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# Review Boards for Scientific Publishing

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NATHAN HAGEN

*While the spread of open access publishing for technical and scientific papers has improved some long-standing problems in the scientific publishing pipeline, it has worsened others. Meanwhile, peer review and the scientific publication system in general have come under increasingly intense criticism, provoking many reform ideas. Despite the strident language of reformists and the widespread opinion that the situation is worsening, reform ideas have generally received a lukewarm response among researchers. I argue that this complacency is a reaction to reforms that ignore the priorities of readers and how readers' needs have shaped the publishing world today. I outline a path for improving the peer-review system through the use of permanent review boards—to accommodate the needs of readers, reviewers, and authors alike—and show how to get from where we are now to where we should be.*

*Keywords: peer review, scientific communication, scholarly publishing*

## INTRODUCTION

While the open access movement has made sweeping changes to the scientific publishing landscape, there is a widespread impression that the changes are incomplete, that a second set of reforms are needed to make scientific and technical work more accessible and useful to the scientific community.<sup>1</sup> Editors are finding it increasingly difficult to locate qualified reviewers for manuscripts, reviewers complain of the mounting burden on their time and of authors taking advantage of the peer-review system, and authors complain of reviewer misbehaviour and of unfairness in the system. Calls for reform have included opening up peer review to public scrutiny or replacing peer review with different evaluation mechanisms, removing restrictions on publication, and making the whole pre- and post-publication phase more interactive with readers and reviewers.

While these are all attractive ideas for improving the current state of affairs, the reform literature has so far been unsuccessful in bringing

about widespread changes to the scientific publishing world. A prominent reason for researchers' lukewarm response to reform proposals is that reform discussions generally focus on the perspectives of authors and publishers but ignore the fundamental needs of *readers*. It is the needs of readers (the audience of fellow researchers and other informed consumers of original scientific research) as much as the needs of publishers themselves that have shaped the scientific publishing world today, and this perspective is essential for a realistic assessment of what reforms are promising and possible, and what are not.

The overriding need of readers that shapes the scientific publishing landscape is the need to locate research results that are both interesting and relevant to a topic of interest, in the face of an ocean of material that is either uninteresting or irrelevant. To this end, journals ask peer reviewers to evaluate whether submitted manuscripts are both a good fit for the journal's topical area and likely to be of interest to the journal's readership. These two filtering criteria are thus designed to help readers sift through and cull the literature. This is essential because we as readers of scientific literature spend a significant part of our time looking for interesting new ideas, as a means of studying a subject or of developing new research directions. Naturally, we try to make this time spent searching and selecting as efficient as possible. Peer review and the focus of subject-specific journals are the primary ways we filter information and reduce the volume of the vast scientific literature. In this sense, we can say that the majority of the scientific readership *wants* the difficulties and frustrations that peer review causes to authors. Even a flawed filter is far more useful to readers than none at all. This tension between the needs of authors to reach as wide an audience as possible and the needs of readers to limit the literature to as narrow a stream as possible is the fundamental problem that drives scientific communication and yet is not widely appreciated.

While readers' needs are underappreciated, writers too have legitimate complaints. Yet while many writers complain of the ugly features of peer review—reviewers' haste and their lack of objectivity and professionalism—the scientific community has yet to find a filtering mechanism that can replace peer review with something better. The need for human evaluation of manuscripts, by those who should have sufficient technical knowledge on the subject to assess their value, is something we have been unable to escape. As a result, reviewers are called on

to assume the gatekeeping role of literature filters for journal readers. While the peer-review system has flaws just as any human institution does, it has suffered accumulating criticism of late, and many see it as the weak point in the current scientific publishing pipeline. I propose to strengthen it and make it more flexible at the same time by creating permanent bodies of reviewers—review boards—with established and permanent names by which others can recognize them. This would be a group of journal reviewers that specialize in a specific area, who would agree to come together as a single body under the journal's guidance and form a review board for reviewing manuscripts. In the area of optical engineering, for example, a lens design review board can come together and agree to review manuscripts on that subject. While this may seem no different than the current system, it has the critical difference that the review board would be a fixed group with long-standing membership so that it has an enduring interest in maintaining its reputation. This feedback and self-policing mechanism is missing from today's ad hoc review teams assembled individually for each manuscript.

