A Synthesis of the Formats for Correcting Erroneous and Fraudulent Academic Literature, and Associated Challenges

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Abstract
Academic publishing is undergoing a highly transformative process, and many established rules and value systems that are in place, such as traditional peer review (TPR) and preprints, are facing unprecedented challenges, including as a result of post-publication peer review. The integrity and validity of the academic literature continue to rely naively on blind trust, while TPR and preprints continue to fail to effectively screen out errors, fraud, and misconduct. Imperfect TPR invariably results in imperfect papers that have passed through varying levels of rigor of screening and validation. If errors or misconduct were not detected during TPR’s editorial screening, but are detected at the post-publication stage, an opportunity is created to correct the academic record. Currently, the most common forms of correcting the academic literature are errata, corrigenda, expressions of concern, and retractions or withdrawals. Some additional measures to correct the literature have emerged, including manuscript versioning, amendments, partial retractions and retract and replace. Preprints can also be corrected if their version is updated. This paper discusses the risks, benefits and limitations of these forms of correcting the academic literature.

Keywords Amendment · Corrigendum · Editors · Erratum · Errors · Integrity · Open science · Peer review · Post-publication peer review · Preprint · Responsibility · Retractions

1 The Preprinted and Published Literature Is Imperfect and Is Riddled With Errors

It is impossible to claim that the published academic literature, which is based on traditional peer review (TPR) is perfect (Teixeira da Silva and Dobránszki 2015a; Dunleavy 2021). Such a claim is unreal because academics around the world exercise different standards of
research, and because editorial independence allows editors to exercise their right to screen and interpret what is valid from what is invalid at their discretion and using their own desired screening methods. Responsibility for the published literature is thus of authors, editors and to a smaller degree, peer reviewers and publishers, because academic publishing is a shared venture (Teixeira da Silva 2013). The modern TPR approach does not exist in a vacuum, and there is a rich historical background of change in peer review that has always been characterized by challenges, tensions and conflicts (Baldwin 2020). Despite this, editors still have the responsibility of being impartial and unbiased towards authors (Teixeira da Silva and Dobránszki 2018a). Editors also have the responsibility of not manipulating peer review and editorial processing to favor themselves or their journal because this would introduce bias—and thus error—into the bibliometric profile of the editor, journal, and any papers that cite it (Kojaku et al. 2021; Lutmar and Reingewertz 2021). Unconventional ideas might also face unfair editorial screening, rejection or exclusion due to status quo editorial groupthink biases (Resnik and Smith 2020).

Inconsistent standards between editors and journals may become pronounced because certain publishers and publishing models have objectives that might not favor the integrity of the academic literature, but rather the business model of commercial and profit-based publishers (Roberts et al. 2020), which might favor opacity at the expense of transparency (Mirowski 2018). Thus, in order to increase published volumes, subscriptions or open access (OA) article processing charges (APCs), standards of entry of literature into a journal might be lowered, making it “easier” to publish, but doing so can also engender an indistinguishable mix of exploitative and predatory publishing practices (Teixeira da Silva et al. 2019; Allen 2021). The editorial barrier of entry into a journal, which is usually in the form of a desk rejection (Dwivedi et al. 2022), may be excessively lenient or strict, or it may be unfair or based on non-academic reasons (Teixeira da Silva et al. 2018). This may cause anxiety among academics, who might feel pressure to publish their scientific findings quickly or, in order to prove their productivity, rush to publish work. The pursuit of volume and the desire for speed might lead to the creation and publication of academic papers that carry errors or fraud, and this has become more evident and pronounced in COVID-19 literature (Roberts et al. 2020; Horbach 2021).

