PEER REVIEW

papers should be

published in their jo[illegible]

Peer review now results in over 1.5 million scholarly articles published each year and is fundamental to the integration of new research findings in hundreds

In Voice of Young Science (VoYS) workshops, early career researchers raised questions about how to get involved in reviewing, how to be sure of doing a good job and what to expect as authors and reviewers.

This is a nuts and bolts guide to peer review for early career researchers written by members of the VoYS network[1]. Using a collection of concerns raised by their peers, the VoYS writing team set off to interview scientists, journal editors, grant bodies' representatives, patient group workers and journalists in the UK and around the world to find out how peer review works, the challenges for peer review and how to get involved.

We have not avoided criticisms of the peer review process in this guide but rather entered into the debate, asking journal editors and reviewers some challenging questions about scientific fraud and plagiarism going undetected; issues of trust and bias; ground-breaking research taking years to publish and the system benefiting a closed group of scientists.

THIS GUIDE WILL HELP EARLY CAREER RESEARCHERS UNDERSTAND:

1. How the peer review process works

2. Some of the limitations of peer review

3. The role of peer review in society

CONTENTS

[1]Voice of Young Science (VoYS) is a network of early career researchers who stand up for science in public debates about science. Further information at www.senseaboutscience.org/pages/voys.html.

The Editors

To gain an insight into how peer review works, we asked editors from a variety of peer reviewed journals, how they select reviewers, reduce potential bias and make decisions about which manuscripts to publish.

WHAT DO YOU DO WHEN A PAPER IS SUBMITTED?

"I have a whole load of manuscripts coming to me each day - far more than I can publish. So I have to look at them and decide firstly, is this paper relevant to the journal I'm editing? (Is it groundbreaking etc.) I'm looking for the best papers, but I often know very little about the nitty gritty of the research area. It is the experts that I send the paper out to review to, who know the subject area well and can help me make a judgement."

CHRIS SURRIDGE
Chief Editor and Associate Publisher of Nature Protocols

"When your paper is submitted, we first of all look through it briefly to check the format and length, the clarity of the discussion, research methods and overall fit with the journal. This is a fairly quick process - around two weeks or so. If it passes this 'desk review' procedure, we then send it out for full review to subject experts."

HOW DO YOU THEN SELECT REVIEWERS?

"If I know the field intimately I will select people to review from my knowledge base. If I don't know the field, I select reviewers by searching 'PubMed' (a free online database of citations and abstracts) for authors of similar research or pick suitable authors from the bibliography of the paper. I don't think it makes sense to carefully and precisely select and invite only verifiable world leaders. Most luminaries are often too busy, and the process of selection becomes far too slow."

DR MICHAEL CURTIS
Editor-in-Chief of the Journal of Pharmacological and Toxicological Methods

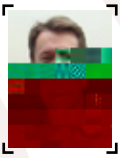
"We invite several reviewers in order to get a view which is independent from the editorial team. If the reviewer and the assigned editor agree that a paper should be rejected, we reject. But if there is reasonable support, then we start a confidential online discussion with additional

Enter the reviewers….

WHAT DO THEY HAVE TO SAY ABOUT THE BENEFITS OF BEING A REVIEWER?

The benefits of reviewing are diverse: from improving your critical thinking, giving and receiving feedback and gaining insights to improve your future publications. Reviewing is an essential skill to develop as a researcher.

WHY DO YOU REVIEW?



"Partly because it is an accepted part of membership in the academic community. But also, it is always interesting to see the latest work in my particular specialist areas and be able to comment on it and hopefully sometimes improve it prior to publication; to act as a gatekeeper for quality in an area of science that I know about and care about."

