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Writing a constructive peer-review: a young PI perspective

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Introduction

Since the start of the industrial revolution, communication in science has been the cornerstone for progress and education. That the scientific community itself safeguards these communications is fundamental to the independence of science. We, as members of the scientific community, have to ensure a fair process and the upholding of standards in scientific progress. However, voices in the scientific community question whether the reviewing system is still upholding this essential part of science, that it is 'broken'. As surprising as it may seem these voices are not new, but have been there since the beginning (Csiszar, 2016), perhaps highlighting the fact that this system can, and perhaps even has, become an impediment to fair publication process: "*In an ideal scientific world, bright ideas lead to hypotheses that are tested by performing carefully designed, well-controlled and rigorous experiments. These lead to exciting results that form the basis of a paper that is written and submitted for publication, followed by the rapid receipt of a letter of acceptance. But life is rarely like that".* (Joels et al., 2015).

However, the power is in our hands to ensure that this system works. We all have to contribute to restore good practice in peer-review, not only by being 'good' scientific citizens ourselves and approach all of our reviewing assignments fairly and seriously, but also by training the next generation appropriately to ensure that future scientists also enjoy the intellectual independence the scientific community benefits from through the peer-review process. It all comes down to constructive peer-reviewing.

How to write a constructive peer-review

Writing a constructive peer-review is not a trivial exercise and it is a skill that has to be trained and can be constantly refined. We are still in the process of refining our methods, but discussing with colleagues we have tried to identify the most important strategies one could follow (see below) but the most important is to keep a positive attitude throughout the process.

Step 1: assessment of the paper

Your work as a reviewer is to assess whether the methods, results and discussion are of sufficient quality to fully address the question, and the question alone.

1. Do you understand the real question asked by the authors (see below pitfalls – this is not your paper so the question may not be the one you would have asked). Focus on these things:
    a. Is the hypothesis clear?
    b. Is it original?
    c. Is it well justified?

The question defines the **originality** and **the remit** of the study (see pitfalls). Assess the solidity of the backbone of the paper and respect the remit of the experimental work presented: this is the key aspect of the process.

2. Is the experimental approach the most suitable to address the question (there are often several experimental approaches equally suitable)?
    a. Are the experiments well designed?
    a. Does the statistical design match the experimental design? This is one of the recurrent weaknesses of contemporary neuroscience research.
    b. Are the methods suitable to address the question (*please note that science is not about shiny techniques, but about the originality of the hypothesis and appropriateness of the methods/conclusions*)?
    c. Are the results of good enough quality?
    d. Are the conclusions supported by the results?
    e. Are there any caveats in the experimental design that question the robustness of the paper?

    If your response to each of these questions is yes then recommend acceptance of the paper straight away and don't ask for more experiments, as there are always more experiments to be done, but they will not fall within the remit of the study and will therefore not strengthen the study.

3. Identify how best you can help the authors improve their manuscript. The new generation seems to have forgotten that a reviewer's job is to help the authors improve their manuscript and the editor make an informed decision. Often you will find that the authors did not make optimal use of the dataset they used in their study.
4. Remember the limits of your expertise and criticise only what you can, don't shy away from your own limitations and tell the editor what it is you feel comfortable assessing (*most editors are aware of your expertise and often ask reviewers from different 'fields' to review a paper to collectively cover all aspects of the paper*)
5. There is no place for opinion in a review: leave your opinion for discussions over coffee or beer with your peers, here your job is to assess the scientific quality of, what is often, several years of work. Whether you like the story or not, your job is to assess whether the research is well conducted and that the conclusions are supported by the results.

Step 2: writing the review

1. Provide an overall assessment of the originality of the hypothesis/question
2. Provide a brief summary of the pros and cons of the paper
3. Offer a numbered points assessment of the study with major criticisms first and then minor criticisms
    a. Major criticism is something that has to do with the clarity of the hypothesis, a major experimental or statistical caveat that warrants a re-analysis of the results or additional control experiments (both associated with a change in

the nature of the figures) or something very wrong in the discussion or conclusions

b. If you don't have any major criticism, then only discuss the minor points. (*it is fine not to identify major criticisms, reviewing process is not a hunt for major criticisms*)

Make sure your score sheet matches your review and the feedback you offer the authors. We would suggest that the score sheet be sent to the authors as part of an open peer-review process.

When to reject a manuscript?

