Peer Review in the Internet Age: Five (5) Easy Pieces

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Recommended Citation
DOI: https://doi.org/10.7771/2380-176X.4345

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fied reviewers from process, rather like a jury selection process that, to avoid bias, ends up with twelve citizens who haven't read a newspaper in years. A few years ago, a Supreme Court decision (Daubert v. Merrell Dow Pharmaceuticals) threw out the old "Frye test" of general acceptability by the scientific community, the Federal Rules of Evidence, rather than the consensus of scientists in the field, now determines what scientific evidence can be used in the courtroom. An amendment attached to a spending bill in 1999 opened federally-funded research to Freedom of Information Act requests, so that critics could get data and do their own analysis if they didn't like the researchers' interpretation. The workings of the republic that Michael Polanyi described depended on trust extended to those who are "in the know." That trust has eroded significantly.

Not too long ago, John Ziman asked the readers of Nature to consider the question "is science losing its objectivity?" He was concerned that scientists were abandoning their traditions of disinterestedness, along with the mechanisms of apprenticeship and peer review that sustained it. "We have personal interests and institutional values that we are bound to promote in our scientific work, however hard we try to suppress them. The virtue of academic science was that it took a strong line in support of "disinterestedness" and often managed in practice almost to live up to its ideals." This is threatened, in Ziman's view, as "public knowledge" is transformed into "intellectual property" (754).

Striking a Balance
At my liberal arts college, we make every effort to support faculty and student research. When necessary, we will pay copyright fees for interlibrary loan articles. But the copyright fee for a single article for one researcher is often more than the price of a book that could be put on our shelves and shared among many readers. The unfortunate outcome is that we buy the one-time rights to the article and hope that when a patron needs the book we didn't buy, some other library will loan it to us. The implications of this practice are alarming.

As I write this, another university press announces it's closing its doors. Academic libraries are their prime market, and the contraction of book budgets means scholars are losing a valuable outlet for sharing research findings and analysis with the community at large. The books that people looked for on September 12, 2001 to understand what had just happened were found on the backlist of university presses. The next time we go through a similar crisis, the books that help us understand it may not be there. The so-called "serials crisis" is truly a cultural crisis with far-reaching implications and, while it's easy to point the finger at for-profit STM publishers, scholars themselves must share some of the blame.

If knowledge is a republic, we need to redefine what good citizenship means. Academic authors should examine their personal motives for publication and take seriously John Ziman's call for disinterestedness. We need to look beyond whatever field we're tending and think about the health of the entire ecology of knowledge. Because ultimately, when we treat the work that academics are expected to do to fulfill their contract with society as mere intellectual property, rather than as a contribution to a public resource, we run the risk that contract will not be renewed.

A bill recently introduced in Congress by Martin Sabo, the "Public Access to Science Act," takes a breathtakingly simple approach to this — it would remove copyright protection from works arising out of federally funded research. Why should the public pay for it twice? This solution, while bold and apparently sensible, is problematic because even those frustrated by the current system don't want their work to be subject to alteration or reuse without attribution — actions that could harm the research record and won't serve the public interest in the long run. We can negotiate better ways to retain sufficient incentives for authors and publishers while honoring the benefits of public knowledge.

All it will take is a little imagination and a better understanding of the intersecting but crucially different perspectives of academic authors, publishers, and the public.

We have a republic — if we can keep it. Can we strike the right balance? That's not just an academic question.

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**Works Cited**


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**Peer Review in the Internet Age:**

**Five (5) Easy Pieces**

by Gerry McKiernan

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"...[In the digital world, the evaluation process stands ready to be reinvented in a clear, rational way by the relevant research communities themselves.]

— Jean-Claude Guédon

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**Purpose of Peer Review**

In general, peer review can be defined as "the assessment by an expert of material submitted for publication." Specifically, its purpose is to ensure that published research is important, internally-consistent, original, technically-reliable, timely, well-presented, and most importantly, benefited from guidance by experts. Overall, "the underlying strength of editorial peer review is the concerted effort of large numbers of researchers and scholars who work to assure that valid and valuable works are published, and conversely to assure that invalid or non-valuable works are not published."

