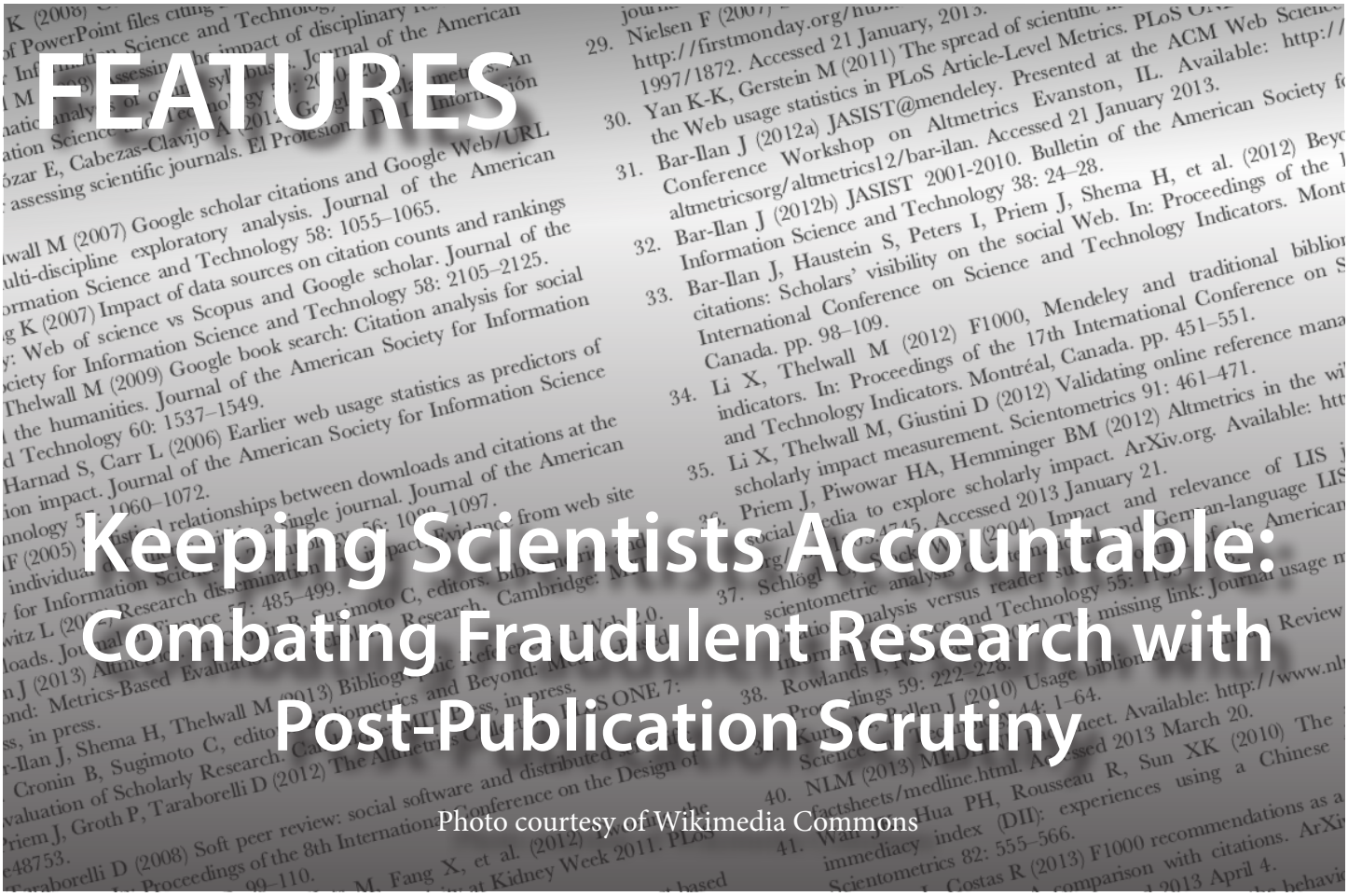

Keeping Scientists Accountable: Combating Fraudulent Research with Post-Publication Scrutiny

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Introduction

In recent years, scientific integrity has become increasingly difficult to maintain. Multiple scandals have shaken public confidence in the scientific process, including within the Harvard community. In 2023, research integrity watchdog Data Colada accused Harvard Business School professor Francesca Gino of fabricating data in several behavioral research papers, leading to her being put on administrative leave and initiating a $25 million lawsuit against Harvard (Hamid & Yuan, 2023; Simonsohn et al., 2023). Additionally, in 2024, Sholto David of For *Better Science* identified widespread scientific misconduct among the leadership of the Dana-Farber Cancer Institute, a cancer treatment and research center affiliated with Harvard Medical School (Mueller, 2024). While extreme, these cases are symptoms of deeper, systemic issues in how research is produced, reviewed, and published.