Preprints (non-peer-reviewed documents), which are one way to speed up the publication process, have gathered steam in recent years in the biomedical sciences. Preprints are also regarded as a tool that could bridge the gap between fallible TRP and reducing the number of errors or misconduct that might eventually enter the literature (Bonnechère 2020). However, preprints should be cautiously used, screened and cited as they represent incompletely scrutinized documents that have not been validated by peers through a more formalized process, TPR (Teixeira da Silva 2017b). Preprints also carry other risks such as hidden conflicts of interest and biases (Teixeira da Silva 2017c; 2017d; 2018b). Nonetheless, unlike TPR-derived academic papers, they have a more dynamic real-time mechanism to correct errors, by simply substituting earlier previous versions of the preprint. This simple form of substituting error may resolve the issue of stigma discussed later in this paper that is associated with corrective mechanisms related to TPR, but should ethical infractions in preprints be given less rigorous attention than in papers derived from TPR? This issue needs urgent debate and resolution because preprints are becoming increasingly incorporated into the publishing models of several STEM publishers (Teixeira da Silva and Dobránszki 2019). Despite this, the author is of the opinion that the suggestion to delete older versions of
preprints so as not to cause confusion with the final versions (Bonnechère 2020) is poor ethical, scholarly, and bibliometric advice since each version of a published paper, including preprints, forms an integral part of its publishing history, including corrections. Retractions of COVID-19-related literature¹ reveal that, despite hopes of preprints removing risks associated with TPR, that both preprinted and peer-reviewed literature is imperfect.

2 Error, Misconduct, and Post-Publication Peer Review

As a result of wide variation in quality control in the entire publishing ecosystem and by its core players (authors, peer reviewers, editors), the published academic literature contains information that ranges widely from well scrutinized, replicable and/or accurate findings to erroneous and potentially tainted papers laden with misconduct and/or false information (van der Heyden 2021). Ioannidis (2005) claimed that the majority of published research findings are false due to under-powered studies, bias and several other factors that reduce the validity of reported findings, aspects that continue to be hotly debated in the field of the integrity of the scientific literature (Furuya-Kanamori et al. 2020). There is also evidence of literature that contains manipulated figures (Bik et al. 2018) or erroneous nucleotide sequence reagents (Byrne et al. 2021), which may invalidate those papers’ scientific findings. The integrity of the published academic literature is further weakened by spin-based research, where claims about a study’s findings are not supported by its methods or analyses (Turrentine 2017). Spin is prevalent in the abstracts of papers related to COVID-19 randomized controlled trials (Wang et al. 2021).

In post-publication peer review (PPPR), or simply post-publication analysis, including by members of the public (The Lancet 2020), individual or collective conscience drives individual academics or groups to seek ways to create a more “perfect” literature that is as free of error as possible, via the discovery and correction of those errors (Teixeira da Silva 2015a; Arend 2019). Some of those discoveries may lead to retractions (Andersen and Wray 2019). Science’s self-corrective process is thus pro-active, but this dynamic can only occur when preprints and TPR co-exist alongside PPPR (Harms and Credé 2020), with a mechanism that allows for studies’ claims to be validated or challenged (Bordignon 2020) in order to, as effectively as possible, prevent predatory publishing practices (Yamada 2021). A consequence of literature that is insufficiently corrected is the unfair and unmerited citation to erroneous or fraudulent literature, a phenomenon known as “citation inflation” (Teixeira da Silva and Dobránszki 2018b). If there is a backlog of errors, or if they are compounded, publishing may become unsustainable. There is also a separate and unique issue of an author’s right to refuse unwanted citations, i.e., to refuse to accommodate citations of literature that they feel is invalid, or to refuse to be cited by literature that they feel might misrepresent their findings or ideologies (Teixeira da Silva and Vuong 2021a).

The current predominant publishing ecosystem, both of preprints and TPR, might still rely on two naive and antiquated premises: (a) that trust exists between all parties (authors, peer reviewers, editors, publishers); (b) that all individuals and players involved in this ecosystem strive for the same ideal state of the published literature. Regarding trust, there needs to be a cultural change from one of “blind trust” to one of “don’t trust” a priori and thus build trust over the course of a paper’s submission to a journal and eventual publication

¹https://retractionwatch.com/retracted-coronavirus-covid-19-papers/.
(Teixeira da Silva 2022a). Many academics tend to know, from experience, that the literature is imperfect and that multiple cases of highly imperfect and duplicated studies remain uncorrected (Malički et al. 2019). Knowing this leads to an appreciation that fundamental principles of academic publishing have failed, to different extents, leaving an unquantifiable amount of literature flawed and uncorrected. In addition, the current publishing culture is biased, i.e., publication bias, because it still overwhelmingly encourages the publication of positive findings, but fails to embrace null or negative findings (Teixeira da Silva 2015b; Smaldino and McElreath 2016; Mlinarić et al. 2017; Furuya-Kanamori et al. 2020; Nelson 2020; Page et al. 2021). When novelty is emphasized at the expense of reliability, the risk of introducing errors into the literature increases (Brembs 2019).

