

# Accountability in Research

## Ethics, Integrity and Policy

ISSN: 0898-9621 (Print) 1545-5815 (Online) Journal homepage: [www.tandfonline.com/journals/gacr20](http://www.tandfonline.com/journals/gacr20)

## The research literature is an unsafe workplace

Jennifer A. Byrne & Adrian G. Barnett

To cite this article: Jennifer A. Byrne & Adrian G. Barnett (2026) The research literature is an unsafe workplace, *Accountability in Research*, 33:1, 1-8, DOI: [10.1080/08989621.2024.2428205](https://doi.org/10.1080/08989621.2024.2428205)

To link to this article: <https://doi.org/10.1080/08989621.2024.2428205>



© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 11 Nov 2024.



Submit your article to this journal [↗](#)



Article views: 4748



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 4 View citing articles [↗](#)

## The research literature is an unsafe workplace

Jennifer A. Byrne<sup>a,b</sup> and Adrian G. Barnett<sup>c</sup>

<sup>a</sup>NSW Health Statewide Biobank, NSW Health Pathology, Camperdown, New South Wales, Australia;

<sup>b</sup>School of Medical Sciences, Faculty of Medicine and Health, The University of Sydney, Camperdown, New South Wales, Australia; <sup>c</sup>School of Public Health and Social Work, Queensland University of Technology, Kelvin Grove, Queensland, Australia

### ABSTRACT

Research is conducted in workplaces that can present safety hazards. Where researchers work in laboratories, safety hazards can arise through the need to operate complex equipment that can become unsafe if faulty or broken. The research literature also represents a workplace for millions of scientists and scholars, where publications can be considered as key research equipment. This article compares our current capacity to flag and repair faulty equipment in research laboratories versus the literature. Whereas laboratory researchers can place written notices on faulty and broken equipment to flag problems and the need for repairs, researchers have limited capacity to flag faulty research publications to other users. We argue that our current inability to flag erroneous publications quickly and at scale, combined with the lack of real-world incentives for journals and publishers to direct adequate resources toward post-publication corrections, results in the research literature representing an increasingly unsafe workplace. We describe possible solutions, such as the capacity to transfer signed PubPeer notices describing verifiable errors to relevant publications, and the reactivation of PubMed Commons.

### ARTICLE HISTORY

Received 7 August 2024

Accepted 7 November 2024.

### KEYWORDS

Post-publication corrections; publishers; PubMed commons; PubPeer

For many researchers, carrying out experiments involves working in laboratories. While laboratories can be supportive and rewarding workplaces, they can also present safety hazards (Bond et al. 2020). These hazards can arise in part from operating and handling different types of laboratory equipment (Bond et al. 2020). Even common equipment such as ultra-low temperature freezers, high-speed centrifuges and liquid nitrogen dewars can be dangerous if used incorrectly or carelessly. Laboratory researchers also know only too well that some laboratory equipment can break down or develop critical faults (Retraction 2013). In some cases, faulty and broken laboratory equipment can lose inbuilt safety features, rendering equipment unsafe for users.

**CONTACT** Jennifer A. Byrne  [jennifer.byrne@health.nsw.gov.au](mailto:jennifer.byrne@health.nsw.gov.au)  NSW Health Statewide Biobank, Professor Marie Bashir Centre, 67-73 Missenden Road, Camperdown, New South Wales 2050, Australia

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

In the early 1990's when one of us (JAB) was undertaking laboratory research training, we didn't always pay enough attention to laboratory safety. While research on laboratory safety remains limited (Ménard and Trant 2020), personal experience indicates that safety in Australian research laboratories has improved over the past 30 years. Many Australian research laboratories are now certified or accredited to external standards to ensure quality operations and worker safety. Occupational health and safety is now a standing item on most meeting agendas where this can inform all laboratory operations. Research laboratories feature prominent safety notices (Jenks and Krueger 2017), advising to use personal protective equipment, check room oxygen monitors, and labeling equipment that needs repair. Laboratory researchers are active participants in safety matters and hence empowered to create and maintain safe workplaces for themselves and their colleagues.