In the discussion below, I first survey some of the landscape of proposed publishing reform and consider how the various ideas can be fitted together into a coherent reform program that meets the needs of readers while also reducing some of the strains in scientific publishing. I show how permanent review boards can be formed with little disruption to the existing system and argue that this simple organization can form the foundation needed for implementing many of the reforms.

#### SURVEY OF PEER-REVIEW REFORM IDEAS

A common criticism of peer review questions whether peer review 'works' at all and suggests that the answer depends on what we think peer review is for.<sup>2</sup> While most researchers suggest that peer review is a method of selecting the best papers to publish, or a means of improving the quality of publications, a better answer is that peer review is primarily for readers—to help select what to read. It is only secondarily to improve quality, though the two are of course related. And in this light, the criticism that peer review 'doesn't work'<sup>3</sup> sounds hollow since no one has been able to suggest an alternative that *does* work. For example, there are often complaints that peer review fails to catch technical errors. However, it is optimistic to expect reviewers to detect many technical errors in a couple hours of their time. Instead, what a reviewer *can* say

for certain is whether he or she understands the work and whether it seems important and interesting. So, rather than consider ideas of eliminating peer review, I instead consider how we might improve on the existing system and shore up its weaknesses.

A common complaint among authors is that the publishing process is far more difficult than it should be. Reviewers are often unreasonable and nasty;<sup>4</sup> publishers charge exorbitant prices to archive manuscripts and place them behind pay walls; journals restrict the *kind* of results that can be published,<sup>5</sup> and so on. Reviewers, too, have their grievances. The review process is more inefficient than it should be; authors are often lazy and submit work that is poorly explained and difficult to read; and many manuscripts pass through multiple review cycles with different journals, wasting reviewers' time. Finally, even reviewers feel that binary pass/fail decisions (the ultimate decision to accept or reject a manuscript that may follow rounds of revision) are an overly crude mechanism for evaluating manuscripts. These complaints about the current system have prompted a number of reform ideas, a representative list of which includes the following:

**Minimize publishing costs**—Allow authors to archive manuscripts for only a nominal fee.<sup>6</sup>

**Pre- versus post-publication review**—Use post-publication reviews of manuscripts instead of pre-publication reviews.<sup>7</sup>

**Graded versus binary review**—Rather than giving a binary-valued accept/reject review, allow reviewers to apply a numerical grade to a paper.<sup>8</sup>

**Open versus blind review**—Use open reviews, in which the reviewers are known and their comments can be viewed by everyone.<sup>9</sup>

**Permanent review boards**—Gather subject-expert reviewers into permanent bodies that can manage themselves, instead of the current system of forming ad hoc teams for each manuscript.

I consider each of these reform ideas in turn.

#### *Minimize Publishing Costs*

One reform proposal is to eliminate the barriers to publishing and allow authors to publish whatever and whenever they want. This promises to reduce costs to authors, improve the speed of publication, and avoid

content restrictions such as the inability to publish negative results.<sup>10</sup> The successful open preprint archiving system arXiv is a model for this idea,<sup>11</sup> motivating some writers to claim that there is no longer a need for journals to host manuscripts at all.<sup>12</sup> Rather, manuscripts can be hosted in an archive, allowing a journal to focus instead on acting as a *curation interface* to the archive. The *Discrete Analysis* journal, for example, was formed along these lines and has demonstrated that it is possible to run an ‘overlay journal’ in this way and keep costs under \$10 per manuscript.<sup>13</sup>

While this proposal excites some authors with its potential, it has received a lukewarm response in the scientific community generally. Authors who use arXiv for their manuscripts typically go on to submit their preprints to peer-reviewed journals<sup>14</sup>—behaviour that may seem surprising, given that the gatekeeping function of peer review is probably the greatest cause of frustration with the current system. However, when viewed from the perspective of readers, we can see why the response to this idea has been weak: eliminating the gatekeeping function of journals—the financial barriers to publishing and the need to meet the requirements of reviewers—would likely produce a flood of material. The worry is that quality will suffer and that readers will have difficulty filtering the literature to locate manuscripts of interest. Thus, the overlay journal *Discrete Analysis*, while removing financial barriers to publication, implicitly acknowledges the priority of reader needs by preserving the gatekeeping function of peer review.

