

## Peer review: past, present and future

Munishwar Nath Gupta

*Most of the authors look at peer review as something which is a 'black box' and 'a hurdle to be crossed'. That is ironical as peer review exists to ensure that good science prospers and is shared. A better appreciation of the respective roles of the authors, reviewers and editors is desirable for a good publication to emerge. Over the years, peer review has taken many shapes and continues to evolve.*

Most scientists worry about peer review fleetingly and only when they receive adverse comments about their manuscripts. Considering that scientists are also required to take up the role of a reviewer (referee) or an editorial board member, a better understanding of the peer review may be desirable. This note is aimed at outlining the various facets of peer review. It is necessary to realize that peer review has evolved into its current form and the evolutionary journey continues.

### What is peer review?

John Donne said 'No man is an island'<sup>1</sup> and that is true of scientists as well. Science progresses because scientists learn about a particular phenomenon, process or object, and then try to understand and analyse, add to or refine this knowledge. So, science progresses by sharing of the knowledge among scientists. Conferences provide a good platform where the scientific findings can be presented, questioned and debated by peers. (In fact, as I mention later, this was among the earliest forms of peer review.) Scientific journals aim to catalyse this sharing of knowledge among a wider section of scientists and preserve that knowledge so that anybody anywhere and at any time may refer to it. The journals also act as a filter to ensure that the findings are based upon valid scientific methods and interpretations are arrived at by rational and sound reasoning. The peer review in any format acts as such a filter.

### How did it all start?

Ray Spier (who was the editor of a fairly well-known journal *Enzyme and Microbial Technology*) had written an excellent short history of the peer review<sup>2</sup>. Apparently, in ancient Syria, a physician was duty-bound to make notes regarding his

patient and these notes were reviewed by a local council of physicians to ensure that the treatment was up to prevailing standard. Spier recalls the fate of Servetus, whose views about the flow of blood did not please a leading theologian and hence he was burned at the stake. That should certainly comfort us when any of us fret about a mere rejection of a manuscript.

The Royal Society of London, by mid-20th century was publishing *Philosophical Transactions*. The discretion rested solely with the editor or whomsoever he may chose to consult. This perhaps can be taken as a birth of the present version of peer review. Some journals, like the venerated *Nature* even today decide internally about the merit of a submitted manuscript. Apparently, the Royal Society of Edinburgh, in the 1730s was more 'democratic'; it relied upon the opinion of a selected panel<sup>2</sup>.

Around the time of Charles Darwin, informal consultation among peers was the mode of decision-making. I remember reading in *A Beautiful Mind*<sup>3</sup> based upon the life of Nobel Laureate John Nash, that at least among the mathematicians, the dealing editor (and the experts) played a proactive role. There was a discussion, manuscripts went back and forth and ultimately what was published was a sort of consensual view. So, there was openness, nobody hid behind the cloak of anonymity. Surely, there were bitter debates and even some bad blood. It was all mostly ruled by scientific conviction.

From the above it is clear that peer review is not a static concept. It has evolved into its current shape. Hence we need not believe that the current shape is sacrosanct and it should not be allowed to evolve further.

### The present peer-review system

When a paper is submitted, many journals like to ensure that it has the desir-

able format and length. This is generally carried out by the editorial office. In some cases, the journals have a limit on the number of figures/tables. If the submitted manuscript exceeds this limit or fails to meet the other above stated requirements, it is returned to the main author (and/or corresponding author). In case of some publishers, this is accompanied by a rather stern letter, which sounds like a rejection letter. Whether it is merely a case of the abstract exceeding the word limit or a totally wrong format, this letter uses a standard format. It is generally reassuring to go down the letter and check out where specific reasons are listed for that particular manuscript.

The next hurdle for the manuscript is that the editor/editorial board members examine the 'suitability' of the manuscript for the journal. The journals with high visibility tend to return a good percentage of manuscripts at this stage without sending them out to the referees. If the manuscript clears this step (on-line system displays 'With the editor'), it is sent out to the referees. Many journals ask the author(s) to suggest possible referee names. The number of referee reports required by a journal may vary from two to five. Some journals may use a single-blind review. In this case, the reviewers know who the authors are, but the authors never learn the identity of the referees. Journals dealing with research related to chemistry and biochemistry generally follow this policy. It is believed that this permits the referees to be more honest and critical. A relatively younger and less established referee may not like to antagonize a senior author in his/her research area. On the other hand, many people think that it encourages reviewers to be unreasonably negative and even be less prompt in returning the review. In the double-blind review, even referees do not know who the authors are. This is aimed at eliminating the obvious possibility of a bias; however, it is difficult to operate in practice. In these

days of specialization, everybody knows who is doing what. Self-citations are also a big give-away.

