2005 by 1 to 3 percent and plans further continuing reductions. (35). Thus, there is considerable room for price reduction through market competition, especially by the commercial publishers, though possible inequities with this approach have been suggested. (36).

The allocation of funds to pay for publication is particularly difficult. Every potential source wants someone else both to provide the money and to take the responsibility. Such arrangements are relatively simple if full subsidies are provided for all articles accepted, yet even here the details of reallocating money within the university may prove beyond the capabilities of academic decision-making. If full subsidies are to be provided only for some articles, this adds yet another layer of academic bureaucracy. The suitability of different possibilities for this is hard to judge, except that from the viewpoint of an academic librarian there is no worse-situated organization to administer such grants than the library, almost always the weakest power center in a university.

The library budget has sometimes been mentioned as a potential source of funds. Libraries are naturally very anxious to minimize this portion because there is obvious equity in transferring funds needed in the past for purchasing material to support the publication of the material instead. Although the library expenses for scientific journals will be reduced under all of the plans except the "Green OA" combination, the libraries naturally want at least some of the released funds to be used for other needs

than science journals. Scholars in the humanities have not forgotten where the money to pay for the science journal price increases has come from.

A last recourse is to expect authors to pay personally. This alternative would produce great inequity, a point frequently emphasized by those who think OA Journals impractical. It is hard to find a replacement for the succinct phrase "author-pays," but those supporting such plans should avoid it and use such terminology as "author/sponsor-pays," or "paid on behalf of the author."

For Article Databases, the usual plans would have the money come from government or institutional sources. Publication solely via such databases would be considerably less expensive than at present. Only overlay journals, peer-reviewing and copyediting services would remain. Conceivably, existing publishers would convert to organizations performing these functions, or more efficient specialized services would arise. The hope, perhaps unrealistic, is that the costs will be so low compared to the present ones that there will be no difficulty in finding the money.

The combination plan for paid publication plus IRs (self-archiving or "Green OA") would continue to require funding for the existing journals and additional funding for the IRs. The expensive functions of peer reviewing and copyediting would continue to be done by the journals and paid through library subscriptions. As the IRs would perform relatively few functions, their cost would be very low, lower than the Article Databases. Even so, this plan would inevitably be slightly more expensive than at present. If sources of funding are not willing to pay the extra expenses, there are two obvious choices: to reduce the number of library journal subscriptions or to reduce their cost. As an increasing number of papers became available as OA, one expects that an increasing number of libraries will cancel their subscriptions, and the industry will decline until only those publications are produced that people actually want~~ed~~ to pay for. (37) However utopian it appears, the alternative, that prices be reduced, is possibly a better solution for publishers.

A major decline in the number of journals removes the quality control functions that underlie self-archiving. Some supporters of "Green OA" leave such matters for future consideration; some even think that concerning ourselves with them slows down the full adoption of OA. However, the speed of the NIH and UK initiatives indicates that the appropriate time has arrived. To maintain quality in a "Green OA" system, additional money will soon be needed, either to add the necessary functions for the IRs to become proper Article Databases, or to subsidize OA Journals. I find it obvious that these improvements should at least be planned, since the need for them can easily be predicted.

Effects on Other Components of the System

Publishers

Much opposition to Open Access comes from the established journal publishers. For the commercial publishers it is understandable that it should, for some of the ways in which OA might develop might well harm their ways of doing business in general, and their profits in particular. All intelligent commercial publishers are making plans to preserve income. (38)

Some of the scientific societies make evident a much more intense opposition than their commercial counterparts. (39). There is indeed reason for researchers to concern themselves with the financial state of these societies. They engage in many educational activities, are often active in outreach to the public, organize the scientific conventions that form a part of the overall system of scientific communication, and are important to the formation and growth of scientific disciplines,. About one-third of the societies have no profit from publication; for those that do make a profit, on average it provides 37% of their overall income. (40) Libraries naturally feel that if the societies' non-publishing activities need outside

funding, they should be funded by more direct means, and distinguished from the societies' role in disseminating scientific articles. The societies naturally feel that libraries should find it more appropriate to support the societies' activities than to add to the profits of the commercial publishers.

