

The “Green” and “Gold” Roads to Open Access: The Case for Mixing and Matching

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Recent discussions on Open Access (OA) have tended to treat OA journals and self-archiving as two distinct routes. Some supporters of self-archiving even suggest that it alone can bring about full Open Access to the world’s scientific literature. In this paper, it is argued that each route actually corresponds to a phase in the movement toward Open Access; that the mere fact of self-archiving is not enough; that providing some branding ability to the repositories is needed. However, doing so will eventually bring about the creation of overlay (or database) journals. The two roads, therefore, will merge to create a mature OA landscape. *Serials Review* 2004; 30:315–328.

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Historically, Open Access (OA) emerged largely as a reaction to the fast increasing prices of scholarly and scientific journals. The concern, first expressed by librarians, was that the high prices of journals obviously limited access by economic means. Gradually, the question has evolved, and issues of access have been increasingly distinguished from issues of costs (or affordability). In parallel, Open Access has been increasingly focusing on articles, beside journals. A number of reasons have contributed to this gradual shift: scientists as readers tend to pay more attention to articles; digital publishing maintains the journal titles mainly for branding reasons, but the bundling strategies used by several major publishers tend to rest about equally on number of titles and number of articles; the very

dynamics of the “Open Access” movement, as we shall see, have also contributed to give greater prominence to the article as a unit.

“Open Access” became a movement after a meeting was convened in Budapest in December 2001 by the Information Program of the Open Society Institute. That meeting witnessed a vigorous debate about definitions, tactics, and strategies,¹ and out of this discussion emerged two approaches which have become familiar to all observers, friends, or foes. First, existing journals find a way to transform themselves into Open Access publications, or new Open Access journals are created. Second, authors and/or institutions “self-archive” published peer review articles or a combination that then becomes the equivalent of published, peer-reviewed articles.

The first strategy amounts to a reform of the existing publication system. It fundamentally relies on journals as its basic unit, and it simply aims at converting or creating the largest possible number of Open Access journals. BioMed Central, a commercial operation, has played a crucial pioneer role in this context. More recently, it has been joined by the nonprofit Public Library of Science (PloS). This strategy obviously threatens the “reader-pays” business plan² and therefore immediately faces the issue of financial viability, with the result that spirited debates have been generated, largely centered on the viability of the “author pays”³ model used by BioMed Central and the Public Library of Science.

In other parts of the world, a number of research councils or academies supported by governmental, public, funds have also begun transforming their

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Several people have had a very direct and most precious input into this paper and I would like to thank them for having taken the time to read this little study. I want also to thank them for having occasionally saved me from my own foolishness. In this group, I would like to include Fred Friend, the well named, David Prosser, Colin Steele, and Ray Siemens. I would also like to thank the editors and referees for their useful and important comments. Last, but not least, I want to mention my very dear Frances, better known to most librarians as Frances K. Groen; please accept this modest expression of my fullest gratitude.

journals into Open Access publications.⁴ In such cases, the issue of financial viability simply rests on the will of governments to support scientific publishing—a point that varies very much with each country and circumstances. While in the United States, such governmental intervention may sometimes seem problematic, especially from the perspective of the publishing business, in other parts of the world, this is accepted and practiced as a matter of course. However, what is at stake in all countries is how to integrate the publication costs within the research costs, given that the latter are largely supported by public money (including the United States, this time).

Deceptively simple to describe—hence its rhetorical seduction—the “self-archiving” strategy appears much more complicated and subtle when approached conceptually. It both relies on, and forgets about, journals. Generally speaking, it rests on the preeminence of the article as fundamental unit. From this perspective, journals matter only to differentiate between peer-reviewed articles and non-peer-reviewed publications and to provide symbolic value: If I archive an article published in *Cell*, it still benefits from the *Cell* branding effect. Therefore, journals contribute to the **impact** of individual articles by their prestige—a dimension generally associated with the notion of “impact factor.” As becomes obvious from these remarks, journals are useful mainly to the **researcher-as-author**; the **author-as-reader**, on the other hand, cares mainly about articles and pays attention to journals only to the extent that they may help guide his/her reading choices. “Self-archiving” consequently proceeds **in parallel to**, and largely independently from, journals. It acts “as a *supplement* to toll access” and not as a substitute.⁵

Finally, and seen from the perspective of “self-archiving,” journals might become (negatively) relevant again only when and if they implement policies that make “self-archiving” difficult or even impossible.

In summary, “self-archiving” is a strategy that has been designed by researchers and for researchers, with little interest for any other player involved in scientific publishing. It simply aims at improving the research impact of established scientists and little else. If it should help (or hurt) other categories or people, so be it, but it is neither its concern nor its worry. It is a tough-minded vision, narrowly focused on scientific communication. Supporters of this vision are essentially interested in only one thing: extracting every ounce of impact a published article may hope to claim.

“Green” and “Gold” Open Access: Are They in Competition?

Various Internet lists (e.g., Liblicense-L discussion list or American Scientist Open Access Forum) have been the site of vigorous discussions about the two strategies identified in the original Budapest meeting and now regularly labeled as the “green” and the “gold” roads to Open Access. This colorful vocabulary emerged in a study led in the United Kingdom under the name of

Rights Metadata for Open Archiving (RoMEO) and now located within another project called Securing a Hybrid Environment for Research Preservation and Access (SHERPA).⁶ Essentially, “gold” refers to Open Access **journals**; green refers to publishers that allow some form of article “self-archiving.”

Sometimes shades of green have been carefully distinguished: pale green limits “self-archiving” to pre-prints only, dotted, or some form of mitigated; green limits “self-archiving” to postprints; and solid green is reserved for publishers allowing both preprint and postprint “self-archiving.” Publishers that allow no form of “self-archiving” are often described as gray publishers (personally, I would have expected red but perhaps I am too influenced by traffic lights to the point of confusing “gold” with orange).

Whatever the perspective adopted, the “gold” and “green” strategies are generally treated as parallel approaches by both sides, and little attention has been paid to the ways in which they might relate to one another. When perchance their relationship is addressed, it is tangentially and mainly in the suggestion that they might be in some form of competition. This has been particularly true of the “green” side.

Treating the “green” and “gold” approaches as separate and in competition, explicitly or implicitly, is not useful; worse, it is potentially divisive and could ultimately weaken the Open Access movement. Far from being essentially separate and in a potential state of competition for resources, I shall argue in this paper that the “gold” and “green” approaches can actually support each other, and ought to. Rather than favoring one approach exclusively at the expense of the other, Open Access promoters should design better strategies by making use of both approaches simultaneously. Only in this way can Open Access become a reality within a not too distant future. This is the challenge for this paper.

Two very recent events help understand this issue and they have also provided an interesting backdrop to this whole question. For one, the appearance of “Scientific Publications Free for All” by the Science and Technology Committee of the UK House of Commons⁷ immediately gave rise to a number of important comments and reactions. Less openly, but quite significantly nonetheless, the House Appropriation Committee in the United States, in its recommendations for the 2005 National Institutes of Health (NIH) budget, included language about the need for Open Access. That very language is reverberating within supporters as well as within publisher associations even as I write these lines.⁸ Together, they give fascinating insights into the ways in which Open Access is actually progressing.

The “green” side has claimed to be particularly pleased with the UK Commons Select Committee Report, and it has certainly taken advantage of its publication to clamor its preference for “self-archiving.” Its summary of the UK Commons Select Committee has been presented in a way that Stevan Harnad, its most representative spokesperson, calls an “order of concreteness.” This “order” really corresponds to the

hierarchical scale of objectives favored by the “self-archiving” side. He summarizes the report’s recommendations as follows:

1. Mandate author–institution self-archiving of all UK-funded research output (and fund and support the practice, as needed).
2. Fund author–institution costs of publishing in OA journals.
3. Encourage the transition to OA publishing and study it further.⁹

This reaction to the British Report also praises the members of the Select Committee for “getting it,” as many would say colloquially. “Getting it” in this case really means that, according to the “green” side, the Select Committee put the accent exactly where it should, namely, at the first point cited above; it also claims that the report has placed other possible characteristics of Open Access in a hierarchically inferior position. For the “self-archiving” side à la Harnad, point one is all that Open Access really needs—a thesis he has constantly supported for about a decade now. He particularly praises the fact that this report’s specific recommendation to Parliament is the only “mandatory” recommendation (hopefully this is not an oxymoron) while points two and three are presented as recommending recommendations (hopefully this is not a tautology). In short, the Report vindicates his own position, or so he claims.