Not all researchers work in laboratories, but all researchers share another much larger workplace. This is the research literature. Just as many researchers work every day in their laboratories, many scientists and scholars work every day in the literature to find information to power their research (Figure 1). This information is described in publications, so publications can be considered as key research equipment (Figure 1). Just like equipment in laboratories, research publications are intended to be accessed by different

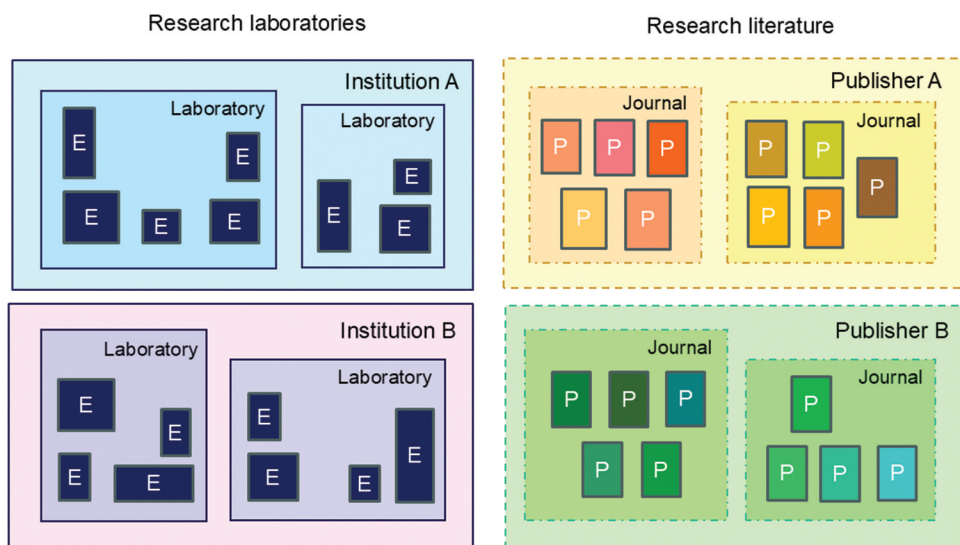


**Figure 1.** Diagram comparing the workplace organization of research laboratories versus the research literature. Research laboratories (left) are hosted by institutions and house equipment (labeled “E”). Researchers typically work in individual laboratories within their institutions, as indicated by the solid lines outlining laboratories and institutions. The research literature (right) includes online publications (labeled “P”) in journals owned by different publishers. Researchers can move more freely within this digital environment, as indicated by the broken lines outlining journals and publishers.

**Table 1.** Examples of approaches to flag faulty or broken publications.

| Approach                                                                                                    | Easy/<br>quick? | Achieves<br>awareness<br>at scale? | Publication<br>repaired as<br>a result? | Potential limitations                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------|-----------------|------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Discuss publication with<br>colleagues                                                                      | Yes             | No                                 | No                                      | Typically limited to small groups                                                                                                               |
| Contact authors                                                                                             | Yes             | No                                 | No                                      | Authors may not respond to reader<br>queries<br>Author contact details can change<br>over time                                                  |
| Post PubPeer notification                                                                                   | Yes             | Yes/No                             | No                                      | Requires awareness/use of PubPeer                                                                                                               |
| Comment directly on<br>publication/preprint                                                                 | Yes             | Yes/No                             | No                                      | Requires awareness of comment<br>functions offered by individual<br>journals/preprint servers                                                   |
| “Bug bounty”/error<br>detection initiatives eg<br><a href="https://error.reviews">https://error.reviews</a> | Yes             | Yes/No                             | No                                      | Requires awareness of error detection<br>initiatives                                                                                            |
| Describe publication to<br>journal and/or publisher                                                         | Yes/<br>No      | Yes/No                             | Yes/No                                  | Some journals do not list contact<br>details for enquiries<br>Publications can be repaired if<br>journals and publishers take further<br>action |
| Publish letter to editor or<br>commentary                                                                   | No              | Yes                                | No                                      | Letters to editor/commentaries may<br>not be linked with queried<br>publications                                                                |