Users

The users want material they think they will use, or they want material they will never use. They want to document their work to the minimum acceptable level, or they want to accumulate a protective shell of unneeded material. They want everything immediately at hand, and not in the way. Given the growth of science, it has long been a commonplace that these needs are incompatible. This is no longer true with electronic resources. The limitation is now not the amount of material that can be stored conveniently, but the amount of material that can be effectively accessed. The challenge is not primarily obtaining material, or storing it, but identifying it.. Recent emphasis has passed to automated citation techniques--the effectiveness of Google is legendary, and the even greater effectiveness of methods still under development is remarkable, as referred to above in notes 22 and 23. The possibility remains that there is no universal solution, that different humans will always work differently, and that adaptive systems will still require user intervention and ingenuity. There is much to be said for the position that the most efficient and flexible way remains to make use of a human specialist, a.k.a. a librarian.

Authors

The attitudes of academic authors have been studied. (41) Most claim to be influenced primarily by the desire to communicate their work in the most effective manner to the most appropriate audience. They

choose journals according to quality, for the highest quality journals have greater readership. Readership requires visibility, and the effect of OA on citation has been noted above. Academic authors are judged based on the quality of their publication, which administrators customarily perceive to be indicated by the reputation of the journals in which their articles are published. This practice can lead to very conservative behavior by academic authors.

Universities

The challenge for universities is the customary one: planning for increased functions without increased budget. Although the regulatory plans do include some additional funding, most administrators (and researchers) suspect that much will have to come from already allotted funds. As explained above, much of the appeal for "Green OA " Repositories comes from the probability that they will be very inexpensive. The largest laboratories at the most prestigious universities have the largest research grants and customarily have used some of the money to pay already existing publication costs. But even such grants are funded on the assumption that these costs will be very minor.

As mentioned earlier, academic institutions rely heavily on authors' publishing records for decisions of hiring, tenure and promotion. This is appropriate in research universities, but such reliance has become usual even in teaching institutions where it is clearly of little relevance to their mission. The predictable result is the faculty production of papers that are low in quality because of lack of facilities and of true faculty commitment to research. This leads to the need to publish them somewhere, which is what sustains the lower quality journals. Any system which removes the effectiveness of judging by journal publication threatens the personnel practices of academic institutions, but no system is likely to be cost effective that does not find significantly less expensive ways of publishing, for at least the lower quality

papers. (It is inevitable that any publication system will need to deal with them: not all papers can be above average.) These factors can lead to very conservative behavior by academic administrators.

Libraries (and Librarians)

Libraries are only intermediaries. They act as transfer agents for the money that goes to publishers. It is not their money: they do not provide the funding, but spend what they are allotted. (42) They do not buy the material for their own use: they buy it for the use of their patrons. They can be seen as having a fiduciary function: the parent institution supplies them funds to provide for the most useful provision of library materials and service to their constituents. Unlike a publisher or a university, a library does not want to accumulate money; on the contrary, its goal is to spend as much as it possibly can.

Given that they are only the intermediaries, why do they care? Trivially, they care because if the supply of materials is inadequate, patrons blame library and the librarians. There is no practicing academic librarian who does not routinely receive abuse for not buying materials that cannot be afforded. The very administrators who provide the funding have been known to complain that it is being spent on expensive material for their faculty's use. Librarians continually try to educate their patrons about library costs, but this has not led to increased funding. Rather, some administrators suspect that any major increase in research library funding will be immediately matched by correspondingly increased prices from publishers.

A deeper reason is that librarians most often identify themselves with the interests of the faculty, and, if they are good librarians, with the students. One important satisfaction of a career in academic librarianship is the encounter with clever people, and the ability to assist in and observe the process of research. At most research universities, the librarians, however well qualified, are not usually the academic equals of their faculty patrons, and their profession is the way they can continue to associate

with them. A basic satisfaction in all branches of librarianship, not just the academic, is being able effectively to assist individual people. The art of the librarian is the ability to understand the often inchoate needs of the users, and to understand the available material well enough to provide what can best meet those needs. This art can be practiced to some degree even in a grossly underfunded library, but the satisfaction from doing it right comes from having the materials to do it right.