Why is the “mandating” part so crucial? To answer this, a fairly long detour is needed. Let us begin by a precise outline of the “green” argument:

1. Librarians initially blew the whistle on the fact that something was amiss in scientific communication when they began observing steep increases in the prices of journals.
2. They should be thanked for that, but alas, this particular angle of analysis also favored a certain degree of confusion between access and affordability.
3. While affordability has been the traditional, library-based, route to access, access can be analytically distinguished from affordability.¹⁰
4. In other words, access can be treated entirely separately from science publishing and its economic characteristics. This is the road that researchers (as distinguished from librarians) ought to follow.
5. If researchers carefully train their sights on the issue of access and nothing else, they can issue themselves the following challenges: How can one provide free access to refereed articles that are locked up behind a price barrier in the published, refereed, journals and that are owned by the publishers of these journals? How can this goal be achieved without relying on having them bought up by a proxy organization such as a library?
6. The solution to this problem begins with technology: Without digital versions of the articles and the Internet, the problem would have no practical solution. However, technology is only a necessary condition for the existence of a solution. Beyond the

technology, human agency is also needed: Authors (mainly) are asked to “self-archive” their articles.

7. The point for authors is not to engage in some sort of civil disobedience, for example, by breaching intellectual property laws. Instead, one must either obtain permission to “self-archive” or find loopholes in intellectual property laws (and possibly journal policies). If explicit permission to “self-archive” is not available, one can still “self-archive” the article as submitted first to the publishing journal and then in a separate file “self-archive” the corrigenda that transform the submitted version into the actually published version.
8. More recently, a number of publishers have simply decided to allow authors to “self-archive” either preprints or postprints or both. The willing or “green” publishers (all shades of green conflated) control around 85% of the (surveyed¹¹) scientific titles published in the world.¹² The somewhat complicated maneuvers associated with point seven above are mentioned as little as possible. They remain necessary, however, for the pale “green” publishers who accept only the archiving of preprints.¹³

So far, so good! However, the issue becomes more contentious when the “self-archiving” side extends the argument to include the “gold” road. It does so as follows:

9. The other possible approach to Open Access is through the publishing of Open Access journals (the “gold” road).
10. A survey of the present situation reveals that Open Access journals cover around 5% of the titles (or number of articles) at best. It also shows a slower growth than the number of articles accessible in open repositories.
11. The reason for this is that the “gold” road is costly, risky, and inefficient.¹⁴
12. Consequently, anyone genuinely interested in Open Access should recognize that supporting the “gold” road is a somewhat ineffective effort at best.¹⁵ At worst, it delays success by diverting resources to an inferior strategy,¹⁶ thus intimating that the two roads, in actuality, compete for rare resources and that money should be diverted to the “gold” road only in proportion to its (very limited) usefulness.

Although this argument appears watertight, it is pragmatically flawed. The problem with the self-archiving argument is that, until now at least, its results are unimpressive. The reason is relatively simple to identify: The “self-archiving” side describes its own strategy as a smooth, yet anarchic, way to Open Access. Beyond the fact that smoothness and anarchy do not couple easily, we are going to see that it creates documentary lacunae that are fatal to the whole project. As a result, librarians looking for credible alternatives, understandably, have not been convinced. Yet they often are the ones left with the duty of organizing institutional repositories. More

important still, a majority of scientists have not been swayed either.

Before examining in more details why this is the case, let us revisit the issue of the relative importance of the two roads. This is important because, it seems to me, the situation is often portrayed in somewhat disingenuous terms. For example, the number of articles published in “gold” journals (5%)—and these are actual numbers of Open Access articles—is often contrasted with the total number of articles published under “green” titles (85% or more), without any mention of the fact that a majority of those are not actually and presently available in Open Access repositories. The reality is more modest. Harnad himself is more careful and generally speaks in terms of percentage of articles available to self-archiving; however, the direct quantitative comparison between “gold” and “green” is often implied, intimated, suggested, connoted, or whatever, in many of the discussions on Open Access. Harnad himself, when he faces this issue squarely, estimates the ratio between the “green” archived articles and the “gold” articles to be roughly three to one in favor of the former¹⁷—a result that, if real, is far from insignificant, but quite different from the 5:85% ratio.

This said, a more fundamental problem remains: Why are repositories not growing at the rapid pace one could hope for.¹⁸ This is the topic of the next section.

Open Access vs. Accessibility: A Potential Source of Confusion

Intuitively, the advantages of Open Access appear obvious: Better access should enhance more reading, and more reading should enhance more citations so that any right-thinking scientist ought to respond positively to such strong incitations. Spontaneously, he should rush and “self-archive.” No mandating should even be needed. The reality, however, is a little different. Even defenders of “self-archiving” have had to admit this:

Institutional archives are being created, but need to be filled more quickly, by authors, with research journal papers. Attracting authors and their papers requires evidence of services that will improve the visibility and impact of their works.¹⁹

By “evidence of services,” the authors of this declaration presumably mean that the increased visibility and impact brought about by Open Access need to be made . . . well . . . more visible. Is it just a question of advocacy, or are there other factors come into play that make most scientists neglect the impact advantages linked with “self-archiving”?

Let us begin with the question of impact. Impact, let us remember, is generally measured by the total number of times a given article is cited from the moment of its publication.²⁰ Discipline-based studies have now confirmed what common sense suggests. Open Access does create more opportunities for more downloads and more “reads”; these parameters, in turn, correlate positively with more citations. The first notable study

in this regard was Steve Lawrence’s article, which appeared in 2001 and which, thanks to the number of times it has been quoted, has itself enjoyed quite an impact.²¹ Lawrence concludes his study in the following manner:

Free online availability facilitates access in multiple ways . . . To maximize impact, minimize redundancy, and speed scientific progress, authors and publishers should aim to make research easy to access.

Note in passing that Lawrence quietly moves from “free online availability” to “research easy to access.” The two are not quite equivalent. The difference, as I am going to argue, amounts to a crucial distinction that must be drawn between Open Access and accessibility.

Since the appearance of Lawrence’s article, several other studies dealing with astrophysics, mathematics, or computer science have also underscored the impact advantage of articles placed in Open Access repositories.²² What emerges from these subject-based studies is that, **all things being equal**, Open Access articles do present a significant impact advantage over toll-gated articles. Impact coefficients of two to five have been mentioned, which is indeed impressive.

These results, I believe, should be broadly accepted and I strongly suspect that more studies will continue to bolster this important claim. However, we must also remember the “all things being equal” clause and once again carefully distinguish access from accessibility. The task now is to define “accessibility” as precisely as possible.

We generally oppose toll-gated access, i.e., access conditional upon sufficient financial resources, to Open Access situations; however, in practice a research scientist enjoys what amounts to “Open Access” to everything in his/her library—hopefully this is a significant fraction of the scientific literature. That is, after all, why libraries exist in the first place. How significant a fraction? This varies with each library and its financial resources, but Open Access it is, and thanks to the library.

As a result, and from the users’ perspective, genuinely “Open Access articles” actually compete with other documents that, although very costly, appear nevertheless to be in Open Access as well. In effect, **the end user, the scientist-as-reader, is being subsidized** and thus benefits from a situation of artificial (and partial) Open Access. Obviously, this greatly distorts the market conditions and it artificially allows toll-gated articles better to compete with Open Access articles—an ironic point that was obviously misunderstood by the drafters of the recent open letter to Dr. E. Zerhouni when they complained about undue governmental intrusion in the private sector.²³ Without governmental intrusion (in the form of support for libraries which produce the conditions for subsidized readers), the whole business plan of most scientific publishers would simply collapse. In the present, distorted, market conditions, the competition between Open Access articles and toll-gated articles simply cannot be played

out on the plane of price comparison; if it is to be played out at all, it will be on the plane of accessibility and value.

Accessibility

Let us start with accessibility. It is more complex than a mere opposition between open and toll-gated access. For example, it can involve the ease, including psychological ease, with which a reader both retrieves information and navigates in it. If Reed-Elsevier prefers flat rate, bundling approaches to pay-per-view tactics, it is to enhance the accessibility of its products, not their access. If price is an issue, a concern, each time an article is accessed, use is inherently deterred because the reader is inhibited by constantly thinking about costs. As a result, accessibility may actually decrease while access remains constant.

