Peer Review: what early-career researchers should know

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The Peer Review system is a hallmark of science as a field. The scientific method, a way of studying the universe about us; the peer review system, a check in place to ensure this method is adhered to appropriately. No other field of endeavour presents such rational scepticism of its own output. The peer review system in its most simple definition from the Oxford English Dictionary is described as "evaluation of scientific, academic, or professional work by others working in the same field." However, this definition doesn't reveal the entire picture. Many, including both academics (particularly early career researchers) and the general public, don't really have any idea as to what the peer review system actually entails.

For this reason, amongst others, charitable organisations such as Sense About Science exist to create awareness and provide education about 'science' for the general public, and their programmes such as Voice of Young Science (VoYS) seek to "encourage early career researchers to play an active role in public debates about science."

Early career researchers like me.

On Friday 5th July I attended a workshop run by Sense About Science as part of their VoYS programme titled 'Peer Review: The Nuts & Bolts.' The free workshop was advertised as offering attendees to 'Find out about peer review,' 'Debate challenges to the system,' and 'Discuss the role of peer review for scientists and the public.' It offered esteemed speakers/panellists including; Professor Mike Clemens, Biochemistry and Molecular Biology, university of Sussex; Dr Michael Curtis, editor in Chief of the Journal of Pharmacological and Toxicological Methods; and Dr Irene Hames, Committee on Publication Ethics (COPE) Council, and independent editorial consultant and adviser to the publishing, higher education and research sectors.

A wealth of information from the speakers, and stemming from debate, was attained by myself and the wide range of attendees, all from very different disciplines of research. In this short article I will try to bring out those key themes and summarise the points highlighted whilst referring to some of my personal experiences in the area and using examples from my discipline of research. Finally I'll hopefully leave some words of advice for both authors and reviewers based upon the workshop and my evolving views of the system.

WHAT IS PEER REVIEW?

As the dictionary definition states peer review is simply the evaluation of scientific work produced by other experts within the particular discipline that the science pertains to. Typically it is thought to include four main functions: 1) dissemination of current knowledge; 2) archiving of the canonical knowledge base; 3) quality control of published information, and 4) assignment of priority and credit for work to authors. It is the third of these functions that is believed to be the primary importance of the peer review system chiefly as the scholarly activities that the process is applied to include submission of papers to conferences, submission of scientific manuscripts to journals, and the application and award of research grants and funding. The idea of some means of quality control is important in light of these activities due to the competitiveness of the 'market' in these areas. Conference programmes and journal's only have so much time or space that can be allocated and with research money there is only ever so much to go around. Typically the process involves two reviewers, experts in their disciplines selected by the editor, and the editor themselves (in the case of journal submissions) and is normally blinded (either single blind where the reviewers know who the author is but the authors does not know the identity of the reviewer, or double blind where no names are revealed). Peer review is intended to ensure that only the 'best' submissions are accepted and those in attendance at the workshop were in agreement that this is an important aspect. However, 'best' can be quite a subjective and indeed relative concept with reviewers incorporating a range of information into their assessments; the scientific rigour of the work, whether it is of 'interest' or advances the discipline, amongst other less savoury criteria. Despite it's consideration as one of the

pillars of the scientific edifice, peer review has its share of warts and worries many of which were also picked up on at the workshop.

Several of the concerns highlighted came from the perspectives of attendees as authors submitting either manuscripts or grant proposals, but some also came from those acting as reviewers themselves or wishing to become involved in such a role.

PEER REVIEW: THE AUTHORS PERSPECTIVE

The main point about peer review providing quality control highlights the general scientific community's consensus on its importance. However, this isn't exactly a comforting notion to an early career researcher preparing to submit their work for the first time to the scrutiny of anonymous peers. Expectations can be quite varied and dependent a lot upon the researcher's mentor's views of the peer review system. Within my discipline, Professor Robert Robergs, in a detailed critical review of the peer review system explained how his early belief "…that any system of peer review was unquestionably good..." stemmed from the mentor system in academia and how senior mentors explaining to students "…that there is a real need to please the reviewers..." reinforces a negative view "…that the need to publish in a peer review system supersedes the need for original thought, expression and perhaps to even question conventional thinking." Some early researchers initially step into the peer review system with rosy views of their original and groundbreaking idea's being forever immortalised in print with some views shifting towards those detailed above after their initial experiences.