Implementation of Open Access

Stevan Harnad titled one of the earliest essays in his *Amsci* forum, "The Urgent Need to Plan a Stable Transition" (43). Although a transition cannot be stable, it can be smooth, and the urgent need has become undeniable. It is easier to plan or to operate a system of OA than to make the transition to it. Advocates of OA probably need not concern themselves further with how to convince academic colleagues. The US and UK governments are almost simultaneously compelling academic authors for their own good to meet the need that they could all understood, but could not apparently treat with the appropriate urgency and coordination.

The summer of 2004 is too early for a discussion of the development, possible modification, fate, and further progress of these regulatory steps. The history of a previous attempt is given in note 8, and the need was just as clear in 1999 as it is now in 2004. My tentative hypothesis is that the renewed and increased interest is connected with the rise in biomedical literacy brought about by the increasing use of the Web. Even without OA, the extent of relevant material can be seen; and the desire to obtain access to it is then inevitable.

Apparently assuming that the previous attempt was prevented by the special interests of the publishers, the current UK and US proposals and their revisions go to great lengths to anticipate their objections and

provide for their protection; their success it not yet known. Possibly by the time this journal issue is published, the publishers will, once more, have prevented the general requirement for OA. Possibly most will have accepted the latest modification of the regulations. (45) Even after enactment the plans now proposed by the regulatory agencies can be improved after experience is gained. Despite the known weaknesses in the proposals, almost all advocates of OA presently urge their adoption unchanged, as the alternative is delay and possible further weakening while amendments are considered.

Even the conceivable failure of the regulations will not affect the desirability of OA to the authors, readers, libraries, universities, and funding agencies, though it will undoubtedly make the adoption slower. The net effect might even be somewhat positive. Some of the least desirable features of both regulatory proposals, such as the acceptance of embargoes, are there only to protect the perceived interests of the publishers. The other parties might do better with stronger plans that can be implemented by themselves, and not handicapped by politically expedient features.

The methods for adopting each of the three principal forms of OA outlined earlier in the article can be sketched independent of the fate of the regulations. The actual merits of each are not being discussed, only the specific difficulties with which that change must contend. Though it is attractive to appreciate the possibility of needing to provide for only a much shorter transition than previously assumed, it remains necessary to plan also for a slower one.

OA Journals

The simplest way of adopting OA Journals might seem the conversion of existing journals by their publisher. For large publishers, the strategy of converting one journal at a time would seem obvious, and at least one major publisher is trying that method. (46). At least one other large commercial publisher is

permitting voluntary "author-paid" OA for individual articles in all its journals, with the proceeds of OA used to decrease the subscription price. (47) A number of other publishers also offer immediate access to those articles whose authors pay an extra fee, but this is probably the first major implementation of linking it directly to the subscription price that all libraries will be offered. Similarly, both the leading current true OA Journal publishers offer reduced publication fees to libraries who become "members."(48) Libraries (and critics of OA Journals) reasonably see these as re-named subscription fees.

Smaller publishers, particularly society publishers producing only a few titles or even just one, face a much less tractable problem. They typically have very small reserves, and fragile finances. It may be possible for them to convert an article at a time through voluntary fees for OA. It probably will be easier for them to form cooperatives of some sort and share the risk of conversion, or, alternatively, to affiliate with larger society or commercial publishers. (49) The risk involved in converting an existing journal has led to the formation of new OA Journals as an alternative. Indeed, the planning for both PLoS and BMC provide obvious examples.

Many additional sources of income for OA Journals have been hypothesized and are discussed in the OAI publications referenced in note 42. The most frequently mentioned is the sale of print subscriptions. It is therefore interesting that PLoS proposes to supply a "reasonable" number of print copies to its members without additional charge. (50) The sale of advertising would appear a chimerical dream except for important journals in applied subjects such as medicine.

The cost savings of OA Journals through reduced overhead has been mentioned earlier. Unfortunately, little savings will accrue to libraries until 100% of journals are OA, and access controls and subscription management can be ended entirely. During the period when OA Journals and conventional journals coexist, and once OA Journals have entered into price competition, the criteria that will induce authors

to submit to one or the other are not clear. Where journals differ greatly in prestige, the author will, as always, choose the most prestigious one, and if s/he must pay personally, s/he will. Where there are journals at the same level with different costs, the choice may well depend on the amount of money available. Perhaps journals with low standards may try to continue as conventional journals, relying for their appeal on cost, while expecting libraries to support them.

