

Harnad, S. (2006) Opening Access by Overcoming Zeno's Paralysis. To appear in: Jacobs, N., (Ed) *Open Access: Key Strategic, Technical and Economic Aspects*. Chandos Publishing (Oxford) Limited, Chapter 8.

Opening Access by Overcoming Zeno's Paralysis

Stevan Harnad

Institut des sciences cognitives
Université du Québec à Montréal

http://www.crsc.uqam.ca/en/index2_en.html

and

Department of Electronics and Computer Science
University of Southampton

<http://www.ecs.soton.ac.uk/~harnad/>

ABSTRACT: Open Access (OA) means free access for all would-be users worldwide to all articles published in all peer-reviewed research journals across all scholarly and scientific disciplines. 100% OA is optimal for research, researchers, their institutions, and their funders because it maximizes research access and usage. It is also 100% feasible: authors just need to deposit (“self-archive”) their articles on their own institutional websites. Hence 100% OA is inevitable. Yet the few keystrokes needed to reach it have been paralyzed for a decade by a seemingly endless series of phobias (about everything from piracy and plagiarism to posterity and priorities), each easily shown to be groundless, yet persistent and recurring. The cure for this “Zeno’s Paralysis” is for researchers’ institutions and funders to mandate the keystrokes, just as they already mandate publishing, and for the very same reason: to maximize research usage, impact and progress. 95% of researchers have said they would comply with a self-archiving mandate; 93% of journals have already given self-archiving their blessing; and those institutions that have already mandated it are successfully and rapidly moving toward 100% OA.

Optimal and Inevitable, but When? First, the foregone conclusions: Open Access (OA) means free worldwide access, immediately and permanently, to the full texts of all 2.5 million articles published annually in the planet’s 24,000 peer-reviewed research journals across all scholarly and scientific disciplines (<http://www.ulrichsweb.com/ulrichsweb/>). 100% OA is optimal for research, researchers, their institutions, their funders, and their funders’ funders (the tax-paying public) because it maximizes research access and impact ([Harnad 2006](#)). 100% OA is also 100% feasible, immediately. So it is safe to say that something that is both optimal and immediately feasible is also inevitable ([Harnad 1997](#)). The rest is just about (1) *when* 100% OA will be reached, (2) *how*, and (3) *what has been taking it so long?*

I will be unable to say here precisely when 100% OA will be reached, apart from saying that it is already well overdue historically, and could already have been reached at least a decade ago ([Harnad 1995](#)). It is clear that 100% OA will not be reached via the “golden road” of first converting all or most of the 24,000 journals to OA publishing; the golden road is too slow and uncertain, and out of the hands of the research community. 100% OA will be reached via the “green road,” with researchers making their own articles -- published in non-OA journals – OA by self-archiving them free for all on the web ([Harnad et al. 2004](#)) (but it is possible that green itself will then lead to gold!).

What has taken 100% OA so long to reach has been a series of purely psychological obstacles that I have dubbed “Zeno’s Paralysis” (<http://www.eprints.org/openaccess/self-faq/#32-worries>). Although each paralytic phobia can be shown to be spurious and based on easily dispelled misunderstandings, a rather relentless history of symptom-transfers, hopping from one phobia to the other, possibly in circles, has by now demonstrated that the only swift and sure way to break free of this paralytic circle is for researchers’ own institutions (<http://www.eprints.org/openaccess/policysignup/>) and funders (<http://www.rcuk.ac.uk/access/index.asp>) to *mandate* OA self-archiving, as some have already begun to do, successfully.

The Status Quo Ante. Worldwide OA today is hovering somewhere between 5% and 25% ([Hajjem et al. 2005](#)). Yet 100% OA has been reachable in principle since the 1980s, with the possibility of immediately depositing all those articles in “anonymous FTP sites ” ([Harnad 1995](#)). Such sites, however, were rather like unmarked common graves if users didn’t know what was where; and search and retrieval was awkward, inefficient and indirect. The author just deposited the document and hoped for the best. Anonymous FTP was just being improved upon with tools like *gopher*, *archie* and *veronica* (now all obsolete), when Tim Berners-Lee invented the worldwide web in the early 1990’s. Websites then immediately became the natural place to deposit articles.