An additional worry about automatic archiving is that many papers will suffer from unclear writing and grammatical errors. Journals currently minimize these errors by requiring papers to be copy-edited prior to publication, and this greatly improves the readability of the literature. With automatic archiving, we can expect increased frustration with poor writing quality, so it will likely prove necessary to indicate in some way that an archived paper has been not just peer reviewed but also editorially endorsed, allowing readers to filter out those manuscripts that are likely of poor writing quality.

We can conclude that as long as we maintain readers’ ability to filter the stream of publications according to their interests, and at a level of quality that they want, then minimizing publishing costs through low-cost archiving will be accepted by the community. Making this work will require that publishers provide sufficient metadata for filtering

algorithms to customize to each reader's needs and will also require the development of a user-friendly platform for developing individualized filtering algorithms.

*Pre- versus Post-review*

In the current publication pipeline, a manuscript is submitted by an author to a journal, the journal editor assembles a team of reviewers to evaluate the paper, and reviewers are asked to recommend whether or not the manuscript is a good fit for the journal. In what can be considered a requirement for the previous idea of immediate archiving of manuscripts, one reform proposal is to eliminate the gatekeeping function of peer review—that is, we should allow submitted manuscripts to be archived *without* review and instead perform evaluations after publication. A touted advantage for post-publication evaluation of manuscripts is that it is open-ended, allowing for something like the comment forums often a part of Internet blogs.<sup>15</sup>

Because this proposal eliminates the pre-publication filter that is so useful for readers, such a reform would need to provide an alternative filtering mechanism, such as attaching a review 'badge' or grade to a paper to signal to readers that the paper has been evaluated by peers and was considered a noteworthy research report.<sup>16</sup>

*Graded versus Binary Review*

While peer reviewers under the current system are asked to evaluate manuscripts with a binary decision (approved or not approved for publication, often after rounds of revision), a more useful measure for filtering purposes is a numerical grade evaluation.<sup>17</sup> This fits in nicely with the ideas of post-publication review and automatic archiving, since unevaluated papers can be labelled as such, and an evaluation grade allows readers to construct filters based on grade. A reader, for example, could choose to look at only those publications that have been reviewed and have received grades better than, say, three out of five. Adjusting the level of the filter would allow a reader to tighten or loosen the stream of material that the filter permits through.

*Open versus Blind Review*

The impressive success of the open-source software movement, and its use of community reviewing of code to improve quality, has influenced

many to try something similar for reviews of scholarly manuscripts. Whereas reviewer evaluations are typically closed and cannot be viewed by readers, it has been suggested that evaluations should instead be open and that open review would promote better behaviour by reviewers since their work would be publicly scrutinized.<sup>18</sup> There is, however, disagreement about whether the quality of reviews would be improved by public exposure,<sup>19</sup> and attempts at measuring the positive or negative effects of public exposure have been frustrated by methodological problems of evaluation and quantification.<sup>20</sup> Making the problem worse, journals making use of open peer review have also found that a significant number of reviewers refuse requests to review manuscripts out of concern for the public scrutiny.<sup>21</sup>

While open peer review can come in many forms, the success of any one depends on whether it serves readers' needs. Looking at journals that have implemented different comment forums for manuscripts, however, we see that these forums have so far attracted little interest,<sup>22</sup> indicating that readers do not find them useful. This should probably come as no surprise when we consider that readers already feel swamped by the amount of material to read, so the low information density provided by comment forums is often a poor use of readers' time.