How libraries can solve this problem is self-evident. What publishing outlet will then remain, if only journals with high standards survive? It might be possible to have a mixed system with an Article Database for such articles, and OA Journals for those with more appeal. Once price competition has begun, in the absence of published data we must determine by experience whether the commercial publishers can reduce costs sufficiently to compete. They appear to have generally double the cost of equivalent non-commercial publishers and expect double the profit. (51) Whether their managers and owners are prepared to adopt the less expensive working style and lower profit expectations that would be necessary is difficult to predict.

"Green" Open Access

The proposals of both governments assume that this will be the customary form. With such support, the need to convince a critical mass of authors no longer is a problem. The subject-limited NIH approach will presumably be the model for other subjects. There will remain a substantial number of articles financed without government or foundation support. It is hard to imagine that a journal would permit OA for the great majority of articles, while exempting those few. To permit is not to require, and there will remain the need for the authors to choose OA. The key incentive of OA to authors will remain--the greater visibility and accessibility. For those who do not care and whose organizations do not care, the

alternative of less-visible publication will remain. By that time the failure to provide OA in whatever repository is then customary will carry such a stigma that high quality journals might well require such posting, just as they require the deposit of certain types of experimental data. Eventually the meaning of government support may well extend to include all higher educational institutions.(52) Even without it academic administrators will inevitably seize upon publication with OA as a prerequisite to tenure, just as they now require peer-review.

Whether "Green OA" can be sustained long enough for the transition is unknown. This was a more critical question when it was assumed that the near-universal adoption of "self-archiving" would require many years; with the mandates, the time will be much shorter. The conventional journals upon which it depends will need to survive financially through the transition. This is the same "tipping-point problem" discussed in note 37. The result will depend upon the availability of library acquisitions funds, special government support, and price restraint by the publishers. For an imposed quick conversion, they will probably be sufficient. Whether they can survive indefinitely past the transition will not be discussed here. There has not yet been occasion to ask whether, when a journal's articles are 100% OA, a library will subscribe merely to gain the benefit of copy-editing~~?~~ (53)

Article Databases

The transition difficulty here is of persuading people to develop and use Article Databasethem, when "Green OA" offers an apparently cheaper and readily-adopted solution. Their intrinsic virtues will not be seen as sufficient while the expensive existing journal structure survives.

There is no real difficulty in the development of a new infrastructure for large-scale use. The use of a centralized repository in the NIH proposal provides an easy institutional basis for such development. Such databases may be needed, even during the transition, as a mode of publication for those fields too

small or specialized to support conventional or OA Journals. They may later be needed for all articles, but only after the journals supporting "self-archiving" fail to survive.

If the regulatory proposals fail, Article Databases provide an alternative route, as they can be organized even against the opposition of the publishers, provided the universities are prepared to adopt more flexible requirements for faculty publication. As mentioned, the academic world is very conservative.

Closing

I offer no conclusion. The one thing of which I am certain is that regardless of the nature or speed of change, and regardless of the degree to which the criteria for OA are met, the users and the authors will experience a period of increased confusion. The burden of helping them through this period will remain, as it does for all sorts of confusion in the use of the literature, with the library profession. We librarians always succeed to some extent, but this may mean only that no other group can do better.

Notes

All Web sites accessed July 25 - August 15, 2004 unless otherwise indicated..

(1) Specific references will not usually be given; otherwise, this article would be predominantly a bibliography. General reference is made:

a/ to the other papers in this issue.

b/ to the archives of *liblicense-l*, www.library.yale.edu/~llicense/ListArchives/ - .

c/ and to the archives of the *Amsci* list

http://www.cogsci.soton.ac.uk/~harnad/Hypermail/Amsci/index.html or

http://american-scientist-open-access-forum.amsci.org/archives/American-Scientist-Open-Access-Forum.html.

d/ A comprehensive discussion of the entire subject is to be found in the Report of the House of Commons Science and Technology Committee *Scientific Publications: Free for All?* http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/399/399.pdf.

e/ The different views are well summarized in the many articles in the *Nature Web Focus* "Access to the literature: the debate continues..." http://www.nature.com/nature/focus/accessdebate/.

f/ The official text of the NIH report was not available while writing this article, and reference was made to the version given by Peter Suber in "The open-access plan from the House Appropriations Committee" *SPARC Open Access Newsletter*, issue 75 (August 2, 2002), http://www.earlham.edu/~peters/fos/newsletter/08-02-04.htm. By my final revision, the NIH has just issued an official version; see note 45.