Scientific publishing operates under enormous pressure. Over 3 million articles in science and engineering were published in 2022, and a 2021 analysis identified over 75,000 unique journals (National Science Board, National Science Foundation, 2023; Singh et al., 2021). This is a jarring difference from the 1.3 million published articles in 23,750 journals in 2006. (Björk et al., 2009). A major factor driving the volume of both research articles and journals is the long-standing “publish or perish” mentality present in science; research output is often a major factor in faculty hiring and promotion decisions, as well as graduate program admissions and post-doctoral research appointments. In a 2010 poll, over two-thirds of researchers claimed that research metrics were used in making hiring, promotion, or tenure appointments (Abbott et al., 2010). As a result, researchers may prioritize generating a high *quantity* of publications rather than focusing on their *quality* (Rawat & Meena, 2014).

The pressure to increase output and the associated rise in publication volume risks pushing fraudulent work through publication channels. The sheer volume of research articles being published is too much for the peer review system to handle. When submitted to a standard journal, a manuscript is initially reviewed by the journal’s editor, after which it is passed on to a team of two to three peer reviewers for additional feedback (Publons, 2018). If all papers were published via this process, at least 6.6 million peer reviews had to be conducted

for the 3.3 million papers published in 2022. Recruiting peer reviewers to fulfill this demand is becoming increasingly difficult, especially considering they are usually full-time researchers themselves (Dance, 2023). Consequently, not all submitted manuscripts receive proper scrutiny, making it easier for misconduct to pass through the filter of peer review. Additionally, because some manuscripts within the scientific literature are contaminated by fraudulent data, the practices built upon them can lead to incorrect conclusions ("10.Q. Scientific Session," 2024). It is critical to identify such articles as they can harm ongoing and future research.

Pipelines for Low-Quality Research

The proliferation of low-quality research is streamlined by various organizations partaking in dubious publishing practices. The high demand for publication has led to the rise of organizations that unethically ease the publication process for profit. Many researchers, to earn promotions and tenure, utilize these methods to quickly increase their citation and publication metrics.

One way for researchers to easily publish papers is through the use of paper mills, which are companies that sell manuscripts using fake data to researchers (Christopher, 2021). These organizations churn out fraudulent and even plagiarized manuscripts for a fee, allowing scientists to pay their way out of doing actual research. Articles produced by paper mills often cite each other, fabricate image data, and utilize nonsensical but convincing figures to seem legitimate. A 2023 analysis found that almost 2% of papers published in 2022 showed signs of being produced by a paper mill, a large difference from an estimated <0.1% of papers published in 2000 (Van Noorden, 2023). In 2023, the former publisher Hindawi retracted over 8,000 articles that were produced by paper mills (Kincaid, 2023).

Some publishers and journals deliberately provide avenues for low-quality research. "Predatory journals" accept almost any paper for a high publication fee, often priced in the thousands of dollars (Beall, 2012). This model facilitates misconduct, allowing researchers to publish several papers with little review. Meanwhile, this model harms honest researchers. Jeffery Beall, the librarian who coined the term "predatory journal," states that "when a researcher's work is published alongside articles that are plagiarized [...] it becomes tainted by association" (Beall, 2012). Cabell's Predatory Reports, an updated database of predatory journals, listed over 15,000 predatory journals in 2021, up from 12,000 in 2019 (*The Source / Mountain to Climb*, 2021).

Post-Publication Peer Review

In response to the limitations of traditional peer review and the rise of predatory journals, post-publication peer review (PPPR) has emerged as a way to evaluate published literature. PPPR allows for ongoing, transparent scrutiny and commentary of research articles, in contrast to the closed-door process of traditional peer review (Hunter, 2012). This process can act as a second layer of quality control in case traditional peer review, or the lack thereof, fails to prevent fraudulent works from being published.