From another perspective, a significant part of Andrew Odlyzko's paper (cited in note²²) actually deals more with the ways in which accessibility can be improved than with Open Access per se. These ways include factors apparently as trivial as the amount of time needed to reach a document—and differences measured in minutes have been shown to be quite significant. Delays in access drastically reduce use even though access per se is not modified.

Yet another way to approach the question of accessibility is to ask: what is more accessible? A large collection of articles licensed by a library (or a consortium of libraries) that is readily exploitable through an easy-to-use, easy-to-reach, portal, or scattered collections of open access articles, more or less systematically (but how systematically?) harvested, and perhaps drowned in collections of very uneven value. Is this not the situation that presently emerges with OAIster, for example?

Clifford Lynch writes something very important in this regard:

I think we are very shortly going to cross a sort of critical mass boundary where those publications that are not **instantly available** in full-text will become kind of second-rate in a sense, not because their quality is low, but just because people will prefer the accessibility.²⁴

In the same pragmatic spirit of ease of use, Andrew Odlyzko reveals a trade secret that I have also given to my own students (and I thought I was so smart): if you search information about recent books, use Amazon; it is far better and much more user-friendly than any library system. This tactic is based on a feel for accessibility rather than a concern for access.²⁵ Both Odlyzko and Lynch are talking about accessibility, not Open Access per se.

The point of all this is that accessibility is wider than Open Access and encompasses it; Open Access derives its real value from its ability to improve accessibility. However, other approaches can also improve accessibility. Yet, if all other things are equal, Open Access will come ahead of toll-gated publishing. However, if toll-gated access is artificially subsidized as it is presently, and if commercial publishers design good retrieval and

navigational tools, then Open Access documents may actually look less attractive to scientists than their commercial counterparts. "All other things being equal": there is the rub! Open Access has to contend with more than toll-gated articles; it must also compete with various enhancements to accessibility. And let us remember the bitter irony of the situation: The very librarians who profess pro-Open Access positions are presently working very hard to ensure that toll-gated articles may enjoy an even playing field with Open Access articles by artificially removing all economic barriers to the reading scientist. No wonder if the library profession sometimes appears caught in a prisoner's dilemma, as Ken Frazier put it so aptly a while back while discussing some of the downsides of the "big deals."²⁶

Commercial and some association publishers have been quick to seize and capitalize upon new possibilities offered by the digital world, in particular the capacity to move seamlessly from a bibliographic tool to a full-text article or from a citation to the cited text. In short, commercial publishers seem to have read Clifford Lynch closely and taken his advice very seriously. Ventures such as CrossRef, Ex Libris SFX, and others²⁷ aim at creating smooth navigational spaces that enhance accessibility; meanwhile, the user remains largely and comfortably blind to the costs of this process thanks to those (oh so discrete!) librarians.

On the Open Access side, similar efforts are being pursued to improve the accessibility of peer-reviewed research papers. It must be remembered, however, that any significant advance on the accessibility front on the Open Access side will quickly be taken up by the toll-gated side as well because, to be effective, such an advance must be openly available to all. The reverse, however, is not true. Tools useful for the stitching together of disconnected archives may be proprietary, putting Open Access endeavors at an economic disadvantage.²⁸

A case in point is the Open Archive Initiative-Protocol for Metadata Harvesting protocol (OAI-PMH). OAI-PMH is absolutely essential for the Open Access depositories because they are evolving in a completely decentralized fashion, but OAI-PMH is equally applicable to open and closed collections²⁹ as Carl Lagoze sometimes explains in his conferences on OAI-PMH.³⁰ This is because OAI-PMH really deals with accessibility issues, not with Open Access per se.

Accessibility tools such as ParaCite exist and they have appeared on the Open Access side, but ParaCite is still experimental. Therefore, commercial offerings to improve accessibility appear more developed than the tools available for Open Access repositories. As a result, thanks to the subsidized reading context of scientific publications, commercial publishers can credibly defend the argument that their literature, although toll-gated, is more accessible to researchers today than are articles placed in Open Access, at least in the richest institutions of the richest countries.

How do scientists, research institutions, or granting agencies react to the issue of accessibility? All of them obviously want to maximize impact, but they may not

want to do it in exactly the same way or for the same reasons. A granting agency, especially if it is publicly financed, likes to demonstrate a degree of public service beyond the support of research scientists. For such an institution, impact will mean more than getting citations; it will also mean demonstrating that Open Access increases the number of readers and attracts individuals from wider walks of life (various levels of education well below the research level, for example, or patients in the case of medical research). As many of these different kinds of readers will not have the benefit of a research library, their access to the scientific literature is not artificially subsidized. This means that without Open Access, it is simply inaccessible.

A private foundation will not react very differently: it too wants to enhance its social function (and public image). Much of the discussions around the granting agencies [Wellcome Trust, Hughes Foundation, Max Planck Gesellschaft in Germany, INSERM (The French Institute of Health and Medical Research) in France, and more recently, NIH] confirm this favorable attitude. A research center, especially if it is publicly supported, or a university will also listen to these kinds of arguments. All will tend to view Open Access in a positive light. Indeed, a simple examination of the list of signatories to the Budapest Open Access Initiative shows widespread acceptance of Open Access ideas within the universities and the research centers.³¹

Value

Scientific associations often display ambivalence to Open Access. Most of the time it is for economic reasons: Demonstrate to us, they say, that a good business plan exists for Open Access and we will consider it. But other, more surprising, objections are sometimes raised as when the Royal Society of Chemistry claims that scientists often favor a limited number of “quality” readers and laboratories over maximum dissemination.³² However surprisingly the issue of accessibility is recast, it recurs nonetheless. Where the issue appears more complicated is at the level of the researchers. The lack of enthusiasm for institutional repositories displayed by scientists and scholars is an interesting symptom.

The justifications that scientists sometimes use to express skepticism can be a little surprising, as when authors advance the spurious fear of “information overload” argument. But “information overload” is not really the issue: Open Access can accommodate filters, hierarchies, and branding just as well as toll-gated contexts. BioMed Central and the Public Library of Science (PloS) offer good examples in this regard. In fact, the whole point of the Public Library of Science is to demonstrate that extremely high ratings can be achieved with an Open Access journal, and Open Access journals therefore can help focus reading as well as toll-gated publications.³³ Value in scientific publishing is measured by content, not by price. These fears appear even more pronounced on the “self-archiving” side, but in reality, they are just as imaginary: The traditional value signals are still operational since “self-

archived” articles are peer reviewed and therefore can exhibit a title with some branding ability. The factors that inhibit the progress of Open Access obviously lie elsewhere.

A partial explanation to this puzzle may be found in a remark recently expressed by Michael Kurtz. In a note devoted to the positive (and important) correlation between “reads” and number of citations, he concludes by a little remark that has not attracted much attention so far:

The fact that many of the inaccessible papers are in the ArXiv probably does not change this much, as the additional effort involved [from leaving ADS’s³⁴ unified resource to go to another system] is a great deterrent.

What Kurtz is alluding to is that tools providing the standard, accepted, research pathways and corresponding to the accepted research tactics also provide a level of **accessibility related habits** and these are not changed easily or lightly. Astrophysicists essentially use one single source to do their research. Sometimes some of the articles found in this manner cannot be accessed within the familiar research environment. Could these articles have been accessed nonetheless? In some cases, yes, states Kurtz, and simply by going to ArXiv; however, doing so would require changing the search context (and habits) of scientists and would force them to move beyond their favored research aid, in this case ADS. Kurtz’ comments on this point is quite simple and direct: “the additional effort involved is a great deterrent.”³⁵ In other words, even when articles can be accessed, a significant difference in accessibility is sufficient to reduce usage.

Librarians know Michael Kurtz’ point well: being formally able to access a document is simply not enough; the availability of attention (and therefore time) must also be taken into consideration. In particular, if, through some familiar method, a scientist finds what appears to be “enough” information and does so within a limited amount of time, chances are that the search will stop there.

The point of all this is that a typical scientist seeking information is a prime subject for what has been called the “attention economy.”³⁶ In a world with enormous amounts of information, the limiting factor is not information itself; it is the processing capacity of the brain multiplied by the time that can be devoted to a particular task, reading for example. Typically, a scientist or scholar will begin interrogating some bibliographic tool, e.g., the Web of Science. In the ideal situation, the scientist would immediately access the search results by simply clicking on the references. Often, this is not possible simply because the local library does not have a subscription to the relevant journal. At that point, rather than trying systematically to gather the whole collection of relevant articles, the scientist reads what is most readily and rapidly available. After all, the information found in that incomplete collection of articles may be enough. The rest is then neglected unless really glaring gaps subsist. The eyes of the beholder are crucial here.

