

Preprints: ethical hazard or academic liberation?

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Abstract

Preprints are one of publishing's hottest talking topics. Having seen a strengthening of investment by several entities and publishers in 2016, both 2016 and 2017 have witnessed a tsunami of new preprint servers, as well as chatter about a centralized preprint service. However, while all this buzz is taking place, few are focusing on the possible ethical aspects of preprints. In January of 2017, Jeffrey Beall's blog became extinct, and lists of journals and publishers that were harshly criticized for publishing poor research, not conducting peer review and for processing research instantly, formed part of what had been termed "predatory journals and publishers." During this period, there has been a boom in preprint servers. Preprints are raw findings and data sets that have not been peer reviewed, scientifically vetted, or verified for potential errors, flaws, and even fraud, but that are in general superficially selected by an advisory board and released to the public within as little as 24 hours. Will this boom in preprints and preprint servers serve as an outlet for poor science and unscholarly work to enter mainstream literature? In other words, could preprints be a form of predatory publishing? Since not all preprints will reach the mainstream literature following regular peer review, and may represent the final state of that document, there is a real risk, given that different preprint servers have different regulatory bodies, that academically unsound and/or scientifically invalid work may flood preprint servers that are emerging at an unprecedented rate. Although preprints should be celebrated for bringing research faster to the public, and while preprint proponents are lauding preprints as one solution to the replication crisis, what is not being discussed is whether preprints pose any ethical or academic risks.

Key words: arXiv; ASAPbio; bioRxiv; Center for Open Science; F1000Research; Gates Open Research; peer review; preprint server; quality control; Wellcome Open Research

The age of preprints: hot buzz

Biomedical science publishing has entered a highly transformative state. Facing threats of many fake elements, including fake data, fake authors, fake peer reviews (Teixeira da Silva, 2017a), and hit by a deluge of errata and retractions as a result of a replication crisis or poorly vetted literature caused by permeable peer review, the publishing industry is seeking rapid, innovative and robust methods to shore up trust, and to restore quality control to an image-

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damaged sector where trust in academic findings is starting to run thin. Preprints have been around since 1991, in the form of arXiv¹, and even though many academics have always informally shared unpublished documents among trusted colleagues to gain insight and to improve their papers prior to submission to a regular academic journal for peer review, preprints were never popular with biomedical scientists, who saw little value and, despite the delays, preferred to slog through the regular peer review process to see their intellectual work validated by peers prior to publication. arXiv even has a section Quantitative Biology that is dedicated to theoretical biology, but even that has not attracted much attention². That lack of popularity is because work that is published in a preprint has not been academically validated by peers and should not be cited, except for exceptional cases, because citation of non-vetted material may corrupt the scholarly record (Teixeira da Silva, 2017b).

The biggest example of the failure of preprints, and to some extent open peer review, to capture the attention of biomedical scientists was the termination of *Nature Precedings* in April 2012³. The reason for the termination of this preprint server was "unsustainability", but no detailed explanations were ever provided by the publisher, Nature Publishing Group, i.e., if that unsustainability was academic or financial? However, ever since a replication crisis began to emerge in the past few years, preprints have been increasingly marketed as one solution to increase reproducibility (Berg et al., 2016), as well as a rapid solution to the slow process of traditional peer review and sometimes endless cycles of reject-and-resubmit (Teixeira da Silva and Dobránszki, 2015), causing a rise in trend in the number of preprints and preprint servers for the biological sciences (Callaway, 2017). By virtue of the fact that greater exposure of these "raw" documents that have not been formally academically vetted by professionals, i.e., preprints, will supposedly be screened by a wider public audience for errors, following resubmission to a valid peer reviewed academic journal for publication in a final state, proponents of preprints claim that the final published paper may have a higher degree of scientific confidence than papers that have passed through regular peer review only⁴. However, these proponents provide no data or evidence to suport this claim. Preprints have become a hot topic in biomedical publishing to a large extent because the replication crisis has become a hot topic in biomedical publishing (Kaiser, 2017), and not because they offer any more intrinsic academic value than they would have 5 or 10 years ago. Preprints have thus become marketed as a replication-fixing tool and a challenge to controversial findings (Kaiser, 2017). Annesley and Scott (2017), who interviewed core proponents of the preprint movement (Hilda Bastian, Vivian Fonseca, John P.A. Ioannidis, Michael A. Keller, and Jessica Polka), disclosed how so much still remains unknown about the future of preprints, and many lingering doubts and potential risks, including the possibility of introducing "junk science" into the literature, the possible usurpation of preprints by for-profit commercial publishers as a new model to generate authors and revenues, and a debate whether the vestigial document, i.e., the preprint, should be eliminated once the document becomes published in a final version. While some of the preprint proponents in that paper advocate that preprints should carry as much weighting as a meeting abstract on a CV, others such as Desjardins-Proulx et al. (2013) argue that for early career scientists, preprints should have much greater weighting. Little or no attention has been paid to possible unscholarly or unethical aspects of preprints. This is the focus of this commentary and opinion piece.