One of the most prominent platforms for PPPR is PubPeer, a site where researchers can publicly comment on others' published research (Townsend, 2013). Any indexed article is available to be commented on, and researchers can comment anonymously if they choose to do so. The platform is often used for identifying flaws in papers and instances of manipulation or fraudulent data. PubPeer has received over 300,000 comments since its founding; 57,000 comments were written in 2024 alone, a drastic increase from the little over 2,100 written in 2013 (Einstein Foundation, 2024). Some publishers and journals, such as *PLOS*, provide their own comment sections for the same purpose (Wakeling et al., 2020).

The benefits of PPPR are significant. These commenting systems can help to identify research issues at any point after publication. In February 2025, a Nobel Prize laureate's article published in 2017 was retracted after PubPeer comments highlighted possible data manipulation (Travis, 2025). Real-time commenting promotes quick responses and corrections, as opposed to the long and obscured process of peer review. Moreover, PubPeer's option for anonymity has protected commenters from retaliation, evidenced by a Michigan court case where a researcher implicated in PubPeer comments attempted to sue the commenters (Servick, 2015). An appeals court ruled that PubPeer did not have to identify the anonymous commenters, successfully preventing repercussions toward them (McCook, 2016). PPPR encourages researchers to partake in ethical practices, since unethical behavior is more readily exposed.

However, PPPR platforms also hold controversies. While PubPeer is anonymous, other comment platforms and journals may not be. As such, colleagues may fear retaliation if they comment on the articles of those they work with or those who hold positions over them (Daungsupawong & Wiwanitkit, 2024). The change in scientific discourse fostered by PPPR has concerned some, as it increasingly drifts away from overall discussion towards scrutiny of minute details (Blatt, 2015). Michael Blatt, editor-in-chief of the journal *Plant Physiology*, states that PPPR comments

often "do no more than flag perceived faults and query the associated content." Additionally, some researchers have made accusations of defamation or cyberstalking from commenters who have criticized their work. The Michigan court case that tested PubPeer's anonymity protections involved a researcher claiming that comments on his articles were defamatory, preventing him from receiving a position at the University of Mississippi (Koziol, 2016). The former Department of Medicine chair and physician-in-chief emeritus at the Brigham and Women's Hospital, Joseph Loscalzo, claims to have received malicious emails and comments via PubPeer (Joelving, 2023).

Despite these challenges, PPPR remains a powerful tool to promote self-correction in science. As flawed work becomes more commonplace with the rising volume of research produced, post-publication scrutiny remains important as a safeguard for research integrity.

Other Means of Scrutiny

Beyond PPPR, a body of independent watchdogs, databases, and individuals helps to keep research accountable. By operating outside of the traditional publishing structure, these sources offer a more agile way to uncover and publicize questionable research practices.

One of the most well-known examples of this is the website *Retraction Watch*. This website, updated daily, disseminates information about retracted or questionable articles and publishes journalistic investigations on scientific integrity (Balyakina, 2022). These articles offer visibility and transparency into the research process, which is often very opaque. This organization also offers an online database of retracted articles, allowing other researchers to monitor scientific integrity at scale ("*Retraction Watch* Database User Guide," 2018). Other websites and blogs offer similar oversight of unethical practices. The website *For Better Science* is another independent scientific integrity watchdog. *For Better Science* identified image manipulation in several papers published by leading researchers at the Dana-Farber Cancer Institute, leading to high-profile retractions and resignations (David, 2024). Another website, *Data Colada*, was critical in identifying the data manipulation present in several behavioral science articles published by Professor Gino of Harvard Business School (Simonsohn et al., 2023).

Alongside institutional efforts, individuals have also helped in maintaining oversight. Scientist Elizabeth Bik has analyzed many articles to identify image manipulation, receiving the Einstein Foundation Award for promoting quality in research (Einstein Foundation, 2024; Vidal & Raoult, 2025). Image manipulation may occur in key data sources, such as Western blots, in an attempt to skew the results and conclusions of an experiment. The retraction of a highly-cited Alzheimer's disease research article highlights this issue (Lesné et al., 2006). This article extended upon the prevailing theory that clumps of proteins known as amyloid-beta are the cause of Alzheimer's disease: fraudulent Western blot images suggested that a certain protein subtype was a major contributor (Piller, 2022). These manipulations were identified by individual watchdogs analyzing the images, and the article's retraction made several news headlines.