Although advocates of peer-review reform are generally sanguine about the potential of open review, the journals that use open review show clearly that, while reviewers are better behaved in their writing, they are also more reluctant to reject papers as uninteresting. This may be great for authors, but it is a major problem from the perspective of readers, who need a strong filter mechanism. It may be that permanent review boards can play a useful role here to make open review a practical reality by protecting individuals from censure through their membership in a group that is *collectively* responsible for reviewing.

### *Permanent Review Boards*

In the most common form of manuscript review for modern journals, an assistant editor assigned to the manuscript seeks reviewers among the various researchers that he or she considers subject-area experts. Many requests are declined, so the editor typically must send several requests sequentially to assemble a volunteer review team of two or three. The inevitable result is that the process of locating reviewers is a burden for editors. In addition, researchers currently have little incentive to devote

serious effort to performing reviews because the work is performed anonymously and without reward.

One way of addressing these issues is to form groups of subject-area reviewers into independent review boards. If the boards are established as permanent entities and keep membership records, reviewer members can receive recognition for their work, much as journal editors are recognized for theirs. Moreover, a permanent body can also cultivate a reputation, giving them visibility and an incentive to maintain their reputation by giving high-quality reviews. An example of implementing such a board would be to bring together as members any potential reviewers recommended to the board and who also agree to review a minimum of  $x$  papers per year. Each manuscript under review by the board is assigned to three members, for example, with two submitting their reviews to the third for compiling the reports into a consensus review. This could be as simple as appending the three and averaging the three evaluation grades, or it could be more complex depending on the accepted practices of a particular board. If the number of board members is insufficient, the board may agree to take on auxiliary reviewers, while maintaining the requirement that the consensus is always compiled by a board member. If such a group is sufficiently protective of its reputation, it may also require the reviewers to evaluate one another's reviews.

As a result, a journal's assistant editor can assign a paper to be reviewed not by an ad hoc anonymous team but rather by a journal-sanctioned board, with a list of members having subject-matter expertise, that has performed many reviews and has consistently demonstrated its expertise. By having board members agree in advance to perform a given number of reviews each month, the burden of repeatedly assembling review teams disappears—replaced by the lighter and more useful burden of administering the board. Finally, the board's reputation is that of the group rather than of the individuals, striking a balance between the safety of anonymity within the group and the exposure of open review—a group small enough to build a recognizable reputation yet large enough to anonymize its members for any individual review. In addition, for those who feel that paying reviewers for their effort is called for,<sup>23</sup> the long-term stability of the board and the obligation for members to perform a given number of reviews over the duration of membership paves the way for this to happen.

## HOW ARCHIVING AND REVIEW BOARDS AFFECT THE SYSTEM

Each of the reform ideas discussed above shows promise for improving the existing state of affairs. With a carefully designed system, the proposed reforms can be made to reinforce one another for a new scientific publishing ecosystem.

An example from an author's perspective on how a manuscript would make its way through this new ecosystem is as follows. An author submits a manuscript to a publisher's online archive, paying a nominal fee to do so. The archivist performs a cursory, minimal review of the submission. If the archivist determines that the submission is 'not obviously of low value,'<sup>24</sup> then it is quickly posted to the archive. Once the manuscript is posted, the author, worried that any problems of grammar or clarity may affect the peer-review grade, requests that it be editorially reviewed for writing quality by paying a fee to the journal. After a few days, the author receives the editor's response, and after implementing the suggested changes, the submission receives editorial approval and is marked as such. The author next selects a review board for the subject area matching the content of the research and submits a request for peer review, paying another fee to the journal. (All these fees can, of course, be bundled together instead of paid out piecemeal.) After a couple weeks, the board grades the paper for its level of interest, and this grade is automatically attached to the manuscript. For an open review system, the board's comments will be attached to the manuscript as well. The author responds to the reviewer comments and revises the manuscript and then requests that the board revise their review. The board reevaluates the manuscript and updates their grade. At each step along this path, the publisher's website maintains a daily feed of information, announcing all manuscripts whose status has changed during the previous day. An algorithm can monitor this stream and filter it based on any reader's settings, restricting the material to only those papers that match the reader's requirements of review grade, editorial approval, keywords, and so forth.