Andrew Odlyzko does not say anything fundamentally different when he concludes:

Also, the reactions to even slight barriers to usage suggest that even high-quality scholarly papers are not irreplaceable. Readers are faced with a ‘river of knowledge’ that allows them to select among a multitude of sources, and to find near substitutes when necessary.³⁷

Odlyzko’s remark suggests that a scientist or a scholar will typically find enough useful information to justify writing what he/she wants to write rather than first researching a field very carefully in order to survey what he/she can usefully add to the field. This may well be one of the unexpected (and not entirely welcome) consequences of the “publish or perish” institutional atmosphere. It may also derive from Bradford’s law of scattering: Exhaustively gathering the literature on any question would require almost infinite time and resources.³⁸

For the sake of the argument, let us assume that the information found in a first hunting expedition is not sufficient. At this stage of his/her work, the author will probably adopt one among the following tactics. The traditional approach (at least from the librarian’s standpoint) would be to make use of interlibrary loans. Since this is a relatively time-consuming operation, a scientist may decide to proceed more directly. If there is an Open Access repository in a relevant discipline, he or she may take a look at it. But please note two details: First, the scientist’s second move is at best a second order recourse; furthermore, in most disciplines, such repositories simply do not exist and institutional repositories cannot substitute for them. Finally, search engines for Open Access collections are not widely known among researchers. And when they are known, they are often considered with some degree of skepticism.³⁹ In general, **and this is the fundamental obstacle**, Open Access articles are not yet sufficiently part of existing research strategies. And the consequence is direct: **If Open Access repositories do not appear very visible and/or credible within a given arsenal of research strategies, why should a scientist spend time to “self-archive” his/her works in what can only look like a dump—OAI-PMH notwithstanding?**

Of course, there is still the recourse to brute force and this is what the use of Google is all about. I can imagine many librarians’ eyes rolling at this point—how can one trust the results acquired through Google, goes the mantra—but not only is this approach common, it actually works rather well.⁴⁰ What does Google yield? It may lead to some Open Access site, such as a personal page or an institutional repository. Google’s discussions with the DSpace network also demonstrate that the owners of the famous search engine are aware of the possibilities. It may also lead to an e-mail address: from there, requesting the interesting article directly is easy. From personal experience, I know this approach works rather well; yet, it has little to do with Open Access but has much more to do with the extraordinary facilitation of communication—accessibility all over again—the Internet provides. E-mail is still the “killer app” of the Internet and improves the accessibility of articles, toggled or not.

As already mentioned, there are steps I do not see being taken very naturally by anyone at this stage of Open Access development: going to OAIster, for example.⁴¹ Why are researchers not using OAIster as a matter of course? The reason is quite simple. Although they would find a collection of texts—a large collection of some 3,420,891 records from 327 institutions—they would also discover that the value of these documents is difficult to ascertain.⁴² Even though OAIster limits itself to academic institutions, the value of what can be found in such repositories remains unclear. On this point, Harnad is completely right when he recommends building archives explicitly limited to peer-reviewed articles.⁴³ A scientist’s search is already complex and uncertain enough as it is. There is no need to burden it further with the noise from other academic activities such as teaching, lab reports, and gray literature. The case of preprints is interesting here, however green they may be, because they too fall in the same murky category and should be stored separately. One of the basic difficulties of “self-archiving” is that, given its necessarily distributed nature—consequence of the anarchic nature of the process—it becomes very difficult to mandate the form in which self-archiving will actually take place. For institutional repositories, the urge to fill it rapidly may translate in motley collections of documents that will serve no one.

The success of repositories will be much more probable when scientists know better what to expect. Then scientists may decide to spend some of their valuable time hunting through these collections. In the case of institutional repositories, I do not remember ever seeing a study discussing their effect on impact. This lack of evidence creates a climate of uncertainty and may also account for the hesitations marked by scholars and scientists. If they are not intimately convinced that there is a clear and present advantage to “self-archiving,” they will simply go by the constraints of an “attention economy” and forfeit going that extra step.

This efficient use of time, sometime labeled as “inertia,” will be even more tempting in the case of a pale green publisher where the procedure to self-archive is so much more complex as to become totally unrealistic. Indeed, let us ask some crucial questions in this regard:

1. How many authors will go through the tedious exercise of creating the corrigenda allowing moving from the submitted paper to the published paper? If people do not appear ready simply to “self-archive” their postprints when they have a green light to do so from the publishers, they will be even less ready to “self-archive” their preprints plus the corrigenda, especially if they harbor real or imagined fears about possible negative reactions from publishers and editors (i.e., powerful colleagues).⁴⁴
2. How many readers will go through the tedium of making sure they have the right statement to use and cite in their own work when they have to deal with a main file and a list of corrigenda?

Given all the issues discussed here, in particular the question of accessibility (as distinguished from access), it becomes pretty obvious why “self-archiving” in simple institutional repositories will not be enough to create a really Open Access science communication system, even with OAI-PMH present. No wonder, therefore, that scientists are not rushing to self-archive; no wonder either that the “self-archiving” side has welcomed mandating “self-archive” so enthusiastically, even though it has nothing to do with the impact advantage argument. If research institutions, for example, through their promotion and tenure procedures, and the granting agencies, through their evaluation procedures, favor documents in Open Access in some ways, then Open Access will indeed progress. But one must understand that it is argument totally independent from the impact advantage argument. The two simply work in the same direction even though the presence of the latter argument (mandating) makes the limits of the former (impact advantage) more visible. It must be added that the mandating argument is a political argument, working therefore at exactly at the same level as the political arguments needed to convince various institutions to support Open Access. “Self-archiving,” despite appearances, needs politics as much as the “gold” road.

It is at this point that the reader must remember an important detail: For the “self-archiving” side, the goal is maximum impact and little more. Open Access is really nothing more than one instrument among several others capable of moving closer to this aim. Present toll-gated journals with subsidized reading on the part of the libraries also contribute to improving impact and this is the reason why some “self-archiving” advocates seem to live quite comfortably with the present publishing system, however unjust it may be for scientists who have not yet managed to establish themselves, for example, for economic reasons.⁴⁵ Harnad explains in the following way:

Even if the growth of the open-access versions is destined eventually to reduce the demand for the toll-access versions, that is a long way off, because self-archiving proceeds gradually and anarchically, and journals cannot be cancelled while only random parts of their contents are openly accessible.⁴⁶

In short, self-archiving, being anarchic in nature and incomplete in essence, works as a sort of impact bonus for those scientists willing to do it. The anarchic nature of the process almost certainly guarantees its incompleteness. Worse, it becomes difficult to know where the incompleteness will appear. As a result, for most researchers, Open Access repositories will probably not figure prominently in their literature search strategy. Moreover, in many disciplines, scientists cannot put too much faith in the capacity of Open Access to enhance their impact. Alas, the evidence that supports the impact advantage thesis is still too new and limited to be part of the scientists’ common knowledge.

In the end, who can be interested by institutional repositories and “self-archiving” in its present form? Some are because they really and deeply believe in the

sharing values that are at the foundation of scientific exchange, and that is wonderful. That argument is rarely, if ever mentioned by the supporters of the “self-archiving” strategy, but then altruism does not appear to be their forte. On the other hand, others may do so because of a strong obsession with their scientific status. They do not want any impact-loss and therefore “seek to eke,” so to speak. In this case, the “eking” is aimed at the last ounce of prestige that can be extracted from their writing. From this perspective, Open Access “self-archiving,” even though the results are “iffy” at best, cannot hurt indeed. However, my impression is that very good people do not really need this step; very mediocre people will not benefit from it anyway. Only a few average scientists might benefit a little from this strategy—hardly an earthshaking result. This is enough, in any case, to understand why self-archiving seems to generate so little enthusiasm at present.

How Should We Build Open Access?

Does all this mean that Open Access will not work? Of course not! It does not even mean that “self-archiving” is fundamentally a bad idea. It only means that claiming that the only or, more modestly, the best road to Open Access is “self-archiving” is excessive, not to say wrong. But it also means that building Open Access collections must be thought out more cautiously than has been the case until now. Finally, it means that we had better think about ways to mix and match the “green” and the “gold” roads to Open Access if we want to ensure success and accelerate the growth of Open Access.