3 Post-Publication Peer Review as a Corrective Mechanism

The PPPR movement has fortified in the past few years, partly in response to current corrective measures that are insufficiently robust to deal with the effective correction of the literature (Yamada 2021). An age of correction, including self-correction, is rapidly transforming the academic publishing landscape, not only in the biomedical and natural sciences, but also in social sciences (Dunleavy 2021). One effort to fortify the integrity of the literature through a non-corrective mechanism is an attempted industry-wide implementation of an author-identification tool ORCID, but it has multiple imperfections (Teixeira da Silva 2020a), including its inability to reduce or eliminate fraud caused by “fake” or fraudulent literature derived from paper mills (Rivera and Teixeira da Silva 2021; van der Heyden 2021), or to effectively differentiate valid/real from fake authors (Teixeira da Silva 2022b). Another attempt to implement an industry-wide peer reviewer recognition platform, Publons, suffers from multiple flaws, and there are several concerns, for example, peer reviewers who claim to have overseen academic papers that were subjected to errata post-publication, or that resulted in retractions, are being offered “rewards” and unfair recognition for peer review failure (Al-Khatib and Teixeira da Silva 2019; Teixeira da Silva 2020b; Teixeira da Silva and Al-Khatib 2019; 2021b). These issues have not been publicly or transparently addressed by Publons or its owner, Clarivate (Teixeira da Silva and Al-Khatib 2021b).

Some of the most prominent mechanisms to reveal or expose errors, misconduct or fraud, or induce change and corrections include whistle-blowing and the emergence of science watchdog movements such as Retraction Watch and PubPeer (Teixeira da Silva 2016a; 2018a; van der Heyden 2021), or the expansion of online journal clubs, blogs, and online debates, such as at PubPeer (Ortega 2022). These platforms are also exposing errors and fraud and allowing the debate on these issues to be expanded with the ultimate objective of correcting the literature (Teixeira da Silva et al. 2017). However, there is a risk of replacing TPR with a destructive culture of naming and shaming (Smith 2021). In this corrective process, academic legends fall because scientists are responsible for the science that they have published (Teixeira da Silva et al. 2016). The desire to reduce focus on the scientist and to focus instead exclusively on the science may blunt efforts to correct erroneous or fraudulent literature (Yarborough et al. 2019).

There is still a strong negative stigma associated with the correction of the literature because the PPPR movement relies on public shaming as one strategy to induce corrections, such as retractions (Bülow et al. 2020; Teixeira da Silva and Al-Khatib 2021a). It
is also difficult to disassociate shame from retractions because the latter represent failure (Teixeira da Silva 2016b). Therefore, there is not always a desire among editors to correct errors (Teixeira da Silva 2016c) or authors to self-correct (Vuong 2020) because it would be an admission of failure. Consequently, PPPR is thus not without its inherent and induced biases. Some status quo or legacy journals or publishers may be benefitting from erroneous or misconduct-laced literature in various forms, such as metrics (e.g., journal impact factor, CiteScore, etc.) based on citations of retracted or fraudulent papers, indexing (one assumption for indexing is that the journal is scholarly and that the literature it has published has been properly vetted, which is not the case for retracted papers), subscriptions (clients such as universities who pay for subscriptions to journals that include retracted papers are in essence purchasing flawed products), APCs (if an APC is received for publication, but then the paper is retracted, then a tidy sum of money is received for the publication of erroneous or fraudulent work), etc. (Teixeira da Silva and Vuong 2021b).

This paper assumes that insufficiently preventive measures to reduce the risk of publishing erroneous literature were not taken, leading to a need to correct it. Even though authors’ intentions might be mentioned in retraction notices (Andersen and Wray 2019), there is considerable inter-journal and inter-publisher variability in the content of retraction notices (Teixeira da Silva and Vuong 2022), lack of clarity regarding the authorship of those notices (Xu and Hu 2018), unclear distribution of responsibility between or among authors despite the existence of authorship responsibility statements (Andersen and Wray 2021), as well as euphemistic language (Hu and Xu 2020). These shortcomings of retraction notices currently renders them as an unreliable tool of correction of the literature, since many lack details and transparency.