¹ https://arxiv.org/

² https://arxiv.org/ftp/arxiv/papers/1411/1411.1955.pdf

³ http://www.nature.com/content/npg/23909.html

⁴ https://www.the-tls.co.uk/articles/public/the-end-of-an-error-peer-review/

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Massive investments in preprints

A major historical point of inflection for the cementation of preprints was likely in February of 2016, at an ASAPbio meeting⁵ with many attendees of major publishers and organizations related to the publishing industry and owners of preprint servers. ASAPbio is more than an initiative, it is a powerful, well-funded lobbying group pushing passionately for the use and implementation of preprints in academic publishing. Since that meeting, preprints have been increasingly promoted, including by many influential members of the academic and publishing communities, such as Berg et al. (2016). Competition and rivalries have also begun to emerge which the first author has dubbed "the preprint wars" because each preprint proponent is seeking to inject influence and guarantee their slice of the new and emerging preprint "market" (Teixeira da Silva, 2017c). Some key events include the approval by Crossref of the indexing of preprint digital object identifiers, or DOIs⁶, the funding of preprint servers by philanthropic groups, such as bioRxiv by the Chan Zuckerberg Initiative⁷ or multiple new preprint servers by the Open Science Framework (Center for Open Science, or COS)⁸, the development of preprint servers for exclusive use by researchers who are grantees, such as the Wellcome Open Research⁹ or Gates Open Research¹⁰ preprint servers, both of which rely on F1000Research functionality, or the increasing calls for an integrated and centralized preprint service 11. Although these are not an exhaustive perspective of the changing world of preprints, and an evolving preprint market with increasingly specialized niches, it begins to show that in the space of less than two short years, how elements of the biomedical publishing community has been investing very heavily, in resources, finances and infrastructure, to prepare for a flood of papers that have not been fully academically vetted. These entities have hedged their bets that preprints will be widely embraced and used by the biomedical community. Generally, in the current preprint model, a preprint server receives documents from scientists that are initially screened by an advisory board, and may be placed online in public view within as little as 24 hours, making this a strong marketing ploy, as a positive pseudo-academic aspect, by preprint advocates. However, little attention is being paid to the academic and ethical consequences, or possibilities, which are explored in a bit more detail next. Now that there are a sufficient number of preprint servers to merit a centralized preprint search engine, discussion is underway about a centralized preprint server, similar to a platform like PubMed (Callaway, 2017), with a consortium of powerful and influential funders standing behind this massive push for such preprint centralization¹².

What academic or ethical risks can preprints pose?

Although voices of concern, skepticism or critique about preprints are mainly limited to blogs and Twitter, usually drowned out or shot down by pro-preprint advocates with clearly great invested interests, the first major organization to object to the use of preprints in grant applications as a collective voice of academics was The Federation of American Societies for Experimental Biology (FASEB). In a publicly displayed open letter directed to the National

⁵ http://asapbio.org/meeting-information

⁶ https://www.eurekalert.org/pub_releases/2016-05/c-cta050416.php

⁷ http://www.cshl.edu/news-and-features/cold-spring-harbor-laboratory-to-boost-sharing-of-global-scientific-research-in-collaboration-with-the-chan-zuckerberg-initiative.html

⁸ https://osf.io/preprints/

⁹ https://wellcomeopenresearch.org/

¹⁰ https://gatesopenresearch.org/

¹¹ https://datascience.nih.gov/preprints/preprints central service

¹² https://wellcome.ac.uk/news/preprints-were-supporting-calls-central-service (The Wellcome Trust lists the following members of the pro-preprint central service consortium: Alfred P Sloan Foundation, Canadian Institutes for Health Research, Department of Biotechnology (India), European Research Council, Helmsley Trust, Howard Hughes Medical Institute, Laura and John Arnold Foundation, Medical Research Council, National Institutes of Health, Simons Foundation, Wellcome Trust)