(2) I rely for many matters on my professional career and my many professional acquaintances among librarians, faculty, and publishers. (I do not name them, as they represent such a wide range of positions that I am not sure they would all thank me.) I express my particular obligation to the other contributors and to the referees, for it is in editing these articles that I have come furthest in appreciating the value of positions other than my own.

(3) To clarify some of the nomenclature used:

a/ *OAI* is the *Open Archives Initiative*, (www.openarchives.org/) It is best known for its protocol for collecting metadata about data files in multiple archives, providing the necessary interoperability for search engines, www.openarchives.org/OAI/openarchivesprotocol.html.

b/ *BOAI* is properly used for the *Budapest Open Access Initiative*, www.soros.org/openaccess/. It provides the most-used definition for OA, among numerous other services. OAI and BOAI are separate, though many of the same people are connected with both.

c/ The *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities*, http://www.zim.mpg.de/openaccess-berlin/berlindeclaration.html provides an alternative definition. Though related, it is not identical.

d/ The statements above are based on the earlier *Bethesda Statement on Open Access Publishing*, http://www.earlham.edu/~peters/fos/bethesda.htm. There seems a desire to use geographical names for distinction, possibly because the relatively small differences in content makes it difficult to use a more specific title.

e/ An unrelated manifesto is the *Washington DC Principles for Free Access to Science*, http://www.dcprinciples.org/statement.htm). Signed by most of the major US biomedical society publishers, it notably provides only for free access to "selected important articles of interest," with the others available after a period of several months, thus providing free access to scientific publications only after they have lost their first importance.

f/ The standard list of OA Journals is *Directory of Open Access Journals* (http://www.doaj.org) Note that its criteria exclude many titles that are often called OA Journals.

g/ The OA policies of the various publishers are listed unofficially in *RoMEO* There are two versions, based on the same data, but using different color-codes, one at Loughborough University (approved by

Stevan Harnad) called simply *RoMEO*, (http://www.lboro.ac.uk/departments/ls/disresearch/romeo/) and the other at the University of Nottingham in "SHERPA: Securing a Hybrid Environment for Research Preservation and Access," http://www.sherpa.ac.uk/romeoinfo.html.

(4) Eugene Garfield's *Daily Newspaper of Science* proposal, reprinted in http://www.garfield.library.upenn.edu/essays/v9p249y1986.pdf.

(5) Carol Tenopir and Donald W King, *Towards Electronic Journals.* (Washington DC: Special Libraries Association, 2000).

Gillian Page, Robert Campbell, and Jack Meadows, *Journal Publishing*. (Cambridge, UK: Cambridge Univ. Press, 1997).

William E. Kasdorf, ed. *The Columbia Guide to Digital Publishing*. (New York: Columbia Univ. Press, 2003).

(6) A notable exception is *Journal of Financial Economics*, which pays the reviewers if the reviews are completed promptly, http://jfe.rochester.edu/jfe_newfee.htm.

(7) An excellent informal discussion of providing material in the humanities can be found in Nicholas Basbane's *A Splendor of Letters: the Permanence of Books in an Impermanent World*, (New York: Harper-Collins, 2003). Presentations from a meeting of the American Council of Learned Societies, which highlight the similarities with journal publication, are in: Carlos J. Alonso, et al, "Crises and Opportunities: the Futures of Scholarly Publication," *ACLS Occasional Paper* no. 57 (2003), http://www.acls.org/op57.pdf.