Indeed questions that came from the attendees for the panel at the workshop included; Does it illuminate new ideas or shut them down? Can a double blind system really work? How do editors avoid bias?

In discussion with attendees there were mixed experiences both within and between.

Some had received constructive feedback from reviewers who picked up on things that they themselves and co-authors had missed which they felt had really assisted in improving the quality of their submissions. The idea of a fresh pair of eyes looking over something is a positive element of the peer review process as sometimes we get too close to our work to pick up on the issues with the bigger picture. In personal experience I currently have a paper in review which has gone through two rounds of review whereby each time the reviewers comments have substantially improved the clarity of the message in my work by highlighting things I had not considered and requesting they be included. In fact the Peer Review Survey 2009 conducted by Elsevier and Sense About Science showed the majority of researchers felt that "*...peer review should improve papers, determine* originality and importance" and reported that 91% of respondents said that their last paper was improved through peer review.

On the other hand some experiences had not been perceived as so productive. I and a colleague have noted our experiences with publishing work which might be considered 'controversial' by others in our discipline and how certain stages of the peer review system can serve to shut down such ideas. Some attendees commented on concerns that selected reviewers had not understood their work and so the criticisms were unjustified and they felt they were not afforded the opportunity to rebut the criticism. Sometimes editorial decisions to reject manuscripts appeared to be unjustified based upon the reviewer's feedback; so called editorial bias. Again a pertinent example of this comes from my own discipline whereby it has been made publicly know that, despite very positive reviews, work offering views contrary to those of authority can be shut down. Indeed 'consensus science,' something I have experienced in reviewers critiques before, is often a scapegoat comment used by reviewers and editors to prevent acceptance while they can hide behind a shield of anonymity due to the blind nature of the system.

Although peer review can significantly improve the quality of submissions it can be easy to be quite indignant about the peer review system from an author's perspective. But we don't often think about how it must feel from the reviewer's perspective.

PEER REVIEW: THE REVIEWERS PERSPECTIVE

The Peer Review Survey also reported that 90% of reviewers say they review because they believe they are playing an active role in the scientific community. A preponderance of reviewers surveyed "*…just enjoy being able to improve papers (85%).*" These seem to be the main expectations of those in the role of reviewer with relatively fewer interested in receiving incentives, whether monetary or less tangible benefits such as perceiving an increased chance of having their own papers accepted.

Evidently there is a blissful naïveté in the noble outlook for the role that one plays as a reviewer. However, many at the workshop noted that part of the reason they were there was to get involved for the reasons above, but also to learn how to review. Those in attendance who had been asked and accepted the role of reviewer all noted that they had not received any training to do so. Despite the noble intentions reported by many reviewers, perhaps this discordance in terms of training explains some of the negative experience that authors receive from reviewers. Some journals provide templates and questions to be answered by reviewers whereas others allow for more freedom in review. My experience of reviewing has in some cases involved the use of such templates which were helpful in some ways, but many of the questions asked were of little assistance.

It seems that some kind of training is required for reviewers and indeed a Reviewer Guidance Program was one of the entries into the Peer Review Challenge offering workshops and mentorship to early career researchers wishing to get involved in peer review. Alternatively it is perhaps the responsibility of journals to provide those they invite to review papers with guidance on how to go about this. International Journal of Exercise Science, a journal aimed at involving students and early researchers in the exercise sciences as authors and reviewers, offers guidance on how to review manuscripts within their journal as do many others. Another suggestion brought up in discussion with the panel for those without any clear guidance was to appraise the paper in the same way they should if they were examining it for citation in their own work.

