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How to write a thorough peer review

Scientists receive too little peer-review training. Here's one method for effectively peer-reviewing papers, says Mathew Stiller-Reeve.

Mathew Stiller-Reeve

Credit: Aurielaki/Getty

Scientists do not receive enough peer-review training. To improve this situation, a small group of editors and I developed a peer-review workflow to guide reviewers in delivering useful and thorough analyses that can really help authors to improve their papers.

The first reading is to get an overall impression of the paper and its aims. Take notes as you go. Make sure the paper is within the scope of the journal. It's unlikely that it won't be, but answering this question forces you to better understand the research and think about the paper's mission: what it's trying to achieve.

Take particular note of the parts of the paper that your expertise speaks best to. Editors do not expect you to be an expert in absolutely every aspect of the paper, although they also don't want you to be a novice. Be upfront and honest with the authors and the editor about which scientific aspects you will focus on in your review.

After the first reading, attempt to 'mirror' the article by writing down, in detail, your understanding of the science. This tells the authors how you — the reader — have interpreted the aims, results and novelty of their research. If they disagree with your analysis, they should, from your comments, be able to understand that this is not your fault. Your analysis is a clear message that the authors need to work on how they communicate their intentions.

You might also notice a fatal flaw during your first reading. Forget minor or major flaws: a fatal flaw is one that stops the review process dead in its tracks. There's not much point in continuing the process if the method is fatally flawed, if an entire section is missing or if the paper is utterly unreadable. Describe all flaws in your review, and submit it. Depending on the journal, you might have the option to 'reject, but resubmit'. Otherwise, simply reject. There's no shame in it!

If you don't find a fatal flaw, continue to the second reading. Remember, you still need time, peace and quiet.

The second reading allows you to concentrate on the scientific nuts and bolts of the research: the method, analysis and conclusions. Remember to distinguish between major and minor issues, and to read the paper in chronological order. Ask the following questions:

• Do the Abstract and Introduction clearly identify the need for this research, and its relevance?

• Does the Methodology target the main question(s) appropriately?

• Do the Conclusions justifiably respond to the main questions posed by the author(s) in the Introduction?

It is particularly important to ensure that the questions put forth in the Introduction are answered properly in the Conclusions. Try to spot anywhere the paper might start to take you on a wild goose chase. The paper should leave wild geese alone, unless it's a submission to an ornithology journal.

At this point, it's a good idea to take a few days away from the paper to step back from the details for a while.

During the third and final reading, you should concentrate on the writing and presentation. The science might be great, but heavy composition and messy structure might bog down the main message. If you comment on the writing, make sure you back up your comments. Don't just note, "This is badly written." Suggest to the authors how to make the story more cohesive and tightly reasoned. Was the paper hard to read because the paragraphs did not flow together? Did the authors flood the paper with confusing acronyms?

You do not need to copyedit a paper — that is generally the job of the journal that has asked you to review the article. But any suggestions for improving the language more generally will be welcome, and they are an important part of the peer-review process.

You should now have a list of comments and suggestions for a complete peer review. The full peer-review document can comprise the following sections:

1. Introduction: Mirror the article, state your expertise and whether the paper is publishable, or whether there are fatal flaws;

2. Major flaws;

3. Minor flaws;

4. Other, lesser suggestions and final comments.

constructive and not offensive. Be helpful and not harmful. Sometimes, you should submit a harsh review, but never a rude one. Remember to adhere always to the "golden rule" of peer reviewing (M. A. McPeek, *et al. Am. Naturalist* **173**, E155–E158; 2009): "review for others as you would have others review for you".

View our full worksheet here.

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A Peer Review Process Guide

"Review for others as you would have others review for you"

- McPeek et al., 2009

INTRODUCTION

This worksheet has been compiled from the advice of a number of journals and publications. The aim of the worksheet is to give less-experienced peer reviewers a concrete workflow of questions and tasks to follow when they first peer-review. ***Please note*** that this is a suggested framework for reviewers to follow. Depending on the journal or subject-field, some elements may be lacking. Users should adapt the worksheet to suit their needs, their personal review style, and the journal's guidelines.