4 Imperfection of Standard Models to Correct Erroneous or Fraudulent Literature

An imbalance between literature that requires correction but that has not been corrected, either because of a lack of corrective mechanisms, transparency, lapses in editorial or publisher responsibility, legal limitations, or other factors, suggests that it may still be easier to publish than to correct the literature (Teixeira da Silva 2017a; Malički et al. 2019; Valdez et al. 2020). It is also not always possible to differentiate intentional versus unintentional error or fraud, so this distinction will not be considered in this paper.

It is not helpful to efforts to correct the literature that factually erroneous or fraudulent retracted papers continue to be cited as if they were academically valid (Teixeira da Silva 2020c), indicating that the downstream processes within academic publishing that are meant to circumvent such situations, i.e., the citation of invalid literature, are failing, or are insufficiently robust to detect and prevent the citation of retracted literature (Teixeira da Silva and Bornemann-Cimenti 2017; Teixeira da Silva and Dobránszki 2017a; 2018c; Bordignon 2020). The corrective mechanisms in place that are allowing retracted literature to be cited do not offer sufficient protection against this mainly illegitimate form of citation (Rubbo et al. 2019; Dal-Ré and Ayuso 2021). It is therefore not surprising to note that, just a few years back, the wording used to define four main categories of literature correction policies, namely retractions, expressions of concern (EoCs), errata and corrigenda in almost 90% of 15 science, technology, engineering and medicine (STEM) publishers differed from the
definitions provided by the Committee on Publication Ethics (COPE), with as much as 61% deviation in the wording and meaning of policies between these COPE-associated STEM publishers (Teixeira da Silva and Dobránszki 2017b). There is thus an urgent need to rigorously scrutinize the corrective mechanisms in place that still award citations to retracted literature, even more so in indexed COPE member journals (Avenell et al. 2019; Hamilton 2019; Rubbo et al. 2019; Grey et al. 2020; Dal-Ré and Ayuso 2021).

In summary, the correction of the literature remains ineffective because: (a) there is variation in the will, desire and effort to correct erroneous literature by authors, editors, journals and publishers, even among STEM publishers that are COPE members; (b) the policies and guidelines that had been drafted by COPE and then applied by leading STEM publishers, are incomplete and insufficiently robust to deal with several of the challenges of PPPR that the published literature is currently facing (Bolland et al. 2021).

5 Partial Retractions and Limits to the Size of Errata and Corrections

In cases where multiple corrections are made to a manuscript, but not enough to merit a retraction because the main findings allegedly remain valid, the publisher may opt to issue an over-sized correction. However, the subjective nature of editors and differences between individual characterization about what constitutes a small versus large correction impedes the wide, standardized or effective use of terms such as ‘mega-correction’ for a wide range of errors. This form of correcting the literature also allows amphibious and nondescript rules to be established, such as the “acceptable” level of plagiarism or textual similarity before it could be considered for retraction (Memon 2020). This flexibility in the interpretation of rules to correct the literature could also lead to ambiguities as to the best course of action or how best to correct the literature when issuing a partial retraction or an over-sized correction. How many errors, and what level of errors, merit an erratum versus a large correction or retraction (Teixeira da Silva 2016c)?

The issue of whether to retract an entire paper because one table or figure has been tampered with lies at the heart of the debate of whether partial retractions have merit, or not, or if they are legitimate. The positive aspect of partial retractions is that it allows readers to ignore only specific faulty or erroneous parts of a paper, while recognizing the remaining parts of that paper as valid or reliable. In contrast, an argument against partial retractions is that if one part has been found to be false or fraudulent, given the interlinking nature of all parts of a paper, then, by association, the entire paper should be retracted because none of it is likely to be reliable or valid.