Perhaps the lack of training in the area of peer review is also a reason for many reviewers reporting that they want anonymity to remain in the process for fear of a poorly conducted review being identifiable with themselves. The Peer Review Survey reported that 58% would be discouraged from reviewing if their signed report was published with the manuscript, 51% would be discouraged if their name was disclosed to the author, and 46% discouraged if their name was published with the paper as a reviewer. An overwhelming majority (76%) favour the double blind review process, though many question whether an author's identity can truly be concealed. Writing style, ideas, citations etc. can sometimes be a dead give away, both for authors and reviewers. Despite the consensus there may be other ways of conducting peer review in order to try and remove some of the 'warts' it currently holds. These questions are being asked and ideas implemented all the more rapidly in the technological advanced scientific publishing climate we reside in.

IS THERE ANOTHER WAY?

Most agree that peer review is a good thing, but they don't necessary agree that the present way achieving its primary outcome is the best way to go about it. Events such as the Sokal affair can paint peer review in a bad light, and bad peer review can happen even in the most respected of journals. At the very extreme we have some who believe that current system is a "*…non*-validated charade whose processes produces results little better than does chance." Not all are of such an extreme opinion but most criticisms revolve around the points already highlighted. New or controversial ideas are shut out and not always for reasons of lack of scientific rigour. Competing interests such as cherished beliefs of the reviewers being questioned by new research or even territorialism can result in unjustified criticisms which reviewers might feel they can get away with due to the blind nature of the system. Other criticisms revolve around the excruciatingly long times to wait for some reviewers comments and journals decisions. As an example I had to wait 8 months for a decision only to receive a rejection accompanied by a single paragraph from the reviewer with criticisms I had already noted would be changed to the editor (due to feedback on another manuscript). In the meantime I could have had the manuscript published elsewhere.

Some suggestions, including additions/amendments to the current system exist to combat these alongside even more radically different systems all together, were highlighted and discussed at the workshop. Examples (many of which were also entered into the Peer Review Challenge) include;

- Preferred/Not preferred Reviewers/Peer Choice – although this has been used by some journals for a long time it stands as an alternative to journal editors receiving manuscripts and having to search for reviewers themselves on topics they may not be experts in. It also hopefully addresses any potential negative biases but could hold its own positive biases as authors are likely to suggest reviewers they think will offer a favourable review. The opposite of this is that reviewers can select the manuscripts they wish to review hopefully ensuring that people who are indeed qualified to review that particular manuscript are utilised.
- Cascading of manuscripts – this involves the transference of a rejected manuscript to a journal from the publisher that may be more suitable in scope. The BMJ group offer this service and I have utilised it with some of my own papers whereby the editors felt that the topic wasn't suitable and it was transferred to a more suitable BMJ journal. Sometimes reviewer's reports accompany these transfers again speeding up the process (similar to the 'Streamline Reviews' that has been trailed by Virology recently). This could greatly speed up the 'trickle down' effect of publication strategy and prevent authors from having to start over with each submission.
- Open Peer Review/Commentary – The traditional single blind system of peer review is often demonised for allowing reviewers to anonymously shoot down certain ideas. An open system removes the shield of anonymity and means that reviewers are either identified with the manuscript they reviewed and in some cases even their reports are made public. The idea of this system is to discourage reviewers from making unjustified criticisms and allowing manuscript and criticisms to stand purely upon their scientific merit. With the advent of more and more online based journals the notion of an online comments section attached to manuscripts is also a possibility of allowing further review from peers. Many publishers and journals such as BioMed Central and F1000Research are utilising variations of this system

and this is something that has been discussed by myself and the other editors of Journal of Evolution and Health as we continue to prepare its launch.

- *'Impact' assessment?* – In light of the above, often scientifically valid ideas can be rejected based upon the supposedly lack of 'impact' or 'interest' in the area. Thus a number of other new journals have opted for a peer review system whereby reviewers will only assess the scientific rigour of the methodology, results and conclusions drawn allowing the 'impact' of the piece to be established post publication by the readers. Journals such as PeerJ and PLOS ONE opt for this method of review and do provide substantive guidelines to reviewers to ensure they adhere to this.

Some new systems such as Peerage of Science have opted to remove the peer review process from the publishers and journals control altogether. Whether these new advancements will eventually come to replace or just enhance and improve the present peer review system is yet to be seen. Nevertheless it is evident that the open debate revolving around peer review is resulting in an evolution of people's views in tandem with the system.

