

Peer Review

Peer review has established itself as a crucial validation mechanism for modern science. Despite the disadvantages associated with its practice, it remains a powerful method to add value to scientific publications.

Peer review is certainly a debated matter. For instance, there are a number of historical accounts in the literature that tell different stories of the genesis of peer review. Some focus on the historical practice of reviewing medical reports, which date back to the time of Galen, as a primordial form of peer review¹. Others look to the first structured forms of peer review, which are connected with the advent of scientific societies in the eighteenth century¹; others even stress that the format of peer review we know today was only adopted in the second half of the twentieth century². And in fact, many journals only introduced peer review as a mandatory requirement for publication in recent times. A very instructive example of this, used by historians of science to explain how the practise of peer review was introduced not without friction, is an anecdote about Einstein being surprised and upset by the fact that the editor of *Physical Review* had shown his paper to another specialist before printing — that is, peer reviewed — and threatening to retract the manuscript².

While academic disputes on the history of peer review are ongoing, others are already busy arguing about its future. The image of a group of scientists chatting at a conference about the down side and flaws of peer review is probably familiar to many of us. Peer review is indeed not perfect, and the list can be long. A few years ago, for instance, Campanario published a very provocative article titled ‘Have referees rejected some of the most-cited articles of all times?’³ based on a study of works that have encountered a high level of resistance during peer review, according to a catalogued list of authors’ commentaries. The consequences of that have been a series of initiatives in the past years aimed at experimenting novel schemes for peer review, including open peer review⁴ forms or crowd-based approaches⁵, to cite but a few. All these efforts have the merit to have stimulated the different scientific communities to discuss the fragilities of the process, and offer, where possible, suitable alternatives.

In the following, however, we would like to focus on the importance of peer review as it stands and recall some of the features that have rendered this scientific practice one of the cornerstones of modern science, notwithstanding its imperfections. In doing that, we will naturally provide a rather subjective perspective using, as an example, the procedures according to which manuscripts are evaluated at *Nature Catalysis* or other *Nature Research Journals* (for a graphical overview, see ref. ⁶).

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There are at least two aspects of peer review that we would like to emphasize herein. The first is that peer review, despite its limitations, can really improve the quality of a manuscript. As editors, we have the chance to witness this as we oversee a large number of peer review processes every month. And in fact, reviewers provide very often important suggestions related to additions or modifications that both reinforce the logic and the presentation of a study as well as its scientific soundness — everyone benefits from a fresh pair of eyes. In a similar way, the careful examination of an expert can lead to the identification of important inconsistencies in a study, or technical mistakes that would otherwise hamper the legitimacy of a research. Crucial for the procedure is to ensure that reviewers can express their considerations on a manuscript without bias — and this requires in turn a great attention in the choice of the experts that should judge the manuscript. At *Nature Catalysis*, we invest considerable care in the choice of the referees. We take potential conflict of interests very seriously,

those for instance flagged up by the authors who tend to identify actual competitors. Moreover, when searching for reviewers we always check their history of publication to try to exclude if they have previously collaborated or worked together with an author — overfriendly reviewers do peer review a disservice too.

Equally important for us is to make sure that the referees — on average three per manuscript — have all the expertise required to rigorously assess a manuscript. Therefore, if the conclusions of a given work hinge on the application of a special technique, we will not make a decision without having an expert on that technique commenting on the manuscript.

Besides technical concerns, however, there is a second aspect of peer review that we will like to emphasize. This has more to do with the nature of science itself. Scientific knowledge, in fact, is not the product of isolated efforts, or a collection of propositions by a few authoritative individuals. On the contrary, it has always been generated through the interdependent actions of multiple individuals belonging to a community. While individuals develop new concepts and test new ideas, these will only become scientific knowledge when the community has reached a consensus on it, through a process of refinement and validation. And this is what peer review brings about: the seed of this process whereby the community as a whole examines, questions and collaborates as initial results move towards widespread acceptance.

We would like to close thanking all the referees who have worked so closely with us, making all this possible so far. □

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