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Viewpoint

The future of science publishing

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We asked the editors at *Cortex* to identify potential challenges in the future of scientific publishing and dissemination. The resulting collection of comments highlights several concerns, including the impact of AI, difficulties in recruiting reviewers, calls for responsible data sharing, and general unease about the effects of Open Access.

The initial, commendable principles of Open Access aimed to challenge the dominance and profits of established private publishing houses by making research funded by public money freely accessible. This movement also fostered greater transparency and improved data sharing.

However, some of its consequences have been detrimental. The most significant of these is the introduction of Article Processing Charges. Institutions often do not or cannot cover the full costs of publication, which discourages submissions of observational studies, single case reports, exploratory research, position papers, and commentaries. Previously, researchers from less affluent institutions struggled to access scientific literature behind paywalls, yet they could still contribute to it. Now, while they can read most Open Access content, they lack the funds to pay Article Processing Charges, exacerbating inequity and widening the divide between wealthier (primarily Western) institutions and less wealthy ones, as well as between established and early-career scientists.

Moreover, in a market dominated by pay-to-publish models, who will ensure rigor and quality? Not the publishing companies, which profit from increased volume. Not the researchers, who may be tempted by the allure of easy publication. Not the readers, who, unaware of potential pitfalls, enjoy free access to journals. Researchers, either out of hubris or disinterest, contribute to this decline. They must reclaim the dissemination of their science, advocating for editing and reviewing to be integral to every workload model, and asserting that any association with predatory outlets should negatively impact one's career. We urgently need to consider ways to challenge this publishing model, or our vanity may lead our science down a path of no return.

Sergio Della Sala, Edinburgh, UK

1. Who has time for that? Peer review for early career scientists

Peer review is the backbone of scientific publication. Yet, it can be hard to make time for peer review, especially for early career researchers (ECRs). Over the last few years, I had the honour of serving on the advisory board at *Cortex*, just as I was adjusting to my first faculty position. Between teaching, research, and grant writing, it sometimes seemed impossible to make time to review papers. As peer review is seldom rewarded or incentivised, it often slips to the lowest priority. Moreover, many early career researchers may feel ill-prepared to deal with peer review efficiently, especially if a misplaced criticism could provoke the wrath of a senior figure in the field.

While it may seem that there is little to gain for ECRs, their input is critical for science. They are often the people who are most familiar with cutting-edge methods. They also tend to

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have a better feeling for new and exciting developments, and can provide a fresh perspective beyond ingrained positions in a field. More recent generations of researchers also tend to come from more diverse backgrounds, which can help to reduce some of the biases that still permeate science.

So, what can peer review offer ECRs beyond another task on their endless to-do list? For one, being involved in the peer review process can be highly educational. Being forced to think critically about other researchers' work and seeing how it is perceived by colleagues has a direct translation for one's own work. It is like a boot camp for doing more robust science and communicating it more clearly. Doing peer review can also provide an incentive to deeply engage with work that is slightly outside of one's narrow field and, thereby, gain a new theoretical perspective or get more familiar with emerging methods. Further, peer review can help drive the change that we want to see, e.g., to push for more rigorous methods, more representative samples, or more honest interpretations.

In conclusion, peer review and serving as an associate editor may seem time-consuming and superfluous. Yet, they can be a catalyst for growth as a researcher. Further, the scientific enterprise depends on the contribution from early career researchers for their fresh perspective. Journals like *Cortex*, which involve many ECRs as associate editors, lead the way in fostering these contributions. Hopefully, other journals will follow this example, to the benefit of both young researchers and science as a whole.

Joe Bathelt, Amsterdam, The Netherlands

2. Phantom reviews, uncivil reviews – what can we do?

Internet memes are not renowned for providing a valid basis of criticism, but when a meme spreads and even fosters a Facebook Group (~180K members) called "Reviewer 2 Must be Stopped!", then perhaps something is happening in the world of peer review that should be examined and addressed.

I first became aware of the Reviewer 2 problem (sometimes Reviewer 3 problem) when a co-author sent me an image of the skulls of rich and poor people, men and women, and several others, all identical, followed by the skull of a lower primate, which was labelled, Reviewer 2 [the image is widely available on the Web as "Reviewer 2"].