**Problems with Classical Peer Review**

While established peer review has its supporters, it has long been criticized as "... slow, expensive, profligate of academic time, highly subjective, prone to bias, easily abused, poor at detecting gross defects, and almost useless in detecting fraud." In a recent review article on the peer review process, Rowland analyzes and briefly characterizes many of the deficiencies of classic peer review as follows:

- **Subjectivity**
  Summary rejections by editor without sending the paper to referees; choice of referees by the editor (choosing for example, a known harsh referee for a paper the editor wishes to see rejected);

- **Bias**
  Discrimination against authors because of their nationality, native language, gender or host institution; situations where author and referee are competitors in some sense, or belong to competing schools of thought;

- **Abuse**
  Too many articles out of one piece of research, or duplicate publication; intellectual theft: omission or downgrading of junior staff by senior authors; plagiarism (stealing others yet unpublished work that has been sent for review), delaying publication of potentially competing research;

- **Detecting Defects**
  Identification of factual errors within submission

- **Fraud Misconduct**
  Fabrication of results; falsification of data false claim of authorship for results.

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Among the most common complaints about peer review is the long delay associated with the review process. As observed by Stevan Harnad, an active proponent of author-self-archiving and institutional repositories, “[t]here is much muttering about publication delay, a real enough problem, especially in paper publication, but peer review itself is often responsible for as much of the delay as the paper publication and distribution process itself.”

Scientific Publishing as Rhetoric

For some, the fundamental problems of peer review are inherent in the peer review process itself as it is currently implemented. As noted by Sosteric, “the traditional mode of peer review obscures the problems of reference and the rhetorical dimension of science. The rhetorical process ... [that] is at the heart of science and peer review conveniently disappears with the final publication of the manuscript. In its place is an ideal typical representation of the scientific paper of the realist assumptions about empirical reference. All the academic world sees is a polished manuscript where the personal involvement of the researcher and reviewers has been systematically eliminated.”

As an alternative to conventional peer review, Sosteric, Gross, and others, promote the framework of the “ideal speech situation,” a “theoretical construct that describes the ideal type of interpersonal interaction that should exist in a rhetorical situation” proposed and developed by Jürgen Habermas, the noted German philosopher and sociologist. Drawing upon Habermas, Gross describes the ideal speech situation in the following terms: 1) the ideal speech situation permits each interlocutor an equal opportunity to initiate speech; 2) there is mutual understanding between interlocutors; 3) there is space for clarification; 4) all interlocutors are equally free to use of any speech act; and 5) there is equal power over the exchange.

As applied in the context of peer review, Gross notes that ideally “scientific peer review would permit unimpeded authoritative initiative, endless rounds of give and take, [and] uncheckered openness among authors, editors, and referees.”

“... The Times They Are A-Changin’”

In 2001, CERN, the European Organisation for Nuclear Research, in Geneva, Switzerland, served as the venue for the first Workshop on the Open Archives Initiative (OAI). Focused on OAI and “Peer Review Journals in Europe,” the purpose of this workshop was to “mobilise a group of European scientists and librarians who want to play an active role in organising a self-managed system for electronic scholarly communication as a means to address the serials crisis. Such a system should be compliant to the technical standards proposed by the Open Archives Initiative (OAI) [www.openarchives.org].”

Two years after the workshop, a policy briefing of the European Science Foundation was published. The publication not only profiled the variety of issues relating to Open Access and the OAI, but also summarized the themes of the first OAI workshop, and the second held at CERN in mid-October, 2002. In addition, the briefing included consensus recommendations from each workshop. While the “participants of the first workshop” were “unanimous in their belief that the certification of scholarly work remains a fundamental part of the scholarly communication system,” they also believed that the electronic environment allows for novel approaches to accord a stamp of quality to scholarly works.” The suggested “new metrics” that could be extracted from a fully electronic communication system include the discussion level generated by a paper submitted to a publication system with open peer review and peer commentary features; automated citation indexing beyond the standard Institute for Scientific Information (ISI) print-focused service; and access statistics.