Institutes of Health (NIH), the FASEB President, Hudson H. Freeze, argued that preprints would not only overburden an already overburdened peer pool, but would also have a "[n]egative effect on rigor and reproducibility of research." Freeze's position, which claimed to represent "30 scientific societies, collectively representing 125,000 biological researchers and engineers", was immediately heavily criticized by many preprint proponents, including ASAPbio¹⁴ and Lenny Teytelman, the CEO and cofounder of protocols.io ¹⁵, two leading proponents of preprints and preprint servers that have risen quickly in prominence since 2016.

All of these events were taking place, curiously, at the time when the Trump Administration was set to replace the Obama Administration, and when much movement was observed in the NIH, EPA and other US Government agencies related to science and science policy. Also, in January of 2017, a blog by Jeffrey Beall went blank. Without any prior notice, this blog, which listed journals and publishers with potentially unscholarly and non-academic practices, the most prominent being the publication of work and research that had not been properly and fully vetted by professionals and peers, referring to them as "predatory", shut down, and the owner, Beall, has yet to offer any suitable response or address the academic and ethical consequences of his blog's closure (Teixeira da Silva, 2017d). Most importantly, for this discussion on preprints, is that one of the core arguments made by pro-Beall anti-"predatory" journal/publisher proponents was that work published in those journals contained flaws, inaccuracies or possibly even fraudulent data or research, the "junk science" I allude to above, by virtue of the fact that no or little (superficial) peer review had been conducted. Even though those lists were highly flawed (Teixeira da Silva, 2017e), Shen and Björk (2015) used those flawed lists to estimate that 420,000 articles had been published until 2014 by 8000 "predatory" open access (OA) journals. In essence, Shen and Björk (2015) insinuated, based on a flawed set of lists (Beall's) and criteria, that 420,000 articles were "junk science", a judgement passed based on the publication venue (journal or publisher) and not on the intrinsic scientific or academic merit of each individual paper. Such a mass insinuation is unprecedented in the history of academic publishing. Despite this, the Shen and Björk (2015) paper is widely praised and cited.

In this paper, an analogy is drawn between "predatory" publishing, i.e., the publication of work in a "predatory" journal that does not conduct peer review or validate the content in a scholarly manner, and preprints. Analogous to such criticisms of these "predatory" OA journals, preprints, which are also OA, are also not vetted for scientific content or accuracy, they are usually approved for broad content and scope by a member of an advisory board, and they are released to the public within as little as 24 hours, and at most a week. Thus, the unverified state of such literature, which may also contain flaws, inaccuracies or possibly even fraudulent data or research, no different to unvetted material published in Beall-listed journals, raises valid concerns that preprints may be a high-tech – because their raw and academically unvetted nature is masqueraded by glitzy OA servers or platforms – version of "predatory" publishing. Another possibility is that, like several of the OA journals and publishers that Beall profiled, and which were – and continue to be – lauded as unscholarly by many of the current pro-preprint advocates, may be as unscholarly, "predatory" and risky, both to academics and society, as the Beall-critiqued OA journals and publishers. This risk of unsound information, brought both by poorly vetted "predatory" journals or by academically unvetted preprints, may have additional weighting in the medical sciences, such as clinical trials, where actual lives and human health is at stake (Loew, 2016; Maslove, 2017). The existence of OA data that has not been critically, scientifically or professionally vetted prior to release to the public may further

¹³ http://www.faseb.org/Portals/2/PDFs/opa/2016/Interim%20Research%20Product%20RFI.pdf

¹⁴ http://www.the-scientist.com/?articles.view/articleNo/48080/title/Scientists-Buck-Opposition-to-Preprints-in-NIH-Grant-Applications/

¹⁵ https://www.protocols.io/groups/protocolsio/news/when-lobbying-against-preprints-and-OA-faseb

weaken or corrupt the OA scholarly platform, serving as a new threat to the author-pays OA publishing model (Al-Khatib and Teixeira da Silva, 2017). Few academics have discussed this potential threat.