Once the necessary reports are in, the editor/editorial board member examines them and gives a decision. Some journals (e.g. *Chemical Communications*) use an editorial step of employing an adjudicator if the referees widely differ in terms of their recommendations about acceptance or rejection of the manuscript. Very few journals entertain any appeals by the authors (in the cases where the manuscripts are rejected). In case a revised manuscript is submitted (if so decided by the editor), the entire process starts all over again.

According to a recent estimate<sup>4</sup>, about 1.5 million articles clear the multi-step peer-review process and are published globally. The average percentage of acceptance is said to be about 50. So, on an average 3 million articles go through the peer-review system every year.

*Every stakeholder has a critical role in the review process*

Broadly speaking, the various stakeholders are the authors, referees and editors. For a review process to be meaningful, efficient and to come close to its ideal concept, all the stakeholders have an important role to play. Let us briefly outline the expected parameters for each of these roles.

**Authors:** The potential publication originates from the authors. The first and foremost issue is the ethical aspect. It is said that 'If a fraudster makes up data carefully, detection is very difficult...'<sup>4</sup>. Also, 'Unfortunately, the peer review process often does not pick up plagiarism as this would require the reviewer to know about every research paper published on the subject area (and remember them)'<sup>4</sup>. The second important issue is preparing the manuscript carefully. It can be a frustrating experience for the editor to receive a badly written manuscript<sup>5</sup>. Graduate students may find a book written by Day<sup>6</sup>, an experienced editor valuable. Those embarking on writing their first few papers may profit from following some golden rules and good advice offered in this book.

The value of writing a careful structured response while submitting a revised manuscript cannot be overemphasized.

The best format is to reproduce the comment and then write your response below it. It is advisable to break up a comment if it bunches numerous issues. Curt and general responses should be avoided. Brevity is not the soul of a response. One should elaborate.

**Referees:** It is a fact that authors quite often end up disliking referees. The amusing part is that most of the referees are authors of some publications as well, who have gone through a similar review process. Almost all of us are trained to write scientific papers as graduate students. We are seldom taught how to review manuscripts. This is sort of learnt intuitively or as we move along in our scientific career. Few years back, the *Journal of Biology (BioMed Central)* published an article 'Are we training pit bulls to review our manuscripts?'<sup>7</sup>. Let us list a few concerns flagged by some editors and well-established scientists. 'Bad papers make it through peer review...'<sup>4</sup>. 'Peer review offers the greatest temptation to steal ideas, to show favor to former students, to boost favored theories or to down rivals'<sup>4</sup>. '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...'<sup>4</sup>. All strong statements, yet none is devoid of a grain of truth. Luckily, all this does not happen all the time. In fact, on the whole, opinions on the peer review range from a 'necessary evil' to the 'best alternative at present'. Also, most of these concerns can be taken care of by a proactive editor. For a referee, it is a walk on the razor's edge. He/she must be critical but stop short of 'pit-bull reviewing'.

**Editors:** All in all, given a chance, it is seldom that an editor would not be helpful to an author. An editor appears on the scene twice. First, when he/she receives a manuscript and accepts it and decides whether it should go forward for a review by the referees. This seemingly innocuous step can actually be a source of serious frustration for the authors. Editors of even high impact factor journals, seldom come out and say 'not of our standard'. Somebody somewhere attempted to draft a polite letter and that seems to have been universally adopted. This format runs along the lines, 'We receive many papers and end up rejecting x% at this stage as we cannot review all/publish

all manuscripts. Also, it is not of a wider interest and may be submitted to a more specialized journal'. This is worrisome on two counts. First, unless the journal is *Science*, *Nature* or something similar, most are specialized. The so-called applied science journals do not do this; so it must be the divide between the so-called basic science and applied science. Secondly, this becomes doubly enigmatic if the author(s) quoted a recent paper published in the same journal and dealing with the same sub-area. Unfortunately, this happens more frequently than necessary. Ideally, it should never happen.