DR STEPHEN KEEVIL
Medical Physicist, King's College London

90% review because they like playing their part as a member of the academic community[2]

85% just enjoy seeing other papers and being able to improve them[2]

Almost all researchers **91%** believe that their last paper was improved through the peer review process[2]

[2] Results from the 2009 Peer Review Survey: Sense About Science with support from Elsevier carried out one of the largest ever peer review surveys of over 4000 authors and reviewers: http://www.senseaboutscience.org/pages/peer-review-survey-2009.html

SOME TIPS FOR NEW REVIEWERS PLEASE!

"When reviewing, try to remember that you are an author too and be professional and constructive in your approach. That can be hard but don't let your inner nitpicker get the upper hand. Leave 24 hours between reading the manuscript and writing your review, to allow time for your reasonable self to rise to the fore."

STEPHEN CURRY
Professor of Structural Biology, Imperial College London

When accepting the invitation to review you are agreeing to provide a fair, robust and timely critique that is useful for the authors in improving their manuscript (whether or not the journal accepts the manuscript).

Before you accept to review a paper, ensure you can submit within the time frame because slow review times are a source of frustration for authors. Many journals record how long a reviewer has taken to submit a review. If they are frequently very slow, editors will take this into account and avoid inviting the reviewer again. Some journals also rank your review once it is submitted, so if you do a good job; you are likely to be invited again.

If, after agreeing to review, you find that you will not be able to complete the review in the agreed time frame, contact the journal and let them know.

If you have any conflicts of interest– for example, you work closely with the author or are in direct competition – you must declare these to the editor. If you are unable to accept the invitation to review, suggestions of alternative reviewers are welcomed by editors.

QUESTIONS REVIEWERS ASK

Aside from assessing the title, abstract, English language of the article and references, reviewers assess the scientific quality of the work.

Does the paper fit the of the journal it is being considered for?

Is the clear?

Was the appropriate?

Is the , methods and analysis appropriate to the question being studied?

Is the study or original?

Does the study challenge existing paradigms or existing knowledge?

Does it ?

?

Are the described clearly enough for other researchers to ?

Are the methods of analysis and level of significance appropriate?

Could of the results be improved and do they answer the question?

If humans, human tissues or animals are involved, was approval gained and was the study ethical?

Are the appropriate?

If the science is sound but the language is poor, some reviewers may suggest edits, whereas others might flag up to the editor that the paper needs an English language edit. If the language is so poor it is difficult to assess the science you might recommend the author improves the language and resubmit. There are English rewriting services available.

DO I NEED TO GET UP TO SCRATCH WITH MY STATS?

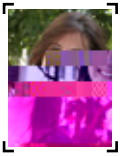
"When it comes to clinical trials and epidemiology papers, statistical literacy is an important issue."

DR STEPHEN KEEVIL
Medical Physicist, King's College London

IS THERE ANY TRAINING?

"Most journals provide online guidelines for reviewers but in my experience little other training is available. The skills are largely learned from colleagues and mentors in the reviewer's own department."

PROFESSOR MIKE CLEMENS
Biochemistry & Molecular Biology, University of Sussex



"When I started reviewing I had no formal training, but I did get invaluable guidance from senior staff. Now there are also training days and web courses which give advice on the structure and content of a review, and, importantly, the expectations of the editor."

DR DEIRDRE HOLLINGSWORTH
Epidemiologist, Imperial College London

Most experienced peer reviewers have 'learnt on the job'. If you are reviewing for the first time, it is a good idea to ask an experienced reviewer with an analytical approach to be your mentor.

Research groups and medical departments often hold their own 'journal club' where they discuss a recent paper. This allows the group to keep up-to-date with scientific developments and develop skills to critically appraise research papers that will be useful when reviewing.

Some journals (eg. the EMBO Journal, BMJ Open) publish reviewers' reports alongside papers which can be useful for inexperienced reviewers to look at.

Once a decision has been made, journals often let reviewers know whether they accepted or rejected the paper, and send them a copy of the other review(s). This allows you to see the assessments and opinion of other experts and whether there is anything you have missed in your own review. It can also help you judge whether you were too stringent for the journal or too lenient. It can sometimes take a few attempts to gain a sense of what the acceptance threshold is for a particular journal as each journal is different.