There are several reasons why the second or third reviewer may be particularly obnoxious. One is that the editors may have written the review themselves (the so-called phantom review) to bolster a decision they have already reached to reject the paper. The phantom review is especially egregious if the first reviewer was positive and the editor needs to find fault with the paper. This is a systemic problem exacerbated by the difficulty of finding competent reviewers in an environment that gives little or no credit for the work involved in being a good citizen in the scientific community. I won't address this source of bad reviews.

Assuming that peer review survives, there are some things to improve the process. First, we should actually teach budding scientists and researchers the business of writing a review. Such a course or seminar would include an explanation of why reviewing is a valuable and expected part of our job as researchers; how many reviews can be expected in a year; how asking authors to cite your papers is acceptable only if the papers are relevant (!); how to organize the review and how to write a review that is helpful to the authors even if it is destined for another journal. Currently, the vast majority of reviewers learned these skills and expectations by reading reviews of their own submissions and possibly being mentored by a senior researcher who wants to further the art and science of good reviewing. It's paradoxical that the training of reviewers should be so random and haphazard. I have yet to see a course at the graduate level on how to conduct peer review, but its neglect in the list of courses is testament to the low status of reviewing. I must admit that it was late in my reviewing career that I learned the rubric for determining the number of reviews that I should do in a year (at least twice for every paper I have co-authored).

Gus Buchtel, Michigan, USA

3. Invasive human and animal brain recordings must be shared

Recent technological advances in data collection within neuroscience have significantly reduced the cost of both central and peripheral brain recordings, while simultaneously enhancing the quality of the recorded signals. As a result, low-budget institutions can now conduct ethically controlled, high-quality, non-invasive experiments comparable to those run by high-budget institutions, thereby expanding and democratizing the dissemination of scientific knowledge.

However, this productive intersection of technology and democratization in science encounters limitations when it comes to invasive neural recordings. Understandably, invasive brain recordings in humans and animals are subject to the strictest ethical and procedural regulations to minimize—or, if necessary, prevent—harm and pain to participants. These stringent requirements necessitate the involvement of a large, multidisciplinary team, particularly from medical fields, and the use of costly equipment. In this area, technological advancements often do not translate into greater accessibility, thus significantly limiting democracy and diversity in accessing data that may hold the greatest scientific potential.

Democracy and diversity in science are not mere formalities—they are essential for scientific progress. When researchers collectively analyze the same data, it allows for crucial integration with AI, public oversight of scientific claims, protection against fraud and, most importantly, the generation of fresh insights that can illuminate longstanding problems. Moreover, wider access to invasive neural data recordings would positively impact the work of ethical committees, allowing them to reject new proposals for invasive studies if sufficiently similar experiments have already been conducted and the data made publicly available.

For these reasons, it is imperative that the scientific community, alongside editors of scientific journals, unite to make public data sharing a requirement for research units worldwide, following an appropriate grace period. Exponentially

increasing re-use and rationalization of invasive neural data collections in humans and animals holds the promise of boosting scientific progress in neuroscience on a global scale.

Alessandro Tavano, Frankfurt, Germany

4. Nurturing scientific innovation: a call to reviewers and editors

Recent concern has been raised over the lack of true innovation in our science, deemed partly due to the difficulty with publishing it. How can we shift our scientific culture to ensure that the publication system welcomes innovative research and increases its uptake in the scientific community?

True innovations and breakthroughs are marked by fundamental changes to how we understand phenomena, and, thus, are usually disruptive. Innovation can challenge deeply seated beliefs. Claims such as that the Earth is round and that the brain, rather than heart, controls thought are not merely embellishing existing theories. Instead, these claims suggest entirely new ways to organise our understanding. While scientific revolutions are necessary for progress, publishing disruptive work faces significant challenges. Timely publication is crucial so that innovative work can be properly considered by the broader community. When innovation is disincentivized, we can expect to see less of it, slowing scientific progress.