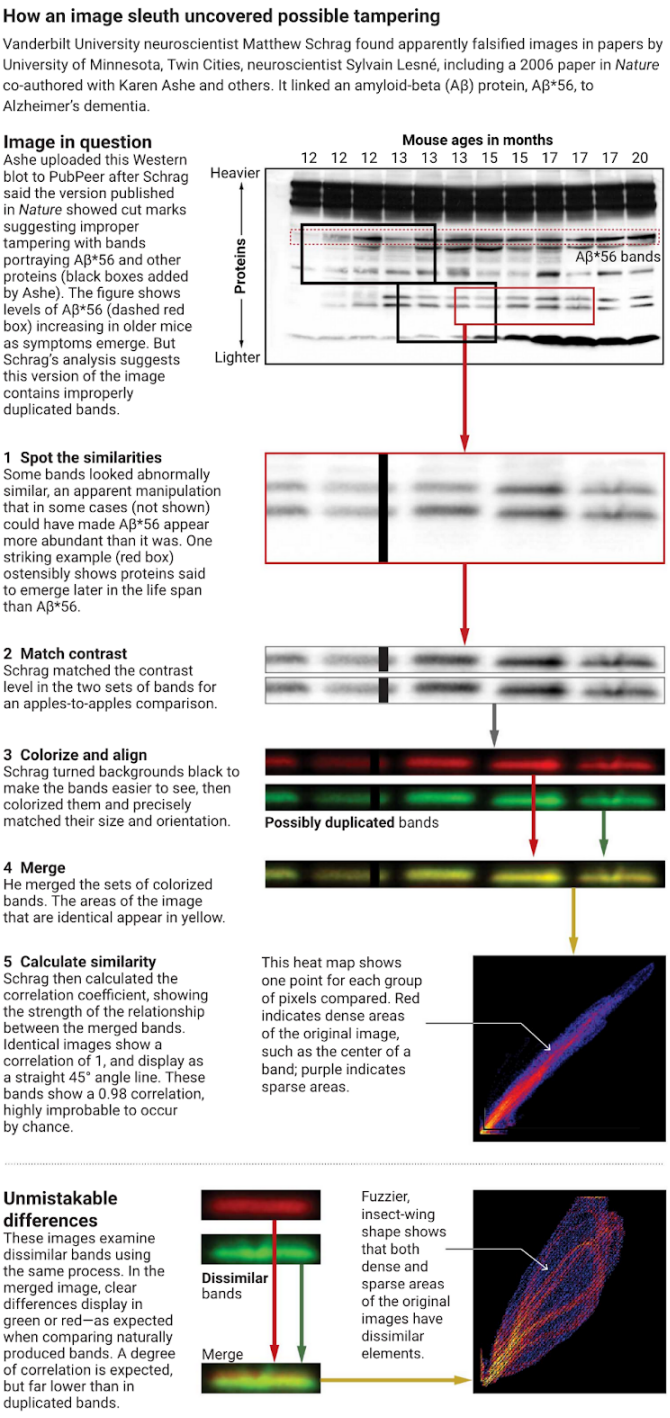

Figure 1. Bands on a key Western blot appeared to be duplicated. Graphic from Bickel/*Science*. Data from S. Lesne et al. *(from Piller, 2022)*

Conclusion

The rise of post-publication analysis via PPPR and independent watchdogs signals a shift to a more transparent and self-correcting culture of science. Unlike traditional peer review, which is often opaque and limited to a small group of reviewers, these platforms encourage open and anonymous critique, normalizing the questioning of published work. This openness also encourages researchers to be more rigorous and make their data accessible, knowing that their work could be subject to public scrutiny.

By raising the standards for scientific rigor and transparency, post-publication review counteracts the risks of fraudulent science created by the "publish or perish" culture. PPPR ensures that quality, not just productivity, drives scientific advancement. In doing so, it safeguards scientific integrity and supports a culture where well-substantiated research is highly valued.

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