Evolution in the correction of the literature: preprints, manuscript versioning, error amendment, and retract and replace

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Abstract

Academic publishing is undergoing a highly transformative process, and many rules and value systems that were in place for years are being challenged in unprecedented forms leading to the evolution of novel ways of dealing with new pressures. One of the most important aspects of an integrated and valid academic literature is the ability to screen publications for errors during peer review to weed out mistakes, fraud and inconsistencies, such that the final published product represents a product that has value, intellectually, and otherwise. It is difficult to claim the existence of perfect manuscripts. The level of errors that exist in a manuscript will depend on the rigor of the research group and of the peer review process that was used to screen that paper. When errors slip into a final published paper, either through honest error or misconduct, and are not detected during peer review and editorial screening, but are spotted during post-publication peer review, an opportunity is created to set the record straight, and to correct it. To date, the most common forms

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[1] The first version of this paper was published as a preprint on MDPI's preprint.org on August 8, 2017:
https://www.preprints.org/manuscript/201708.0029/v1

of correcting the literature have been errata, corrigenda, expressions of concern, and retractions. Despite this range of corrective measures, which represent artificially created corrals around pockets of imperfect literature, certain cases do not quite fit this mold, and new suggested measures for correcting the literature have been proposed, including manuscript versioning, amendments, partial retractions and retract and replace. In this commentary, a discussion of the evolving correction of the literature is provided, as are perspectives of the risks and benefits of such new measures to improve it.

Key words: amendment; corrigendum; erratum; errors; open science; peer review; preprint; replacement; retractions

The published literature is imperfect

It would be impossible to claim that the literature is perfect. Such a claim is unreal because academics around the world exercise different standards of research, 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, despite their responsibility of being impartial and unbiased towards authors during peer review (Teixeira da Silva and Dobránszki, 2018a). For these reasons, what is acceptable in one journal may be unacceptable in another. Inconsistent standards may be come pronounced because certain publishers and publishing models have objectives that are not always seen to favor the integrity of the

academic literature, but rather favor their business model[2]. As a result, the global published academic

literature contains information, including figures that may have been manipulated (Bucci, 2018), ranging

widely from well scrutinized and/or accurate to erroneous and potentially tainted with misconduct and/or

false information (Ioannidis, 2005). This is confounded by spin-based research, where findings are claimed,

either by authors or the media, that are not supported by the study's findings (Turrentine, 2017). It is a

collective conscience that drives individual academics or groups to seek ways to create a more "perfect"

literature that is as free of error as is possible, science's so-called self-corrective process, and to correct those

errors when they are discovered. An unintended consequence is when the literature is insufficiently corrected,

leading to unwanted citations to erroneous literature, a phenomenon that has been termed "citation inflation"

(Teixeira da Silva and Dobránszki, 2018b).

However, the current predominant publishing system relies on two potentially false fundamental

premises: a) that trust exists between all parties (authors, peer reviewers, editors, publishers) (Pentz, 2012);

b) that all these publishing-related parties are striving for the same ideal state of the published literature.

Most seasoned academics who have been researching and publishing for several decades will know, from

experience, that the literature is imperfect, and with some extreme cases of highly imperfect studies, several

of which remain uncorrected. Knowing this leads to an understanding that these two fundamental principles

of academic publishing have failed, to some extent, leaving an unquantifiable amount of literature flawed

and as-yet uncorrected. These flaws exist within a culture of publishing that still encourages the publication

of false-positive findings (Smaldino and McElreath, 2016).

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[2] https://www.theguardian.com/science/2017/jun/27/profitable-business-scientific-publishing-bad-for-science

Claims were made over a decade ago that most research findings are likely to be false, in essence warning that there is some probability of error in the majority of biomedical papers (Ioannidis, 2005). If in fact those claims are true, that would indicate that the vast majority of these errors have yet to be discovered, and corrected. Bik et al. (2018), for example, suggested that the number of images in scientific papers may be high, using *Molecular and Cellular Biology* as the test journal, and that the vast majority of them have yet to be corrected, or retracted in the case of misconduct or invalidation of scientific findings. *PLOS ONE* has started to respond to claims of manipulated images, with 22 retractions resulting from just over 380 reports[3]. The post-publication peer review (PPPR) movement has only begun to evolve in the past few years (Teixeira da Silva, 2015a), but some academics have started to believe that the current corrective measures that have been in place for decades, or perhaps longer, are no longer applicable or robust enough to deal with the effective correction of the literature. A new age of correction, including self-correction, is taking place in academic publishing, but it has evolved relatively quickly, possibly faster than the current system can handle such change, leading to considerable changes in rules, regulations, and even publishing models, all within the space of just a few years. Efforts include an attempt at the industry-wide implementation of ORCID[4] (Teixeira da Silva, 2017a) to try and reduce the level of fraud caused by a widening "fake" movement (Teixeira da Silva, 2017b). However, this militarization of the publishing system, with endless checks and balances (Teixeira da Silva, 2016a) may fray authors' rights (Al-Khatib and Teixeira da Silva, 2017a) as they are forced to conform to rigorous systems that do not give them personalized choices.

