Peering into peer review

Following recent discussions of pervasive ghostwriting of referee reports by early career researchers in the life sciences, we shine a light on the peer review process at *Nature Microbiology* and hopefully bust some myths along the way.

Much has been written about the pros and cons of peer review, and we have previously discussed our thoughts on this issue (*Nat. Microbiol.* **3**, 1; 2018). A preprint recently deposited in bioRxiv detailing the results of a survey of early career researchers on their participation in the peer review process has prompted discussion about whether appropriate recognition is given to those involved (McDowell, G. S. et al. *bioRxiv* http://doi.org/c6w6; 2019). More than half of respondents had written entire peer review reports on behalf of, and without feedback from, their group leader, and 70% reported making significant contributions to a peer review report without knowingly receiving credit. This has prompted us to shine a light on how *Nature Microbiology* approaches peer review and what are common, desirable and acceptable practices.

We assess every submission in depth (yes, we read the whole paper) and don't really worry about format at this stage. We only seek external peer review of those studies that we think provide a compelling conceptual advance, in part to avoid unnecessary work for our reviewers. Shortlisting suitable referees is a crucial part of the process and one in which we invest a substantial amount of time. We choose referees whose expertise cover all conceptual and technical aspects of the work; some of the technical referees may not have direct experience with the topic at hand, but are key to assess the conclusiveness of the study. In addition, we strive to have a panel with different levels of seniority — younger referees tend to look at the data in more detail, whereas senior researchers may have a better sense of where a study sits in the wider context of the field and of what are 'must-dos' and 'nice-to-haves'. When a study deals with a contentious topic, we avoid referees that are clearly on one side of the debate or, if this is not possible, ensure we hear from both sides. We try to balance gender and geographic location, and avoid returning to a small group of people repeatedly by continuously expanding our referee pool, which we curate by making note of reviewers that submit, for example, dismissive, biased, very late or no reports.

We usually approach independent investigators with a track record of publishing on a given topic, and, although we expect our reviewers to keep information confidential and not to share or use the knowledge gained to advance their own studies, we encourage co-reviewing with members of their lab. This is an important part of scientific training and a good way to gain first-hand experience in assessing scientific work; it also helps early career researchers understand the process that their own studies go through. However, when co-reviewing, we expect the person approached by the journal to lead the process, read the work in full, discuss the report with the team member(s) involved and, importantly, tell us who helped them assess the work. This will ensure that the study we send out is assessed by people with the expected level of expertise, and that co-referees are credited where possible and directly approached in the future, especially once they become independent. We consider ghostwriting, whether of referee reports or in any other context, an unacceptable practice.

Contrary to the view of the editor as a barrier to overcome, when a study is sent for peer review, the editor is largely in the authors' corner, and the aim is to ensure that the work is conclusive and the claims do not overreach the data. We aim to minimize potential conflicts of interest and always honour referee exclusions, although we might ask to reduce the list if more than three people are excluded (excluding people working in a whole continent, or that have ever trained there, is not allowed, nor is excluding everyone working in a given field of study). Referee suggestions are especially useful if the study uses a technique or type of analysis that not many people are familiar with, or if it pertains a topic not usually published in our pages. However, it is unlikely that all referees will be selected from among the suggestions, and if several people on that list have clear conflicts of interest, we may choose not to approach the others. Similarly, we expect referees to disclose if they are conflicted in any way, including competing work, ongoing collaborations or unknown personal relationships. By agreeing to review a study, we assume a referee will also assess its revised versions, as recruiting new referees at a later stage will unnecessarily delay and often complicate the process. Reviewers are free to sign their reports and authors can opt into double-blind peer review, but take-up for either option is very infrequent.

We take an active role in making a decision after review, which is more than a vote-counting exercise. Although we value opinions on advance and impact for the field, we may ultimately disagree on those counts; however, we are very unlikely to overrule technical concerns, at least without involving an arbitrating referee of similar expertise. We take into account each referee's expertise (which we also convey to authors) to decide the experiments needed to strengthen a study versus those that are further reaching or pull the work in a tangential direction, which may not need to be addressed for publication.

Referees and authors are the same group of people on different sides of the process and change sides every so often, which allows for interesting dynamics. Some authors try to guess the identity of the reviewers, and are often wrong. For example, when referees suggest references that need to be included and discussed, they are usually not referring to their own work, and we frequently see that the harshest reports are provided by suggested people. Sometimes we receive complaints that referee X is clearly not an expert, followed by requests to contact a specific person deemed to be 'world leader' on the topic, who is none other than referee X. Successful authors understand that the referees have invested their time to suggest ways to strengthen the work, and they approach the revision process constructively. On the other hand, good referees have a consistent and constructive attitude, and provide clear and critical reports. Useful referee reports avoid providing a divergent assessment in confidential comments to the editor, summarize key facts so that authors can see that the main implications were appreciated, highlight experimental limitations and provide clear guidance on essential experiments, discussing further-reaching work separately.

In the opinion of this editorial team, the importance of the reviewers in the publication process cannot be sufficiently emphasized. We sincerely thank our referees and encourage them to enlist the help of early career researchers, but to please always remember to acknowledge their participation in the process. ❐