The second time an editor appears on the scene is at the end of the review process. Another article on 'pit-bull reviewing' contains an important sentence '... editors are unable or unwilling to judge for themselves the justice of the referees' advice'<sup>8</sup>. To my mind, this simple statement summarizes the crux of the matter. Much of the unfairness of the current peer-review process emanates from the fact that editors fail to play a proactive role. Recently, I mentioned the difficulties which editors are going to increasingly face as broad-based journals publish papers based upon multidisciplinary research<sup>9</sup>. A good comprehensive discussion on peer review can be found elsewhere<sup>10</sup>.

To sum up the situation about the current peer-review system, there are some serious concerns. The situation is going to only get worse because of the following reasons. The number of the new journals is increasing rapidly. So, every competent and efficient referee is under tremendous pressure. The situation is so bad that graduate students who have just published their first paper are being approached for reviewing manuscripts by some new journals. Many of these journals do not even have a clearly identified publisher. There is a website and an e-mail address. Many of us are being asked to review manuscripts in areas far removed from our research interests/expertise. New areas are developing fast with multiple interfaces with different disciplines. This growth, especially in chemistry and biology, is so sudden and rapid that often one feels a need to quickly seek a formal definition. For example, it became necessary to draw a line that nano dimension ends at about 100 nm. System biology and more recently synthetic biology needed to be defined and explained as for a while

nobody was sure what exactly these disciplines included or excluded. So, the days of a passive editor/editorial board are over. People who are more widely read and have an overview of the fast-moving frontiers are badly needed and have to be involved in the peer review.

Let us accept that editors tend to side with the referees. This is more so if the editor is not proactive. Many a times, the referees are biased. There are no ideal solutions. However, people are actively searching for answers. This search has led to some alternatives.

### Emerging alternatives

The *PLoS* range of journals gives clear guidelines to the reviewers to just decide whether good science has been done and not worry about applications, etc. BioMed Central formats for reviewers clearly identify comments into various categories; one of these is that it is left to the discretion of the authors whether they should undertake the suggested revision. That is a good nudge to avoid 'pit-bull reviewing'.

*BMC Biology* has a re-review opt-out policy<sup>11</sup>. To quote 'What is missing is decisive editors at the other end of the

process... editor needs to step in and clearly state that while this would be a nice experiment, it will not be required for the acceptance of this work'<sup>10</sup>. I think editors should also step in when the referee provides a long list of his/her own papers which must be cited. The recently launched journal *F1000 Research* is based upon post-publication peer review<sup>12</sup>. The names of the reviewers and their comments are all put out along with the manuscript. This is a good beginning. Hopefully, it will also result in a fair review.

It may be a good idea for the reviewers to come out of dark and identify themselves. That is how it all started. Open discussion with a common aim of creating good science should be part of any good peer-review system. It is interesting to note that all the above initiatives have come from the open access journals<sup>13</sup>. I think we are getting there. Unfairness cannot be totally eliminated. However it can be minimized.

1. Donne, J., Meditation XVII; [www.online-literature.com/donne/409/](http://www.online-literature.com/donne/409/) (downloaded on 15 May 2013).
2. Spier, R., *Trends Biotechnol.*, 2002, **20**, 357–358.

3. Nasar, S., *A Beautiful Mind*, Faber and Faber, UK, 1998.
4. Peer review: nuts and bolts; [www.senseaboutscience.org](http://www.senseaboutscience.org) (accessed on 14 March 2013).
5. Murray, R., *Anal. Chem.*, 2011, **83**, 633.
6. Day, R. A., *How to Write and Publish a Scientific Paper*, ISI Press, Pennsylvania, USA, 1979.
7. Walbot, V., *J. Biol.*, 2009, **8**, 1–3.
8. Robertson, M., *BMC Biol.*, 2011, **9**, 1–3.
9. Gupta, M. N., *Curr. Sci.*, 2012, **103**, 126–127.
10. Peer review and the acceptance of new scientific ideas; [www.senseaboutscience.org](http://www.senseaboutscience.org) (accessed on 14 March 2013).
11. Walter, P. and Robertson, M., *BMC Biol.*, 2013, **11**, 1–3.
12. [www.f1000research.com](http://www.f1000research.com)
13. Brown, P. O., *BMC Biol.*, 2013, **11**, 1–3.

ACKNOWLEDGEMENT. Two of my group members, Ms Veena Singh and Ms Benu Monga helped in the preparation of this article.

*Munishwar Nath Gupta is in the Department of Biochemical Engineering and Biotechnology, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016, India.*  
e-mail: munishwar48@yahoo.co.uk