The one recurring theme that emerges from the previous discussion is value and accessibility is but a tool to enhance it. When they play the part of an author, scientists obviously seek value (i.e., impact). Value is perhaps the single most important element for the Open Access movement but in dealing with value the Open Access movement must not forget that scientists are also readers. At that precise moment, the “attention economy” kicks in. Scientists look for value there too, but it is search and retrieval value that is of the essence in the scientist-as-reader context. Value, in short, is a little more complex than what the supporters of pure “self-archiving” imagine.

In the case of the “gold” road, thinking about value can be quite simple since it amounts to transposing the familiar practices and strategies of the traditional publishing sphere. This is exactly what PLoS and BioMed Central journals already strive to achieve, and they are already reaching interesting results. Likewise, the more national or regional approaches of Brazil and other Latin American countries (plus Spain)⁴⁷ are also bearing fruit. We may expect more of this latter kind of Open Access journals in the near future, particularly in countries like India⁴⁸ and China.⁴⁹ Similar trends may appear in richer countries with a centralist political tradition. France,⁵⁰ Italy,⁵¹ and Spain⁵² are prime candidates in this regard. In the case of France, various national research centers are already studying the issue, for example, CNRS (The French National Center for

Scientific Research), INSERM, and INRA (The French National Institute for Agricultural Research).

The “gold” road is not always an easy road to follow. Stevan Harnad is right to underscore this point. But as the previous pages demonstrate, the “self-archiving” side is not easy to follow either. Where governments decide to move in and press for Open Access publications, a great deal of time-consuming political groundwork must be done and requires countless interventions from people who need support. But, as we have seen, the need to rely on mandating shows that the “self-archiving” side cannot avoid political maneuvers either.

Business

In the cases of associations or society journals, the issue of a business plan quickly surfaces and that is what the “subsidized author” model allows to explore. Various other schemes have been suggested to help the transition from a toll-gated to an open access journal, for example, offering open choice to authors in order to demonstrate that within a particular journal (the “all things being equal” issue again) Open Access articles enjoy a better impact on the average than their toll-gated counterparts.⁵³

Recently, we have seen at least one commercial publisher (Springer) offering open choice to its authors.⁵⁴ The move is certainly bold, especially with the steep up-front payment required, but it is also a clever move. Potentially, the following results can be demonstrated or achieved through such a move:

1. It may reveal a new business plan where money can be siphoned-off from granting agencies on top of what libraries already provide. In a world of plateauing library budgets, the perspective of extracting some money from the granting agencies to increase the revenue stream may look quite intriguing to a business leader who responds to his stock holders only.
2. It may also help set a value scale between impact factors and article costs.
3. Finally, it may also try to demonstrate that the whole “author-pays” (so-called) business plan simply does not and cannot work.⁵⁵ Running an experiment within a large profitable company does lead to a great deal of leeway when time comes publicly to report financial results and interpret them.

Ultimately, the point of the “gold” road is to create intellectual value in new and better ways. To achieve this goal, the “gold” road must pay attention to more than the impact advantage that addresses only the **author** side of the scientist. A scientist is **also** a hurried reader and value can be built out of better searching, retrieving, and navigating tools. As a result, all the “gold” projects should strive to collaborate to create citation links and indices.

Meanwhile, the role of the “green” road must be carefully and precisely defined. The “pale green” case should be treated apart from the two other shades of green, and this specific status should be clearly indicated in the metadata, particularly in OAI-PMH. In parallel, a

very deep shade of green should be set aside for publishers that give an **irrevocable** right to “self-archive” to their authors, or alternatively they could leave the copyright in the authors’ hands. The reason is that we simply do not want to see publishers suddenly rescinding the permission to “self-archive” and thus bringing down the whole OA edifice as if it were a house of cards. Stevan Harnad generally chooses to ignore this issue or treats it as useless speculation, but the danger is much more concrete and real than he is willing to admit or concede.

More fundamentally, we must find a way to move **from institutional to disciplinary and even specialty** repositories. This is important because it is easier to create the former than the latter and they are presently multiplying. However, as we have seen, the effects of such repositories are problematic at best and a failure now will set the Open Access movement back for many years. It becomes important therefore to move beyond simple, isolated, institutional repositories. This means aggregating and repackaging the information that is contained in these institutional repositories along subject lines. In practice, this also means interinstitutional collaboration and coordination.

In an institutional repository, the metadata should be organized in a sufficiently clear and standardized fashion to allow a quick disciplinary representation of what is available there. This would allow the efficient concatenation of disciplinary articles across a number of depositories. The point, indeed, is that harvesting across all repositories in one simple, single sweep is not enough. While this task must be maintained and even enhanced, disciplinary harvesting must be available and be as user-friendly and efficient as possible—a daunting problem in itself. In parallel, competitive forms of subject packages should also be allowed to emerge. This would lead to new value hierarchies and new ways to create value. As a consequence, the value creation capacity of toll-gated journals would tend to be somewhat diluted.

These goals raise a new question relating to ways and means: Who should take charge of this new form of presentation? Actually, the answer is not very difficult to sketch, but we all know the devil will be in the details. Various consortial forms already exist among sets of libraries: licensing consortia, interlibrary loan consortia, new kinds of consortia based on institutional repositories, such as the DSpace network.⁵⁶ Consortia of any type among institutions that view each other as peers can become the bearers of these new kinds of disciplinary projects. In particular, the present deployment of DSpace might be a good place to start exploring and implementing such a strategy. In parallel, licensing consortia might consider extending their objectives to providing support for the creation of strong sets of disciplinary repositories across their members. Prestige hierarchies, based on the reputation of the institutions involved, will emerge from such efforts.

I would suggest starting not with peer-reviewed articles, but rather with doctoral dissertations. These documents are totally controlled by university professors and students, except in the case of patentable results stemming from doctoral research supported by private

money. But these cases form a minority at best and can be left for special treatment. Meanwhile, an interinstitutional strategy to promote the intellectual value, authority, and prestige of doctoral theses could easily provide the testing ground for the emergence of interinstitutional disciplinary archives.

Evaluation Levels

The metadata should also be extended to provide some indication of quality. It could be designed to help identify the identity and the nature of the evaluating body that passes judgment over the documents in the repository. In other words, the metadata should help identify the quality, nature, and procedures of groups that begin to work as editorial boards would. The metadata could also help design evaluations scales—imagine a one brain, two brain, . . . *n*-brain scale, similar to a Michelin guide for restaurants.

Users should have a clear idea of who the reviewers are and how much they can be relied upon. This leads to a new project: If various universities create consortia of disciplinary repositories, then nothing prevents them from designing procedures to create various levels of peer review evaluation, e.g., institutional, consortial, regional, national, international. At that point, a recognized hierarchy of evaluation levels can begin to emerge; as such, it should also be clearly identifiable through the metadata. Not only could the user know what level of peer review and evaluation is being used, but also which group is backing it. In effect, this is what a journal does and this is how it acquires some branding ability.

An international registry of such evaluation procedures and of the teams of scholars involved could then be developed, perhaps in parallel to the *Directory of Open Access Journals (DOAJ)* at Lund University. This obviously would lend transparency and credibility to these value-building procedures. In this fashion, a relatively orderly framework for expanded peer review and evaluation can emerge. In parallel, these consortia should also work toward enhancing the accessibility tools that will tend to make these Open Access resources as valuable and easy to use as the best commercial products. In particular, this could be the expected (but not necessarily exclusive) province of the librarians.

These remarks lead to intriguing possibilities. For example, any paper could be evaluated more than once, and in any case peer review is certainly no longer limited to the prepublication stage. All this demonstrates that new forms of evaluation can (and probably will) develop. For example, while the number of formal citations obviously defines the impact of an article, the number of informal citations—e.g., within the Web, the number of links that refer to a particular paper—can also provide further evaluation information.⁵⁷

There are further advantages accruing from this approach. By involving researchers in the design of these new modes of evaluation, the debate about Open Access begins to take on a tangible, credible, even vibrant form. While thinking about evaluation, scientists should also begin to understand how these new tools can improve both the process of scientific research and

the management of a scientific career. By moving in the direction of Open Access, granting agencies can do their part and help clarify the evaluation levels and processes. In this fashion, they would constructively participate in the general reworking of value creation that is so lacking in pure “self-archiving” at the present time.