Before the advent of FTP and the Web, researchers had been mailing *reprints* (hard copies) of their articles to would-be users who wrote to request them; but now, “eprints” could be emailed, or, better still, deposited on an openly accessible FTP or web site, so all would-be users could search and retrieve them directly as/when needed. As of 1999, such websites could even be made “interoperable” by making their metadata (authorname, title, date, journalname, etc.) compliant with the Open Archives Initiative (OAI) protocol (<http://www.openarchives.org/>). That means they could all be automatically harvested from the many distributed websites and seamlessly searched and retrieved as if they were all in one global archive reserved only for research articles.

Research Impact. It’s worthwhile pausing at this point to ask why, in the paper era, researchers would have taken the time, trouble, and expense to mail out paper reprints in the first place: Don’t authors just want to publish their work and then collect the sales royalties? Not researchers. They publish their findings so that neither they nor their research perishes, but instead progresses (“publish or perish”). They need to publish so as to earn their salaries and research grants, and their research is evaluated and rewarded

not just on the basis of its quantity but on the basis of its quality and importance – and its quality and importance depends on its *research impact*.

What is research impact? A cure for cancer or global warming is what most laymen have in mind when they think of research. In reality, however, research is a slow, collective, cumulative process, with occasional punctuated leaps; and even those leaps are mainly leaps in basic research progress, measured in terms of still more research generated. Only rarely are they direct leaps to applications such as curing cancer.

For research to lead to progress, whether in the form of further basic research or in the form of applications, the research findings first have to be accessed and used by those who might build upon or apply them. And therein lies the reason why no author of a peer-reviewed research journal article ever sought payment from users for the privilege of accessing his article: because whatever restricts research access also restricts research impact and progress, thereby also restricting the researcher's own career progress ([Diamond 1986](#), [Garfield 1988](#)) as well as the return on his institution's and funder's investment in his research ([Harnad et al. 2003](#); [Harnad 2006](#)).

So researchers don't want to be paid for their articles: that would be an access restriction. They just want their articles to be read, used, applied and built upon, in as much further research as possible, without restriction. That is also why researchers are rewarded by their institutions and funders not merely on the basis of the number of articles they publish, but on their uptake, influence and impact on further research -- of which one important measure is the number of subsequent articles that *use and cite* their findings. This is known as their "citation impact" ([Garfield 1973](#); Moed 2005a).

From Reprints to Eprints. Researchers' quest for maximal research impact is also why, in the paper era, they used to give away free reprints of their articles to all would-be users (rather than trying to collect fees or sales-royalties, as other kinds of authors do). Their *publishers* did have to charge access-tolls to subscribing user-institutions, to be sure, because there were real costs that had to be recovered in order to pay for the peer-review and editing and for printing and distributing the paper edition. The online era reduced some of those costs, but as long as there continues to be a demand for the paper edition, the costs for the double edition, paper and online, remain higher than costs had been in the paper-only era, not lower. And even online-only journals still have real costs to recover.

So, just as providing reprints to would-be users had been a parallel practice in the paper era -- supplementing the subscription-based access for users whose institutions could afford the journal with free copies for those who could not -- so providing OA by self-archiving *eprints* on a publicly accessible website is the natural online-era extension of the researcher's perennial effort to maximize the accessibility and impact of his work.

Is OA Needed? Well then: If it is natural, feasible, optimal, and inevitable, why is OA still hovering at around 15% instead of immediately fast-forwarding to 100%? One hypothesis might be that OA is no longer necessary: That online toll-based access, via

institutional subscriptions and licenses, already ensures that all users have access to all the articles they need, and all authors have all the users and impact they want. But is this true? There is no doubt that the online medium itself has increased access; but there is considerable evidence that it has not maximized it:

(1) Librarians continue to report that their institutions cannot afford all the journals they need (the “serials crisis”), and the Association of Research Library statistics confirm that most institutions can only afford a small fraction of the total number of journals published (<http://fisher.lib.virginia.edu/arlib/index.html>). That all represents lost potential access and impact.

(2) User surveys suggest that many researchers do not feel they have access to all the journals they need (e.g., [Swan & Brown 2005](#), Question 8; but cf. “Pretty-Sitting,” below). A very small number of disciplines do already have 100% OA: astrophysics, because it has a small, closed circle of journals that are OA to virtually all research-active astrophysicists worldwide online via ADS ([Kurtz et al. 2004a](#)); and high-energy physics, which has been self-archiving near 100% of its research for many years now ([Brody & Harnad 2004](#)). But most disciplines are still nowhere near 100% OA.