LAMPSS: Lots of Alternative Models Provide Sensible Solutions

[1] Open Peer Review

During much of its recent history, conventional peer review has been wholly or partially anonymous. In the former arrangement, neither reviewer nor the author is known to each other; in the latter, the author is identified. Until five years ago, the British Medical Journal (BMJ), the high-impact, general medical journal of the British Medical Association, had “used a closed system of peer review, where the authors do not know who has reviewed their papers ... but the reviewers do, however, know the names of the authors.” In announcing a change in its editorial policy, Richard Smith, the BMJ editor further observes that “[m]ost medical journals use the same system, ... based on custom and not evidence. Now we plan to let authors know the identity of reviewers. Soon we are likely to open up the whole system so that anybody interested can see the whole process on the World Wide Web. The change is based on evidence and an ethical argument.” He further notes that “the primary argument against closed peer review is that it seems wrong for somebody making an important judgment on the work of others to do so in secret.” In a supportive argument, Smith quotes Drummond Rennie, a deputy editor of JAMA: The Journal of the American Medical Association, stating that identifying the reviewer links “privilege and duty, by reminding the reviewer that with power comes responsibility: that the scientist invested with the mantle of the judge cannot be arbitrary in his or her judgment and must be a constructive critic.”

Journals that have implemented open peer review include not only the British Medical Journal (www.bmj.com), but also select journals published by BioMed Central (www.biomedcentral.com), as well as Internet Health: Journal of Research, Application, Communication & Ethics (www.virtualmed.net/ffrms/internethealth/), among others.

[2] Commentary-Based

A journal that offers a novel form of ‘open review’ as well as conventional peer review is continued on page 53
the Electronic Transactions on Artificial Intelligence (ETAI) (www.etai.org). "The ETAI is an electronic journal that uses the Internet medium to the fullest extent for scientific communication: not merely for distributing the articles, but also for the review procedure, for bibliographic infrastructure, and other applications." With respect to reviewing, "it...uses a novel, two-stage procedure where the first review phase is open and allows the peer community to ask questions to the author, and to create a discussion about the contribution. The second phase — called refereeing in the ETAI — is like conventional journal refereeing except that the major part of the required feedback is supposed to have occurred already in the first, review phase." After refereeing, accepted articles are published in the ETAI journal in both a paper edition and an electronic edition where the latter is available free of charge, and contains a variety of other information, including past discussions.22,23

Launched in September 1996, the Journal of Interactive Media in Education (JIME) (www.jime.open.ac.uk), a borne-digital e-journal has incorporated one of the most varied forms of peer interaction and review. Its review environment provides an "opportunity to redesign the conventional journal review model to be more open, responsive and dynamic." In the JIME review model "authors have the right of reply," "reviewers are named and accountable for their comments, and their contribution acknowledged," and the wider research community has the chance to shape a submission before [formal] publication.24,25 Specifically, "articles submitted to JIME are first reviewed by three reviewers who are named, and acknowledged for their contribution to a review. They post their reviews as threaded comments to a private [Web] site. Reviewers have the option of posting anonymously, but usually...[they] are happy [to be]...named...[In turn], authors are encouraged to respond to [reviewer] comments. This [particular part of the process] takes place during an agreed period when authors and reviewers are able to respond in a timely manner."

