

What is the Future of Preprint Peer Review?

Qual é o Futuro da Revisão por Pares de Preprints?

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Sharing research manuscripts as 'preprints' that have not been formally peer reviewed is increasingly common in the biomedical sciences. Authors can upload their manuscripts to preprint servers such as bioRxiv (pronounced "bio-archive") and medRxiv (pronounced "med-archive"), and these are posted online for anyone to read within two to three days after screening for appropriateness (the servers do not perform peer review but typically check that papers are actually science and do not contain dangerous or inappropriate material). Manuscripts posted as preprints are usually then submitted to journals for traditional peer review and publication, but this is not required. bioRxiv, launched in 2013,¹ focuses on basic science. medRxiv, launched in 2019, focuses on clinical research.² To date the two servers have posted approximately 220 000 preprints, and they became critical tools for rapid dissemination of COVID-19 research during the pandemic.

The primary goal of preprint servers is to speed up science by allowing rapid dissemination of research many months before it is available in journals. Preprints also provide an opportunity for authors to get feedback on draft manuscripts before submitting to a journal for formal evaluation. In addition, they offer a mechanism for sharing certain findings that have traditionally been difficult to publish in journals, such as replication studies and negative results. The decoupling of dissemination and evaluation by preprints has another important consequence though: it enables the emergence of journal-independent peer review mechanisms that complement or serve as an alternative to traditional journal peer review.

There are various informal mechanisms for readers to provide feedback on preprints. Preprints are frequently discussed on social media, with hundreds of thousands of mentions on Twitter that can include long threads of in-depth expert analysis. Many servers also include on-site comments. On bioRxiv and medRxiv, only around 5% to 8% of papers receive on-site comments. But while many of these are simply brief responses and requests for clarification, there are some extensive discussions of papers that resem-

ble formal peer reviews, and people reviewing papers for journals occasionally post their reviews as comments if the submission has also been posted as a preprint. The critique of research manuscripts on social media is transparent and inclusive, but some authors have expressed concerns that the process is vulnerable to the kind of hype and conflict magnification that is a frequent feature of these platforms.

It will be interesting to see how this informal peer feedback evolves. It is important to emphasize that, in contrast to journal peer review, it is usually unsolicited and entirely independent of the author. The ability to provide unsolicited feedback is of particular benefit to early career researchers (ECRs), who are less likely to participate in journal peer review. Initiatives like PreReview seek to bring the type of 'journal club' research institutions and university departments often run to preprints.³ Preprint peer review provides an opportunity to train ECRs in peer review, as well as a way for them to demonstrate their critical skills to potential employers both inside and outside academia.⁴

Unsolicited peer review is of course not editorially curated. Thus, it presents a good opportunity to reflect on the role of editors. Not only do editors solicit reviewers; they must also solicit the 'appropriate' reviewers. For manuscripts of clinical interest, this means weighing the need for specific medical *versus* research expertise, as well as engaging reviewers that can review the quantitative data analysis employed. Editors also police conflicts of interest to ensure the integrity of the peer review process.

It is therefore significant that a decoupled publishing ecosystem means that formal complements and alternatives to peer review can emerge. Portable peer review is an idea that has been discussed for many years in publishing circles, but preprints now allow it to be realized. Review Commons is an initiative recently launched by EMBO and ASAPbio, a preprint advocacy group.⁵ It functions as a journal-independent peer review service to which authors submit preprints and obtain peer reviews that they can then present to journals to consider. The process is overseen by professional editors at EMBO Press, and 17 journals have

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agreed to consider peer reviews of preprints that Review Commons has solicited (authors are also free to submit their manuscripts and the Review Commons reviews to journals outside the consortium). Peer Community In (PCI) is a similar initiative,⁶ comprising a series of communities that peer review preprints authors have submitted. Currently 16 PCI communities exist, covering areas from infectious disease to paleontology. Authors can take the peer reviews PCI communities arrange to journals that are considering their papers or alternatively submit to a dedicated journal run by PCI.

Another organization that is blurring the lines between preprint review and journals is eLife. eLife is an open access journal funded by the Howard Hughes Medical Institute (HHMI), the Wellcome Trust, and the Max Planck Society. It has required all authors to post preprints since 2020 but recently took the bold step of re-defining itself as a peer review service: eLife no longer accepts or rejects papers it considers; it simply peer reviews them and posts the reports online alongside the preprint.⁷ PLOS Biology has also experimented with preprint peer review by asking editors to consider both formal peer reviews and unsolicited comments on bioRxiv preprints they are considering for publication.

Preprint peer review thus encompasses a spectrum of activities from informal commenting to new services that can augment or potentially displace journals in the research ecosystem. Perhaps most significantly it prompts us to consider what peer review is and what it should be. Journal peer review is currently mostly concentrated among a small fraction of senior scientists who are overloaded and not representative of the global potential reviewer pool. ECRs are not often involved, nor are scientists from the Global South. Preprint peer review provides an opportunity to involve a more diverse sample of the scientific community. Increasing the representation of researchers from marginalized groups and the Global South in the review of clinical research could boost fields like neglected tropical diseases and socio-economic determinants of health. And since decoupled review is not exclusive or restricted to a single point in time, it could provide the basis for a new, more multi-dimensional approach to the evaluation of scientific research.

A key question is how preprint peer review should operate in the clinical sphere. Journals do more than simply or-

ganize peer review, and the additional editorial checks they perform are particularly important for clinical studies. The medRxiv preprint server requires authors to make various ethics declarations, provide clinical trial IDs, and name the oversight body that approved any human subject research. But things like patient consent need to be verified for interventional studies, especially if identifiable images of research participants (which medRxiv will not post) are published. Who should perform these in a more decoupled ecosystem? Clinical research also presents a more fundamental challenge to the preprint system: from their origins in physics to their adoption by the life sciences, preprints have been posted on the tacit assumption that they would be read primarily by researchers, who could critically evaluate their content. Manuscripts of medical interest, however, may bring in a much more diverse readership, from physicians with no research training, to patient groups and investors. Clinical journals and new initiatives seeking to bring experiments in preprint review to medical publishing will need to consider this if the approach is to be successful.

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