Finally, scientific associations and societies that have decided to go further than pale green can take advantage of this situation to create specialty juries and develop new metrics of science that will ensure pushing some articles up the value chain that would have simply been ignored otherwise. Many articles are regularly undervalued not because of their content but because they appeared in journals with a modest status. Others are overvalued for symmetrical reasons. This part of the value creation project can take the form of the “Faculty of Thousand” invented by BioMed Central, or it can take the form of prizes or any other form susceptible of attracting more attention to these articles. In short, “marketing” could be totally redesigned along lines that have more to do with the quality of content than with the ability to bundle huge amounts of articles and titles. Let us remember that the latter method—the “Big Deal”—amounts to promoting mediocrity rather than excellence: It does so by making inferior products far more accessible and thereby artificially stimulates usage through a clever exploitation of the attention economy principles. And it justifies all this by using the fallacious pretext that the cost per title is decreased!⁵⁸

New Journal Models

Transparency, prestige, and rigor are needed to create credible value. In effect, something like “overlay journals”⁵⁹ begin to emerge, and as such they can gradually acquire visibility and respect. At that point, the institutional repositories will have effectively morphed and matured into a consortium-based network of repositories with a rich set of value-creation tools and increasingly recognized names or labels. As a result of this evolution, overlay journals can hope to become part of the search strategies of the scientists. Eventually, original submissions will be addressed to these new channels of scientific communication. They will own a reputation, a profile, editorial orientations, and this despite, or in parallel with, the fact that most of these articles (or even all of them), at first, will have been already “published” in traditional journals. This is where the importance of “self-archiving” really finds its anchoring point.

All kinds of consortia should begin to engage in this kind of activity, sometimes building on the experience gained from doctoral theses online, sometimes not, to enhance their offerings to their constituencies. When “republishing overlay journals” turn into original publishing channels, they will be equivalent to “gold” journals. The difference is that they will result from a succession of small, incremental, transformations rather than from a dramatic one-step creation or conversion of scientific journals. All this can be accomplished with a good alliance between librarians and scientists. All this can be achieved by treating the “self-archiving” strategy as a transition phase on the way to the “gold” objective.

Such a strategy does not exclude “self-archiving”; neither does it compete with the direct creation or transition to Open Access journals. It simply welds these various parts of Open Access into a coherent vision of what Open Access ought to look like.

The “green” and “gold” roads toward Open Access will thus merge while helping each other. The haphazard, anarchic process of “self-archiving” will be made more orderly by the disciplinary classifications and the evaluation hierarchies. Researchers will know that the collections are incomplete, but they will also know that they are rich and therefore quite valuable and useful. Moreover, various filters corresponding to requirements about quality, beside those organized around topics (keywords, etc.), will greatly enhance the accessibility of these repositories. Discovering this will incite ever more people to “self-archive.” The fear of information overload will vanish. Granting agencies will not have to fear the resistance of scientific communities.

Finally, because an even playing field will be established between toll-gated publications and open access articles, be they “gold” or “green,” the impact advantage of genuine Open Access will have a much better chance of asserting itself unambiguously. Probably at this stage, the tipping point toward Open Access will truly be in the offing.

Conclusion

The vision presented here is nondogmatic. It leaves plenty of room for revisions, critiques, and reevaluations. It tries to present a constructive evolutionary scenario where the “green” and “gold” roads can find their proper place without feeling in competition with one another. It also rests on the two following premises that some advocates of the “green” road do not seem ready to accept:

1. The finality of the scientific exchange is not just for scientists-as-authors; it must also take into consideration the scientist-as-reader, and it is in this context that the issue of Open Access must be complemented by that of “accessibility.”
2. Even if we accept reducing science to maximizing impact—a dubious, simplistic claim, at best—scientists, now limited to being scientists-as-authors, appear incapable of implementing a complete form of Open Access simply through “self-archiving,” be it mandated or spontaneous. In fact, the need to rely on institutional policies and parliamentary committees demonstrates the incomplete nature of the “self-archiving” strategy taken in isolation.

If we now refer back to the British Report from the Commons Select Committee, we can now suggest a more interesting reading of this document. Far from putting all of its eggs in the first “self-archiving” strategy and mentioning other actions only as inferior and secondary (the “mandating” versus the “recommending”), perhaps the Select Committee meant to lay out a phased strategy: Right now, they seem to say, we can begin by doing all the “self-archiving” we can.

In parallel, other strategies should be studied and implemented later to complete the “self-archiving” strategy and make it viable. What might be interpreted by some “self-archiving” supporters as the results of a blurred vision may be better interpreted as symptoms of deep wisdom indeed. It is not that the committee members “got it” on one point and wasted time on some others; rather, they appear to have “gotten it” from beginning to end, and this paper has done little more than try and argue why this is the case. In the end, Open Access will not be reached by a narrow focus on impact optimization alone—although this argument is a very useful one—it will be reached only if the full complexity of the scientific communication process is taken into consideration.

Open Access can be helped by tough-minded forms of arguments. Taking the relentless quest for impact optimization as a basis for modeling scientific behavior does yield interesting working hypotheses; however, it is false to assert that this is enough to encompass and fully apprehend the rich behavior patterns of those engaged in knowledge creation and validation. Fundamentally, science deeply agrees with Open Access not only because it is the best way to achieve the greatest impact for a particular individual, but also because it provides the most favorable environment to foster the widest form of distributed intelligence on this planet. And deploying distributed intelligence should not be fostered for the sake of intelligence alone: This activity has meaning and use and all of humanity is concerned by it.

Presently, scientific communication is limited roughly to one fourth or one fifth of the individuals that, through their native abilities, can contribute to scientific progress. Even in rich countries, many good brains are incapable of reaching their full potential and therefore are wasted because of the ways in which access to scientific literature is limited. Think of a promising young professor who must take a first job in a small college with limited library facilities (and probably limited lab facilities as well) simply because he happened to graduate in a period of PhD glut. While Open Access does hold the promise of enhancing the career of many established scientists, more fundamentally, it promises to create a much more open field for a widened circle of researchers. It can also reach into communities of concerned users. Think of patients seeking useful information to assist in their own treatment.

Open Access should not be the tactical tool of a few, elite, established, scientists that want to enhance their careers and little else; neither should it be approached only from a kind of Hobbesian attitude where the worst scenario is used to demonstrate that even seen in this dire way, things turn out right in the end. OA mainly aims at improving the knowledge creation system of science and better insert its results within our societies.

Open Access does not need to draw an absolute knowledge divide between scientists and the rest of the population, between elites and the “masses”; while it does not eschew vigorous competition, Open Access insists that the playing field should remain reasonably even and fair. In the end, Open Access is the *sine qua non* condition for the optimal deployment of scientific

research worldwide, as well as for its widest applicability in the general population.

And if, finally, some people should object to the last argument as being irrelevant to scientific research, they should also remember that the public pays for much of it.⁶⁰