The resistance to publishing disruptive science is understandable and likely stems from two intertwined factors. First, there's an emotional component affecting even seemingly objective reviewers. Researchers may become personally connected to theoretical ideas they support and feel threatened if the conclusions on which they built their career turn out to be incorrect. Furthermore, reconceptualization can be unsettling and time consuming. Second, practical considerations come into play, such as our own and our associates' ability to compete for grants, prestigious awards, and promotions. We may feel that such work reduces this ability. Consequently, reviewers may have both emotional and practical conflicts of interest that bias them against innovative work. While editors may spot reviewers with the highest conflict of interest, they cannot reasonably exclude all who would be affected by these factors – perhaps most in the field of research under consideration.

So, what can reviewers and editors do? To promote innovation in science, we must carefully examine our reactions to papers. When feeling negative about a submission, we should question whether our response is determined by its true level of excellence or the extent to which the submission agrees with prior beliefs. Conversely, when feeling positive, it's crucial to ask if this approval is due to the paper's true merit or merely because it confirms existing views. Highly skilled authors can frame papers as innovative when they merely offer benign twists on the status quo. While anodyne studies offer incremental advances, those masquerading as innovation can consume the oxygen needed for truly disruptive work. Our advice is to self-reflect on one's reaction, whether positive or negative, to mitigate bias and nurture genuine innovation. Editors can often distance themselves more than reviewers, but promotion of innovation may require disregarding recommendations for rejection and sending reviews to other scientists for comment.

Recent technological advancements may offer tools to more objectively assess innovation. For example, BrainGPT, a large language model trained on the neuroscience literature, can estimate the likelihood of particular scientific claims better than human experts. Disruptive results, which run contrary to the existing literature, would be deemed unlikely by BrainGPT. This signal could serve as an additional cue for reviewers and editors to reflect on their treatment of potentially innovative work – low scores flagging that we must pay especially close attention. The fact that BrainGPT can anticipate most results by training on the existing literature underscores our point that the scientific literature is highly redundant and that truly disruptive findings are rare.

Finally, it's important to recognize that all ideas, no matter how groundbreaking, will eventually be superseded. This natural progression doesn't imply that the original concepts were poorly conceived or that their authors were incompetent scientists. Most scientists embarked on their careers with open-minded curiosity and would like to think they are excited by innovation, and hence, disruption. We should all nurture that deep motivation in ourselves and in colleagues to better enjoy the scientific process and support innovative work. By embracing this mindset, we can create a scientific culture that values both incremental advances and paradigm shifts. We offer these suggestions as a starting point, hoping to spark a broader conversation on mitigating biases and fostering a more receptive environment for truly innovative research.

Clare Press and Bradley C. Love, London, UK

5. Large language models challenge editorial oversight

Large language models (LLMs) are becoming increasingly prominent in academia, and despite journals' and universities' policies for transparent declaration of usage, they feel like steroids in the gym—many use them, few talk about it. And like steroids, they deliver better results in less time. While academic judgment should focus on scientific content, appearance matters. Well-crafted sentences not only improve understanding but also boost face validity. Suddenly, "the first study conducted on the topic" transforms into "pivotal evidence." This is why a booming industry of English proofreading services—given the dominance of English as the primary scientific language—emerged.

LLMs, by extension, may help level the playing field between eloquent English-fluent scientists and the awkwardly formulating rest of the world, offering them a bridge to present their research without paying for linguistic polishing. But there's another side: LLMs will further accelerate the already explosive growth of scientific literature. This isn't just about the obvious unethical cases of individuals using these models to invent research for career gain or for lobbying purposes; it's about how these tools will speed up the writing process for everyone. More manuscripts will mean more noise created by increased submission of articles with pseudo-knowledge or minuscule advances in knowledge. And this surge in submissions inevitably trickles into the review process. Editors

are more challenged to distinguish scientific information from noise.

LLMs enhance whatever they touch, and by such it is also tempting for a reviewer to save time by generating quick revision recommendations. This is especially true with the number of submissions on the rise. However, LLMs base their evaluation on language, not on scientific content, and typically adopt a positive-friendly tone. Authors who receive these vague, friendly reviews are faced with the dilemma of reporting seriously to pointless comments or reporting the generated review to the editor – with the risk of receiving a delayed, more critical second review.