(3) 34,000 biomedical researchers signed the Public Library of Science (PloS) petition (<http://www.plos.org/about/history.html>) in 2002, demanding OA from their publishers -- which they presumably would not have demanded if they felt they already had it!

(4) When the citation counts for OA and non-OA articles in the same journal and year are compared, OA articles consistently have 25%-250% more citation impact in every year and every field tested so far, beginning with computer science ([Lawrence 2001](#)) and physics ([Brody & Harnad 2004](#)), and ten other fields in biological and social sciences ([Hajjem et al. 2005](#)). Many factors contribute to the OA impact advantage -- including (i) a selective tendency for better authors' better papers to be self-archived, (ii) a competitive advantage of OA over non-OA (which will of course vanish at 100% OA), (iii) a permanent added advantage from providing OA earlier, (iv) and an early usage advantage (many more downloads) ([Kurtz et al. 2004b](#)), which is itself correlated with and predictive of a citation advantage 18 months later ([Brody et al. 2005](#), Moed 2005b). These consistent OA advantages in citation counts also confirm that non-OA articles are not maximizing their research impact.

Hence both the accessibility data and the usage/citation data indicate that neither access nor impact is being maximized today, and that substantial benefits still await the 85% of articles that are not yet OA. Even on the most conservative estimate, research is losing 25% x 85% or at least a fifth of its potential impact today. Yet the remedy has been within reach for at least a decade, and entails only a few keystrokes per article ([Carr & Harnad 2005](#)). Why has the research community taken so long to reach for the optimal and inevitable?

Out in the Cold. There are many reasons for the research community's inertia, and virtually all of them unaccountably begin with the letter "P", which also happens to be the first letter of "Paralysis." So I have dubbed the condition that they induce "Zeno's Paralysis," after the philosopher who worried "How can I possibly walk across the room? There isn't enough time! Before I can get across the room I first have to get half way across the room, and that takes time; but before I can get half way across the room, I have to get half of half way across the room; and so on. So there isn't the time even get started; hence I can't possibly walk across the room."

The pragmatic solution to Zeno's Paradox is of course to just go ahead and let your legs do the walking anyway. The cure for Zeno's Paralysis is the same, except it's your fingers that need to do the walking. Why would anyone ever have thought that they couldn't possibly do the few keystrokes that would get us all to 100% OA?

The PLoS Petition to Publishers. Before I list all the P's that have held us back, I begin with another P that merely portends the syndrome: the 34,000 biomedical researchers I mentioned earlier, who signed the October 2000 PLoS Petition to their Publishers (threatening to boycott them if by September 2001 they did not agree to make all their contents OA within 6 months of publication) [<http://www.plos.org/about/history.html>]. The 34,000 did all the keystrokes required to sign that petition, but the petition was unsuccessful: Publishers failed to comply. So, come the day, September 2001, as there was nowhere else for them to go, the 34,000 signatories did not abide by their boycott threat either, and are, to this day, still waiting for journals to convert to OA. (So far, fewer than 10% of journals have done so: <http://www.doaj.org/>.) Hence the puzzle that already portends Zeno's Paralysis: For if the 34,000 had simply performed a few more keystrokes per paper, they themselves could have provided the very OA they were passively petitioning their publishers for, without having to wait for or count upon the compliance of any other party!

Why did the 34,000 PLoS signatories – and 85% of the rest of the world research community – not do the optimal, inevitable and obvious in order to *provide for themselves* the OA that (the boycott threat would tend to indicate) they so urgently needed and wanted? What has instead been keeping most researchers in a state of Zeno's Paralysis for a half-decade as of the PLoS petition (and for more than a decade, if we date the pandemic from the time self-archiving was first formally proposed ([Harnad 1995](#)) – or even longer, if we reckon as of when de facto self-archiving had first begun to be practiced by the stout-hearted computer scientists who had created the online medium itself and the philanthropic physicists who had been systematically sharing preprints amongst themselves even back in the paper era)? Here are 19 of the most common causes of Zeno's Paralysis, and their antidotes. (A full treatment of all 32 symptoms identified to date is available at <http://www.eprints.org/openaccess/self-faq/#32-worries>.)