Papers can go through several rounds of peer review, when a paper is rejected, the author will in most cases submit it to another journal. The new journal editor will then send the paper out to new reviewers. There is concern amongst the scientific community that this leads to "wastage" of reviews as previous reviews are not always taken into consideration.

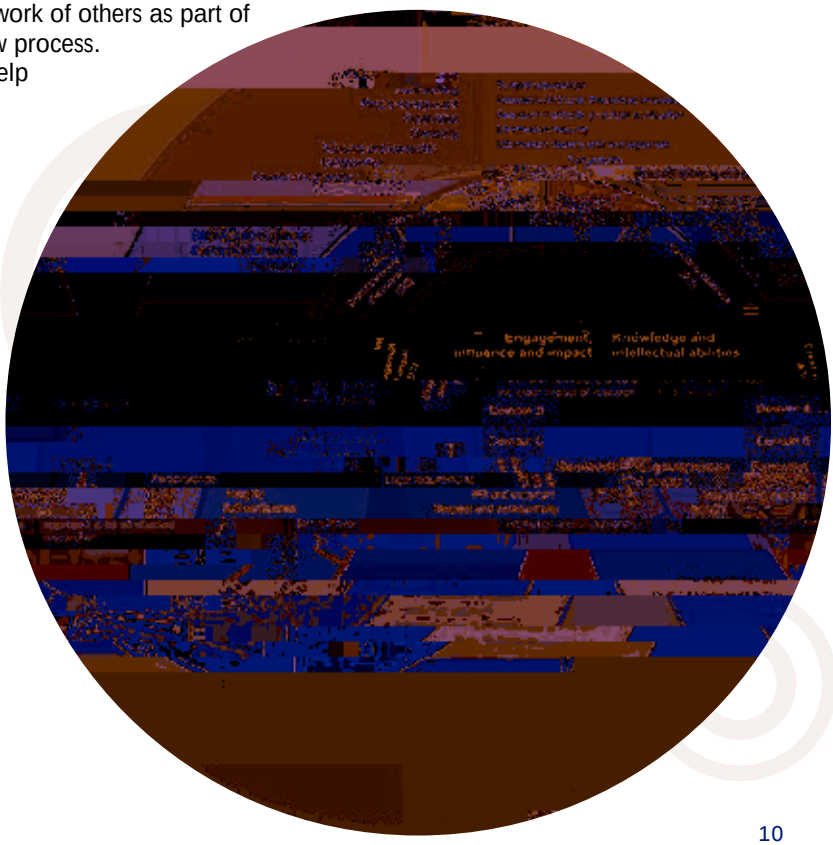
IS ANYTHING BEING DONE TO PREVENT “WASTAGE” OF REVIEWS?

“Cascading peer review (a.k.a. ‘waterfall peer review’) is when a paper that has been rejected after peer review, is passed to another journal along with the reviewers’ reports. The peer review process at the second journal can be kept relatively short because the Editor considers the reports from an earlier round of peer review, along with any new reviews. Variations on this process exist, according to the type of journal - but essentially reviews can “cascade” down through various journals.”

DAN MORGAN
Executive Publisher of Psychology & Cognitive Science

HOW THE VITAE RESEARCHER DEVELOPMENT FRAMEWORK CAN HELP YOU WITH PEER REVIEW

Being a successful researcher involves developing many skills including reviewing the work of others as part of the peer review process. This skill will help you in many employment destinations, not just research.



The Vitae Researcher Development Framework (www.vitae.ac.uk/rdfresearcher) is a guide to identify your strengths and priorities for professional and career development. It sets out the knowledge, behaviors and attributes of successful researchers and assists you in achieving higher levels of development.