EVERY PEER-REVIEW PROCESS SHOULD AIM TO (HAMES, 2008):

- Prevent the publication of bad work – filter out studies that have been poorly conceived, designed or executed
- Check that the research reported has been carried out well and there are no flaws in the design or methodology
- Ensure that the work is reported correctly and unambiguously, with acknowledgement to the existing body of work
- Ensure that the results presented have been interpreted correctly and all possible interpretations considered
- Ensure that the results are not too preliminary or too speculative, but at the same time do not block innovative new research and theories
- Select work that will be of the greatest interest to the readership
- Provide editors with evidence to make judgments as to whether articles meet the selection criteria for their particular publications
- Generally improve the quality and readability of a publication (although this is more a by-product of peer review)

Mathew Stiller-Reeve PhD, NORCE Klima, Bergen, Norway
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In collaboration with Prof. Geraint Vaughan, University of Manchester and Bronwyn Wake PhD., Nature Climate Change

BEFORE YOU READ

Check if the journal has review-guidelines and adjust the following work plan where appropriate.

READ 1st TIME: Gaining an overview

1 Is the article in line with the journal's scope?

Yes?	No?
Continue	Doubtful since the Editor has accepted it for review. However, contact the Editor for clarification before proceeding.

2 Does your expertise cover all aspects of the article? If not, describe which sections you can respond to and why?

3 "Mirror" the article. Make a first draft describing the main aim of the article and why it's innovative.

4 Is the article publishable in principle?

Yes?	No?
Continue to 2nd reading	Describe the **fatal flaws** and submit your review.

READ 2nd TIME: The science

For the rest of the review, try and separate your points into **"Major"** or **"Minor" issues** and/or suggestions. Using bullet points can help the author(s) keep track when responding to your review.

5 Do the ***Introduction*** and ***Abstract*** clearly identify the need and relevance for this research?

Major issues:

Minor issues:

6 Does the ***Methodology*** target the main question(s) appropriately?

Major issues:

Minor issues:

7 Are the ***Results*** clearly and logically presented, and are they justified by the data presented? Are the figures clear and fully described?

Major issues:

Minor issues:

8 Do the ***Conclusions*** justifiably respond to main questions the author(s) posed? Do the Conclusions go too far or not far enough based on the results?

Major issues:

Minor issues:

READ 3rd TIME: The writing and formulation

9 Is the manuscript's story cohesive and tightly reasoned throughout? If not, where does it deviate from the central argument?

Major issues:

Minor issues:

10 How are the grammar and spelling in the manuscript?

Major issues:

Minor issues:

FINISHED?

11 Round off your review with a comment about whether you like to peer-review a re-submitted version of the paper, or if you look forward to reviewing the next round of edits.

12 Compile your responses to the points above into a single document. Here is a suggested order for your review:

A. Introduction: Mirror the article, your expertise and whether the paper is publishable or if there are fatal flaws;
B. Major issues:
C. Minor issues;
D. Other itsy-bitsy suggestions.

BEFORE SUBMITTING: READ YOUR OWN REVIEW!

13 Remember the quote on the first page! **"Review for others as you would have others review for you".** Make sure that your review is constructive and not offensive. Please change text that could be considered rude before you submit!

References and some other interesting and useful articles/resources about peer review

Hames, Irene. Peer review and manuscript management in scientific journals: guidelines for good practice. John Wiley & Sons, 2008.

McPeek, M. A., D. L. DeAngelis, R. G. Shaw, A. J. Moore, M. D. Rausher, D. R. Strong, A. M. Ellison, L. Barrett, L. Rieseberg, M. D. Breed, J. Sullivan, C. W. Osenberg, M. Holyoak, and M. A. Elgar. 2009. The golden rule of reviewing. American Naturalist 173:E155–E158.

Nature Masterclass: Focus on Peer Review (free). https://masterclasses.nature.com/courses/205

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