users and reused many times over many years. Laboratory researchers typically use equipment in their own laboratories or in nearby core facilities (Meder et al. 2016) (Figure 1). In contrast, it would be a rare (and unsuccessful) researcher who only accessed their own papers, or papers written by their institutional colleagues. When working in the literature, researchers can instead access millions of publications distributed across many thousands of journals and publishers (Singh et al. 2021). Most of these publications will have been written by teams of unknown authors, who might also work in remote countries and/or in unfamiliar fields.

Differences between laboratories and the literature extend to how these workplaces recognize or flag faulty or broken equipment. Faulty or broken laboratory equipment, such as freezers that no longer maintain the required temperature, can be immediately obvious to users. Once problems are discovered, laboratory researchers can immediately place written notices on faulty or broken equipment, warning that equipment needs repair and should not be used in the meantime. Written notices describe specific problems, associated safety risks, and when faults were reported. Laboratory notices are also signed by their authors and provide contact details for follow-up if required.

In contrast, flagging faulty or broken publications is more challenging. Whereas broken laboratory equipment is usually obvious to most users, some faulty or broken papers require months or even years of follow-up before issues are discovered. Once readers become aware of faulty or broken papers,

they have several options to flag these papers to other users (Table 1). For example, readers can write directly to corresponding authors, yet some authors may be reluctant to engage in discussions about possible errors in their papers (Allison et al. 2016). Some readers engage in post-publication commentary through PubPeer (Barbour and Stell 2020), yet not all researchers know about PubPeer or use the web browser plug-in to link PubPeer notices to publications. Readers can also submit letters or commentaries to journal editors (Allison et al. 2016; Hardwicke et al. 2022; Vorland et al. 2020). However, even where journals agree to publish post-publication commentaries (Hardwicke et al. 2022), restrictions can be imposed on timing, format and length, and time-consuming or burdensome publication processes could discourage readers from pursuing this form of post-publication critique (Allison et al. 2016; Vorland et al. 2020).

There are also differences between how faulty or broken equipment is repaired in laboratories versus the literature. In the case of laboratory equipment, researchers typically organize repairs first, before considering how equipment came to be broken. Equipment repairs are typically undertaken by external companies who are paid for their services and therefore incentivized to work quickly and efficiently. Repairing complex equipment can still be challenging and time-consuming (Linsen, Van Landuyt, and Ectors 2020), but laboratory notices can be easily updated to explain repair timeframes or delays. In this way, laboratory notices continue to isolate the effects of faulty or broken equipment on researchers and their experiments, while repairs are completed.

In contrast, publication repairs can be delayed by journals and publishers first investigating why publications came to be faulty or broken, before undertaking repairs (Allison et al. 2016; Grey et al. 2024; Vorland et al. 2020). There are few meaningful incentives for journals and publishers to repair publications (Barnett and Byrne 2023), which requires journal and publisher time and human resources, without generating direct income. Citations to post-publication notices are also not included in journal impact factor calculations (McVeigh and Mann 2009). The lack of financial incentives to repair publications, combined with performing root cause analyses before repairs, could explain why many journals and publishers can take years to respond to publication repair requests, or fail to respond at all (Byrne et al. 2021; Grey, Avenell, and Bolland 2023). Delays in post-publication corrections, combined with the frequent lack of effective safety notices, can result in research communities being continually exposed to faulty or broken publications for months or years (Byrne et al. 2021; Grey, Avenell, and Bolland 2023).

It could be argued that there are too many differences between laboratories and the literature to make fair comparisons between how these workplaces repair key equipment. However, error correction in the literature compares

poorly with other online workplaces. Many researchers also work in dry laboratories, where simulations and data analyses represent experiments, and software and code serve as research equipment. Here, broken code can be directly flagged online by users and quickly fixed with the release of updated versions (Cadwallader and Hrynaskiewicz 2022). The popular code-sharing site Github has specific features where users can highlight errors or suggest enhancements. Researchers can write code to fix errors, meaning that the original authors only need to accept the change and create an updated version. Code fixes often involve lively discussions between researchers across the world, sparking ideas for other efficiencies and enhancements.