At the end of September, 2016, after a 10-year experiment and 42 partial retractions, the US National Library of Medicine, which runs MEDLINE/PubMed, announced that it would no longer identify partial retractions as a form of correction, treating it instead as an erratum. Despite that announcement, it was still possible to find two partial retractions on PubMed, one in 2019, and one in 2021. The partial retraction experiment has thus failed,

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2 This term is used at Retraction Watch: https://retractionwatch.com/?s=mega+correction.
3 https://www.nlm.nih.gov/pubs/techbull/so16/so16_partial_retractions_pol_change.html.
4 From 2019: https://pubmed.ncbi.nlm.nih.gov/31141074/; from 2021: https://pubmed.ncbi.nlm.nih.gov/33663138/.
leading some academics to rethink the correction of the literature and to propose some suggestions, which are discussed next.

6 Risks and Merits of Several Models Aimed at Correcting the Literature

What if a paper is corrected, but is insufficiently corrected? What if a paper is retracted, but additional errors are detected in the retracted paper that were not registered in the retraction notice? There is still no efficient method to accommodate the correction of corrections, or the correction of retractions, except to issue a correction of either each time a new error is found. As one example, a *Molecular and Cellular Biology* paper was published following TPR, retracted, corrected, then republished, demonstrating how the correction of the literature is becoming more complex, and not more simplified. Alternatively, addendums and editorial notes could also be appended to papers (Boxheimer and Pulverer 2019), but even if these are appended transparently, the corrective process becomes messy as newly needed corrections emerge. The difficulty in correcting the literature efficiently lies partly in the overlap of invalidating errors between honest error, but also incorporating errors derived from fraud and bad science (Brown et al. 2018).

Barbour et al. (2017) proposed referring to all corrections and retractions as “amendments”, thereby removing the negative stigma associated with correcting or retracting faulty, erroneous or fraudulent literature: “researchers continue to refine or extend the work, removing the emotive climate particularly associated with retractions and corrections to published work” (p. 8). They suggested that amendments be classified as “minor, major, and complete” (p. 6), although an earlier preprinted version of their paper indicated these as “insubstantial, substantial, and complete” in the abstract. Although the idea of the real-time update of a paper is not a novel idea—the concept already exists for preprints—the reasoning behind the Barbour et al. (2017) proposal raises some concerns. The suggestion that a mere modification of terminology will somehow erase the over-arching negative stigma associated with the correction of the literature, especially retractions, is naïve, especially if there is no guarantee that “researchers continue to refine or extend the work” (p. 7). Barbour et al. (2017) also recognized that the COPE guidelines for retractions are imperfect, i.e., unable to meet publishing’s ethical challenges: “their consistent implementation has proved more difficult as publishing has evolved” (p. 3). In the author’s understanding, errata and corrigenda are distinct documents, representing edits or corrections made or suggested by authors versus those suggested by the editor or publisher, respectively, an extremely important distinction because it allows for the unique assignment of responsibility for error. Despite this distinction, Barbour et al. (2017) referred to errata and corrigenda as “a now meaningless and poorly understood distinction” (p. 4). An additional risk of the Barbour et al. (2017) proposal is that it might allow fraud or misconduct to be hidden, under-estimated or under-appreciated, by allowing dishonest authors to easily replace fraudulent data with valid data in a follow-up version, thereby escaping the negative stigma associated with a retraction and, even more importantly, ethical scrutiny and investigation if in fact the replacement takes place absent an ethics investigation. The same risk of abusing the corrective measures of the scholarly record exists for preprints, where ethically dubious findings,
fraud or serious errors can simply be erased and replaced by an updated version of a pre-print. This risk was neither raised, nor discussed, by Barbour et al. (2017).

In some cases, “pervasive” errors may change the final conclusions, and in such cases Heckers et al. (2015) suggested retracting and replacing the paper with a new version, i.e., a “retract and replace” (R&R) mechanism, only if the authors are able to address those errors following reanalysis of their study. Their model is a reasonable and realistic option for authors for the following reasons, and provided that some cautionary measures are followed: (a) it allows authors to correct the literature and set the record straight; (b) it allows the journal and publisher to offer a new and fair opportunity to correct the literature by allowing for a new round of peer review involving new and unbiased reviewers based on a revised and reproducible data set; (c) it assigns responsibility for error, both to the authors for creating the errors, as well as the journal and publisher for not detecting them during TPR and editorial quality control; (d) the model is only good if the “old” flawed version remains, with a “retracted” stamped across it to indicate that it should not be used or cited, except for educational purposes, and not simply replaced because replacing would erase a historic version of record, which is an important aspect of scholarly publishing.\(^6\) Point d) is extremely important and any editor or journal that attempts to use the R&R\(^7\) policy to hide misconduct by substituting the original study’s files (HTML, PDF, etc.) with the “latest, correct” version, would be in fact committing publishing misconduct, and possibly fraud, by deliberately concealing the erroneous version of the paper and hiding its true publishing history or versions of the record. Such an action could be perceived as unethical, in much the same way as silent retractions, where publishers hide the existence of a retracted paper, to save their own image, thereby depriving the public of knowledge of serious error, misconduct, and negligent editorial processing (Teixeira da Silva 2016d). These risks exist for preprints as well (Teixeira da Silva 2021a).