Notes

1. The Open Access movement has been characterized by a common objective—namely, Open Access to peer-reviewed, scholarly articles—and a dual strategy to attain this objective. See the Budapest Open Access Initiative (BOAI) published on the Web on February 14, 2002, <http://www.soros.org/openaccess/read.shtml>. To qualify as Open Access, a document must follow two different sets of conditions that were clearly outlined in the Bethesda declaration, <http://www.earlham.edu/~peters/fos/bethesda.htm#note1>. (1) The user is granted a number of rights (e.g., “a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit, and display the work publicly and to make and distribute derivative works”); (2) the document must be archived “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”; these are the exact words of the Bethesda Statement on Open Access. They refine and elaborate upon the definition that emerged with BOAI. The Public Library of Science endorses the Bethesda definition of Open Access (see <http://www.plos.org/about/openaccess.html>).
2. This “reader pays” phraseology is as inaccurate as the “author pays” expression. Later in this text, we shall speak about a “subsidized author.”
3. This is, at best, shorthand for journals deriving their income at the point of production and not at the point of sale. Effectively, the point of sale disappears with Open Access. Someone, perhaps a granting agency, a foundation, a research institution, or even in some rare cases, an author, pays the publishing fee set up by the publisher. A better expression would be “paid on behalf of the author,” which is accurate but a little unwieldy. Perhaps a “subsidized author” would foot the bill and provide a nice parallel for the “subsidized reader” expression used later on.
4. In India, Brazil, Chile, Cuba, etc. See notes 47–52.
5. <http://www.ecs.soton.ac.uk/~Harnad/Temp/self-archiving.ppt>, slide 47. Specifically, Harnad writes: “Open access through author/institution self-archiving is a *parallel* self-help measure for researchers, to prevent further impact-loss now. Open access is a *supplement* to toll-access, but not necessarily a *substitute* for it.” Note the reference to “impact-loss.” This is really a “manque-à-gagner” (loss of possible gains) rather than a direct loss. What Harnad means to say is not that impact already gained is going to be lost; it is that impact that might be added to already gained impact is not being added. What he really meant to write is that self-archiving is a self-help measure to open up the possibility of further impact gains.
6. See <http://www.lboro.ac.uk/departments/ls/disresearch/romeo/>. The SHERPA version of RoMEO, which is to be preferred as it is current, can be found at <http://www.sherpa.ac.uk/romeo.php>. SHERPA is funded by JISC and CURL. It is hosted by the University of Nottingham. The “green” and “gold” terminology itself seems to have been invented by Stevan Harnad while discussing the results stemming from the RoMEO study.
7. <http://www.publications.parliament.uk/pa/cm/cmsctech.htm>.
8. A summary of the House Committee recommendations (July 15, 2004) can be found at the following URL: <http://www.arl.org/sparc/core/index.asp?page=o31>. For the publishers’ reactions, see their open letter to Dr. Elias Zerhouni, dated August 28, 2004, available at <http://www.pspcentral.org/>. It is important to read the full letter rather than the excerpts published by Ann Okerson on Liblicense-l on August 30th (<http://www.library.yale.edu/~license/ListArchives/0408/msg00137.html>).
9. <http://www.ecs.soton.ac.uk/~Harnad/Hypermail?Amsci/3875.html>.
10. The tradition of exchanging offprints among scholars and researchers is a clear example of a situation where affordability and access are sharply kept distinct.
11. This is an allusive reference to a very recent discussion (August 6, 2004), <http://listserv.sigmaxi.org/sc/wa.exe?A2=ind04&L=american-scientist-open-access-forum&O=D&F=I&P=68397>
12. For an interesting discussion on the number of refereed journals and articles, see <http://www.ecs.soton.ac.uk/~Harnad/Hypermail/Amsci/2983.html>. The figures quoted in this discussion range from 15,000 titles (Eugene Garfield) to 24,000 titles (Stevan Harnad) with a corresponding spread in the number of articles published annually: from 1.5 to 2.5 million—the ratio of 100 articles/journal/year is commonly used in the scientific, technical, and medical disciplines (STM). The figure of 85% dates back to the early part of August 2004. On August 25th, Stevan Harnad advanced the 92% figure along with the conversion of the Royal Society of Chemistry (<http://www.ecs.soton.ac.uk/~Harnad/Hypermail/Amsci/3938.html>).
13. It must be noted that until publishers gave their various forms of green light to self-archiving, its very possibility was very problematic at best. From the standpoint of intellectual property laws, no one has tested Harnad’s tactic of archiving two files (submitted file plus corrigenda)—a point which would worry any university manager in charge of an institutional repository. This approach has to be tested in at least two ways: with regard to the notion of derivative work, and also plagiarism. It may sound strange to say that an author could be accused of plagiarizing himself or herself, but copyright law, let us remember, deals with property, intellectual property in this case, and signing away copy rights is signing intellectual property away. Copyright laws emerged in part to prevent an author from selling a manuscript to several publishers. Without the publishers’ agreement, self-archiving is also problematic from a practical standpoint. I shall return to this point later.
14. <http://www.nature.com/nature/focus/accessdebate/21.html>.
15. See, for example, Stevan Harnad’s reaction to an article in an Indian publication at <http://www.ecs.soton.ac.uk/~Harnad/Hypermail/Amsci/3156.html> (accessed November 8, 2003).
16. See, for example, <http://www.ecs.soton.ac.uk/~Harnad/Hypermail/Amsci/3161.html> (accessed November 12, 2003) where Stevan Harnad writes: “I’m afraid that all this eminently accessible open access will continue to be **needlessly delayed** as long as our attention and enthusiasm continue to be directed solely or primarily at the slower road. We should really be promoting both roads, and each in proportion to its immediate capacity to deliver Open Access. What is happening now is instead rather like trying to increase the population by promoting in vitro fertilization alone, neglecting the faster, surer path. . .” Note, in passing, the rhetoric: gold is to green as in vitro fertilization is to natural fertilization! The metaphor is funny because it caricatures the situation. But it is only a caricature, not an analysis.
17. See <http://www.ecs.soton.ac.uk/~harnad/Hypermail/Amsci/3162.html>. Harnad estimates that 10% of all articles are in Open Access. Of these, one fourth or 2.5% of all articles published appear in gold publications while about three fourths or 7.5% of all articles published appear in green titles. While 85% of all articles could potentially be placed in Open Access, about a tenth of that quantity actually is.
18. Harnad, <http://www.ecs.soton.ac.uk/~Harnad/Temp/self-archiving.ppt>, slides 42–43.