The Framework is made up of four domains, which encompass

knowledge and intellectual abilities
personal effectiveness
research governance and organisation
engagement, influence and impact

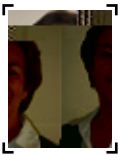
These are further broken down into a number of characteristics, which you would be developing through peer review including:

- reputation and esteem
- collegiality
- publication
- knowledge base
- critical thinking and analysis
- networking and responsiveness to opportunities
- reputation and esteem
- time management skills
- continued professional development

Peer review varies widely depending on the research field in terms of what reviewers are looking out for and the time the process takes (in mathematics, peer review can take years whereas in biomedical subjects it can take just weeks).

In some fields, like physics, it is more common to put research online in a subject

WHAT ARE THE DIFFERENT TYPES OF PEER REVIEW?



DR IRENE HAMES (Editorial Consultant and author of Peer Review and Manuscript Management in Scientific Journals) RUNS US THROUGH THE DIFFERENT TYPES OF PEER REVIEW

SINGLE-BLIND REVIEW

The reviewers know who the authors are, but the authors do not know who the reviewers are. The most common system in science disciplines.

- ✓ This allows reviewers to provide honest, critical reviews and opinions without fear of reprisal from the authors.
- ✗ Lack of accountability, allows unscrupulous reviewers to submit unwarranted negative reviews, delay the review process and steal ideas.

DOUBLE-BLIND REVIEW

The reviewers do not know who the authors are, and the authors do not know who the reviewers are. Main form of peer review used in the humanities and social sciences.

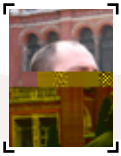
- ✓ Reduces possible bias resulting from knowing who the authors are or where they come from, work assessed on its own merits.
- ✗ Involves some effort to make sure manuscripts are anonymized, reviewers can often guess who the authors are (particularly if the authors have cited many of their own papers), information important for a complete critical appraisal is missing.

OPEN REVIEW

PEER REVIEW WARTS AND ALL

Peer review is not a perfect system. It relies heavily on trust, and as scientists are human like the rest of us, there will always be cases of misconduct.

SO IS PEER REVIEW EFFECTIVE?



"Bad papers sometimes make it through peer review and the system is not set up to catch outright fraud. However, it acts as a useful first barrier to junk science and journalists should treat information from non-peer reviewed sources accordingly."

JAMES RANDERSON
Environment and Science News Editor at the Guardian

"It's a good thing scientists are mostly honest, because peer review offers the greatest possible temptation to steal ideas, to show favour to former students, to boost favoured theories, or to do down rivals. Honest they may be but they aren't saints, so we must expect all of these things to happen from time to time."

NIGEL HAWKES
Straight Statistics

"Regardless of its weaknesses, peer review is something the scientific world cannot do without."

PROFESSOR MAMMO MUCHIE
Editor of the African Journal of Science, Technology, Innovation and Development

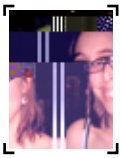
Just as a washing machine has a quality kite-mark, peer review is a kind of quality mark for science. It tells you that the research has been conducted and presented to a standard that other scientists accept. At the same time, it is not saying that the research is perfect (nor that a washing machine will never break down).

BUT WHAT DO EDITORS THINK? DO WE TRUST REVIEWS TOO MUCH?

"Perhaps we do. It is easy to find plausible reasons to reject a paper, especially at the highly competitive end of the market. If a reviewer has a vested interest or a conflict of interest this is rarely disclosed. Indeed, any 'expert' in the field must be a rival by definition, and conflicted by definition. Yet we trust their judgements."

DR MICHAEL CURTIS
Editor-in-Chief of the Journal of Pharmacological and Toxicological Methods

CAN WE PREVENT REVIEWER BIAS?

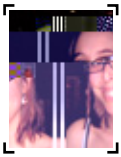


"Reviewers are trusted to deliver an opinion but the editor knows this to be subjective and so will carefully consider this when making a final decision on a paper. And journals rarely accept papers based on only one review."