Using a specific case\(^8\) to illustrate their model, the Heckers et al. (2015) R&R suggestion is an excellent model that could serve the academic community well. It would certainly involve an additional amount of work and investment by authors, the journal and publisher, because distinct DOIs (digital object identifiers) and PubMed entries are required, but ultimately with the correction of the literature in mind. The model proposed by Heckers et al. (2015) may go some way in annulling the negative stigma and reputational penalty associated with retractions when authors retract of their own accord (Lu et al. 2013), provided that this is done in a transparent manner (Marasović et al. 2018). Two specifics not covered by Heckers et al. (2015) are: (a) in such cases, where an APC is levied for the “original” paper in an OA model, is this APC refunded, or, alternatively, is no new APC levied for the R&R paper? For this reason, published papers should carry more open and transparent information about APCs (Teixeira da Silva 2020d). (b) Should the authors and journal/publisher responsibly inform the authors and editors of any papers that have cited the R&R paper to correct their citations to reflect the new version? The ethical validity of this model of correction needs further debate. For example, would duplicated or manipulated images, as was

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\(^6\)https://scholarlykitchen.sspnet.org/2021/04/05/publishers-care-about-the-version-of-record-do-researchers/.

\(^7\) To date (November 13, 2021), at least according to the Retraction Watch database (search for “retract and replace” in “Reason(s) for Retraction”; http://retractiondatabase.org/RetractionSearch.aspx), there are 801 cases of R&R.

\(^8\)https://www.ncbi.nlm.nih.gov/pubmed/25054836.
suggested to occur widely in some literature by Bik et al. (2018), be allowed to be retracted and replaced, or should such literature simply be retracted? In other words, does the Heckers et al. (2015) R&R model only allow a section, or portion of the data set to be replaced, or does the entire experiment need to be repeated? This may have implications for the reproducibility of that research in the latter case (Brito et al. 2020). Even some R&R papers have carry-over biases, reducing trust in their findings, despite novel analyses and republication (Agarwal and Ioannidis 2019). A similar concept to R&R introduced by JAMA Network journals was also instituted in 2015 by The Lancet and The Lancet Respiratory Medicine as “retract and republication” (The Lancet 2015; Cagney et al. 2016).

The concept of “self-retractions” (Fanelli 2016; Hosseini et al. 2018) could be considered a new category of retraction that has a positive connotation, lauding the authors for seeking to correct the literature out of their own initiative (Pulverer 2015). However, who is qualified to offer an unbiased assessment of authors’ “good” intentions? The five categories suggested by Fanelli et al. (2018) to replace retractions where misconduct has not been shown include: (a) withdrawal (“this is a peer-reviewed paper in which the authors retract one or more of their previous publications based on presenting detailed new evidence, data, methodologies, results or theoretical arguments that invalidate previously published claims”; p. 2); (b) retired (“a guideline or recommendation article is retired when its content is deemed outdated and its authors are unable to update it”; p. 2); (c) cancelled (“this is a full retraction of a paper due to an editorial, production or publishing mistake. It is, in essence, the retraction equivalent of an erratum”; p. 4); (d) self-retraction (“a short retraction notice signed by all co-authors of the original paper and issued if and only if the co-authors make a joint and unsolicited request of retraction to the journal”; p. 4); (e) removal (“under exceptional circumstances a publication may be entirely removed from the public record if its content presents a serious and substantial risk for society, individuals or the environmental”; p. 4). As these suggestions currently stand, there are several potential problems. Category a (withdrawal) sounds very much like the JAMA-suggested R&R policy, so this new category would be redundant. Similarly redundant would be the “cancelled” category because an erratum already fulfills this function perfectly well, so renaming it would add a layer of confusion for academics. Finally, category e (“removal”) is exceptionally vague, and could be ripe for abuse by interest groups seeking to retract work by competing groups. These suggestions must thus be viewed with extreme caution. More importantly, who would be responsible for implementing these new categories?