On the basis of this interaction, if the assigned editor deems that the manuscript is of acceptable quality based on this discussion, the submission "will be published will then be published as a preprint for public open peer review, and announced to relevant communities to invite their participation." This second phase of the JIME open review is open for a month after formal posting. After public review and comment, the assigned JIME editor will "post to the discussion an editorial report summarising the most significant issues, and specifying change requirements to the authors." After formal acceptance and publication, JIME continues to support discussion about the revised, published article. In addition, the most interesting review comments/exchanges are published with the final version of the revised submission, "providing readers with insight into the issues that arose during review, and enabling them to build on those discussions."24,25

Within JIME, authors can "post links to publications to point to subsequent work. Readers can post comments and links to point to work which has not been referenced, or did not exist when the article was written. [In addition], authors, reviewers and anyone else who has subscribed to the article will receive email alerts to new postings to its discussion forum."25

[3] Community Based
Paul Ginsparg, the creator and developer of arXiv.org, the physics e-print service originally based at the Los Alamos National Laboratory, has proposed a tier-based hybrid review system that offers enhanced conventional review in conjunction with open submission and alternative assessment. In his model, any and all submissions are accepted after a cursory examination or other pre form certification and assigned to a "standard" tier. This phase of the review process would be "minimally labor-intensive, perhaps relying primarily on an automated check of author institutional affiliation, prior publication record, research grant status, or other related background; and involve human labo: primarily to adjudicate incomplete or ambiguous results of an automated pass."26

"At some later point (which could vary from article to article, perhaps with no time limit), a much smaller set of articles would be selected for the full peer review process [and assigned to an upper tier]. The initial selection criteria for this smaller set could be any of a variety of impact measures, to be determined, and based explicitly on their prior widespread and systematic availability and citability: e.g., reader nomination or rating, citation impact, usage statistics, editorial selection, ... "27

It is expected that this approach would lead to an overall efficiency in the review process by expending "community intellectual resources" on submissions that are "most likely to be archivally useful, and hence merit the enhanced editorial treatment for upgrade into the upper tier, including, for example, text clarifications and other improvements."28

Upper tier enhancements could also include continued on page 54
“anything from a thorough blind refereeing to open professional annotation and comment. The upper tier could also combine commentary on many related papers at once. The point is that it’s possible to provide more signal of various sorts to users on a smaller subset of articles, without worry about fairness issues of limited dissemination for the rest, and this can be done at lower overall cost than the current system, both in time spent by editors and in elective time spent by referees.”

As noted by Ginsparg, “the standard tier would provide a rapid distribution system only marginally less elite than much of the current publishing system, and enormously useful to readers and authors,” particularly in fields “in which the time to publication is perceived to be too long.” In addition, “the standard tier availability could also be used to collect confidential commentary from interested readers so that eventual referees would have access to a wealth of currently inaccessible information held by the community.”

More than five years ago, David Stern, Director of Science Libraries and Information Services at Yale University, proposed a model with many of the components of the Ginsparg approach. Stern envisioned a system that would allow “the widest range of scientific manuscripts to be archived, searched, and distributed electronically at the lowest possible cost.” As Stern notes, “this would be accomplished through very minimal filtering and subsequent placement of eprints on a non-commercial archival server by a subject-specific Moderator appointed by a society (or consortia of societies).” A society-appointed Editorial Board (with double-blind peer review approved by the non-profit Peer Review Inc. organization) would then identify the most important materials from among these archived items, and the stamp of approval for these items would be included in a secondary Virtual Collection.

In the Stern model, there are no direct submissions to the Editorial Board, instead manuscripts would be directed to the Editorial Board in one of three ways: 1) nominated by the eprint Moderator upon receipt for the archival server; 2) notification sent to the Editorial Board when a threshold number of hits are generated by any one manuscript on the archive server; or 3) nominated by readers of material from the archive; this process requires a letter of support outlining the importance of the work to the Editorial Board.