COLLETTE TEASDALE
Development Editor - Economics Journals, Routledge Journals,
Taylor & Francis Group

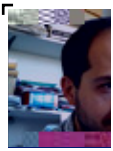
Reviewers could potentially slow down the publication of a paper to enable them to get their paper out first. However, reviewers are given a deadline to submit their review. If they are very late then journals will invite an expedited review from a backup reviewer or consider the reviews they already have in-hand at an editors' meeting to minimize the delay for the authors.

One criticism of peer review is that it "shuts down new ideas" as research that goes against the status quo may be rejected by reviewers. We put this issue to the experts:



"Rather than shutting down new ideas, the process of peer review should mean that they are carefully considered and subject to close scrutiny before being released to a wider audience. Often the processes of peer review itself can specifically enhance a paper and the ideas it seeks to communicate."

COLLETTE TEASDALE
Development Editor - Economics Journals, Routledge Journals,
Taylor & Francis Group

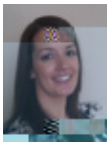


“Fundamental physics sometimes advances with the presentation of ideas which may sound crazy at first. This exposes the field to being hijacked by deranged minds with their own “theory of everything” in their pocket. It can be difficult for a reviewer to know whether a study is worthy of publication and so there is a risk that reviewers decide on the basis of their personal biases and turn down good work, or let crazy papers pass.”

TOMMASO DORIGO
CMS experiment at CERN

New research that goes against current thinking might take longer to pass peer review, but if it is scientifically sound, it will eventually be published.

We often hear about cases of fraud going undetected. But can peer review ever really detect fraud?



"Unfortunately, the peer review process often doesn't pick up plagiarism as this would require the reviewer to know about every research paper published on the subject area (and remember them!). However, journals use a plagiarism checker that produces a report highlighting the similarities with published papers. Reviewers can carry out their own similar check using etBlast, a free database where they can paste the abstract and see which papers are similar. This process is also useful to help reviewers see where the paper fits within published literature, as well as how novel a paper is."

ELIZABETH HAY
Managing Editor, RCOG Journals

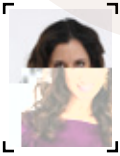
The Committee on Publications Ethics (COPE) is an international forum for editors of peer reviewed journals who discuss all aspects of publication ethics. They have developed best practice flowcharts for editors on how to handle cases of research and publication misconduct including plagiarism and research fraud as well providing guidance on how editors can responsibly carry out peer review.

After publication, if a paper is found to be fraudulent or plagiarised, or researchers realise they made a mistake in their calculations that invalidates the paper, the journal publishes a which appears alongside the paper online. These can be tracked on Retraction Watch. If editors are concerned about the validity of a paper and there is an investigation underway, they will publish an .

The internet has created novel ways of reviewing research both pre and post peer review. Some researchers have started to use blogs, wikis and other Web 2.0 technologies to communicate their own research to other scientists in the field as well as share their

"Peer review is not a guarantee that the science is right, just that it seems to have been done properly. So whether I report the status of research or not depends on the content. If some distinguished cosmologist tells me - without benefit of peer review - that in his opinion the universe went through a phase that resembled custard before splashing into sticky globules that coalesced into galaxies, I might very well make a story out of it. Right or wrong, such a conjecture affects no one. On the other hand, if someone claimed a successful treatment for multiple sclerosis without benefit of a peer reviewed publication, I'd not touch it at all because it would be cruel to raise unfounded hopes."

TIM RADFORD
Freelance journalist



"Many of my editors - and many of the people that I write for - don't understand the difference between research that has been peer reviewed, and research that hasn't so I tend not to include those terms in my writing. However I, personally, certainly do consider whether research has been peer reviewed or not when considering how much credibility to give to claims."