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[3] https://retractionwatch.com/2019/04/25/how-one-journal-became-a-major-retraction-engine/
[4] https://orcid.org/

Some of the most prominent changes include whistle-blowing, with the most popular platform likely being PubPeer[5], public exposure and/or shaming by Retraction Watch[6] (Teixeira da Silva, 2018a) to expose cases of misconduct, errors and retractions, and the expansion of the concept of journal clubs, including via online channels, to expose errors and fraud and expand the debate on these issues with the ultimate objective of correcting the literature (Teixeira da Silva et al., 2017, 2018). The effect of these changes are augmented by social media sites that allow error, and/or scandal, to reach an unlimited audience within a very short space of time, causing, in extreme cases, the fatal termination of legends (Teixeira da Silva et al., 2016). Several cases have been recorded on the blog of a science watchdog, Leonid Schneider[7]. There is still a strong negative stigma associated with the correction of the literature (Teixeira da Silva and Al-Khatib, 2019a) simply because the current PPPR movement strongly relies on public shaming to force corrections. This entire evolving PPPR is not without its biases, and there are many vested interests in creating new publishing models that can render already published as well as newly published literature as free of errors as possible. In the case of for-profit publishers, a clean image and error-free literature represents a product with increased market value, whether that be a pay-per-view or pay-per-download article, or a journal subscription. Similarly, for journals published by academic societies, such literature represents a journal and society with integrity, that can be trusted, thereby attracting new membership, or maintaining a regular stable of members. Therefore, except for unscholarly and/or "predatory" publishers, whose objectives may largely be non-academic, or whose objectives are overly commercial, the correction of the literature is in the interest

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[5] https://www.pubpeer.com/
[6] http://retractionwatch.com/
[7] https://forbetterscience.com/

of all parties involved.

However, the increase in retractions, as is being documented to some extent at Retraction Watch on their database[8], and observed across some of the most powerful and profitable mainstream publishers, indicates that failure in peer review and the current publishing model is widespread (Benson, 2015; Teixeira da Silva and Dobránszki, 2015a; Teixeira da Silva, 2016b), causing reputational damage to authors, editors, journals and publishers. Reducing the risk of erroneous literature would involve measures that should be implemented long before the publication process during the development of an academic prior to the publication of their first paper, such as rigorous reproducibility testing, the valorization of work based on its content and not on the venue where it has been published, as well as a host of other measures and checks and balances that lie beyond the scope of this paper, some of which were discussed more extensively elsewhere (Teixeira da Silva and Shaughnessy, 2017). This paper assumes that such preventive measures were not taken, leading to the publication of erroneous literature.

Current models to correct erroneous or fraudulent literature

An ideal literature would be error-free. However, this is not possible and is also likely not realistic because authors make errors, either because the peer review system has limited screening – when it is in fact conducted at all – frequently employing peers that are not financially compensated for their professional activity (Teixeira da Silva and Katavić, 2016), or because productivity and growth are not always compatible with high quality. A weak or incomplete peer review journal would require astute readers and proactive

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[8] http://retractiondatabase.org/

PPPR participants to step forward to expose these errors. Even when evidence is presented, however, there is tremendous resistance to correcting the literature, even among member journals and publishers that claim to follow COPE (Committee on Publication Ethics) editorial- and publishing-related ethical guidelines. Ample cases exist at PubPeer and Retraction Watch. As a result, COPE gives the impression of an organization that serves the interests of the for-profit publishing industry, serving as a "quality" brand, while showing limitations, weaknesses and relative lack of accountability (Teixeira da Silva, 2017c). This imbalance between what requires correction and what has not been corrected, either because of a lack of transparency, a lapse in editorial or publisher responsibility, legal impasses, and a wealth of other factors, makes it clearly apparent that it is currently much easier to publish than to correct the literature (Teixeira da Silva, 2017d).