So, what to do? Given the challenges of rising information overload (Abdullaeva, Bromfield, and Sheldon 2022), combined with an overburdened peer review system (Severin and Chataway 2021), we believe that the literature must learn from laboratory approaches to workplace safety. In wet and dry laboratories, researchers can effectively flag faulty or broken equipment that might only be used by a handful of researchers. We need the same capacity to flag faulty or broken papers that can be downloaded and shared by thousands of readers, including those with both the expertise and motivation to flag published errors.

As in laboratories, literature safety notices would need to meet basic requirements. Notices on laboratory equipment serve to facilitate repairs, as opposed to assigning blame. Literature notices could be similarly restricted to describing independently verifiable errors and being signed by named individuals (Byrne and Christopher 2020). Literature notices would also need the capacity to be updated, to describe how problems are being addressed (Byrne and Christopher 2020).

How could this be achieved? In the short term, PubPeer notices could be directly linked to the affected papers (Besançon et al. 2022). This capacity could be restricted to signed PubPeer notices that describe verifiable errors, such as wrongly identified experimental reagents (Byrne and Christopher 2020). PubMed Commons was also tested as a system of placing notices in PubMed (Reardon 2013) but withdrawn due to insufficient use (Dolgin 2018). We believe that PubMed Commons was a resource ahead of its time, discontinued before researchers, journals and publishers became aware of the problem of industrial-scale research fabrication by paper mills (Abalkina 2023; Byrne and Christopher 2020, Else and Van Noorden 2021; COPE and STM 2022). A two-way flow of information between PubPeer (Barbour and Stell 2020) and PubMed Commons notices that are similarly linked with publications (Allison et al. 2016) could provide system resilience and build much-needed awareness of problematic literature across research communities.

While the capacity to flag broken or faulty publications at scale represents a first step to improve literature safety, this capacity alone may not improve the

scale or speed of article corrections. Just as laboratory accreditation can serve to focus attention on worker safety, a system of journal or publisher accreditation could include requirements to meet minimum post-publication correction standards. Minimum standards for post-publication response transparency, timeliness and scale would help to recalibrate the current incentives to publish versus correct, particularly if publications in accredited journals were to be mandated by institutions and funding bodies. Researchers can also influence journal and publisher policies by advocating for the use of broader, more informative journal quality metrics (Wouters et al. 2019), and by choosing the journals that they support as authors, editors, and peer reviewers.

In summary, we need to recognize the literature as a daily workplace for millions of researchers and scholars across all career stages, where every publication can serve as key research equipment (Figure 1). We would not accept research laboratories and institutions slowly filling with broken and unsafe equipment, lacking even basic safety notices, yet this could be happening in some sections of the literature (Byrne et al. 2022; Ponting and Haerty 2022). Based on this comparison, we believe that if some journals were laboratories, they would be shut down as unsafe.

We hope that treating research and scholarly publications as key equipment might help to simplify and speed up how publications are repaired. No researcher should be obliged to work in an unsafe laboratory. Researchers must therefore be empowered to create safe working conditions for themselves in the literature.

## Acknowledgments

JAB thanks the NSW Health Statewide Biobank team for their commitment to laboratory safety. JAB gratefully acknowledges funding from the National Health and Medical Research Council of Australia (NHMRC) for Ideas grant ID APP1184263, and from the University of Sydney. JAB and AGB gratefully acknowledge funding from NHMRC Ideas grant APP2029249. We thank two anonymous reviewers for their constructive comments that helped us to improve the manuscript.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

The work was supported by the National Health and Medical Research Council [APP1184263; APP2029249].