(8) This model was the one proposed by Harold Varmus, former director of the NIH, and discussed in Rob Kling, Lisa B. Spector, and Joanna Fortuna, "The Real Stakes of Virtual Publishing: The

Transformation of e-Biomed into PubMed Central," *Journal of the American Society for Information Science and Technolo*gy 55, no.2 (2004):127-148.

(9) As this article goes to press, both the United Kingdom and the United States are considering making the deposit of such versions required for research articles if the research used government funding. Some private funding agencies are acting similarly. OA Journals will also meet this requirement. The version to be required is also not yet clear. At this time, the UK version envisions the use of IRs; the US version--so far applying to biomedical research only-- makes use of the PMC (PubMed Central) service of the NIH. (National Institutes of Health), http://www.pubmedcentral.nih.gov/. For the UK, see the Report cited in note 1; for the US, see the "Notice" in note 45.

(10) This is known as the Inglefinger Rule, named after its chief advocate Franz Inglefinger, the former editor of the *New England Journal of Medicine*.

(11). One example of such a journal is the *Journal of Financial Economics*, an Elsevier ScienceDirect title http://jfe.rochester.edu/jfepapers.htm; another with some added complication, is *Journal of Biological Chemistry*, a society publication, http://www.jbc.org/pips/index.dtl.

(12). See the archives of *Amsci*, note (1), for much more sympathetic discussions of the virtues and justifications of the different practices for posting other than the final publisher's version.

(13) For a full discussion of the issues read Sarah E. Thomas, "*Project Harvest*: The Cornell University Library's Proposal to The Andrew W. Mellon Foundation to Develop a Repository for E-Journals," (October 15, 2000), www.diglib.org/preserve/cornellprop.htm.

(14) http://*arXiv*.org/ covers high-energy physics and many related fields. A good discussion is in Paul Ginsparg's "Creating a Global Knowledge Network" (2001) http://*arXiv*.org/blurb/pg01unesco.html.

(15) In *Library Technology Reports* (July-August 2004) Susan Gibbons discusses comprehensively the use of such repositories for many purposes; their best uses may be for other things than journal articles.

(16) Much greater experience may very soon be gained from regulatory action, as discussed in note 9. Some, particularly publishers, view such extensive plans as precipitous in view of the limitations of current knowledge, http://www.dcprinciples.org/letter.pdf.

(17) The reader will notice the similarity to a Web log, sometimes called a blog. There is also a somewhat similar service, not OA,(BioMed Central) BMC's *Faculty of 1000,* www.facultyof1000.com/ .

(18) See http://www.virtualjournals.org/vjs/partpub.jsp. There is obvious potential for bibliographic confusion; however, each item in the virtual journals carries the designation of the original source journal. In less scrupulous hands than the APS (American Physical Society), there remains the possibility of double publication (and, if not OA, possible double payment.).

(19) This may remind some of the original methods for bibliographic searching in OCLC.

(20) The search engine OAIster, and a full description, is at oaister.umdl.umich.edu/o/oaister/.

(21) James Testa and Marie E. McVeigh, “The Impact of Open Access Journals: A Citation Study from Thomson/ISI, “ The Thomson Company (2004), http://www.isinet.com/oaj.

(22) Citebase at http://citebase.eprints.org and described briefly by Tim Brody in http://citebase.eprints.org/help/, and in detail in his "Citebase Search: Autonomous Citation Database for e-Print Archives"http://physnet.physik.uni-oldenburg.de/projects/SINN/sinn03/proceedings/brody/brody_sinn03_paper.pdf;

(23) CiteSeer at http://citeseer.ist.psu.edu/citeseer.htm and described in Steve Lawrence, C. Lee Giles, Kurt Bollacker "Digital Libraries and Autonomous Citation Indexing," http://citeseer.ist.psu.edu/aci-computer/aci-computer99.html; published in *IEEE Computer*, 32, no.6 (1999): 67-71.

(24) The classic study is Steve Lawrence, "Online or Invisible?" (2001). The postprint is at http://citeseer.ist.psu.edu/online-nature01/; the edited version is in *Nature*, 411, no. 6837 (2001): 521. Recent studies have greatly extended these results. See Stevan Harnad and Tim Brody "Comparing the Impact of Open Access (OA) vs. Non-OA Articles in the Same Journals" *D-Lib Magazine* 10, no.6 (June 2004), http://www.dlib.org/dlib/june04/harnad/06harnad.html,
and Michael J. Kurtz, et al., "The Bibliometric Properties of Article Readership Information," preprint at http://cfa-www.harvard.edu/~kurtz/jasist2.pdf, and *Journal of the American Society of Information Science and Technology* (2004), in press.