1. Permission/Piracy: "How can I possibly self-archive? It's illegal!"

This is the most common worry.

First, of the nearly three-quarter million self-archived computer science papers harvested in <http://citeseer.ist.psu.edu/> or the nearly half-million physics papers self-archived in <http://arxiv.org/> across the past decade and a half, fewer than 0.0001% have since been removed citing copyright reasons. That is the sensible strategy: to self-archive all papers immediately, and consider whether or not to remove them only if/when there should ever be a request from the publisher. If the authors of all those articles had simply remained paralyzed about whether or not they should self-archive, because publishers might object, computer science and physics would have had 1.25 million fewer articles freely accessed and used across the past 15 years.

Second, far from requesting removal, the principal journal publishers in physics subsequently became the first to officially endorse author self-archiving. Since then, 93% of the nearly 9000 journals registered so far (and this includes virtually all the most important ones) have also given author self-archiving their “green light”: <http://romeo.eprints.org/stats.php>

Third, the remaining 7% of papers should also be self-archived in any case; if access to their full-texts is set as “restricted” instead of OA, their OAI metadata (authorname, title, journalname, date, etc.) are still visible and searchable to everyone, and the archiving software will allow would-be users to automatically transmit their email addresses with one keystroke to the author, who can in turn automatically email the full eprint to them with one keystroke. So even restricted-access articles are just a few extra keystrokes and a short delay away from being OA – as long as they are all self-archived OAI-compliantly.

Fourth, and perhaps most important, “piracy” pertains to consumer *theft* of the producer’s product (music, video, software), presumably against the producer’s will. Self-archiving, in contrast, is producer *give-away* of his *own* product (to maximize access and impact).

2. Peer-Review: “*How can I possibly self-archive? It’s not peer-reviewed !*”

OA self-archiving is the self-archiving of peer-reviewed journal articles, before (preprint) and after (postprint) peer review. OA self-archiving is a *supplement* to – not a *substitute* for – publishing in a peer-reviewed journal.

3. Prestige: “*How can I possibly self-archive? It lacks the prestige of publication!*”

Variant of the above: the self-archived version simply provides supplementary access to a published, peer-reviewed journal article. The prestige comes from having met the established quality standards of the journal. Self-archiving merely maximizes access and impact.

4. Promotion: *“How can I possibly self-archive? It won’t count for performance review!”*

Another variant of the above: Self-archiving is not self-publishing. It is the peer-reviewed, published journal article that counts for performance review. Supplementary access provided by OA self-archiving merely serves to increase the article’s citation impact, which then also counts for performance review ([Smith & Eysenck 2002](#)).

5. Preservation/Posterity: *“How can I possibly self-archive? It may not last forever, like paper!”*

First, once again: OA self-archiving is a *supplement* to – not a *substitute* for – publishing in a peer-reviewed journal. It is the published journal version, whether paper or digital, that needs to be preserved for prosperity, just as it always did. The purpose of the self-archived supplement is to maximize access and impact.

Second, the self-archived supplements nevertheless can, and should, and will be preserved too. (The older self-archiving by computer scientists and physicists is still with us, and continuing to be used and cited to this day. If the authors of all those articles had simply remained paralyzed about whether or not they should self-archive, because it might not be preserved forever, computer science and physics would have had 1.25 million fewer articles freely accessed and used across the past 15 years.

6. Priority: *“How can I possibly self-archive? I may lose priority for my work!”*

Publicly self-archiving a date-stamped preprint online is the best way to establish priority even before publishing.

7. Plagiarism/Poaching/Property: *“How can I possibly self-archive? My work could get plagiarized!”*

All work that is made public can be plagiarized, but plagiarism of online OA text is easier to detect and document. The only way to make plagiarism impossible is to neither publish nor make it accessible to anyone.

8. Privacy/Patents: *“How can I possibly self-archive? My ideas could get stolen!”*

Again, the only way to prevent ideas from being stolen is to keep them secret, by neither publishing nor making them public. But OA is for research findings, published to be used and applied, not for secrets, kept private to be patented and sold.