It is not really the reviewers' job to decide whether to reject a manuscript or not, instead their job is to offer advice to the editor – who has the final say. Collectively we have been reviewing ~ 60/70 papers per annum for the last 6 years and only on a very few occasions have we issued the advice to reject a manuscript. Most of the time we have suggested a major revision. On the few occasions when we suggested the paper be rejected, the main reasons were:

1. the manuscript was extremely poorly written, so much so that it was not understandable
2. the experimental design was very poor or the, statistical analysis and data were of very poor standards
3. the experiments did not address the hypothesis put forward.
4. the authors did not address the criticisms in a revised version of the manuscript.

In general, all papers can be improved, so when to reject? For first review we would argue a straight rejection when the paper is near beyond improvement – when a great number of experimental flaws are identified that need a dramatic change in experimental design or the data have been presented in a previous paper by the same authors, or when there seems to be substantial concerns over ethics, fraudulence of data or figure presentation. On rare occasions, papers are rejected at resubmission if authors do not take on board the reviewers' comments and fail to address them appropriately in a well constructed rebuttal letter.

How to assess a resubmission?

Assessing a resubmission is not a 'fresh' review, one should steer away from identifying new criticisms that one overlooked when seeing the paper at the first round. We approach the assessment of a resubmission, in addition to reading the rebuttal letter, by reading the old version and the new version to both refresh ones' memory and to identify how the changes made have improved the overall paper; and to evaluate whether our comments – and those of the other reviewers, have been appropriately addressed. Then, ensure that the changes, in general highlighted in the manuscript and justified in the rebuttal letter, and potentially added experiments, have sufficiently improved the manuscript. If they have, then suggest the manuscript be accepted and congratulate the authors on their work. If, not then write a constructive comment on how the paper can be further improved – in line with what was stated before, so that you give the authors a second chance to address your concerns. Upon the second revision, if the authors to not satisfactorily address your major comments, then you can suggest the paper to be rejected.

How to adjust your assessment to the expectations of the journal for which you perform the review?

Should you adjust your assessment to the expectation, impact factor, of the journal? Should papers submitted to high impact journal be reviewed differently than papers submitted to a

lower impact factor journal? What is the definition of when to review 'rigorously' or 'less rigorously' according to impact? - is there some clear definition out there? - We don't think so.

We argue that it is the question addressed and the knowledge gained that determines the impact of a paper, not the technology used in the study or how fashionable the topic is. Thus, often 'low' impact factor journals publish 'high' impact papers. For example, many papers contributing to Nobel Prizes have been published in journals such as Brain Research, Experimental Neurology and Pflügers Archiv European Journal of Physiology rather than in Nature, Science and Cell. Thus, our approach is to review each paper on its own merit (as listed above), it is the quality of the paper that will define its impact, not the impact factor of the journal in which it is published. Thus, only comment on suitability if it is clearly outside the scope of the journal, and leave the decision on whether the paper fits the editorial policy of the journal in the hands of the editors.

We must ensure our contribution to the field goes beyond the papers score on the Web Of Science Board or their associated Impact Factor and think about the right things to do, so that the next generation will thrive in a positive and constructive system - with its limitations indeed. By contributing to a new generation of reviewers that produce constructive and fair feedback on manuscripts – we will safeguard the honesty and integrity of science and the scientific record and prevent the ever-growing trend of 'impact factor obsession'.

How to handle potential conflict of interest?

At any time during the reviewing process, but preferably at the start, if you identify that you may have a potential conflict of interest – contact the editor immediately and discuss with them how best to continue. Contact the editor if you are in doubt or if you find that the authors have not stated/revealed a clear conflict of interest in the manuscript.

Potential pitfalls:

Accepting to review:

Writing a constructive peer-review requires time, a great deal of curiosity, honesty, and expertise, but most of all, it relies on one being devoid of any form of jealousy. In other words, if you feel frustrated in your current situation, do not accept to review a manuscript. Your mind-set won't be compatible with the requirements of the task. How do you expect to treat the manuscript of a colleague who has a tenure track position with a big lab and a lot of funding and whose work you judge to be of a lesser quality than yours when you are on a 2-year contract, or struggling getting enough money to finish setting up your lab or struggling with a manuscript in an unfair reviewing process?