If non-OA material becomes more visible on the Web, its use also would be expected to be somewhat increased.

(25) The working standard is the *OAI* specifications as given in note (1).

(26). The most telling example is the withdrawal of an article from the Elsevier title *Human Immunology* because of ethnic prejudice expressed by the author (and not relevant to the scientific conclusions). The article remains in print copies, but has been deleted from ScienceDirect. See "Elsevier's Vanishing Act," http://chronicle.com/free/v49/i18/18a02701.htm for a discussion of this and other instances.

(27) An introduction to the extensive literature on interlibrary loan is Jean Murdoch's "A Comparative Study of Access to Journals through Subscription and Document Delivery" (1996), http:///www.icsti.org. The situation has not materially changed since then.

(28) This uses the wording of the BOAI, http://www.soros.org/openaccess/read.shtml.

(29) See http://creativecommons.org/faq for the official explanation of the various options. There are at least thirteen combinations, with more under development.

(30) http://lockss.stanford.edu/. Though open-source (essentially the software equivalent of OA), LOCKSS is copyrighted http://lockss.stanford.edu/softwarelicense.htm. The system provides a standardized interface and programs for maintaining multiple synchronized copies of electronic material. That it can be used for paid material need not prejudice us against it.

(31) Consider what would have been the result if in the 1930s it had been possible to concentrate scholarly material in the most technologically and bibliographically sophisticated country --Germany.

(32) This has been treated by numerous authors, but I am thinking of the elegant and comprehensive solution in Anne McCaffrey's *All the Weyrs of Pern*. (New York: Ballantine, 1991).

(33) For an indirect approach to the real cost savings, see Fenton et al. "The Nonsubscription Side of Periodicals" (2004) for the Council on Library and Information Resources, http://www.clir.org/pubs/reports/pub127/.

(34) The standard source for costs is the Wellcome Foundation Report, "Costs and Business Models in Scientific Research Publishing," (2004), http://www.wellcome.ac.uk/en/images/costs_business_7955.pdf. Interpretation is hampered because publishers consider their costs confidential. I consider that such confidentiality is intended to conceal either the high costs that imply inefficiency, or the low costs that indicate price-gouging.

(35) librarians.aps.org/2005pricing.html. It appears reasonable to use this as the benchmark for all scientific publishers.

(36) The lowest quality journals might compete by having very low production expenses, and reducing peer-review costs by accepting essentially all articles, thus lowering their quality further. Having very few subscribers, they already follow such strategy. As most articles get published somewhere (Tenopir and King, *Toward Electronic Journals*), the journals in the bottom tier are already as low in quality as possible.

Large institutions produce a greater proportion of journal articles than the proportion of journals they subscribe to, and would thus pay more than their present share (e.g., very few institutions can publish first-quality work in high-energy physics; many more subscribe to journals in the subject.) These large institutions have the most research grants, and smaller institution might find it reasonable for them to pay a larger share than at present.

An analogous problem is that industrial organizations produce relatively few articles, but have many subscriptions and would thus pay less than their present share. This is known as the "free rider problem." Many journals already provide for increased subscription fees from such organizations; similarly, they could be charged higher article publication fees.

(37) How high the percentage of OA material must be for a library to cancel is sometimes called the "tipping-point problem." It has been argued that no further libraries will drop subscriptions until 100% of the contents are OA-- because those libraries that might have done so already have, leaving only those research libraries that would retain a subscription to the end. However, many research libraries subscribe only because they must, under the terms of "big deal" licensing. Other libraries can be expected to follow Cornell, Wisconsin, and MIT in leaving such plans, specifically in order to discontinue some titles.

(38) Their earlier business plans relied on the mindless propensity of research libraries to renew regardless of price increases. The alternative current plans might be characterized as the "some rob you with a shotgun" approach of continued maximal pricing (see note 41). The subtler "some with a fountain pen" technique of relying on long term-contracts (see note 40) may prove successful for a slightly longer period. (Woody Guthrie, "Pretty Boy Floyd," 1940).