It is not helpful that retracted papers continue to be cited, 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 not robust enough to detect, and prevent the citation of, retracted literature (Teixeira da Silva and Bornemann-Cimenti, 2017; Teixeira da Silva and Dobránszki, 2017a, 2017b, 2017c, 2018c). It is therefore not surprising to note that: a) 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 leading science, technology, engineering and medicine (STEM) publishers differ from the definitions provided by COPE; b) as much as 61% deviation in both the wording and meaning of policies between these STEM publishers exists (Teixeira da Silva and Dobránszki, 2017a). It can therefore be concluded that as it currently stands, 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 notices that had, to a large extent, been drafted by COPE and then applied by leading STEM publishers, were incomplete and insufficiently robust to deal with many of the challenges related to the age of whistle-blowing (Teixeira da Silva, 2018a). It is not helpful that any association with PPPR or science-shaming sites, and with correction of the literature, is, to some extent, an automatic association with bad science, fraud, or misconduct, even if only errors have been made.

Close examination of the parties behind this name-and-shame trend and campaign behind exposing fraud, misconduct, errors and faults in the published literature, especially in cancer and psychology, will lead to a close link to the John Arnold of the Laura and John Arnold Foundation (LJAF) "war on bad science"[9]. Thus, willfully, or by association, there is a negative stigma associated with correcting the literature (Teixeira da Silva and Al-Khatib, 2019a). Proponents of the STEM publishing industry, some of whom are alarmed by this trend and shaken by the reputational damage it has caused in just a few years to their publishing models, but are unable to effectively reign in fraud and misconduct, despite several new measures being put into place described in the section above, have scrambled to find effective solutions to soften the tone related to correction of the literature. Part of this realization has to do with controlling reputational damage by attempting to minimize the publishing crisis[10] and correcting the erroneous literature. It is within this highly volatile environment that the new models discussed next, likely emerged.

Experimental publishing models, partial retractions and mega-corrections

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[9] https://www.wired.com/2017/01/john-arnold-waging-war-on-bad-science/
[10] http://www.wiu.edu/libraries/news/2000s/2009/scholarlyPublishingInCrisis.php

One of the reasons for the apparent Retraction Watch – PubPeer – COS (Center for Open Science) – LJAF

alliance may be to assess the lack of reproducibility associated with flawed literature. Although solving the

reproducibility crisis is beyond the scope of this paper, it is worth noting that some measures in academic

publishing evolved to try and deal with issues related to reproducibility, improved accountability, and

openness of the publishing process. The first is PPPR in publishing, in essence blogs, which would give free

reign to any academic to launch their own "journal" that is independently controlled, although excessive

self-published journals or blogs could potentially drive publishing into a chaotic state since there would be

the lack of central regulatory bodies to oversee quality. Currently, a fairly centralized anonymous PPPR

platform exists, PubPeer, but it is moderated by the owners, and there are issues with comment moderation

and ownership (Teixeira da Silva, 2018b) as well as opacity of its foundation (Teixeira da Silva, 2018c). A

signed PPPR platform was available, PubMed Commons[11]. However, PubMed Commons shut down

abruptly in early 2018, dealing a blow to badly needed variation in PPPR platforms (Teixeira da Silva,

2018d). Publons[12] serves as a hybrid PPPR platform, either with anonymous or signed comments on

published literature, but there are concerns that this platform may lead to a greater commodification of peer

review (Teixeira da Silva and Al-Khatib, 2019b) that rewards the quantity of peer review rather than its

quality (Al-Khatib and Teixeira da Silva, 2019). To deal with the issue of reproducibility, and thus

theoretically reduce the need to correct the literature, would also involve the need to publish negative results

(Teixeira da Silva, 2015b), which are currently not given sufficient importance by most mainstream STEM

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[11] https://www.ncbi.nlm.nih.gov/pubmedcommons
[12] https://publons.com/home/

journals, either because they are not glitzy enough or due to journal page restrictions, even though negative

results form an important aspect of the bulk of most biomedical research studies (Mlinarić et al., 2017).

In cases where multiple corrections are made to a manuscript, in some cases more than a dozen, but not

enough to merit a retraction because the main findings allegedly remain intact and valid, the publisher may

opt to issue a mega-correction[13]. However, the subjective nature of editorial independence and differences

between individual characterization about what constitutes a large or a mega-correction, impedes the wide,

standardized or effective use of this category of correction. This ambiguous form of correcting the literature

also opens up amphibious, flexible and odd rules, such as the "acceptable" level of plagiarism before it

should be considered for retraction[14]. This flexibility in the interpretation of rules to correct the literature

could lead to ambiguities as to the best course of action or how best to correct the literature when issuing a

partial retraction or a mega-correction. How many errors, and what level of errors, merit an erratum versus a

mega-correction or retraction (Teixeira da Silva, 2016c)? Wide variation among COPE member journals and

publishers sows confusion on the academic populace. The issue of whether to retract an entire paper because

one table or one figure has been tampered with lies at the heart of the debate of whether partial retractions[15]

have merit, or not. Those in favor of partial retractions claim that it allows readers to ignore only specific

faulty or erroneous parts of a paper, while recognizing the remaining parts as valid or reliable. In contrast,

those who disagree with partial retractions will argue that if one part has been found to be fraudulent, or false,

given the interlinking nature of all parts of a paper, that the entire paper, as a whole, should be retracted