Writing a peer review is an exercise that can be performed only if you can master your emotions! Because it can often become frustrating, if not infuriating, sometimes as much as it is to receive the decision letter from the editor when you are on the other side. Choose to decline to review if the moment is not right – never use it as an opportunity to vent your anger or get even!

Assessment of the paper

(1) One needs a dash of empathy for reviewing a paper, steer away from falling into the pitfall of imposing on the authors a question you would rather have asked. You did not do these experiments! If you have a conflict of interest then you must declare it to the editor.
(2) Don't think of shaping the paper the way you would have written it had you done the experiment yourself. You did not do this research! If you have done very similar research, then you are in a conflicted position and you need to share it with the editor.
(3) Reviewing is not about religion, therefore there is no room for beliefs in this process.

– An open but critical mind is needed and you should never make statements of the like of "I don't believe".

Reviewer 3 syndrome, the trend for more and more, and the never-ending reviewing process.

This piece is mostly about what a reviewer should do, as also described in the Council of Science Editors' white paper (Scott-Lichter and Editorial Policy Committee, 2012). However, what a reviewer should clearly ***not do*** is be judgmental and/or ask endlessly for more, often unnecessary experiments. That often reflects the reviewer's volition to tailor one's study, that is not theirs, to fit their intellectual approach and their own scientific background, or even worse when they set out simply to "kill" the manuscript, all manuscripts can be argued to death if so is wished. These are often referred to as "reviewer 3".

We have all come across one of them, we have all suffered the biased, unfair, acidic comments from "reviewer 3" who asked for additional experiments worth two decades and which are not fully related to the working hypothesis of the study, but on which a decision to reject the paper has been issued. This upward trend of extra experiments is evident as the amount of the data incorporated, and the amount of panels per figure in 'high' impact factor journals have quadrupled in the last few decades (Powell, 2016). This is a frightening fact, which threatens the independence of science and risks that only large well-funded and well-established labs can contribute to the pinnacle of science. There are no recipes for a good study and such practice can easily be tackled by a change in the peer-review process, by ourselves!

Some have blamed the blind review process for this, and it is not the scope of this opinion piece to discuss this. Several constructive initiatives, such as those promoted by Frontiers, or eNeuro, with its double-blind peer-review system in which an active engagement of the handling editor to find a consensus with the reviewers with regards to the justification for asking more experiments (https://www.sfn.org/News-and-Calendar/News-and-Calendar/News/Spotlight/2014/QA-eNeuro-An-Innovative-Open-Access-Publishing-Venue-for-Excellent-Science) may, in the near future, contribute to help the overall peer-review process mutate. EJN is also taking part in the initiative to support a more transparent and honest peer-review process. From the end of the year, the journal will make the peer review documentation (referees' reports, authors' responses and editors' comments) available alongside the published article.

However, at the individual level, you really can contribute actively to eradicate inappropriate reviewing behaviour, and it starts with partaking actively in the peer-review process. If your reviews are objective, constructive and really help the authors improve their manuscript and equip the editors with material to make informed decisions, and your reviews are submitted on time, you will eventually take the place of this reviewer 3. Editors appreciate good reviewers and often complain there are too few of those who really do a good job.

Training the new generation of reviewers

Reviewing is a skill that requires extended training before it is practiced individually. Among your mentoring activities, review training should be high on the list since it is going to contribute to shape the expertise and the behaviour of the next generation of reviewers. In that context, our generation must above all and foremost break with the cultural trend found in young graduate students or post-docs that pride is to be found in shredding a paper to pieces.

For instance, we use ~5-10% of the papers we review for a training programme, keeping in mind that all manuscripts reviewed are under confidentiality agreement, we ensure the trainees (e.g. students and postdocs) are aware of this and will respect the confidentiality of the manuscript before they take part in the exercise. In this context, we ask one of our lab members if they are interested in reviewing a manuscript. If they are willing to perform the review, we give them ten days to do so, during which time we perform our own review of the

manuscript. Then, in DBs case, either the review is presented by his young colleague instead of the weekly journal clubs, during which DB actively contributes to the discussion and finalises the review that will be sent to the journal at the end of the session, or, more often in RTKs case, the young colleague is asked to compare their review to the one performed by their PI; in both cases the editor is made aware that the reviewer was assisted by a young colleague. Most of the time, the final review is a compromise between PI and trainee, but the decision is seldom to suggest to reject the manuscript (see above for a discussion about rejection). In a few cases RTK has set up a reviewing exercise of some papers where 5 young scientists work together to discuss the paper and how to improve it and draft the review. What is learnt in these different exercises is that it is more difficult to help the authors improve their manuscript than merely criticising each and every word of it. It is our opinion that graduate students and young post-docs should receive as much supervision at peer-reviewing as they do at writing. But whatever our opinion is on this topic, we should never let one of our lab members submit a review without an assessment of their work, as we would do for the submission of a manuscript we authored.