From a reviewer's perspective, the process appears as follows. On the first of each month, a board member receives an email containing a link to a manuscript to review, email contacts for two other members of the review team, and a pre-review summary generated by an evaluation algorithm. The evaluation algorithm looks for things such as plagiarism and for related publications by the same authors—things that are often

easier for an algorithm to do than for a human.<sup>25</sup> Algorithms applied to complex data can be inaccurate, however, so the pre-review data are used as information for the reviewer to take under advisement. After writing comments and grading the manuscript, the reviewer waits for the remaining two reviewers to complete the same steps, after which the full set of reviews becomes visible. Since he or she is the primary reviewer for this manuscript, the reviewer compiles the consensus review according to the board's rules, possibly with some emails to ask the other reviewers for more feedback, and submits the final result. The consensus grade and comments are attached to the posted manuscript. Finally, according to the board's rules, the reviewers must also submit grades for their fellow members' work, and so the reviewer also submits those to the review board's Web interface.

From a reader's perspective, the process is not much different from what it is today, with the exception that the reader needs to supply the journal with more specific information about the type of publication he or she wants to receive notification of. Thus, a reader can specify to receive news of peer-reviewed papers with grades of three or higher in the field of optical engineering and grades of two or better in the field of lens design. With this filter definition, the reader will receive a weekly update email announcing every manuscript whose status has changed during the week with those criteria.

A major advantage that this new ecosystem has over the existing one is that by separating the content review and editorial review steps from the archiving step of manuscript preparation, it allows journals to nudge authors into better performance. Authors are often lazy and are willing to submit sloppy writing, knowing that they will receive professional editing without cost once the manuscript has received peer-review approval. However, if journals separate the costs for archiving, editorial correction, and peer review, then those authors requiring multiple reviews, or heavy editorial effort, will be forced to pay higher fees.<sup>26</sup> This rewards authors who are willing to take on some of this work themselves and penalizes those who are not, providing healthier incentives for the system. While this clearly also penalizes non-fluent writers, it does so by removing an implicit subsidy in the current publishing pipeline. This can be explicitly inserted back into the system if the journal desires, by redistributing the editorial costs to the archiving and peer-review steps, as is done now. The advantage of healthier incentives,

however, is sacrificed—incentives whereby those who can perform are encouraged to do so, thereby reducing costs for everyone else.

A second advantage of the new ecosystem is that it also penalizes the inefficiency caused by ‘forum shopping’: the common practice of submitting work to the highest-regarded journal and, if rejected, then submitting to the next journal down and so forth until the work is finally accepted.<sup>27</sup> This often involves multiple submission and review cycles, with a lot of redundant work. More recently, some authors have begun to climb the ladder in the opposite direction by submitting to lower journals and, anticipating rejection, collecting reviewer comments in order to learn how to massage the paper into one acceptable for a higher journal. In the proposed ecosystem, because manuscripts are typically not rejected outright but instead are given a permanent review grade, there is no longer an incentive for multiple submissions in different forums. After the first submission, any second submission would be a duplicate publication.

Below I summarize the various problems and how the proposals address them, from the perspectives of the different roles: author, reviewer, editor, and reader. I follow this with a consideration of drawbacks to this alternative publishing system.

#### *Author Grievances*

**Expense and wait**—Automatic archiving makes the initial publication process almost instantaneous. The *expenses* of publishing, for editorial work and for administering peer review, are difficult to reduce, but the authors who can afford to forgo them will have the freedom to do so.

**Reviewer misbehaviour**—Review boards will police member behaviour to maintain their reputation, and authors can choose which board to send their manuscript to, among those approved by the publisher archive.

#### *Reviewer Grievances*

**Forum shopping**—With automatic archiving, forum shopping is no longer useful for authors.

**Overburdened reviewers**—Elimination of forum shopping decreases the burden on reviewer time, and algorithmic pre-review can help

lighten some of the tasks that reviewers are called on to do, such as plagiarism checking. The use of graded reviews means that authors will have a stronger incentive to write clearly, helping to reduce review time.