9. Paranoia: *“Why should I self-archive? My institution would own or control my work!”*

A researcher’s institution, like its researchers, has vastly more to gain from maximizing the impact of its research output by maximizing access to it than it does from trying to collect access-tolls. But in any case, authors retain an article’s authorship, the journal editors and peer-reviewers control the article’s quality, and the institutional archive merely provides supplementary access, to maximize the article’s impact. (There is no need, by the way, as a precondition for self-archiving, for authors to retain copyright, or to transfer copyright to their institutions, or to adopt a Creative Commons (CC) license [<http://creativecommons.org/>]. Although any of these, especially the CC license, are welcome and desirable in their own right, it is a great mistake to make self-archiving contingent in any way on first having to successfully re-negotiate rights with one’s publisher.)

10. Proliferation: *“How can I possibly self-archive? Users won’t know which is the authentic version!”*

The definitive version of a published article is the publisher’s version, accessible to those who can afford it, as it always was. The supplementary author-self-archived version is for those who cannot afford access to the publisher’s version, and who would otherwise have to do without. In addition, authors can and will self-archive pre-peer-review preprint drafts if they wish; but what they should always self-archive is the peer-reviewed postprint – as well as any subsequent corrections, revisions or updates. (Nevertheless, version-tagging and control can and is feasible, and is being implemented in the self-archiving softwares.)

11. Paper-Glut: *“Why should I self-archive? It’s already hard enough to find things and to keep up!”*

OA self-archiving is done in order to maximize the impact of one’s own research, by maximizing access to it. Online navigation, search and retrieval are incomparably more powerful and efficient than any other means of navigation, search and retrieval, but it also has the virtue of being self-limited: If a user has had too much, they can always quit surfing. But the reverse is not true: If an article has not been made OA online, and a would-be user cannot afford access to it, they cannot access it at all – and that bit of its potential usage and impact is lost. Surely interest and time are a less arbitrary arbiter of what we can access and use than affordability (to our institutions).

12. Pricing: *“Why should I self-archive? All we need is affordable journals!”*

What is needed in order to maximize research impact is to maximize potential-user access. Making journals more affordable (i.e., lowering the cost of access) increases access but it does not and cannot maximize it; for even if all 24,000

journals were sold at-cost (zero profit), and their costs were minimized, most institutions still could not afford all or most of them. Hence articles and authors would continue to lose potential users and impact. Any cost barrier is always and access/impact barrier.

13. *Pretty-Sitting*: “*Why should I self-archive? I already have all the access I need!*”

Author and user hats are being mixed up here: Authors self-archive their work for impact, not for access: they already have access to their own work! Even if an author is “sitting pretty” – i.e., even if their institution seems to be able to afford access to all the journals they, as a user, feel they want and need – there is still the problem of users at other, less well-endowed institutions, who may wish to access (and use and cite) that author’s work. There is an element of golden-rule reciprocal altruism underlying self-archiving, insofar as user-access alone is concerned, but when it comes to author-impact, self-archiving is a matter of pure self-interest. And with 85% of articles not yet OA, and no institution able to afford even 85% of the planet’s 24,000 peer-reviewed journals, there just might be a few items out there that even the prettiest-sitter today would find useful, even if they don’t realize it, from where they sit.

14. *Papyrophilia/Print/PDF*: “*Why should I self-archive? It’s print-on-paper we need!*”

The print journal is fine for those who prefer and can afford it. For the rest, online use, or printing off hard copy have to suffice. For surfing and browsing, online is even better than on paper. For users starved for access, only Marie Antoinette would counsel “let them read paper!” The knock-on effect is there for authors too, starved for impact.

15. *Publishing’s Future*: “*Why should I self-archive? It’s OA journals we need!*”

To keep waiting passively for Gold OA, instead of going ahead and providing Green OA is not only a counsel of despair, but it casts some doubt on the research community’s putative need and desire for OA: If we want it so much, why are we not yet providing it for ourselves? If OA is so important, how can we afford to sit waiting for the remaining 22,000 journals to convert, one by one? And why *should* journals convert, at some sacrifice and risk to their revenue streams, if the authors clamouring for OA cannot even be bothered to do some obvious, risk-free self-help, in order to get it, by giving it?

