EOS
EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION

VOLUME 92 NUMBER 28
12 JULY 2011
PAGES 233–240

# A Quick Guide to Writing a Solid Peer Review

PAGES 233–234

Scientific integrity and consensus rely on the peer review process, a defining feature of scientific discourse that subjects the literature forming the foundation of credible knowledge in a scientific field to rigorous scrutiny. However, there is surprisingly little training in graduate school on how to develop this essential skill [*Zimmerman et al.*, 2011] or discussion of best practices to ensure that reviewers at all levels efficiently provide the most useful review. Even more challenging for the novice peer reviewer is that journals also vary widely in their review guidelines. Nonetheless, the goals of peer review are crystal clear: to ensure the accuracy and improve the quality of published literature through constructive criticism.

To make the peer review process as efficient and productive as possible, you may want to consider a few useful approaches to tackling major steps throughout your review, from contemplating a review request and reading and assessing the manuscript to writing the review and interacting with the journal's editors (see Figure 1). These tips are particularly relevant for graduate students or other first-time reviewers, but they may also be useful to experienced reviewers and to journal editors seeking to enhance their publication's processes.

While the peer review process is intended to improve published science, it likely also improves the scientific process, as reviewers reflect on what constitutes high-quality science and incorporate lessons learned from the paper they read into their own work. The process of producing a thoughtful evaluation of a paper's scientific merits may vary widely, and reviewers are likely to develop their own review style with experience. In that spirit, the guidelines discussed here serve as a launching point rather than a narrow prescription.

## *Considering a Request to Serve as a Reviewer*

When you receive a request from an editor to review a manuscript, there are several issues to consider, including how your expertise matches what the editor is looking for, whether you can be unbiased, and whether you can provide the review by the stipulated deadline. Subject matter expertise is essential to being able to substantively critique a manuscript. However, it is just as important that you are able to provide a fair review. Finally, timeliness in the peer review process is critical because journals strive to publish new material as expeditiously as possible.

First ask yourself, "Does my area of expertise and experience qualify me to thoughtfully evaluate the manuscript?" If you feel that you are not qualified to comment on the methodological or statistical techniques used in the manuscript or the overall contribution to the field, it may be best to pass. However, if your expertise allows you to comment meaningfully on key sections of the paper, you can offer to review these areas and let the editor know you cannot comment on other aspects outside your expertise.

Another question to ask yourself is, "Can I provide a fair and unbiased review of this work?" Editors seek to prevent conflicts of interest by avoiding the solicitation of reviewers who share a significant professional relationship with any of the authors. The goal is to use reviewers who will evaluate the paper based solely on its merits and not let their evaluation be influenced by a personal relationship with the authors or the potential for personal or professional gain. Editors may not know that a conflict exists unless you alert them. Reviewers should also assess whether they will be able to evaluate the manuscript with an open mind. If, for any reason, you feel negatively predisposed to the paper before you have read it or predisposed to review it positively due to a potential personal benefit, you should decline to review it. Check the journal's guidelines for more specific guidance on avoiding conflicts of interest.

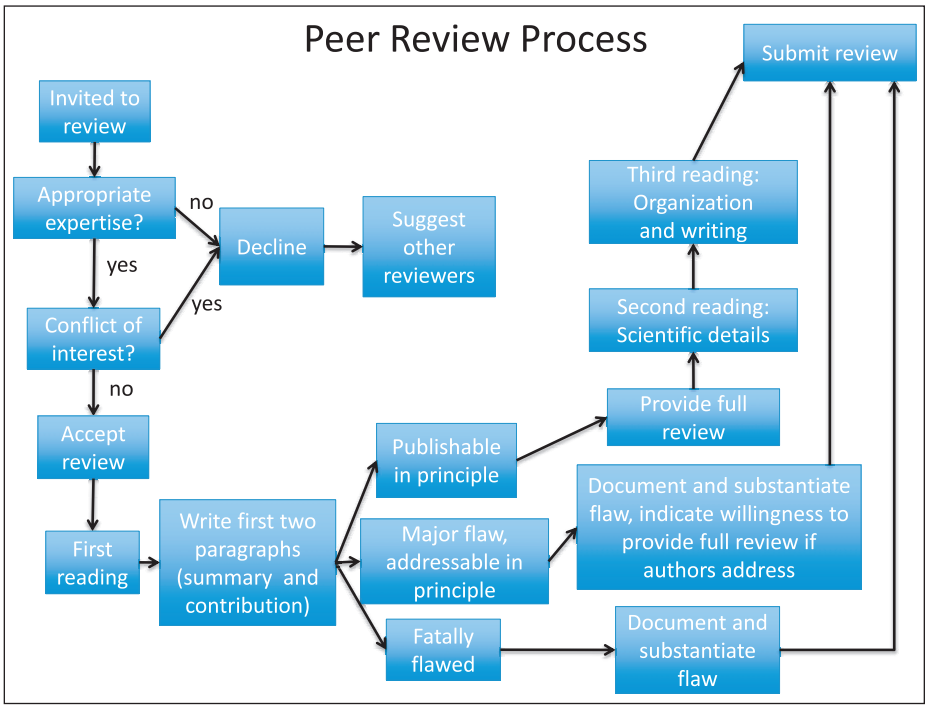


*Fig. 1. A flowchart depicting the major steps and decisions facing a peer reviewer throughout the review process.*