**Lack of reviewer recognition**—The idea of improving recognition for the work of reviewers is an issue that often comes up in discussions of scientific publishing reform, and membership on publisher review boards is a means of achieving this.

#### *Editor Grievances*

**Authors creating false reviewers**—Many journal submission systems have recently started to ask authors for reviewer suggestions to help lighten the load on editors. However, this has also caused some authors to take advantage of the system and create fake reviewers. With review boards, however, this type of unethical behaviour will be much more difficult for authors to pull off.

**Much time spent assembling review teams**—Most of this burden is taken up by review boards.

#### *Reader Grievances*

**Excessive focus on journal prestige**—Journal prestige is widely used as a proxy for research quality, but this association weakens when we allow for the differentiation of review board reputations. The prestige of a journal is largely a by-product of the selectivity of its board, and this becomes clearer when the two are differentiated from one another. That is, readers will learn to focus more on the reputation of the board and less on the name of the journal.

#### *Drawbacks*

- There is a clear bias against non-native writers of English in the proposed pipeline. This can be mended by requiring all authors to pay editorial expenses, as now, or with an explicit subsidy for non-native speakers.
- In the current system, if a manuscript is rejected due to reviewer misunderstanding, there are second chances. The author can rewrite and resubmit elsewhere. In the new system, some form of

re-review appeal process will be needed to address such errors that create bad evaluations. But if review boards are protective of their reputations, they will maintain a mechanism for correcting any errors that may occur.

- With the creation of review boards comes a set of new administrative tasks. It is possible that the overall burden on publishers and on reviewers may be left unchanged.

#### HOW TO GET THERE FROM HERE

Critics of the current publishing system suggest that radical changes are necessary, but the discussion above makes clear that the changes needed are actually moderate. While moving to a near-automatic archiving system and the use of review boards may appear to be sweeping changes to the publishing cycle, it is important to realize that they can be implemented with minimal disturbance to the current system. A publisher, for example, can create a new journal name connected to this archive and allow authors to submit to the archive system or to the traditional system in parallel, or can allow any manuscript evaluated with a high grade to be published in the traditional journal instead of the archive.

Review boards, too, can be implemented gradually and without disturbing the current system. A journal can start by forming a couple of small review boards with reviewers who agree to try the new system. Editors can send a few manuscripts to the boards instead of working to assemble review teams, and the consensus review can then be used exactly as other reviews are currently.

Moreover, there is no need to eliminate the current subscription system for journal readers. If publishers forgo charging authors for editing and formatting, then the authors can in return agree to give the publishers rights to restrict viewing of the papers to the set of paid subscribers—basically the same system that we have now. It seems likely that moving to an archival system will eventually relax this long-standing system, but there is little reason to think that it will disappear overnight.

#### CONCLUSIONS

It has been little acknowledged that the central problem in scientific communication is the tension that exists between authors and readers—the battle to reach a wide audience versus the battle to defend one's time. For the last century, readers have waged their battle using peer reviewers

to defend the gates to publication, a fight that has come under increasing strain with the multiplying number of gates to defend and the swelling armies of authors assaulting them. It is time for both sides to switch tactics and reduce the intensity of conflict.

I propose to establish an arXiv-like archiving system to improve the situation for authors while also implementing review boards to give reviewers the permanent administrative structure they need to have their work recognized and to let publishers make more efficient use of their skills. If implemented in tandem with the development of filtering software tools that allow readers to take advantage of the improved flexibility, many of the choke points in the existing publishing pipeline will relax.

As a teacher, Professor NATHAN HAGEN currently works in the Optical Engineering Department of Utsunomiya University in Japan. As an author, he publishes research in optical science. As a reviewer, he was recently awarded an Outstanding Reviewer Award by OSA, the Optical Society. His email address is nh@hagenlab.org and his ORCID is 0000-0003-1122-9081.

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