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[13] http://retractionwatch.com/category/by-reason-for-retraction/mega-corrections/
[14] https://publicationethics.org/case/what-extent-plagiarism-demands-retraction-vs-correction
[15] http://retractionwatch.com/category/partial-retraction/

because none of it can be relied upon. At the end of September, 2016, after a 10-year experiment and 42

partial retractions, the U.S. National Library of Medicine, which runs MEDLINE/PubMed, announced that it

would no longer identify this form of correction, treating them instead as an erratum[16]. The partial retraction

experiment thus failed. It is likely impossible to reconcile both parties (for and against partial retractions),

leading some academics and STEM industry-related parties to rethink the correction of the literature and

propose novel suggestions, as discussed next.

New and emergent models to correct the literature: outline and potential risks

The new models for correcting the literature that will be discussed in this paper relate primarily to Heckers et

al. (2015), Barbour et al. (2017), Hosseini et al. (2018), and ideas put forward in 2017 at the 5th World

Conference on Research Integrity by Fanelli et al[17]. Those ideas were concretized in a paper (Fanelli et al.,

2018) published in a Wiley journal that was accepted in one day, and in which the second author of the paper,

Ioannidis, served as the Editor-in-Chief[18], as was pointed out by Hindawi's Head of Research Integrity, Matt

Hodgkinson[19]. In their paper, which scored them an interview with the science watchdogs at Retraction

Watch[20], Fanelli et al. suggested that five categories of corrections should evolve, namely, withdrawal,

retired, cancelled, self-retraction and removal, i.e., that correction of the literature could be better achieved

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[16] https://www.nlm.nih.gov/pubs/techbull/so16/so16_partial_retractions_pol_change.html

[17]

http://wcri2017.org/images/documents/1.%20Monday%20May%2029,%202017/1.%20Aula/D.%20Fanelli%20-%20A%20system%20of%20self-retraction%20for%20honest%20error.pdf (the precise authorship is not defined)

[18] http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1365-2362/homepage/EditorialBoard.html

[19] https://twitter.com/mattjhodgkinson/status/973541383884759045 ("Interesting that Daniele Fanelli's Perspective on a new taxonomy for retractions & corrections in the European Journal of Clinical Investigation (http://onlinelibrary.wiley.com/doi/10.1111/eci.12898/abstract … $) was accepted on the day it was received, and co-author John Ioannidis is the Editor-in-Chief of the journal")

[20] https://retractionwatch.com/2018/03/13/the-retraction-process-needs-work-is-there-a-better-way/

by expanding the "taxonomy". It is important to point out that a power axis of a restricted ethical and

publishing elite assisted the Fanelli et al. group[21], suggesting that policy in academic journals related to

correction of the literature is being increasingly decided by a narrow set of individuals who are closely

connected and well positioned, and with apparently biased agendas. Despite this, Fanelli made a surprising

about-turn, claiming in 2018 that science was not in crisis, despite what mounting evidence suggested

(Fanelli, 2018). Although, in general, preprints should not be cited as they represent incompletely scrutinized

documents (Teixeira da Silva, 2017e), they serve the purpose of advancing the discussion related to how the

literature could be more effectively corrected. A brief note is made on preprints as a prelude to the discussion

of these new models to correct the literature, and two cases are discussed that set the stage for reform.

Preprints represent one tool that is passionately marketed by ASAPbio[22] (see criticisms of ASAPbio here[23])

as a solution to the replication crisis and to speed up the publication of findings, within the wider context of

open science, by presenting new or contradictory results, in a crude state, open to public review, screening

and criticism, before such work enters the mainstream peer review path. However, as indicated in the next

section, there are some vested interests and inherent biases in and among the pro-preprint proponents,

causing a distortion of the need and importance of preprints, and a realistic potential for their abuse (Teixeira

da Silva, 2017f). While the benefits of preprints are being increasingly marketed, the risks are not, including

intellectual phishing, hidden conflicts of interest and hidden data, which are beginning to increase as

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[21] "Patricia Baskin (Council of Science Editors), Philip Campbell (Nature), Catriona Fennell (Elsevier), Jennifer Lin (Crossref), Emilie Marcus (Cell), Ana Marusic (European Association of Science Editors), Ivan Oransky (Retraction Watch), Kathy Partin (US Office of Research Integrity), Iratxe Peubla (PLoS ONE), Bernd Pulverer (EMBO), Jason Rollins (Thomson Reuters), Elizabeth Moylan (BioMed Central), Hilda Bastian (National Library of Medicine),   Ijsbrand Jan Aalbersberg (Elsevier), Annette Flanagin (JAMA), Virginia Barbour (COPE)"

[22] http://asapbio.org/

[23] https://medium.com/@OmnesRes/my-concerns-regarding-the-asapbio-central-service-and-center-for-open-science-5c2f0d2dfca

preprints get scrutinized in more detail (Teixeira da Silva, 2017g, 2017h, 2018e). Despite this, preprints are

becoming increasingly incorporated into the publishing models of several of the mainstream STEM

publishers (Teixeira da Silva and Dobránszki, 2019).