[4] Usage-based

As noted several alternative peer review models recommend a metric that uses access statistics as an indicator of significance. While the European Science Foundation policy briefing observes that “new metrics” could include the discussion level generated by a paper, as well as access statistics overall, the Ginsparg model recommends that second tier review candidates might be selected on a “variety of impact measures, that would include reader nomination or rating, or usage statistics.” In the Stern model, candidates for review for an editorial board would be identified “when a threshold number of hits are generated by one manuscript on the archive server.” More recently, Harnad, notes that a “new potential measure of on-line impact, not available in the paper era, is usage in the form of ‘hits.’” This measure is noisy in that it can be inflated by automated Web-crawlers, short-changed by intermediate caches, abused by deliberate self-hits from authors, and undiscriminating between nonspecific site-browsing and item-specific reading ... but seems to have some signal-value too, partly correlated with and partly independent of citation impact.”

[5] Citation-based

More than fifty years ago Eugene Garfield developed and applied a method of citation indexing to enhance access to the scholarly scientific journal literature. In October 1999, the Open Citation Project: Reference Linking and Citation Analysis for Open Archives (http://opacic.eprints.org) was officially inaugurated. One of its most notable outcomes was the creation of Citebase (http:// citebase.eprints.org/cgi-bin/search), a Web-based citation index for Web scholarship and “Google for the refereed research literature.”

Among its various functionalities, Citebase can provide several of the established scientometric measures of research impact, notably citation counts for a Web-based article, citation counts for the researcher, as well as co-citation analysis. In addition, it has enabled the creation, development, and implementation of new measures of “impact,” notably citation counts for the preprint phase of a publication, usage measures (“hits”) for preprints and postprints, time-course analyses, and usage/citation correlators and predictors. Using Citebase, pre- and post-publication citations for individual papers can be measured against usage for the first time.

More recently in February 2004, the Institute for Scientific Information (ISI) – the producer of the Web of Science and numerous specialized print and electronic citation indexes covering a variety of disciplines and subjects, announced a new initiative to create, test, and provide a “Web Citation Index” for Web scholarship. In addition to tracking online publications, the new index will also document citations to print works by online sources.

The new service will utilize the NEC CiteSee technology (http://citeseeer.ece.psu.edu/cis), which includes “extraction of bibliographic citations, autonomous citation indexing, calculating citation statistics and related documents, reference linking to cited articles, citation context display, automatic notification based on user profiles, correlation of related documents, full-text indexing, query-sensitive summaries of the context of search terms in an article, citation graph analysis, and targeted Web crawling.”

New Opportunities

“Let us be imaginative in exploring the remarkable possibilities of this brave new medium.” — Stevan Harnad

As observed by Harnad, “the Net ...not only] offers the possibility of implementing peer review more efficiently and equitably ...” but more significantly, provides a “real revolutionary dimension” with such features as “open peer review.”
Peer Review and Pay-to-Publish: The World Turned Upside Down?

by Michael A Mabe (Director, Academic Relations, Elsevier, Langford Lane, Kidlington, Oxford OX5 1GB, and Visiting Professor, Dept. Information Science, City University, London) <m.mabe@elsevier.com>

Listen to me and you shall hear, news hath not been this thousand year:
Since Herod, Caesar, and many more, you never heard the like before.
Holy-days are despis’d, new fashions are devise’d.
Old Christmas is kick out of Town.
Yet let’s be content, and the times lament, you see the world turn’d upside down.

[Popular ballade from English Civil War c. 1640s]

S o legend has it was the song played when the defeated British surrendered to Washington at Yorktown at the conclusion of the revolutionary war on October 19th 1781. The current hubbub in journal publishing, in favour of a drastic revolution from a reader-pays to an author-pays business model, is not yet a victory or defeat parade but could legitimately be viewed as a “World Turned Upside Down” moment — in all senses of that phrase. However, the inversion of who pays may turn out to be less of a panacea and more of a poison to the many delicate relationships involved in the journal publishing process, not least the efficacy of peer review as a guarantee of quality.