This places journals that undergo valid peer review but that accept the submission of preprints for peer review in an academic quandary. Firstly, by making an exception to the 1969created Ingelfinger Rule (see discussion by Relman, 1981), i.e., that no publication should appear twice in a published state, a core value of publication ethics is challenged. Even though COPE (Committee of Publication Ethics) and the ICMJE (International Committee of Medical Journal Editors)¹⁶, among other ethics bodies and several biomedical publishers, indicate that preprints are an exception to duplicate submission, the ethical and academic premise for this exception may now be seriously challenged. The biomedical community, ethics organizations and publishers now have to reach a consensus: is a duplicate publication now acceptable, whether we refer to it is as a Xerox copy, a modified or amended version, a preprint or a published paper in a final state? Until now, the volume of preprints relative to the volume of published articles has been tiny, but what happens when the volume of preprints reaches the tens or hundreds of thousands of papers, unvetted, with unclear quality and/or unscreened errors? Will reprints still be considered as an exception to the ICMJE-defined "duplicate submission" or "duplicate publication" rule that forms the bed-rock of publishing ethics, or will the concept of duplicate publication fall to the wayside, especially considering that many preprints represent the final published state of a paper or research results? The final state of a document as a preprint, and hence its rudimentary academic nature, was suggested by several of the preprint proponents in the Annesley and Scott (2017) paper. In other words, preprints pose an academic risk because they are being over-marketed as some sort of academic savior when in fact they present no real academic value whatsoever, except for a quick, cheap and easy mode of OA publication.

As indicated above, new and emerging preprint servers are starting to become increasingly specialized, at least in terms of themes, and thus target audiences, which I refer to in this paper as "preprint niches". For example, COS currently has 10 or more subject-based preprint servers (in my lexicon, subject = niche): architecture, arts and humanities, business, education, engineering, law, life sciences, medicine and health sciences, physical sciences and mathematics, social and behavioral sciences. Thus, the COS preprint server engXiv (which imitates the original style of Arxiv), as one example, serves the engineering niche. However, what will prevent other entities from establishing preprint servers such as engineering Xiv, i.e., with similar names, but covering the same subjects? Even worse, since preprints are currently academically unregulated, entities might establish sub-niches, such as chemengXiv for chemical engineering. In such cases, it is not difficult to envision a situation where a whole range of preprint servers will explode onto the preprint "market", some established by zealous or unscholarly entities, simply trying to complete with "valid" or established preprint servers. The second analogy here is with the "predatory" OA scholarly publishing market, where the efforts of potentially valid scholarly publishers became usurped by unscholarly entities who mimic journal titles, publishing platforms and models, to give the impression of a valid scholarly journal or publisher, but display "predatory" qualities, aimed exclusively at extracting article processing charges, or APCs.

Regarding APCs, there continues to be a notion that was partially inculcated by Beall that one of the predatory qualities of a "predatory" OA journal was that a journal's APCs are not publicly displayed, and that one of the main objectives of such journals, or publishers, was to extract profit from unsuspecting authors. However, the author of this commentary has published several papers in OA journals that had been listed by Beall as "predatory", between

¹⁶ http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/overlapping-publications.html (see criticisms about the ICMJE in Teixeira da Silva 2017h)

