Substantia
An International Journal of the History of Chemistry

Firenze University Press
www.fupress.com/substantia

Editorial

Peer Review – Critical Feedback or Necessary Evil?

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Anyone who has participated in scientific publishing, either as author or editor, has dealt with the process of peer review. Of course, individual opinions on peer review vary, with viewpoints ranging from it being an important part of ensuring the quality and reliability of scientific publications, to thoughts that the process as a whole is completely broken. Unfortunately, it also seems that authors often look at peer review as being a painful exercise forced upon them by journals, while those serving as reviewers too often see it as something expected of them, but not important enough to spend considerable effort performing. Before discussing various points of the peer review process, however, it is worth considering where this process began.

Current historical studies generally suggest that the modern process of formalized peer review developed in the 19th century and grew slowly and haphazardly, encountering skepticism and criticism along the way. One such recent study by Melinda Baldwin[1] suggests that the practice of soliciting written reviews by specialists found its origins in 1831, when William Whewell (1794-1866) proposed that two Fellows of the Royal Society should write their views on submissions to the journal *Philosophical Transactions*, after which the written reports would be published in the new journal *Proceedings of the Royal Society of London*.[2] While the plan to publish the reviews was abandoned, the practice of sending submitted papers out for refereeing endured and by the mid-19th century, coordinating refereeing was one of the chief responsibilities of the Secretaries of the Royal Society. In Germany and France, however, refereeing remained relatively uncommon throughout the 19th and early 20th centuries. Although it had been originally intended for the referees' identities to be known to both the author and the journal's readers, the Royal Society quickly decided that referees would give more candid advice if they remained anonymous. Thus, the modern practice of referee anonymity has been part of peer review since very early in its history, with the most common form referred to as *single blind peer review* (i.e, only the reviewer's identities are anonymous).

Prior to this modern form of peer review, other practices had sought to fulfill some of the same goals. One common practice by some scientific societies was that papers were required to first be orally presented at the meeting of the corresponding society, at which it could be vetted through discussion among the meeting participants. This practice, however, resulted in a number of famously long delays in the publication of critical works. Some societies had other internal practices for evaluating the work of their members before it was circulated,[3] but those systems have not been viewed to be ones that led to the modern form of systematic external refereeing. In Germany, some of the most prominent journals were controlled by powerful editors who preferred to make decisions without relying on the opinions of others, although they would sometimes add their own personal critical comments as editorials after select papers, thus providing review in some form.

Of course, many have voiced dissatisfaction with modern peer review, citing problems with bias,[3,4] problems of objectivity and the ability to gauge reliability or importance, and the opinion that traditional refereeing is antiquated. Such views have led to the conclusion by some that the system has broken down and has become

[1] M. Baldwin. *Isis* **2018**, *109*, 538.
[2] A. Csiszar. *Nature*, **2016**, *532*, 306.
[3] C. J. Lee, C. R. Sugimoto, G. Zhang, B. Cronin. *J. Am. Soc. Inf. Sci. Technol.* **2013**, *64*, 2.
[4] C. J. Lee. *Philosophy of Science*, **2015**, *82*, 1272.

an obstacle to scientific progress.[2] As a response, some publishers have attempted to introduce new forms and variants of peer review, including double blind review,[3] open review, and post-publication peer review.[5] Double blind review, in particular, aims to remove the author's identity and thus protect the author against forms of social bias.[3] However, even without knowledge of the author names, all too often it is easy to discern the identity of more established authors in your field and thus bias favoring established authors and hindering newer authors still remains.

Personally, as an author, I am always disappointed with negative reviews. Still, I try to view the overall review exercise as a positive process. I have always realized that my published work is a permanent record and the last thing I would ever want is to include a stupid mistake that will never go away. As such, I always pray that reviewers catch any such possible errors. Even when reviewers fail to understand the point of the work submitted, or I view the reviewer's comments to be in error, this usually leads to a stronger publication. As I always strive to make my publications clear and approachable to the lay reader, such misunderstandings on the part of reviewers result in additional efforts on my part to focus the message or further improve the clarity of my arguments. In that respect, I will always view peer review as a critical part of the publication process, despite its potential flaws.

As a reviewer, I think that my experience as the recipient of peer review influences the way that I provide criticism, as does my decades as an educator. In that respect, I have come to regard peer review as much more than just pointing out errors in the experimental methods or in the interpretation of results. That is, I have come to approach each review as a teachable moment and present my comments in nearly the same way as when I am revising the writing of my graduate students. The goal too is really the same, helping the authors to improve their paper and make it the best it can be. This, of course, includes ensuring that the methodology and analysis is sound, but also includes things like ensuring that prior work on the topic has been properly credited and acknowledged, correcting misconceptions that have crept into the literature, and ensuring that the paper is written in a clear fashion, such that it can be understood by others less familiar with the subject. Along the way, I will suggest alternate wording to improve clarity or remove errors in terminology, and I always try to back up more significant criticisms with specific references for the authors to consult. Furthermore, I try to approach every review the same, whether the manuscript is from one of the top researchers in my field or from those that have little to no prior experience with the topic.

To write a good review, however, takes both effort and time. In addition, it necessitates a sound understanding of the fundamental concepts dealt with in the paper under review. Unfortunately, as an editor, I find that many reviewers are either unwilling to contribute the time and effort required to provide a quality review, or simply lack the ability to do so. Because of this, journals that want to ensure high quality peer review really need to actively cultivate a pool of reviewers that are committed to taking peer review seriously, rather than just a task to be completed as quickly and effortlessly as possible. Of course, this too requires time and effort, and it means keeping track of both reviewers and the quality of their reviews, both good and bad, and then finding ways to encourage the better reviewers to keep accepting future reviews for their journals. In this respect, a number of journals and publishers have done a much better job at recognizing top reviewers for their efforts in recent years.[6]

Lastly, it is important to remember that the value of peer review goes beyond the scientific community and impacts everyone, both the expert and the public at large. We are at a point where public trust in science is diminishing[7,8] and traditions that instill confidence in science are critical. As the process of peer review developed, the referee was gradually reimagined as a sort of universal gatekeeper, with peer review emerging as a mighty public symbol that scientists had a structured process for regulating themselves and for producing consensus in science.[2] Thus, while it may have its flaws, peer review is still the best way to ensure that scientific literature is sound, correct, and presented without bias. If we want the public to feel that they can depend on scientific studies and presented results, then we need to do everything we can to make sure that the scientific literature is as absolutely strong as it can be.

[5] E. Stoye. *Chemistry World* **2015**, January 12th, https://www.chemistryworld.com/news/post-publication-peer-review-comes-of-age/8138.article (accessed Sept. 19, 2019).

[6] A. Meadows. Recognition for Review: Who's Doing What? https://orcid.org/blog/2016/09/20/recognition-review-who%E2%80%99s-doing-what (accessed Sept. 22, 2019).

[7] G. Tsipursky. (Dis)trust in Science. *Sci. Am.* **2018**, https://blogs.scientificamerican.com/observations/dis-trust-in-science/ (accessed Sept. 22, 2019).

[8] G. C. Kabat. *EMBO Rep.* **2017**, *18*(7), 1052 (doi: 10.15252/embr.201744294).