I have worked in scholarly publishing for nearly 25 years. In that time, the journal — like Mark Twain — has frequently been declared dead only to be discovered to be still alive and kicking, while its much vaunted replacements wither on the vine. Proponents of these alternative futures almost universally overlook the importance of the journal system to the intellectual and personal requirements of scholars, past, present and future. Whether digital or on paper, as means of registering, validating, disseminating and archiving scholarly articles, the journal is still very much alive.

The latest challenge comes from the Open Access movement. It is not an attack on the principles of the journal system per se but an attempt to create an entirely different approach to its philosophy and economics, at its heart lies a pay-to-publish rather than a pay-to-read business model. The fundamental creed of Open Access is that all information should be free at the point of use, that the internet should be a universal library free for all mankind. Such altruistic ideals are difficult to disagree with (and as some commentators have respectfully remarked, contrary views in this debate are too often regarded as heretical rather than critical), nevertheless I believe that this dream, like so many other utopias, could lead to a nightmare outcome for authors, readers, librarians and publishers.

The drivers behind the pay-to-publish movement are clear if confused. There has been and continues to be a crisis of funding affecting university libraries. In real terms the proportion of university spending devoted to the library has been allowed to fall at the same time as the scholarly literature has grown, both in terms of journal titles and papers. Although not widely discussed, the pay-to-publish model does have one major advantage among its many downsides: it automatically links research activity to literature provision through the mechanism of charging authors to publish. In this respect, if no other, it goes to the heart of the library-funding crisis, or it would if a realistic economic model prevailed among its proponents. In addition, the digital transition — still far from complete — continues to redefine the roles and fundamental processes of all players in the information chain. All these factors play their part in creating a generalised dissatisfaction with the status quo, and Open Access has acted like a lightning rod for all these discontent. It is a symptom, not a cure.

The principal goal of Open Access is simple: access for all. The means to achieve it is the pay-to-publish model and it is frequently asserted that such models are automatically going to be cheaper and save libraries money.

At the heart of these arguments lies the idea that if something is non-corporeal then it must be free, or at the very least substantially cheaper. While there are some savings in a fully electronic world, we are far from that position; a significant proportion of journal customers still expect paper versions of journals as well as electronic ones. Even in a fully electronic world, it appears that any savings are not likely to be as great as many hope and electronic delivery introduces some new costs not present in the paper world. At its core, the fundamentals of the publishing process remain unaltered by the digital transition: journal editors still have to be found, and they and their editorial offices are needed in the acquisition and peer review of journal content; that content, albeit supplied in electronic form, still has to be unified and made consistent with addition of tags and other elements that allow it to be fully functional electronically.

Googling simplifies reproduction and distribution but there still has to be a master file or “first copy” from which both the digital and the print versions derive. The economics of these core processes have been extensively studied: first copy costs per article are reckoned by Odlyzko and Tenopir and King (and most recently John Cox Associates) at $3000 to $4000. The economic challenge for the pay-to-publish model is to devise a method that yields revenues at this level without putting authors off, otherwise the viability of their alternative is in doubt. Yet pay-to-publish publishers are currently charging authors only $500 to $1500, a shortfall of $2500 to $3500 per article. These publication charges assume that every published author can and does pay; and if the proportion that does not pay rises so will the average charge.

Anticipating these criticisms, Open Access advocates suggest that novel revenue-raising approaches are available to supplement publication payments and that these are not fully exploited. They believe advertising, sponsorship and charitable donations can supplement lower article charges and allow all barriers to access to be removed. The scale of subsidy required to do this should not be underestimated. Each year about 1.2-1.4 million articles are published: given the shortfalls per article above, are annual fees from advertising or sponsorships or donations of the order of $2-3 billion available?

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Column Editor’s Note: This article is based on “Alternative Peer Review: Quality Management for 21st Century Scholarship,” an invited presentation delivered at the Workshop on Peer Review in the Age of Open Archives held May 23-24, 2003 at the International School for Advanced Studies (SISSA), Trieste, Italy. A copy of the corrected and revised PowerPoint presentation is available at http://www.public.iastate.edu/~gerrymc/ APR.ppt.

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