2015 and 2017, even though APCs had been clearly indicated on those journals' websites, peer review had been suitably conducted, and no APCs had been charged, paid or waivered. So, the notion that a new or academically weak OA journal that clearly displays APCs should almost automatically receive a "predatory" label needs to be carefully rethought. In fact, a study by Bolshete (2017) indicates that 12 out of 13 OA publishers, mainly from Beall's list, clearly displayed their APCs. Even though most preprint servers do not charge APCs to publish a preprint, at least not yet (Loew, 2016), there is now a real risk that the "preprint" market will explode with valid and also invalid preprint servers, some seeking to exploit the naivety of academics, including the potential exploitation of preprint-related APCs, similar to what happened during the past decade or so in OA publishing¹⁷. There is also increasingly a change in paradigm, namely that OA journals that charge low APCs might not deliver a stated service, such as peer review, or might only be providing superficial "peer" review, i.e., representing a lower stratum of quality, but being erroneously labelled as "predatory". In other words, there is a real risk that a low APC will now be automatically be associated with low academic quality, as was insinuated by Beall when he referred to the highly respectable SciELO (Scientific Electronic Library Online) platform as a "publishing favela" simply because its APCs were around 100 US\$, and mainly from South American countries, some of which are still developing, such as Brazil. Academia thus risks stigmatizing academic OA journals as being of poor quality simply because they have no, or low, OA APCs. Similarly, preprints that publish any superficially vetted grey literature 19 also risk evolving a unique "predatory" preprint market simply because academics might be drawn to the fact that no APC is charged, and find it an easy way to sneak in poor science into the literature that can then be cited, either via Crossref (as a result of having a DOI), or via Google Scholar. Thus, a link between academic quality and APC might be emerging, even if false, since the concept that a low APC = low quality^{20,21} may be conflagrated by no-APC preprints. Ultimately, it will be authors, and their institutes and funders, who will be increasingly carrying the burden of the gold OA authorpays publishing model (Al-Khatib and Teixeira da Silva, 2017) in which preprints may simply be serving as a "trap", marketed falsely as a "free" and rapid publishing venue, in an attempt to then channel papers to profitable OA journals of partner publishers (possible collusion?) where APCs will then be extracted.

Finally, a new academic threat in preprints has emerged: metrics. It is abundantly clear that journal-based metrics have failed the academic community since they have irreversibly corrupted the scholarly record. This has taken place by assigning a pseudo-academic value to a published paper based on its perceived "value" or "quality", assessed erroneously and simply by the level at which the journal in which it was published has been cited. The most obvious metric is the Clarivate Analytics journal impact factor, but Elsevier's CiteScore and other derivatives also serve as new corrupting factors, offering non-academic pseudo-quality value, using journal-based metrics, to extrapolate to author-based or article-based metrics (Teixeira da Silva, 2017f; Teixeira da Silva and Memon, 2017). This "impact" game, which has plagued traditional publishing, and which is often critiqued by preprint proponents, has now begin in preprints, initiated by Brian Nosek²², the COS Executive Director²³.

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¹⁷ https://poynder.blogspot.jp/2017/08/the-state-of-open-access-some-new.html

¹⁸ http://blog.scielo.org/en/2015/08/01/the-fenced-off-nice-publication-neighbourhoods-of-jeffrey-beall/

¹⁹ https://en.wikipedia.org/wiki/Grey_literature

²⁰ http://davidwojick.blogspot.jp/2016/09/predatory-versus-low-cost.html

²¹ http://bjoern.brembs.net/2017/11/is-a-cost-neutral-transition-to-open-access-realistic/

²² https://osf.io/pxr8c/wiki/home/?view

²³ https://www.projectimplicit.net/nosek/

Conclusions

Preprints for the biomedical sciences are increasing dramatically²⁴. Following some major structural developments in 2016 and early 2017, several new preprint servers have emerged and a strong push is being made, strongly advocated by ASAPbio, to encourage biomedical scientists to first post their findings to preprint servers prior to submitting to a regular journal. The main reasons for promoting preprints, proponents will claim, is faster access to important findings, an additional step of journal-independent peer reviewer-free quality control, and a possible tool to increase reproducibility by serving as a platform to present contradictory data. What is not discussed that much, because exposing such risks would weaken the massive investments made thus far in preprints, is that preprints pose real academic and ethical risks. In order for current preprint servers to not become extinct like Nature Precedings, and to gain trust in biomedical researchers who would use their preprints to deposit their raw findings in a non-peer reviewed state, preprint proponents must show how they plan to deal with the "predatory" aspect of unscreened literature that may contain flaws, errors, factually false or fraudulent data or information, and which would clearly be harmful to both academia, and society. Preprint proponents like COS and ASAbio should also give public guarantees that preprints will not be gamed via their metricization. Unless these caveats are addressed openly, and discussed widely among academics, a crisis of trust in preprints may arise (Teixeira da Silva, 2017g). This is because preprints, by introducing potentially flawed data into the public domain, have the potential to harm OA as much as "predatory" OA journals (Eve and Priego, 2017), introducing new risk into green OA, namely a cancer (the "predatory" nature and the hijacking of the OA movement and the fairness of APCs by for-profit vanity publishers) that gold OA has already succumbed to.

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²⁴ http://www.nature.com/news/2016-in-news-the-science-events-that-shaped-the-year-1.21159

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