CLAIRE COLEMAN
Freelance journalist who often writes about beauty treatments for the Daily Mail

PEER REVIEW MATTERS

Peer review may have its limitations, but it is also a remarkable process which relies on the trust and co-operation of the scientific community and acts as a quality control ensuring that published research is valid, significant and original. The process is essential for the dissemination and advancement of scientific knowledge. Without peer review, how would we weigh up claims and know what to believe?

3

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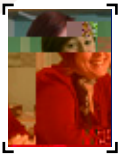
[3] Results from the 2009 Peer Review Survey: Sense About Science, with support from Elsevier carried out one of the largest ever peer review surveys of over 4000 authors and reviewers: http://www.senseaboutscience.org/pages/peer-review-survey-2009.html

Reviewing is a role that is integral to the scientific community and so it is important that early career researchers get involved in the process early on.

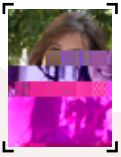
"One of the reasons I like to review papers is that it makes me feel like an important part of the academic community, and that my opinion about what is (or isn't) good science actually matters."

JAMIE MCCLELLAND
VoYS



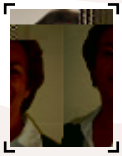
"Reviewing for journals is my chance to stop bad science being published and improve the quality of good science papers which deserve to get published!"

MARGARET HESLIN
VoYS



"If the results in a paper have important consequences for the public, it is essential that the work is reviewed by peers to check that the conclusions are reliable."

DR DEIRDRE HOLLINGSWORTH
Epidemiologist, Imperial College London



"Peer review is important because it helps people make decisions about what to believe, what to treat with scepticism and what to trust. When research work has been scrutinised and critically assessed by experts before publication it helps prevent the release of work that is unsound, inadequate or has been wrongly interpreted. Its role is to ensure the scholarly record is as sound as possible. It isn't, however, a guarantor of absolute truth – it does sometimes go wrong and there are shortcomings - but it is considered by many to be crucial to the reputation and reliability of scientific research."

DR IRENE HAMES
Editorial Consultant and author of Peer Review and Manuscript Management in Scientific Journals

4. FURTHER INFORMATION

SENSE ABOUT SCIENCE PUBLICATIONS:

All are available as free downloads from www.senseaboutscience.org

I Don't Know What To Believe

Peer review Survey 2009 Final Results

Peer review and the Acceptance of New Scientific Ideas

Peer review Education Resource http://www.senseaboutscience.net/

OTHER GUIDES TO PEER REVIEW:

Peer review: a guide for researchers Research Information Network
http://www.rin.ac.uk/our-work/communicating-and-disseminating-research/peer-review-guide-researchers

Anthony M. Vintzileos, MD, Cande V. Ananth, PhD, MPH 2010 The Art of Peer-Reviewing an Original Research Paper; Important Tips and Guidelines J Ultrasound Med 2010; 29:513–518

BMJ training materials for reviewers:
http://www.bmj.com/about-bmj/resources-reviewers/training-materials

USEFUL RESOURCES FOR REVIEWING

To find published papers with similar abstracts: etBlast: http://etest.vbi.vt.edu/etblast3/
Clinical Trials registration information (all clinical trials should be registered before the first patient is enrolled): http://www.icmje.org/faq_clinical.html
The Declaration of Helsinki; international ethical principles for medical research
http://www.wma.net/en/30publications/10policies/b3/
Committee on Publication Ethics: http://publicationethics.org/
Guidelines for research to be published in a biomedical journal, flowcharts and checklists for e.g. systematic reviews, meta-analyses observational studies, and randomized controlled trials: http://www.equator-network.org/
International prospective register of systematic reviews:
http://www.crd.york.ac.uk/prospero/

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A statistical review has been shown to improve the quality of manuscripts:Cobo E, Selva-O'Callagham A, Ribera JM, Cardellach F, Dominguez R, Vilardell M. Statistical reviewers improve reporting in biomedical articles: a randomized trial. PLoS ONE 2007;2(3):e332.

Acknowledgements

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