Two clear cases demonstrate the need for reform in the correction of the literature. The first case relates

to Brian Wansink at Cornell University (USA). As part of a wider examination of errors within the

psychology literature, which reportedly contains as much as 50% erroneous statistical errors (Nuijten et al.,

2016), van der Zee et al. (2017a) closely examined what they had perceived to be a large amount (150 in

total) of statistical errors and inconsistencies in four papers emerging from the Cornell Food and Brand Lab.

That case, which was quickly dubbed "Pizzagate" by Wansink critics, was initially published as a *PeerJ*

preprint (van der Zee et al., 2017b), and quickly spread to the analysis of a wide swathe of the Wansink

literature, revealing considerably more errors[24,25], some of which have begun to be corrected, including the

first retraction in April of 2017[26]. However, one of the original authors of the team that originally analyzed

Wansink's papers discovered more errors in the correction of two papers that had issued errata[27], raising

doubts about the competence not only of the authors, but also of the journal's editors. According to the

Retraction Watch database (on May 8, 2019), the retraction count currently sits at 18 with 7 expressions of

concern and 15 corrections[28], although more retractions are likely as editors begin to alert readers of possible

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[24] https://medium.com/@OmnesRes/cornells-alternative-statistics-a8de10e57ff;
https://medium.com/@OmnesRes/cornells-alternative-statistics-part-deux-cdb370a70c74
[25] https://arstechnica.com/science/2017/04/the-peer-reviewed-saga-of-mindless-eating-mindless-research-is-bad-too/
[26] http://retractionwatch.com/2017/07/11/notices-appear-embattled-cornell-food-researcher/;
http://retractionwatch.com/2017/04/10/first-retraction-appears-embattled-food-researcher-brian-wansink/
[27] https://medium.com/@OmnesRes/worst-correction-ever-70c5e126d688;
https://medium.com/@OmnesRes/how-serious-is-this-correction-64920f7df32f
[28] http://retractiondatabase.org/RetractionSearch.aspx#?auth%3dWansink%252c%2bBrian

wide-ranging errors[29]. This case fortifies the notion that correcting the literature is essential, but that a more flexible system of correction is required, especially if more errors are encountered in the original paper, or in the published erratum. In one case of retract and replace at *JAMA Pediatrics*, additional errors were found by Nick Brown[30], eventually leading to the retraction of the paper, and calling into question the robustness of the "retract and replace" model of correcting the literature, and meriting critique from Schneider[31]. A second similar case, also involving Wansink, took place in *Preventive Medicine*, which had originally been corrected, but was then retracted after additional problems were identified by James Heathers[32].

The second case involves the retraction of a retraction in a Wiley journal[33]. In this case, the paper (Namazi and Kulish, 2016) was retracted after Nanyang Technological University (NTU) in Singapore requested the journal to pull it, indicating that proper ethical approval had not been obtained from NTU. The first author refuted this claim, indicating that ethical approval had been obtained from a non-NTU institute. The publisher retracted the retraction notice, but the case had yet to be completed in early 2017. The retraction notice was originally pay-walled, which is against COPE policies for retractions (Wiley is a COPE member) (Teixeira da Silva, 2015c), but has since been made open access. The paper is now definitively retracted. These two cases highlight how correcting the literature under the current existent structure is clearly inefficient and is unable to deal efficiently with complex cases. However, the Namazi and Kulish

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[29] https://retractionwatch.com/?s=Wansink
[30] http://steamtraen.blogspot.jp/2017/09/problems-in-cornell-food-and-brand-labs.html
[31] https://twitter.com/schneiderleonid/status/911901038269157376
[32] https://retractionwatch.com/2018/02/27/after-considerable-intellectual-agony-journal-retracts-wansink-paper/;
https://hackernoon.com/introducing-sprite-and-the-case-of-the-carthorse-child-58683c2bfeb
[33] http://retractionwatch.com/2017/06/07/retraction-gets-retracted-first-authors-contract-still-terminated/

(2016) paper in its unretracted state remains feely available on the black OA pirate site, Sci-Hub[34], in essence annulling the effect of a retraction as academics around the world who use and access Sci-Hub (Bohannon, 2016) could easily continue to rely on and cite, this retracted paper.