## References

- Abalkina, A. 2023. "Publication and Collaboration Anomalies in Academic Papers Originating from a Paper Mill: Evidence from a Russia-Based Paper Mill." *Learned Publishing* 36 (4): 689–702. <https://doi.org/10.1002/leap.1574>.
- Abdullaeva, M., J. J. Bromfield, and I. M. Sheldon. 2022. "Expansion of Information in Scientific Research Papers." *bioRxiv*. doi:10.1101/2022.05.06.490896.
- Allison, D. B., A. W. Brown, B. J. George, and K. A. Kaiser. 2016. "Reproducibility: A Tragedy of Errors." *Nature* 530 (7588): 27–29. <https://doi.org/10.1038/530027a>.
- Barbour, B., and B. M. Stell. 2020. "PubPeer: Scientific Assessment without Metrics." In *Gaming the Metrics: Misconduct and Manipulation in Academic Research*, edited by M. Biagioli and A. Lippman. Cambridge, MA: MIT Press. doi:10.7551/mitpress/11087.003.0015.
- Barnett, A., and J. Byrne. 2023. "Retract or Be Damned: The "Bystander Effect" is Worsening the Situation." *BMJ* 382. <https://doi.org/10.1136/bmj.p1654>.
- Besançon, L., E. Bik, J. Heathers, and G. Meyerowitz-Katz. 2022. "Correction of Scientific Literature: Too Little, Too Late!" *PLOS Biology* 20 (3): e3001572. <https://doi.org/10.1371/journal.pbio.3001572>.
- Bond, M. R., A. E. Gammie, J. R. Lorsch, and M. Welch. 2020. "Developing a Culture of Safety in Biomedical Research Training." *Molecular Biology of the Cell* 31 (22): 2409–2414. <https://doi.org/10.1091/mbc.E20-03-0167>.
- Byrne, J. A., and J. Christopher. 2020. "Digital Magic, or the Dark Arts of the 21st Century-How Can Journals and Peer Reviewers Detect Manuscripts and Publications from Paper Mills?" *FEBS Letters* 594 (4): 583–589. <https://doi.org/10.1002/1873-3468.13747>.
- Byrne, J. A., Y. Park, R. A. Richardson, P. Pathmendra, M. Sun, and T. Stoeger. 2022. "Protection of the Human Gene Research Literature from Contract Cheating Organizations Known as Research Paper Mills." *Nucleic Acids Research* 50 (21): 12058–12070. <https://doi.org/10.1093/nar/gkac1139>.
- Byrne, J. A., Y. Park, R. A. West, A. Capes-Davis, B. Favier, G. Cabanac, and C. Labbé. 2021. "The Thin Ret (Raction) Line: Biomedical Journal Responses to Incorrect Non-Targeting Nucleotide Sequence Reagents in Human Gene Knockdown Publications." *Scientometrics* 126 (4): 3513–3534. <https://doi.org/10.1007/s11192-021-03871-9>.
- Cadwallader, L., and I. Hrynaskiewicz. 2022. "A Survey of researchers' Code Sharing and Code Reuse Practices, and Assessment of Interactive Notebook Prototypes." *Peer Journal* 10:e13933. <https://doi.org/10.7717/peerj.13933>.
- COPE, and STM. 2022. "Paper Mills - Research Report from COPE & STM - English. 2022." <https://doi.org/10.24318/jtbG8IHL>.
- Dolgin, E. 2018. "PubMed Commons Closes Its Doors to Comments." *Nature*. doi:10.1038/d41586-018-01591-4.
- Else, H., and R. Van Noorden. 2021. "The Fight Against Fake-Paper Factories That Churn Out Sham Science." *Nature* 591 (7851): 516–520. <https://doi.org/10.1038/d41586-021-00733-5>.
- Grey, A., A. Avenell, and M. J. Bolland. 2023. "Ten Years Later: Assessments of the Integrity of Publications from One Research Group with Multiple Retractions." *Accountability in Research* 1–21. <https://doi.org/10.1080/08989621.2023.2295996>.
- Grey, A., A. Avenell, A. A. Klein, J. A. Byrne, P. Wilmshurst, and M. J. Bolland. 2024. "How to Improve Assessments of Publication Integrity." *Nature* 632 (8023): 26–28. <https://doi.org/10.1038/d41586-024-02449-8>.