EVOLVING VIEWS

From my initial expectations of the peer review system my views have been altered immensely as a result of my experiences (both good and bad), the literature on the topic, the rapidly changing scientific environment, and through conversations with my colleagues and peers such as those I met at the workshop.

A few days after the workshop I was sat having coffee with a colleague and discussing some of our good and bad experiences regarding peer review. We both could agree on the benefits of having a good peer review experience, but he offered an interesting perspective on having a 'bad' experience. A 'bad' peer review experience depends on perspective. Sure a rejection isn't what you want, but if that rejection comes with some of the negative points highlighted above you can take that information and streamline future publication strategies by 'scrubbing that journal of your list.' As the panel

agreed upon in the workshop – if you don't like the experience don't go back for more. Most publishing strategies go something like this; aim for a high impact journal with the aim of receiving quality reviews to improve the manuscript and hopefully getting it published in a slightly lower journal after a few rejections. Well any 'bad' experiences along the way only serve to inform your choices of submission later. The negative experience might be associated with time where you have sensitive findings or your work may become out of date. It might be associated with a particular organisations/journals philosophies and biases – this only informs your search for what Martin calls the 'open minded scientist.'

I've come to believe that peer review is never a bad experience even if it can sometimes leave a bad taste in your mouth initially. But even if peer review can act as such a powerful force of good for both scientists and science as a field, the beneficiaries of the value of much of the work done – the public - aren't entirely aware of its importance.

PEER REVIEW AND THE PUBLIC

The general media often reports on 'research' findings, some of which end up being well supported by the body of scientific literature in the area, but often are rife with hyperbole that never amounts to anything. At the end of the workshop we began to discuss some of the things that we look for when reading research claims in the media. Who conducted the research? Where was it conducted? What's the aim of reporting it? Can we get access to the primary literature?

"Is it peer reviewed?"

As much as we've noted the good and bad points about peer review, for the layperson that doesn't have the training, time or inclination to scour the literature to question media claims about research, asking these questions, particularly whether it is peer reviewed, offers a degree of confidence. But, many of the questions that the attendees noted they would ask when reading media claims came with a caveat; the attendees were all scientists and researchers in their own right. These are some of the

questions we ask each and every day when assessing each other's and our own research. The general public however don't always know how to question media claims and can be left reeling and confused from the apparently contradictory claims popping up in the news week by week.

That's where Sense about Science comes in. Science often exists in shrouded mystery to the perceptions of the general public and many don't know that things like peer review occur or even what peer review actually is. From personal experience talking with family members and friends they are often surprised at the process and rigour that I have to go through to have my own research acknowledged and published. Sense About Science has produced a publication entitled 'I Don't Know What to Believe' to provide an explanation and summary of how peer review works in science and to get the public asking the right questions about whether there really is any validated evidence for claims they hear.

WRAPPING UP AND A WORD OF ADVICE

If you've read this far you've done well. A lot of information came out of the workshop and I didn't want to leave anything important out. Before signing off I want to leave with two key points of advice for early career researchers like myself.

1. Remember, every experience you have of the peer review system can be made into a learning experience whether as an author or reviewer. If it's good it may improve your own work, or offer you the chance to improve someone else's work. If it's bad it may help inform your future decisions whether to submit or review for those journals.
2. Remember, authors, editors and reviewers are all human too. The peer review system may not be perfect and we are all subject to our own idiosyncrasies as human beings. But by recognising that at the end of that anonymous manuscript/reviewers report is another human being who, if we go by the Peer Review Survey results, likely has noble motivations of helping you, we can realise that opening a polite dialogue can go a long way to achieving the best outcome for everyone. This was something key that the panellists brought up and has been my experience also. Dialogue with the editor as an arbiter between authors and

reviewers can allow for polite, constructive discourse regarding submitted work and ultimately result in the most informed decision being made. If as an author or reviewer you disagree with a comment or decision respectfully offer your rebuttal and you never know what may happen. It’s worked for me in the past!