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. *A priori*, it is important to note that several of those who put forward these new models have potential invested interests, financial and otherwise. Barbour, who is the former COPE Chair (2013-2017), and colleagues including Theo Bloom of the *BMJ*, Jennifer Lin of Crossref, and Elizabeth Moylan of BioMed Central, and all members of the STEM industry claiming to represent COPE in the preprint preceding the Barbour et al. (2017) article, put forth a system in which amendments that are made would be classified as "insubstantial, substantial, and complete." Although the idea that a paper can be updated real time is not a novel idea – the concept already exists for books and preprints – it is the reasoning behind this new proposal that is alarming and of concern: "researchers continue to refine or extend the work, removing the emotive climate particularly associated with retractions and corrections to published work." Barbour et al. (2017) recognize that the COPE Guidelines for retractions, which have been used and implemented by hundreds or thousands of COPE member journals and publishers, are imperfect: "their consistent implementation has proved more difficult as publishing has evolved." In other words, until July 2017 and possibly beyond, academics have been exposed to an imperfect system that has been imposed by this ethics organization, despite COPE's knowledge of its flaws and imperfections. Errata and corrigenda have always

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[34] https://scihub.bban.top/10.1002/cnm.2805 (PDF file is the unretracted state but the citation indicates retraction)

been used to distinguish edits made or suggested by the authors versus those suggested by the editor or publisher, an extremely important distinction because the historical record of a published manuscript should indicate the entity responsible for fault or error. Despite this important distinction, Barbour et al. (2017) refer to the difference between errata and corrigenda as "a now meaningless and poorly understood distinction", i.e., COPE is partaking in ideological flip-flopping, claiming the importance of such concepts for years, imposing it on global academia, or the support of COPE members imposition, and then suddenly changing its tune regarding their importance. Such volatile positioning by highly powerful and influential groups such as COPE damages the integrity of the STEM publishing system that academics are expected to respect and abide by. Although social media such as Twitter and blogs can certainly raise awareness and discussion about a published paper (Yeo et al., 2017), in cases where valid criticisms merit corrections, but where corrections are not made, or are not permitted by the journal because of editorial policy (e.g., letters to the editor are not published), then indeed an amendment policy would be required.

As a result of vested interests by COPE to continue show-casing new guidelines, even if they contradict older ones, is the biased promotion of new models. The preprint preceding the Barbour et al. (2017) article was met almost immediately with ridicule by the science watchdog, Schneider (Teixeira da Silva, 2016d), who claimed that the abolishment of retractions by COPE would allow fraudulent academics to hide their misconduct, or to subtly replace fraudulent data with valid data without the negative stigma associated with a retraction[35], thus escaping the possibility of being punished, academically and/or criminally. Incidentally, Klaas van Dijk, a Dutch ornithologist, identified dozens of errors, concerns or possible problems with the

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[35] https://forbetterscience.com/2017/03/29/cope-the-publishers-trojan-horse-calls-to-abolish-retractions/

Barbour et al. (2017) paper's preprint published in *bioRxiv*, calling publicly initially for its retraction in the first quarter of 2017, precisely when the Schneider blog was published, but then adjusting his position to request a correction of the preprint after *bioRxiv* adjusted its publication policies[36]. Although the Barbour et al. preprint was already in version 4, the authors had not yet addressed most of the concerns raised, i.e., while they were advocating that academics should make changes to their own manuscripts using their "amendment" policy, they themselves had failed to correct their own paper. *bioRxiv*, which was aware of these issues, also did nothing to encourage the authors to address these errors and concerns, casting concerns about this preprint server. In fact, several serious concerns about *bioRxiv* already exist[37]. The Barbour et al. (2017) paper's preprint was eventually anchored as an opinion article, downgraded from the status of "new results" at *bioRxiv*.

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 only if the authors are able to address those errors following reanalysis of their study. This model is a reasonable and realistic option for authors for the following reasons and provided that the following 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 fresh peer review based on a fresh and reproducible data set; c) it assigns responsibility for error, both on the authors for creating the errors, as well as the journal and publisher for not detecting them during peer review and editorial quality control; d) the model is only

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[36] https://forbetterscience.com/2017/03/29/cope-the-publishers-trojan-horse-calls-to-abolish-retractions/#comment-7000
[37] https://medium.com/@OmnesRes/why-biorxiv-cant-be-the-central-service-24530d119c89

good if the "old" flawed version remains, with a "retracted" stamped across it to indicate that it should not be used, and not simply replaced because replacing would erase a historic version of record. Point d) is extremely important and any editor or journal that attempts to use the "retract and replace" 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. Such an action would be as unethical 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, 2016e). In some ways, the "withdrawal" of a preprint to which a DOI had already been assigned[38], and in which apparent misconduct had been detected following public exposure on the Schneider blog[39], could constitute a form of "hiding" a public document that was once in the public domain. The ethics of withdrawing preprints that were published in the public domain needs a vibrant discussion.