By K. A. Nicholas and W. Gordon

Last, but not least, you should ask yourself, "Do I have time?" It can take 8 or more hours to provide a thoughtful, thorough, and well-referenced review for a journal article. If existing commitments will prevent you from providing a high-quality review in the time required, consider turning down the request so that you can maintain a high standard for the reviews you do provide. One tardy reviewer can hold the entire process hostage and cause a great deal of consternation for all involved. However, it is critical that reviewers bear in mind the importance of the peer review process to scientific endeavors and make an effort to provide reviews whenever possible.

*Reviewing the Manuscript*

Once you have accepted an invitation to review, the strategy described below will help you maximize your effectiveness in performing the review. Some journals will ask you to answer specific questions or rate the manuscript on various attributes (these often are not visible until you log in to submit your review, so upon agreeing to do the review, check for any journal-specific guidelines). If this is the case, then let those guidelines direct the writing of your review.

An exemplary journal guide for reviewers can be found at http://www.nature.com/authors/policies/peer_review.html. However, many journals do not provide criteria for reviews beyond requesting your "analysis of its merits" or similarly open-ended directions; in that case the techniques below are a useful approach to writing a constructive and efficient review.

*1. Skim the entire paper and evaluate whether or not it is publishable in principle.*

Use the first reading to make an initial assessment of the authors' question, approaches, and conclusions and their relevance and evaluate whether the paper is publishable in principle based on its contribution to the field. The first reading should help you answer questions like, "What is the main question addressed by the research? Is this question pertinent to the field of study? Do the results of the research contribute substantively to the question?" Carefully go through all figures and tables so that you understand all units, axes, and symbols. Use the figures to build a sense of the story being told and evaluate the conclusions they are used to support. If the manuscript needs copyediting by a proficient English speaker before you can evaluate it on its scientific merits, it is legitimate to make such a suggestion to the editor at this stage. You may also want to ask the editor if comments on the writing style and copyediting points are welcomed, as they are at many smaller journals, or if they are unnecessary, which is the case at some larger journals that have copyediting teams who will catch typos and grammatical errors at a later stage.

After this first pass, write the first two paragraphs of your review, which will summarize the research question addressed and the contribution of the work. If the journal has a prescribed format, consider these paragraphs a synopsis of your comments for your own use. You will write a more detailed evaluation of the paper after your next reading. The first paragraph should state the main question addressed by the research and summarize the goals, approaches, and conclusions of the paper. This serves two purposes. First, it shows the editor you have read the paper carefully, which both gives your review weight and can help the editor consider insights that might not have been immediately apparent. Second, it helps the authors see what main messages are conveyed to the reader, so they can be sure they are clearly communicating their main points. Try to include positive assessments of aspects in which the paper succeeds in this first paragraph—you can save negative aspects for the remainder of the review—so that the authors will have a sense of what they have done well.

The second paragraph of the review should provide a conceptual overview of the contribution of the paper. Is the central question asked by the paper interesting and important? Are the appropriate methods used to address the question? Do the data support the conclusions? Evaluate the magnitude of the advance within the field that the paper provides, in the context of the audience of the journal, to inform the editor's decision of whether the contribution warrants publication in their journal. Does the paper present a case study of a known phenomenon in a new system (an incremental advance), present a methodological or technical advance, or change thinking in the field (a fundamental advance)?

At this stage you should evaluate whether the paper is publishable in principle (in which case you should continue with the review) or whether it is flawed in a way that cannot be fixed and which you believe renders it categorically unsuitable for publication in the target journal. Examples of such fatal flaws might include drawing a conclusion that is contravened by the author's own statistical evidence, the use of a discredited method, or ignoring a process that is known to have a strong influence on the system under study. If this is the case, carefully explain your reasoning, provide clear evidence (including citations from other scientific papers and books) to support it, and conclude your review here.

If the manuscript contains a major theoretical or methodological flaw that would prevent publication but that can be addressed in principle, similarly document the problem and conclude the review, stating a willingness to provide a full review if the authors can address this major problem first.

*2. Read through the paper a second time for detail, and draft the main points of your review.*

Now that you have identified the main ideas of the paper and are satisfied that it is worth considering for publication, read the manuscript in detail from start to finish. Pay attention to assumptions, methods, underlying theoretical frameworks, and the conclusions drawn and how well they are supported. Refer to figures and tables when referenced in the text, making sure that the text and the graphics support rather than repeat each other; use your careful study of the figures at the end of the first reading to avoid too much disruption to the flow of your assessment.

As you read the manuscript a second time, draft the main points of the review, including both the positive and negative aspects of the paper. Organize your points clearly and logically, using separate paragraphs or bullets to make each point clearly stand out. Such an approach will help the editor confirm that the authors have addressed each point during the revision process.