Of course, self-archiving is not without *perceived* risk: that is what gives rise to Zeno’s Paralysis! But the 93% of journals that are Green have already taken the step of eliminating even the perceived risk for 93% of authors, by giving self-archiving their explicit blessing. So waiting passively for Gold in particular seems particularly paradoxical (and I suspect it is more often publishing-reform-theory-driven rather than research-access-impact-need-driven)...

16. Publishers' Future: *“How can I possibly self-archive? It will put my publisher out of business!”*

All the evidence to date is that subscription-based journal publishing and author self-archiving can co-exist peacefully, the latter supplementing the former, to maximize research impact, to the benefit of both. The two foremost publishers in physics (where self-archiving has been practised for 15 years, with some subfields having reached 100% years ago) report that there has been no detectable decline in subscriptions associated with self-archiving across those years ([Swan & Brown 2005](#)).

But if 100% self-archiving ever were to create a decline in subscriptions that made cost-recovery via subscriptions unsustainable, that would not put non-OA publishers out of business; it would merely put them into the OA publishing business ([Harnad 2003](#)). Each institution's annual windfall savings from canceling the subscriptions for its incoming journals would be more than enough to cover its annual costs for the OA publishing of its outgoing articles.

All of this is counterfactual speculation (Zeno style), however, for all the actual evidence to date is that self-archiving has highly positive effects on research access and impact and no effect on journal subscriptions.

17. Professional Societies' Future: *“How can I possibly self-archive? It will ruin my Learned Society!”*

The reply is the same as for publishers in general, except that whereas commercial publishers are presumably only in the business for the revenue, Learned Society publishers are supposed to be acting in the interests of their memberships, i.e., the research community. To the extent that Learned Societies fund their good works (meetings, scholarships, lobbying, etc.) out of their publishing revenues, an illuminating way to put the question to their member-researchers is whether – if the two were ever in conflict – they would willingly and knowingly choose to continue subsidizing their Learned Society's good works with their own lost research impact? The reply is very likely to be that the good works should find some other way to fund themselves.

But that too is speculation, as all evidence to date is that self-archiving has highly positive effects on research access and impact and no effect on journal subscriptions.

18. Professional Future of Librarians: *“How can I possibly self-archive? It will put librarians out of work!”*

The library community too will find plenty to do in the digital world, including the OA subset of it. As with publishers and Learned Societies, the status quo cannot be sustained and subsidized by needlessly lost research access and impact.

19. Priorities/Perspiration: “How can I possibly self-archive? It’s too complicated and time-consuming and I already have more to do than I can manage!”

This comes closest to Zeno’s original paradox about its being too time-consuming to cross the room. Part of the antidote is to stop sitting on one’s hands and simply let one’s fingers do a few deposits, to discover for themselves how simple and quick it really is to self-archive ([Carr & Harnad 2005](#)). But for the bigger problem of assigning self-archiving its proper priority in researchers’ time-management hierarchy, 95% of researchers surveyed the world over have signalled that if their institutions and/or their research funders *mandate* self-archiving, they will comply ([Swan & Brown 2005](#)).

The Prophylaxis Against Zeno’s Paralysis. It is accordingly time now to put the prophylaxis against Zeno’s Paralysis into place: The UK Research Councils (<http://www.rcuk.ac.uk/access/index.asp>) have proposed mandating self-archiving, and five institutions (the Universities of Minho, Southampton, and Zurich, Queensland University of Technology and CERN) have already done so and are as a result well on their way toward 100% OA, exactly as the Swan & Brown survey predicted <http://www.eprints.org/openaccess/policysignup/> . Once the rest of the planet follows suit, the optimal and the inevitable outcome for research, researchers, their institutions, their funders, and their funders’ funders – the tax-paying public – will be upon us at long last.

REFERENCES

Brody, T. and Harnad, S. (2004) Comparing the Impact of Open Access (OA) vs. Non-OA Articles in the Same Journals. *D-Lib Magazine* 10(6).

