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The good and the bad of preprint servers in plant physiology

A B S T R A C T

Preprint servers allow rapid publication of research findings by eliminating the time gap between submission and publication associated with editorial and peer review of scientific works. Consequently, non-peer-reviewed articles are essentially accessible immediately to researchers and the public. There are many valid justifications for sharing work on preprint servers, such as the ability to collect feedback from the research community and improve work prior to journal submission and a reduced risk of work being "scooped" by competitors. Rapid access to the latest scientific developments can furthermore expedite progress in important research areas. Significant downsides of preprint servers, however, are that the public, including members of the media and policy makers, cannot judge the quality of such non-reviewed publications and that misinformation may be spread. Balancing the good and the bad of preprint servers as opposed to classic peer review, we provide guidance for authors of the Journal of Plant Physiology.

1. What are preprints?

A preprint is a scholarly manuscript posted by the author(s) in an openly accessible platform, usually before or in parallel with the peer-review process. (source COPE).

2. Why are preprint serves so popular?

Most proponents see early and fast dissemination as the primary advantage of preprint posting. Preprint servers circumvent the sometimes lengthy peer-review process and allow for exposure to, and feedback from, a broader audience. For most preprint servers, the fact that peer review for posted works does not occur is explicitly stated on their homepages. Especially early-career researchers like to include preprint posts in their CVs to improve their track record (Sarabipour et al., 2019; Wolf et al., 2021). Some editors make use of preprint servers and search for suitable submissions for their journals.

3. What are the risks of preprint postings?

Preprints go public without much quality control. In most cases they cannot be removed from the platforms, may even be posted on multiple platforms, and may remain available in perpetuity. They can be cited, are aggregated on platforms such as Google Scholar, and can be, and often are, covered by the press and disseminated by social media. While, according to some estimates, approximately 40% of works that first appear as preprints are finally accepted for publication, following peer review, almost 60% are not (Abdill and Blekhman, 2019). In addition, revisions are commonly requested during peer review, and misinterpretations, overstated conclusions, data incongruities, methodological flaws, incidences of plagiarism, missing literature coverage etc. can be addressed. Hence, the final publication may substantially differ from the original submission, which, however, remains stored on the preprint server and which may already have "made the rounds" in the media or even other scientific publications. Overstated conclusions in preprints may also be incentivised by the likelihood of greater pre-publication press and social-media coverage (Sheldon, 2018; Besançon et al., 2021) but are less likely to survive editorial and peer-review scrutiny at scientific journals. Furthermore, if concerns arise with respect to published results, journals have developed standards to correct published records (e.g. through the publication of corrigenda). Such mechanisms do not exist for preprint servers. Additionally, preprint papers are available to everyone, whereas papers published in peer-reviewed journals may not. This harbors the risk that only the non-peer-reviewed paper may be distributed among members of the public, while the quality-controlled or revised paper may be bypassed. Thereby, scientific flaws or misinformation can readily be promulgated and perpetuated.

4. Why do we need structured peer review as practiced by most traditional journals?

Unlike the instantaneous publication of information and points of view on often poorly monitored social-media platforms, scientific publications are supposed to be created for eternity. It is expected that the data in a publication on, e.g. the melting point of a specific material, is highly accurate so that this information may be used in related fields to create, for example, a specific instrument. How could a non-expert potentially find their way through multiple contradicting non-reviewed publications? Peer review has its flaws but still provides significant and important quality control. The fact that fewer than half of preprints are published in a journal (Abdill and Blekhman, 2019) underlines the poor quality of many submissions. We fear that uncontrolled publication of manuscripts will reduce the quality of scientific work to that of social-media platforms.