- Hardwicke, T. E., R. T. Thibault, J. E. Kosie, L. Tzavella, T. Bendixen, S. A. Handcock, V. E. Köneke, and J. P. Ioannidis. 2022. "Post-Publication Critique at Top-Ranked Journals Across Scientific Disciplines: A Cross-Sectional Assessment of Policies and Practice." *Royal Society Open Science* 9 (8): 220139. <https://doi.org/10.1098/rsos.220139>.
- Jenks, H., and J. Krueger. 2017. "Selected Topics on Safety, Equipment Maintenance, and Compliance for the Cytogenetics Laboratory." In *The AGT Cytogenetics Laboratory Manual*, edited by M. S. Arsham, M. J. Barch, and H. J. Lawce, 975–1010. New Jersey, USA: John Wiley & Sons.
- Linsen, L., K. Van Landuyt, and N. Ectors. 2020. "Automated Sample Storage in Biobanking to Enhance Translational Research: The Bumpy Road to Implementation." *Frontiers in Medicine* 6:309. <https://doi.org/10.3389/fmed.2019.00309>.
- McVeigh, M. E., and S. J. Mann. 2009. "The Journal Impact Factor Denominator: Defining Citable (Counted) Items." *JAMA* 302 (10): 1107–1109. <https://doi.org/10.1001/jama.2009.1301>.
- Meder, D., M. Morales, R. Pepperkok, R. Schlapbach, A. Tiran, and G. Van Minnebruggen. 2016. "Institutional Core Facilities: Prerequisite for Breakthroughs in the Life Sciences." *EMBO Reports* 17 (8): 1088–1093. <https://doi.org/10.15252/embr.201642857>.
- Ménard, A. D. A., and J. F. Trant. 2020. "A Review and Critique of Academic Lab Safety Research." *Nature Chemistry* 12 (1): 17–25. <https://doi.org/10.1038/s41557-019-0375-x>.
- Ponting, C. P., and W. Haerty. 2022. "Genome-Wide Analysis of Human Long Noncoding RNAs: A Provocative Review." *Annual Review of Genomics and Human Genetics* 23 (1): 153–172. <https://doi.org/10.1146/annurev-genom-112921-123710>.
- Reardon, S. 2013. "PubMed Opens for Comment." *Nature*. doi:10.1038/nature.2013.14023.
- Retraction. 2013. "Retraction." *Cerebral Cortex* 23 (4): 1002. October 2011. <https://doi.org/10.1093/cercor/bhr183>.
- Severin, A., and J. Chataway. 2021. "Overburdening of Peer Reviewers: A Multi-Stakeholder Perspective on Causes and Effects." *Learned Publishing* 34 (4): 537–546. <https://doi.org/10.1002/leap.1392>.
- Singh, V. K., P. Singh, M. Karmakar, J. Leta, and P. Mayr. 2021. "The Journal Coverage of Web of Science, Scopus and Dimensions: A Comparative Analysis." *Scientometrics* 126 (6): 5113–5142. <https://doi.org/10.1007/s11192-021-03948-5>.
- Vorland, C. J., A. W. Brown, K. Ejima, E. Mayo-Wilson, D. Valdez, and D. B. Allison. 2020. "Toward Fulfilling the Aspirational Goal of Science as Self-Correcting: A Call for Editorial Courage and Diligence for Error Correction." *European Journal of Clinical Investigation* 50 (2): e13190. <https://doi.org/10.1111/eci.13190>.
- Wouters, P., C. R. Sugimoto, V. Larivière, M. E. McVeigh, B. Pulverer, S. de Rijcke, and L. Waltman. 2019. "Rethinking Impact Factors: Better Ways to Judge a Journal." *Nature* 569 (7758): 621–623. <https://doi.org/10.1038/d41586-019-01643-3>.