19. Steve Hitchcock, Tim Brody, Christopher Gutteridge, Les Carr, and Stevan Harnad, "The Impact of OAI-based Search on Access to Research Journal Papers" (September 2003), <http://opcit.eprints.org/serials-short/serials11.html>.
20. Some authors have defined impact differently. For example, Sidney Redner suggests to multiply the total number of citations by their average age. This suggests that measuring impact is not as simple and transparent as a simple citation count suggests, but I shall not address this question here and will act as if citation counts suffice. See S. Redner, "Citation Statistics from more than a Century of Physical Review" (July 27, 2004), <http://xxx.arxiv.org/abs/physics/0407137>.
21. Steve Lawrence, "Online or Invisible?" <http://www.neci.nec.com/~lawrence/papers/online-nature01/>. Edited version appears in *Nature* 411, no.6837 (2001): 521.
22. See, for example, Stevan Harnad, Tim Brody, Francois Vallières, Les Carr, Steve Hitchcock, Yves Gingras, Charles Oppenheim, Heinrich Stamerjoanns, and E.R. Hilf, "The Green and the Gold Roads to Open Access," *Nature* (Web focus) (2004), <http://www.nature.com/nature/focus/accessdebate/21.html>. See also Michael J. Kurtz, "Restrictive Access Policies Cut Readership of Electronic Research Journal Articles by a Factor of Two" (2004), <http://opcit.eprints.org/feb19oa/kurtz.pdf>, and Andrew M. Odlyzko, "The Rapid Evolution of Scholarly Communication." *Learned Publishing* 15 (January 2002): 7–19, <http://www.catchword.com/alpsp/09531513/v15n1/contp1-1.htm>.
23. See note 9 above.
24. *Educom Review* Staff, "Networked Information: Finding What's Out There—Clifford A. Lynch Interview," *Educom Review* 32–36 (1997), <http://www.educause.edu/pub/er/review/reviewarticles/32642.html>.
25. Incidentally, why has no librarian, so far as I know, ever tried to implement a similar system on any campus? I have not systematically investigated this question and I would be delighted to stand corrected.
26. Kenneth Frazier, "The Librarians' Dilemma. Contemplating the costs of the 'Big Deal'," *D-Lib Magazine* 7 (3) (March 2001): <http://www.dlib.org/dlib/march01/frazier/03frazier.html>.
27. <http://www.crossref.org/>, <http://www.exlibrisgroup.com/sfx.htm>. Elsevier's Scopus proceeds from the same argument. It also introduces fascinating implications about who will eventually control the search engines of science: Google, ISI's Web of Science, or Elsevier's Scopus?
28. This is the case with the "Digital Object Identifier" (DOI). As stated in the DOI Handbook, "specifically, DOI relies on copyright and trademark law to protect the DOI brand and reputation. DOI is not a patented system; the IDF has not developed any patent claims on the DOI system and does not rely on patent law for remedy," http://www.doi.org/handbook_2000/governance.html#7.2.
29. See <http://paracite.eprints.org/>, <http://citeseer.ist.psu.edu/cs>.
30. Carl Lagoze (Cornell University) and Herbert Van de Sompel (Los Alamos National Laboratories) are two of the leaders of the OAI-PMH protocol.
31. <http://www.soros.org/openaccess/view.cfm>.
32. At the hearings of the UK Commons Select Committee, the Royal Society of Chemistry advanced this kind of argument in the following terms: "Currently most authors care where their work is seen and who it is seen by far more than they care about how many people have seen it," "Scientific Publications Free for All," the Science and Technology Committee of the UK House of Commons, vol. II, Oral and Written Evidence, p. EV-209 (p. 217, section 4.5 within a PDF reader). This statement is quoted in the main report (p. 9, item 8) and commented as follows: "This dispute goes to the core of the question of who should pay for the costs of scientific publications: those who argue in favor of the widest possible dissemination tend to be more receptive to the author-pays model of publishing; those who prefer targeting publications at a small, selected audience tend to be more content to maintain the status quo." Odlyzko, on the other hand, suggests that Open Access brings the literature to new categories of readers (and appears to enjoy it): "Much of the online usage appears to come from new readers (...) and often from places that do not have access to print journals." Odlyzko, "The Rapid Evolution," 8. As Odlyzko puts it, "... scholars ... are engaged in a 'war for the eyeballs'." *Ibid.*, p. 9.
33. We are talking about impact factors here, as we are dealing with "gold" journals. For good or bad reasons—probably bad ones in fact—most scientists are more familiar with impact factors than with impact (and their tenure and promotion committees also).
34. ADS = Astrophysics Data System. The part in brackets that clarifies Michael Kurtz' statement presumably comes from Stevan Harnad as moderator of the American-Scientist-Open-Access-Forum, <http://listserver.sigmaxi.org/sc/wa.exe?A2=ind04&L=american-scientist-open-access-forum&O=A&F=l&P=44671>.
35. *Ibid.*
36. On this concept, see Michael H. Goldhaber, "The Attention Economy and the Net," *First Monday*, http://www.firstmonday.dk/issues/issue2_4/goldhaber/ (accessed April 1997).
37. Odlyzko, "The Rapid Evolution."
38. The original article is Samuel C. Bradford, "Sources of Information on Specific Subjects," *Engineering* 137 (January 26, 1934): 85–86. The law of concentration appears in Eugene Garfield, "The mystery of the transposed journal lists—wherein Bradford's law of scattering is generalized according to Garfield's law of concentration," *Essays of an Information Scientist* (Philadelphia, ISI Press, 1977): 222–223. The original article appeared in August 1971. Conversely, Garfield's law of concentration could be (ironically?) read as a way to justify a more pragmatic and relaxed attitude to the documentation search problem.
39. See for example the recent remarks by Heather Morrison, <http://listserver.sigmaxi.org/sc/wa.exe?A2=ind04&L=american-scientist-open-access-forum&O=D&F=l&P=69057>. For a related argument, see Eugenio Pelizzari, "Harvesting for Disseminating. Open Archives and Role of Academic Libraries" to be published in January 2005 in the *Acquisitions Librarian*. Available online at <http://www.bci.unibs.it/doc/Pelizzari-REVIEWED-harvesting%20for%20disseminating%20FINAL.doc>.
40. It works rather well, but it is not perfect, far from it. David Goodman, whom I think, has attracted my attention on a study done by Péter Jacsó ("Péter's Picks and Pans CiteBaseSearch, Institute of Physics Archive, and Google's Index to Scholarly Archive," *Online* 28, no.5 (September 5, 2004): 57–58, showing that Google did not perform all that well on deep searches within Open Access databases. A summary of the results is found on Peter Suber's precious Weblog on Open Access: http://www.earlham.edu/~peters/fos/2004_08_29_fosblogarchive.html#a109406153195893347.
41. <http://oaister.umdl.umich.edu/o/oaister/>.
42. See the description of the article base at <http://oaister.umdl.umich.edu/o/oaister/description.html>. In a recent intervention, Stevan Harnad writes, "But Pubmed and PMC are not only better because of their better search features (which can all, of course, be fully duplicated by OAIster and by any other OAI search engine, whenever we wish to implement them!):..." <http://listserver.sigmaxi.org/sc/wa.exe?A2=ind04&L=american-scientist-open-access-forum&D=0&F=l&O=D&P=68930>. However, if this search engine is so simple to duplicate, why is it not already done?

43. Stevan Harnad, www.ecs.soton.ac.uk/~Harnad/Temp/self-archiving.ppt, slide 45: "Don't conflate the different forms of institutional archiving."
44. It is important to recall that the varieties of green involve a shade of pale green limiting "self-archiving" to preprints. In Stevan Harnad's powerpoint presentation (www.ecs.soton.ac.uk/~Harnad/Temp/self-archiving.ppt, slide 41), the pale green publishers account for 30% of all publications but they are not treated separately, presumably on the basis that the preprint plus corrigenda strategy is realistic. Personally, I have always questioned the viability (and even legality) of the "self-archiving" strategy to the point that I had given very little credence to "self-archiving" before "real" green publishers began to be identified in the RoMEO project.
45. This remark applies particularly well to scientists in poor or in "transition" countries.
46. <http://www.ecs.soton.ac.uk/~Harnad/Temp/self-archiving.ppt>, slide 47.
47. See <http://www.scielo.org/index.php?lang=en>.
48. See, for example, <http://www.jpgmonline.com/>. The Indian Academy of Science has also placed its journals in Open Access. See Subbiah Arunachalam, "India's march towards open access," *SciDev.net* (March 5, 2004), <http://www.scidev.net/Opinions/index.cfm?fuseaction=readOpinions&itemid=243&language=1>.
49. Some ideas about China's evolution with regard to Open Access can be found in Liu Chuang, "Recent Development in Environmental Data Access Policies in the Peoples' Republic of China," <http://books.nap.edu/books/0309091454/html/74.html#pagetop>.
50. For France, the best sites to find information on Open Access are H el ene Bosc's site (http://www.tours.inra.fr/prc/internet/documentation/communication_scientifique/comsci.htm#auto) and the INIST site (<http://www.inist.fr/openaccess/>).
51. See, for example, Susanna Mornati, "Progetto AEPIC: gli archivi aperti italiani su una piattaforma nazionale," http://e-prints.unifi.it/archive/00000461/01/1_multipart_xF8FF_2_Relazione_Mornati.pdf. and Valentina Comba, *AEPIC Academic E-Publishing Infrastructures-CILEA: Progetto di editoria elettronica per la ricerca e la didattica* (2002), <http://eprints.rclis.org/archive/0000066/01/AEPIC-CO511.pdf>.
52. Spain appears a little behind in the Open Access movement. However, the efforts of Crist obal Pasadas Ure na (University of Granada) must be noted (he pushes for Open Access within IFLA, for example). Likewise, Catalonia appears to be moving ahead, at least with theses and dissertations (http://www.tdx.cesca.es/index_tdx_an.html).
53. On both fronts, the Information Program of the Open Society Institute has been extremely active and useful.
54. <http://www.lib.utk.edu/mt/weblogs/scholcomm/archives/000300.html>. The new Springer is the result of the merging of the old Springer plus Kluwer. The CEO for this new publishing behemoth is Derk Haank, formerly Reed-Elsevier's CEO. A better understanding of what is happening at the new Springer can be derived from the fascinating interview of Derk Haank, "Put up or Shut up," recently published by Richard Poynder (<http://www.infotoday.com/it/sep04/poynder.shtml>).
55. Springer places a US\$3,000 fee on its articles, i.e., twice as much as PloS. This is how Derk Haank explains this decision in his interview with Richard Poynder: "As always, I am very serious—\$3000 is a very competitive price. Even Open-Access advocates would have to acknowledge that. The Wellcome Trust report, for instance, estimated the true cost of publishing a paper at more like \$3500."
56. On DSpace, see McKenzie Smith, "An Open Source Dynamic Digital Repository," <http://www.mybestdocs.com/smith-m-etaldspace.htm>. It was originally published in *D-Lib Magazine* 9, no.1 (2003).
57. See Odlyzko, "The Rapid Evolution," p. 9.
58. This is the argument that David Kohl, for example, regularly gives in his talks. See, for example, "Better value from bigger deals: issues and experience" available from <http://www.subscription-agents.org/conference/200302/> as a PowerPoint presentation.
59. The expression "overlay journal" may not satisfy all and other terms have been suggested, such as "Article Database" or "deconstructed journal." Debates and usage will eventually stabilize these terms. On the notion of "deconstructed journal," see John W. T. Smith, "The Deconstructed Journal—A New Model for Academic Publishing," *Learned Publishing* 12, no.2 (April 1999), <http://library.kent.ac.uk/library/papers/jwts/d-journal.htm>.
60. A very recent (September 3, 2004) statement released by NIH completely supports this view. See: "Notice: Enhanced Public Access to NIH Research Information," <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-04-064.html>. Thanks to the guest editor for this issue of *Serials Review* for having attracted my attention to this document.