Thus, Fanelli et al. (2018) suggested that correction of the literature could be better achieved by expanding the “taxonomy” as five new categories. To date, there is no evidence to suggest that this change in, or expansion of, taxonomy has been widely adopted. The fact that Fanelli et al. (2018) limit the opportunity to replace retractions only to cases where misconduct has not been found (presumably by officials such as institutes) fortifies the punitive nature of the entire retraction process, solidifies the stigmatization process and does not provide a fair and liberal opportunity for those who might have been found guilty of misconduct to reform, and prove, through new and reproducible experiments, that their findings were in fact initially valid. There is thus a need for editors to encourage a culture of encouraging the correction of erroneous or fraudulent literature, while also providing the tools and framework to allow self-correction to be a sustainable publishing model (Vorland et al. 2020).
7 Other Polemic and Unresolved Issues Related to the Correction of the Literature

Several issues need to be debated before any new corrective measures are implemented. The first issue that needs to be thoroughly considered is how to correct the downstream literature that cites literature that has been corrected and/or retracted (Teixeira da Silva 2015c; 2015d). The corrective measures currently in place deal only with the first layer of literature’s correction, but not the underlying (downstream) layer. Whose responsibility is it (authors, editors or publishers) to examine and correct any literature that has cited corrected or retracted literature? If editors of old papers are deceased or cannot be contacted, or are unwilling to participate in the corrective process, or in the case of deceased academics, then it is publishers who must be held responsible for correcting the downstream literature (Teixeira da Silva and Dobránszki 2015b).

The second issue pertains to the ethical regulation of the evolving preprint market. Currently, the issue of correcting preprints, and preprint versioning, is limited only to mild edits and corrections. However, the issue of fraud, data manipulation, radical edits caused by incorrect interpretations, and other cases that might merit the retraction of a preprint are all issues that are not being addressed by preprint servers or leading preprint proponents of their funders. Why have no preprint servers become COPE members?

A third issue relates to the use of HTML-based “editor’s notes”, in which editors issue an alert about ethical or integrity issues related to a paper, but limit this alert to HTML text without assigning a DOI, so as to remove the negative stigma associated with an EoC, thereby skipping an essential step in the versioning of the publication record (Teixeira da Silva 2021b). Separately, the clustering of EoCs into a single notice (Teixeira da Silva 2021b) seems to be a strategic reputational management technique to avoid separate negative “hits” on databases when searching for “expression of concern”. In such cases, the ideal form of correcting an EoC is to assign an EoC for each paper that is being examined, with a permanent DOI assigned to the EoC of each paper that is affected. The correction of literature that lies “in limbo” when an EoC is assigned, with its academic destiny in an unknown state, should be resolved as quickly as possible by editors (Teixeira da Silva and Yamada 2021). This “clustering” phenomenon is not restricted to EoCs, and on occasion, it is possible to see a single retraction notice representing multiple retracted papers.

A fourth issue pertains to temporary removals, in which a paper is temporarily taken down, either in response to a public compliant or the detection of an error at the post-publication stage. However, many of these notices are opaque, do not indicate the precise reason why a paper has been temporarily removed, and some seem to remain in this

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9 As two examples, an EoC for an unspecified number of papers in a special issue of Elsevier’s Microprocessors & Microsystems: https://doi.org/10.1016/j.micpro.2021.104304; an EoC for 10 abstracts in Wiley’s Basic & Clinical Pharmacology & Toxicology: https://onlinelibrary.wiley.com/doi/https://doi.org/10.1111/bcpt.13547.

10 As two examples, a single retraction notice with one DOI for four dozen retracted papers in IOS Press’ Journal of Intelligent & Fuzzy Systems, https://doi.org/10.3233/JIFS-219218, and a single retraction notice with one DOI for 31 retracted papers in IOS Press’ Work, https://doi.org/10.3233/WOR-219001.