Why engage in a peer-review?

By establishing yourself as a Principal Investigator you have demonstrated that you are capable of publishing and securing funding, two qualities for which peer-review journals (Scott-Lichter and Editorial Policy Committee, 2012) and funding agencies/charities have an insatiable thirst. If, as a PhD student or a post-doc, you were already solicited to review papers or grant applications, this will exponentially increase when you become PI. Yet, this activity is not remunerated, at least in the case publication peer-review, and it remains somehow neglected as a service to the community. Indeed, even though the peer-review process is the angular stone on which relies the current scientific dissemination system on which our career depends, being actively engaged in peer-reviewing does not count towards your career advancement.

So why should you spend time reviewing your peers' manuscripts and grant applications when you want first and foremost to dedicate your time and energy consolidating your laboratory and nurturing your lab members?

Here are some of our thoughts on why we review:

(1) If not us, the new generation of enthusiastic PIs who know they ought to contribute to the inflexion of the system, no one will put a stop to the never-ending perpetuation of decline of our peer-review system.

(2) Reviewing unpublished material forces you to read beyond your immediate primary interest and contributes to maintain you ahead of the community by getting a sense of the intellectual and methodological trends in your field before they are out in the open.

(3) It is the best avenue for you directly to influence your field, through indirect discussion with your peers (the authors and the reviewing/handling editors) during the review process which you can use as an avenue to constructively disseminate your knowledge.

(4) It is refreshing (especially when you are very busy writing a grant application or a paper, or marking essays), to have to immerse yourself in the heart of the science of a manuscript which is remote from, or sometimes right at the centre of, your immediate subject of rumination. At the same time, it contributes to give you an edge, and helps you and your lab members to refine your own writing skills.

(5) It is an excellent support for training, and contribute to disseminate new values to, the next generation

(6) Helping to shape the reviewing culture, by providing constructive comments such as, suggesting an alternative, refined, statistical design, thereby contributing to the promotion of better practice in statistics (one of the major problems found in publications nowadays). A neutral, factual, yet constructive criticism, offering alternatives or solutions to the authors if a caveat has been identified that really threatens the validity of the manuscript. Transfer knowledge to the editors too, thereby influencing their culture, and

indirectly shaping the process of editorial decisions. Eventually, if your expertise feeds into the manuscripts you review, it will, after they are published, somehow become a norm.

(7) Another reason is that you are part of the scientific community, peer-review is at the heart of the 'scientific method' and so it is our duty to contribute to this process, particularly as we wish/expect to have our own papers and grants reviewed

Conclusion

In a nutshell, peer-review is a skill that really needs training to acquire. It requires empathy, honesty and a real understating of the question addressed in the study you assess. This defines the remit of the study and its originality. Your duty is to help the authors improve their manuscript (not to the point that your intellectual contribution would justify you authored the manuscript, in that case it is not suitable for publication). You must avoid the temptation of asking for experiments that are not directly related to the study or do not necessarily strengthen the case made. There are many benefits to being actively engaged in peer-review: contribute to eradicate reviewer 3 and shape a fairer peer-review process, disseminating your knowledge through constructive feedback to your peers, learning, learning, learning, and teaching the next generation good values and good practice of the reviewing process. Much rests on our shoulders with regards to changing the system. We inspire to the future of fair constructive and helpful peer-review.

References

Csiszar, A. (2016). Peer review: Trouble from the start. *Nature* 532, 306-308

Joels, M., Di Luca, M., and Everitt, B.J. (2015). Neuro opinion: reforming the academic system is a joint responsibility. *Eur J Neurosci* 41**,** 1111-1112.

Powell, K. (2016) The waiting game. *Nature* 530, 149-152

Scott-Lichter, D., and Editorial Policy Committee, C.O.S.E. (2012). *CSE's White Paper on Promoting Integrity in Scientific Journal Publications, 2012 Update.* Wheat Ridge.

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