Using a specific case[40] to illustrate their model, the Heckers et al. (2015) suggestion is an excellent model that could serve the academic community well. It certainly would involve a considerable amount of additional work and investment by authors, the journal and publisher, as distinct DOIs (digital object identifiers) and PubMed entries are required, but ultimately with the correction of the literature in mind. Other papers have been "retracted and replaced" in JAMA Network journals as this new model of correcting

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[38] https://www.preprints.org/manuscript/201811.0370/v1
[39] https://forbetterscience.com/2019/01/23/the-bio-talent-of-nanofabrication-in-poland/
[40] https://www.ncbi.nlm.nih.gov/pubmed/25054836

the literature begins to take hold[41]. Two specifics not covered by Heckers et al. (2015) are: a) in such cases,

where an article processing charge (APC) is levied for the "original" paper in an open access model, is this

APC refunded, or, alternatively, is no new APC levied for the "retracted and replaced" paper? b) Will the

authors and journal/publisher responsibly inform the authors and editors of any papers that have cited the

"retracted and replaced" paper to correct their citations to reflect the new version (see link to discussion on

downstream literature below)? The science watchdog Schneider raised a pertinent point on Twitter,

questioning if acts of potential misconduct could be side-stepped with this new publishing correction model[42].

This calls into question the ethical validity of this new model of correction that needs further debate. For

example, would duplicated or manipulated images, as was 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?

A similar concept to "retract and replace" 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).

There are some cases in which errors exist in a paper as a result of honest error, estimated to be about

20% of the retracted literature (Fang et al., 2012). In such cases, when errors are minor, a correction will

suffice, but in cases where key or core conclusions are altered, such papers still need to be retracted. It is then

incumbent upon authors, if they are still actively researching, to reanalyze their data and resubmit and

republish their work. However, honest errors that are met with a retraction are still met with negative

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[41] http://retractionwatch.com/2016/06/20/retract-and-replace-jama-may-expand-use-of-this-tool/

[42] https://twitter.com/schneiderleonid/status/915879685095133184 ("Same @JAMA_current invented Retract & Replace, which allows cheaters to fix fraudulent papers without actually retracting them")

stigmatization associated with the retraction, in most cases by other researchers who might not know the

background of the case, or who might not be sympathetic to the notion of "honest error". One classic case is

a paper by Mann et al. (2012), which was retracted from *PLOS Computational Biology*, and then republished,

after a fresh round of peer review, in the same journal in 2013 (Mann et al., 2013). One criticism of this case

is that the APC had to be paid twice, a business model that is unsustainable because it taxes and exploits the

authors, or their institutes, both intellectually, and financially (Al-Khatib and Teixeira da Silva, 2017b). A

negative stigma associated with retractions may be annulled when authors retract of their own accord (Lu et

al., 2013). The concept of authors seeking to retract their own erroneous papers, especially those whose

conclusions may be irrevocably changed, prompted the science watchdog Retraction Watch to term the

action as "doing the right thing"[43], although Retraction Watch displays extreme subjectivity when deciding

which cases qualify for this category. To eliminate this bias, which can still be detrimental to those who are

profiled by Retraction Watch for not doing the right thing, "self-retractions" (Pulverer, 2015; 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. The problem here is who

exactly would be in an unbiased position to ascertain whether authors were "doing the right thing"? Making

an erroneous distinction between those that do the right thing from those that do not could amount to libel,

and thus finding a set of individuals who would be competent and unbiased enough to make such an

assessment would be complicated. The five categories suggested by Fanelli et al. at the 5th WCRI, and

solidified as Fanelli et al. (2018), to replace retractions where misconduct has not been shown include: a)

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[43] http://retractionwatch.com/category/by-reason-for-retraction/doing-the-right-thing/

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"); b) retired ("a guideline or recommendation article is

retired when its content is deemed outdated and its authors are unable to update them"); 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"); 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"); 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"). As these suggestions currently stand, there are several potential problems. Category a

(withdrawal) sounds very much like the JAMA-suggested retract and replace 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 will be responsible for implementing these new categories? The groups or publishers that

represent these new categories must be carefully analyzed to ensure that there are no hidden conflicts of

interest. It will be interesting to see how many COPE member journals and publishers will adopt these new

categories to replace the old COPE-enshrined errata, corrigenda, and retractions, and how they will

re-characterize older retractions issued before these new categories are implemented. Once again, academics

will be part of an experimental system, serving as guinea-pigs for lobbying and interest groups that are starting to plague academic publishing and gradually restricting authors' rights (Al-Khatib and Teixeira da Silva, 2017a).