If making a criticism, try to offer concrete, actionable ways to address the problem. Specifically state what you think the appropriate alternative approach would be and why; back this up with citations from the literature. If the problem you identify cannot be addressed using current technology, note the uncertainty associated with the approach and assess how well the authors have addressed the issue using available technology.

*3. Quickly read through the paper a third time, looking for organizational issues, and finalize the review.*

At this stage, pay attention to issues with the writing such as organization, section headings, and details of language and grammar. Evaluate the logical flow of the paper and whether all necessary (but not more than necessary) references, data, and background are present. Flesh out any gaps in your review and support your points with examples from the manuscript. If the editor indicated that copyediting comments are welcomed, you might provide them in a separate section after you discuss the scientific merits and issues with the paper. However, do not feel obligated to catch every typo, missing reference, and awkward phrase; your rigorous assessment of the scientific merits of the paper is more important. To strike a balance between efficiency and accuracy, note any pervasive errors that can be fixed by later copyediting and technical review at the journal (i.e., specific problems with the writing or style) rather than trying to document each occurrence. Finally, read

over your review to make sure it is concise and complete, and submit it to the editor.

### *After the Review Process*

Congratulations! You have completed a demanding but rewarding review of a contribution to your field. There are just a few more items to be aware of as the peer review process for a manuscript comes to its conclusion.

Expect to hear back from the editor about his or her decision to accept or reject the manuscript. You may be asked to review another version of the manuscript to assess whether the manuscript has been modified sufficiently (if requested) in response to criticisms, comments, or suggestions. Keep in mind that an author may have legitimate reasons to dismiss a suggestion or criticism. As the reviewer, you will have to determine if failure to address a criticism is grounds for recommending rejection. That is, does the flaw significantly undermine the findings of the manuscript, or are you convinced by an author's argument for why the manuscript need not be modified at this stage?

If the editor makes a decision on the manuscript counter to the direction you recommended in your review, you may request an explanation. This could be an important learning experience, particularly if you are a novice peer reviewer. Even experienced reviewers will sometimes find themselves on the opposite side of an editor's decision. In addition, to ensure the impartiality and confidentiality of the peer review process, you should not discuss your review of the paper with anyone either before or after publication. Unless you chose to reveal yourself to the author or authors during review and are publicly acknowledged as a reviewer, you should not reveal your identity. In particular, you should not reveal to the author or authors after review that you were a reviewer (if they were successful in publication, you are in danger of appearing to butter them up for favorable treatment in the future). Finally, you are under an ethical obligation to neither make public the contents of the manuscript nor use any information in the manuscript until it is published.

### *Putting Yourself Out There*

If you are not already an established reviewer, you might be wondering how you can break into the peer review network. The good news is that editors are always on the lookout for willing, qualified reviewers—having a doctorate in your field is not a prerequisite to serving as a reviewer. For example, through AGU's Geophysical Electronic Manuscript Submission (GEMS) system, you can identify your expertise, which will be helpful to editors looking for reviewers. Contact editors of journals you read regularly and tell them of your willingness to serve as a peer reviewer in specific disciplines. You may also want to let your mentors know that you are interested in serving as a reviewer so they can pass along appropriate opportunities to you directly. Not only will you gain valuable insights into the peer review process by becoming an active participant, which will likely improve your own manuscripts, but also you will be fulfilling one of the most fundamental responsibilities of scientific practice.

### *A Word to Teachers and Professors*

Faculty guide graduate students during the process of writing a scientific paper. A similar emphasis on mentoring students on how to review scientific papers would fill a gap in graduate school training. Generating a review together is one approach. Another would be to review a manuscript as a group laboratory exercise. Faculty might share copies of reviews they have received on their own manuscripts. Advisors to postdoctoral trainees should also ensure that these new scientists receive proper guidance on this key responsibility.

### *Acknowledgments*

The inspiration for this paper came out of productive conversations with Mike White at the Dissertations Initiative for the Advancement of Climate Change Research (DISCCRS) V Symposium in March 2010. Symposium travel and on-site expenses were covered by the U.S. National Science Foundation through collaborative grants SES-0932916 (Whitman College, P. Yancey, principal investigator (PI)) and SES-0931402 (University of Oregon, R. B. Mitchell, PI) and through a pending award from NASA (Whitman College, P. Yancey, PI). M. White provided thoughtful comments on an earlier draft of this manuscript. Comments from two anonymous reviewers contributed to the improvement of this paper.

### *Reference*

Zimmerman, N., R. Salguero-Gomez, and J. Ramos (2011), The next generation of peer reviewing, *Front. Ecol. Environ.*, *9*(4), 199, doi:10.1890/1540-9295-9.4.199.

### *Author Information*

Kimberly A. Nicholas, Centre for Sustainability Studies, Lund University, Lund, Sweden; E-mail: kimberly.nicholas.academic@gmail.com; and Wendy S. Gordon, University of Texas at Austin