11 To date (November 13, 2021), at least according to the Retraction Watch database (search for “temporary removal” in “Reason(s) for Retraction”; http://retractiondatabase.org/RetractionSearch.aspx), there are 144 cases; see also: https://retractionwatch.com/?s=temporary+removal.
elusive state indefinitely. A detailed study of these notices is necessary but evidently, as for retraction notices, there is a need for greater details and accountability (Teixeira da Silva and Vuong 2022). Even with regard to retracted COVID-19 studies, “[t]he retraction process is inconsistent and often ambiguous, with more than half of retracted Covid-19 research articles remaining available, unmarked, from a wide range of online sources” (p. 15) (Frampton et al. 2021).

Finally, as increasing numbers of corrections and retractions get published, the scholarly validity, reliability and intellectual integrity of platforms such as PubMed (Teixeira da Silva 2021c), or databases such as Scopus or Web of Science (Pranckutė 2021), which have offered a platform of academic validation to erroneous or fraudulent literature, need to be assessed.

8 Conclusions

TPR and preprints are in a highly transformative phase. So, too, are. This is because science and publishing’s fallibilities reflect scientists’ fallibilities (Bishop 2018) and the lack of an open science culture (Mirowski 2018). Greater awareness caused by wide use of the internet and web-based search engines, greater exposure to information within published papers caused by the OA movement, a fortified and expanded PPPR movement via blogs, social media and science watchdogs, and a more conscientious and perhaps rebellious generation of academics that is willing to challenge the status quo among author, editor, journal and publisher ranks, as well as a host of other factors and stresses being imposed on academic publishing (Teixeira da Silva and Shaughnessy 2017) is causing tectonic shifts in the way in which academics view a preprint or a peer-reviewed published paper. In essence, these revolutionary changes reflect widening and louder voices to fortify the rigor of science and related publication practices (Valdez et al. 2020) that are generally considered to be “slow, inefficient, inconsistent, inadequate, and opaque” (p. 1) in terms of dealing with the correction of the literature (Bolland et al. 2021). Errors or fraud are generally corrected by errata, corrigenda, and retractions, but alternative forms of alert to readers and users emerged, such as EoCs, partial retractions, or temporary removals. However, the correction of the literature, even with new and emerging models and experimental strategies, cannot be effectively achieved until there is a tectonic shift in the culture of how research is conducted and reported, how publications and their citations are gamed and abused for unfair credit, and how science is commercialization and academic publishing is financially rewarded (Teixeira da Silva 2021d).

The lexicon for correcting the literature that was once considered to be sufficient and robust has become increasingly specialized but also more ambiguous and confusing (Andersen and Wray 2019). In part, this is because the corrective mechanisms for dealing with preprints or the published peer-reviewed literature are not error- or fraud-proof. The processes that underlie the implementation of retractions and other corrective measures need to

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12 As one example, in Elsevier’s Injury, the notice states that “The publisher regrets that this article has been temporarily removed. A replacement will appear as soon as possible in which the reason for the removal of the article will be specified, or the article will be reinstated.”: https://pubmed.ncbi.nlm.nih.gov/32061357/. However, the precise reason for removal is not indicated, the precise date of that removal is not indicated, but judging from the online publication date (February 3, 2020), and the lack of updates, the removal seems to be permanent, or in indefinite limbo.
be standardized and applied more stringently and transparently. There also needs to be an adjustment of policy related to the need for journals to adjust their rewards (Triggle et al. 2022), especially metrics that have relied on citations to retracted literature (Dobránszki and Teixeira da Silva 2019). The epistemological cost of citing retracted literature, for example on the overall validity of meta-analyses, even more so in health and biomedical sciences, needs wider assessment (Fanelli et al. 2021).

Rebranding corrections of the literature might not advance its correction but instead might complicate it further. Conversely, the peer review process might be further complicated by introducing new ways of correcting the literature since peer reviewers would have to be constantly upgrading their knowledge skill-sets. Moreover, current models to correct the literature are unable to effectively deal with corrections of errata or retraction errors when errors are found in these correction notices. Even though the process for the detection and correction of error and fraud might be fairly well established and “standardized”, such as in COPE or ICMJE guidelines, inter-journal and inter-publisher variability, including editorial responsibilities, will continue to limit the effective correction of erroneous and fraudulent literature globally.

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