Other polemic issues and unresolved aspects related to the correction of the literature

Several issues need to be debated urgently before a whole suite of new corrective measures starts to become 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, 2015d, 2015e). The corrective measures currently in place deal only with the top layer, but not the underlying layer of literature. Whose responsibility is it to correct any literature that has cited corrected or retracted literature? The responsibility should lie squarely on the shoulders of authors, editors and publishers to issue a notice to readers of papers that have cited erroneous, corrected or retracted papers not to rely on, or cite, such "tainted" 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, publishers must be held responsible for correcting the downstream literature, even if in literature published by other publishers (Teixeira da Silva and Dobránszki, 2015b).

The second issue that is not being addressed is the safety of open data (Teixeira da Silva and Dobránszki, 2015c, 2015d). As the publishing industry sways towards an open access-only model, more and more papers that form part of an open science model will require that background data be deposited in a public repository, or made available to the public. In some cases, such data sets are massive, and in other cases, they might

even be represented as supplementary material on publishers' web-sites. Data-rich files such as Excel or PDF are ripe for abuse and data hijacking, but this issue also does not appear to be addressed by the STEM publishing industry, even though the risks may be real. Although a fraudulent academic might not necessarily hijack data from open data files for publication in a top notch indexed journal, they may easily hypothetically use an open data file to manipulate the data points and generate a paper for publication in a lower level journal.

The third issue pertains to the 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 can be argued that merit the retraction of a preprint are all issues that are being skirted by key preprint proponents such as ASAPbio and *bioRxiv*. The MDPI / preprint.org case highlighted above fortifies this risk. Inconsistencies and one-sided decisions made recently by *bioRxiv* raise red flags about the safety and reliability of preprints, and the measures being taken to shore trust in preprints such as greater editorial scrutiny, or possibly standardized correction and retraction policies, dilutes the concept of preprints because when such measures are taken, they begin to approach a format of a standard or regular academic journal.

Conclusions

What was once thought to be a fixed and stable publishing model in STEM is now in a highly transformative phase. Greater awareness caused by the existence of the internet, greater exposure to information within published papers caused by the open access movement, 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 published paper. Until just a few years back, errors or fraud were corrected by errata, corrigenda, and retractions. Intermediate forms of alert crept in such as expressions of concern or partial retractions, and slowly the lexicon that was once fixed for correcting the literature began to become more fragmented, specialized, and confusing. The very same ethical entities such as COPE, and many of the leading STEM publishers who are COPE members, who were entrusted by the academic community to provide a fail-safe and robust system of correcting the literature, failed academia to some extent by not foreseeing the current explosion in whistle-blowing-induced reports of errors and fraud, leading to the very same entities, and their allies, to make some vastly radically different suggestions as to how to correct the literature, such as the abolishment of retractions. While some of the new suggestions have good intentions, such as corrections rather than retractions for authors who "do the right thing", such calls are highly subjective, and unless carefully regulated, will become problematic. The concept of retractions should not be retracted. Rather, the application of retractions and other corrective measures must be standardized and applied and regulated more stringently. However, there is doubt that rebranding corrections of the literature would actually advance the correction of the literature, and might in fact complicate it further[44]. Similarly, while most of this conversation refers to correcting erroneous or fraudulent literature that will appear henceforth, several aspects still appear to have not been carefully considered by the academic community, or by the STEM

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[44] http://blogs.plos.org/absolutely-maybe/2017/11/30/re-branding-retractions-and-the-honest-error-hypothesis/

publishing status quo. While few academics and even the publishing industry are keeping tabs, Retraction

Watch randomly monitors the evolution of this trend, as indicated by select "retract and replace" cases on

their blog that may shed light into how this model of the correction of the literature is fairing. However, one

case at *Molecular and Cellular Biology* of a paper that was published, then retracted, then corrected, then

republished[45], shows how the correction of the literature is becoming more complex, rather than more

simplified.

Conflicts of interest

The author has been critical of several of COPE's policies. The author has also openly challenged possible

flaws and short-comings of preprints to ASAPbio and *bioRxiv*. The author was banned in 2015 from all

Taylor & Francis / Informa (a COPE member) journals for being critical of many failed and imperfect

editorial policies and decisions. The author has been critical of, and subsequently banned from commenting

at Retraction Watch, PubPeer and the Leonid Schneider blog. The author declares no other relevant conflicts

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[45] http://mcb.asm.org/content/38/3/e00493-17

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