(39). The societies apparently take the position that if their prices remain lower than those of the commercial publishers, that is all that any library should ask. See their contributions to the *Nature Web Focus*, and , their testimony at the UK hearings, both referred to in note 1.

(40) Christine Baldwin's "What Do Societies Do with Their Publishing Surpluses?" http://www.alpsp.org.uk/news/NFPsurvey-summaryofresults.pdf.

(41).For example, Ian Rowlands, Dave Nicholas and Paul Huntingdon S*cholarly Communications in the Digital Environment: What Do Authors Want?* (2004), ciber.soi.city.ac.uk/ciber-pa-report.pdf . Also see Tenopir and King, *Toward Electronic Journals.*

(42) Book funds of a few fortunate libraries are supported by dedicated endowments. These are much more likely to be significant in the humanities than elsewhere.

(43) http://listserver.sigmaxi.org/sc/wa.exe?A2=ind98&L=september98-forum&F=l&S=&P=9712, September 2, 1998).

(44) All aspects of the financing of OA Journals are exhaustively covered by the papers from The Open Society Institute: "Open Society Institute Guide to Business Planning for Launching a New Open Access Journal," July 2003, http://www.soros.org/openaccess/oajguides/business_planning.pdf; "Open Society Institute Guide to Business Planning for Converting a Subscription-based Journal to Open Access," February 2004, http://www.soros.org/openaccess/oajguides/business_converting.pdf;

"Model Business Plan: A Supplemental Guide for Open Access Journal Developers & Publishers," http://www.soros.org/openaccess/oajguides/oaj_supplement_0703.pdf.

(45) As the final version of this article is being written, the NIH had just issued "Notice: Enhanced Public Access to NIH Research Information," Notice Number: NOT-OD-04-064, Release Date: September 3, 2004, http://grants.nih.gov/grants/guide/notice-files/NOT-OD-04-064.html (Accessed Sept.5, 2005).

It is no longer required that the manuscript be public "immediately in cases in which some or all of the publication costs are paid with NIH grant funds." However, "if the publisher requests, the author's final version of the publication will be replaced in the PMC archive by the final publisher's copy." Thus, on the one hand, the proposal is weakened further, and, on the other, an upgrade path is provided. I interpret this as an adjustment to meet objections from the publishers. At this time, it remains to be seen whether publishers consider this additional compromise to be sufficient. For additional differences, see Peter Suber's blog posting on September 4, 2004, http://www.earlham.edu/~peters/fos/2004_08_29_fosblogarchive.html#a109434642679402483. For their significance, see his expected later postings.

(46) Oxford University Press, with the journal *Nucleic Acid Research*. See http://www3.oup.co.uk/nar/special/14/default.html. There were special advantages in starting with this journal: the journal's quality is exceptionally high, OA for a special issue had been successfully tried, and the journal is in a field where the open posting of the actual nucleic acid sequence data has long been the practice, http://www.ncbi.nlm.nih.gov/Sitemap/index.html.

(47) Springer, which calls its plan "Springer Open Choice." The details of price reduction are somewhat complicated, and some of the usual elements of OA are somewhat different (e.g., the publisher owns the

copyright, and the article will be available only from the publisher's server) http://www.springeronline.com/sgw/cda/frontpage/0,11855,4-40359-0-0-0,00.html.

(48) The multilevel PLoS plan is described in http://www.plos.org/support/instmembership.html; the even more complex BMC plan is described in http://www.biomedcentral.com/info/libraries/instmembership.

(49) A great many societies have long used such arrangements for their conventional journals.

(50) PLoS memberships, http://www.plos.org/support/instmembership.html, footnote B.

(51) Wellcome Report, http://www.wellcome.ac.uk/Pen/images/costs_business_7955.pdf.

(52). There is certainly precedent in the form of student loans and similar mandates.

(53) That it has apparently proven stable in high-energy physics may not be generally applicable. A research program in this field is impossible except for a well-funded institution with large grants, and the principal publisher has shown rare price restraint. (see note 35).

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