Early evidence of peer review of written works predates the

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evolution of scholarly journals and dates back to at least ancient Greece (Kelly et al., 2014), whereas the modern, most widely practiced version of anonymous peer review is much more recent. The German natural philosopher Henry Oldenburg, Royal Society of London, is often credited with having pioneered pre-publication peer review in 1665 (Spier, 2002; Wagner and Steinzor, 2006), as a measure to gauge suitability of manuscripts for the Society's proceedings. The Royal Society of Edinburgh then introduced the system of anonymous peer review in 1731 (Spier, 2002; Benos et al., 2007; Ware, 2008; Despeaux, 2011; Kelly et al., 2014). However, it was not until the middle of the 20th century that the systematic procurement of external, anonymous reviews became the norm for most journals. Indeed, even the medical flagship journal *The Lancet* did not introduce the system until 1976 (Benos et al., 2007). As well, the "Ingelfinger Rule" (named after Franz Ingelfinger, former editor-in-chief of the *New England Journal of Medicine*), establishing the principle that a scholarly journal will not publish works previously published elsewhere in other journals or other media, was not formally introduced until 1969 (Ingelfinger, 1969; Relman, 1981; Altman, 1996; Netland, 2013). These developments, gradual as they have been, have however been rightly celebrated as having lifted the standards of scrutiny and objectivity and represent important evolutionary advances in scientific publication. Preprint servers threaten and circumvent these principles evolved by the scientific apparatus.

At JPP, as at most journals, many low-quality submissions are received on a daily basis, leading to desk rejection by editors before full peer review is even initiated. Some of these rejections occur because papers fall outside the scope and mandate of the journal, but many others because of poor study design, lack of novelty, text or image plagiarism, poor writing, or readily evident issues with data integrity or statistical treatment. For those manuscripts that undergo full peer review, the vast majority require revision, many resubmission with re-review. Without this evaluative, ameliorative, and often iterative process, standards of publication would be significantly lower. As many of us are aware, some predatory journals, including many for-pay open-access venues, have already facilitated the erosion of publication standards, making it increasingly difficult to know what has undergone peer evaluation and what has not.

We, the editors of JPP, while sympathetic to those who have come to be supportive of preprint servers, view the potential for the spread of poorly conceived or executed science, of overstated ideas, of poor writing, and even misinformation, as too high if the checks and balances of editorial and peer review were lifted in favor of the speed, and possible advantages to scientists' CVs, of non-peer-reviewed, unedited preprint publications. We are also of the view that, in the area of plant physiology, unlike perhaps in certain areas of medicine (see recent arguments in the context of the COVID-19 pandemic; Besançon et al., 2021), data sets rarely possess quite the urgency of dissemination that the time frame of proper peer evaluation becomes prohibitive. In cases of emergency, fast-track publications including peer review are possible. For instance, all major publishing houses, including Elsevier, have facilitated fast-track publication on COVID-19-related topics during the COVID-19 pandemic, and this has shown that the classic peer-review-based publication apparatus is capable of responding nimbly when unique circumstances require rather than providing justification for the publication of unreviewed information on preprint servers.

We note that the classic peer review system is far from perfect, and that there is constant need for vigilance and refinement. Many instances of missed errors, data fraud, delayed publication, theft of ideas, and favoritism of certain authors and blockage of others have been recorded (Kelly et al., 2014); even Albert Einstein was known to be opposed to peer review of his works, except for editorial stamps of approval (Kennefick, 2005). Yet, we here argue that the peer-review system's checks and balances as practiced by traditional journals such as JPP, and responsibility and accountability for such checks and balances resting with editors and publishing houses, provide the best system the scientific apparatus has evolved, and that these checks and balances are essential to the integrity of the scientific process.

5. What is the policy of JPP?

We discourage authors to post preprints prior to acceptance of their manuscripts in JPP. Submissions undergo peer review, and it is not uncommon that the content of the first submission is significantly altered. These (often essential) modifications are not included in the preprint, which remain as independent "publications" with their own digital object identifiers (DOIs) and continue to be listed by platforms such as Google Scholar.

We discourage authors to cite preprints. At JPP, formal citations are reserved for publications that underwent peer review. We additionally accept *citations of textbooks, chapters, databases, and online web servers that research communities broadly agree provide authoritative information and data within a relevant subject area* (source Stoddard and Fox, 2019). As exemplified above, preprints might significantly deviate from finally published articles. This could result in the omission of experiments or other content cited in the manuscript. Equally plausible is the sudden disappearance of certain preprint listings and platforms, thereby rendering durable referencing challenging, as curation of such platforms remains murky and internet databases are well-known for their often transient or rapidly changing nature.

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