<http://eprints.ecs.soton.ac.uk/10207/>

Brody, T., Harnad, S. and Carr, L. (2005) Earlier Web Usage Statistics as Predictors of Later Citation Impact. *Journal of the American Association for Information Science and Technology (JASIST)*. <http://eprints.ecs.soton.ac.uk/10713/>

Carr, L. and Harnad, S. (2005) Keystroke Economy: A Study of the Time and Effort Involved in Self-Archiving. <http://eprints.ecs.soton.ac.uk/10688/>

Diamond, Jr., A. M. (1986) What is a Citation Worth? *Journal of Human Resources* 21:200-15. <http://www.garfield.library.upenn.edu/essays/v11p354y1988.pdf>

- Garfield, E. (1973) Citation Frequency as a Measure of Research Activity and Performance, in *Essays of an Information Scientist*, 1: 406-408, 1962-73, Current Contents, 5 <http://www.garfield.library.upenn.edu/essays/V1p406y1962-73.pdf>
- Garfield, E. (1988) Can Researchers Bank on Citation Analysis? *Current Comments* 44. October 31, 1988 <http://www.garfield.library.upenn.edu/essays/v11p354y1988.pdf>
- Hajjem, C., Harnad, S. and Gingras, Y. (2005) Ten-Year Cross-Disciplinary Comparison of the Growth of Open Access and How it Increases Research Citation Impact. *IEEE Data Engineering Bulletin* 28(4) pp. 39-47. <http://eprints.ecs.soton.ac.uk/11688/>
- Harnad, S. (1995) Universal FTP Archives for Esoteric Science and Scholarship: A Subversive Proposal. In: Ann Okerson & James O'Donnell (Eds.) *Scholarly Journals at the Crossroads; A Subversive Proposal for Electronic Publishing*. Washington, DC., Association of Research Libraries, June 1995. <http://www.arl.org/scomm/subversive/toc.html>
- Harnad, S. (1997) How to Fast-Forward Serials to the Inevitable and the Optimal for Scholars and Scientists. *Serials Librarian* 30: 73-81. <http://cogprints.org/1695/>
- Harnad, S. (2003) For Whom the Gate Tolls?, in Law, D. and Andrews, J., Eds. *Digital Libraries: Policy Planning and Practice*. Ashgate <http://eprints.ecs.soton.ac.uk/8705/>
- Harnad, S. (2006) Publish or Perish ? Self-Archive to Flourish: The Green Route to Open Access. *ERICIM News* 64. <http://eprints.ecs.soton.ac.uk/11715/>
- Harnad, S., Brody, T., Vallieres, F., Carr, L., Hitchcock, S., Yves, G., Charles, O., Stamerjohanns, H. and Hilf, E. (2004) The Access/Impact Problem and the Green and Gold Roads to Open Access. *Serials Review* 30(4): 310-314. <http://dx.doi.org/10.1016/j.serrev.2004.09.013>
- Harnad, S., Carr, L., Brody, T. and Oppenheim, C. (2003) Mandated online RAE CVs Linked to University Eprint Archives. *Ariadne* 35. <http://eprints.ecs.soton.ac.uk/7725/>
- Kurtz, M. J., Eichhorn, G., Accomazzi, A., Grant, C. S., Demleitner, M. and Murray, S. S. (2004a) Worldwide Use and Impact of the Nasa Astrophysics Data System Digital Library *Journal of the American Society for Information Science and Technology* 56(1) 36-45. <http://cfa-www.harvard.edu/~kurtz/jasist1-abstract.html>
- Kurtz, M. J., Eichhorn, G., Accomazzi, A., Grant, C. S., Demleitner, M., Murray, S. S. (2004b) The Effect of Use and Access on Citations. *Information Processing and Management* 41(6): 1395-1402. <http://cfa-www.harvard.edu/~kurtz/IPM-abstract.html>

Lawrence, S. (2001) Free online availability substantially increases a paper's impact Nature, 31 May 2001 <http://www.nature.com/nature/debates/e-access/Articles/lawrence.html>

Moed, H. F. (2005a) Citation Analysis in Research Evaluation. NY Springer.

Moed, H. F. (2005b) Statistical Relationships Between Downloads and Citations at the Level of Individual Documents Within a Single Journal, Journal of the American Society for Information Science and Technology, 56(10): 1088-1097

Smith, A. and Eysenck, M. (2002) The correlation between RAE ratings and citation counts in psychology. Technical Report, Psychology, Royal Holloway College, University of London, June 2002 <http://psyserver.pc.rhbnc.ac.uk/citations.pdf>

Swan, A. and Brown, S. (2005) Open access self-archiving: An author study. JISC Technical Report, Key Perspectives, Inc. <http://eprints.ecs.soton.ac.uk/10999/>