Publishers like Elsevier are calling on authors and reviewers to disclose their use of LLMs, urging transparency and restricting their application to language refinement rather than content generation. This appeal is likely to be as successful as telling athletes to report the use of performance enhancers. The responsibility to maintain high standards in both manuscript and process quality falls on the editors, who must carefully evaluate submissions and reviewer feedback.

Given that editors often juggle these responsibilities alongside their own research, grant applications, and academic duties, success may require appropriate incentives. One possible solution is performance-based compensation, holding the editors accountable for the quality of their oversight. Other approaches could also be considered. With the increasing influence of LLMs, it is clear that the role of editors must evolve.

Ilona Croy, Jena, Germany

6. Will the legendary Sergio Della Sala be back?

Weirdly we in *Cortex* are busy finding ways of the understanding how the brain works and at the same time using those same brains to process and understand what we have understood; this cycle, identified by Einstein as so mysterious, continues. We have at our disposal a digital and information processing revolution yet at heart we still rely on the same inputs and processing for epistemology. We still obsess with structure, grammar, punctuation and spelling to the nth degree and the written word glues everything together, with pictorial illustration using the same inputs. Yes, we have digitised text, image and sound, but the old epistemological skills are still required. Years of training the brain to the required standard produces eagle eyed editors such as the now legendary Sergio Della Sala, aided by the ubiquitous Cheryl Phillips. But are things about to change with artificial intelligence first making things potentially more complex and even more mysterious? Will we look back in the next century and contemplate the early stages of the information revolution in which historical scientific epistemology kept going, only doing things more efficiently? Will it be a paradigm change that occurred in about 2025, when a multimodal body of interactive knowledge started to emerge, blurring the boundaries between journals and disciplines, ceding control to artificial intelligence? And yet, will the limitation of our brain processing and the need to for human consciousness to make sense of it all ultimately put a break on this process as the old and then the newly valued old epistemology returns?

Robin Morris, London, UK

7. The importance of balancing accessibility, cost, and quality

As scientists we rely on publishing to share our research. We consider publishing in journals of our domain(s) a primary outlet for scientific dissemination of research advances. However, the landscape of scientific publishing faces several challenges even considering open and accessible systems and digital platforms to share data.

First, a major limitation of scientific publishing is an often rather lengthy peer-review process. Excellent science depends on rigorous and differentiated input from scientific peers and experts. However, time is limited, and many reviewers cannot spend the time anymore that is needed for critical and detailed feedback. This can lead to either superficial reviews or significant delays and might hinder how quickly research is published. Given that most scientific domains move faster and faster, this is a problem. While preprint servers circumvent some of these delays as they give researchers the opportunity to share their research before peer review, they come with their own pitfalls as presented results might not yet be fully verified.

Second, another and quite critical limiting aspect of scientific publishing is the rising costs related to it. How can we promote open access if costs for science dissemination skyrocket and often seem to be linked to the impact factor of a specific journal rather than publishing costs per se? Unless academic or research institutions have specific agreements with publishers, it is almost impossible for individual researchers to keep up with open access costs through individual funding. Worse, these costs severely limit the contributions of early career and underfunded scientists or those from developing countries to promote their scientific insights and visibility in the science community. If publishing open access encounters the same limitations as subscription-based access to scientific knowledge, we have not gained much ground in making scientific insight accessible.

Third, and likely because of increased publishing costs, the number of predatory journals is on the rise. They truly threaten the integrity of scientific publishing by offering free publications, often without a peer review or editorial oversight. If these publications continue to flood the market, it will become increasingly difficult to distinguish rigorously reviewed and low-quality scientific output. We are therefore in need of clear regulations and transparency of the publication process.

Despite some of these challenges, scientific publishing also has developed positively.

Digital platforms make sharing research faster and easier and facilitate collaborations worldwide. Interdisciplinary research particularly has benefitted from these platforms, as scientists from different fields can more easily access and build on each other's work.

Ultimately, to improve scientific publishing, it is important to balance accessibility, cost, and quality. Making peer-reviewing more transparent, offering affordable open-access

options, and controlling predatory journals are essential steps to achieve such a balance. Some of these considerations could support sharing scientific research widely and speeding up the dissemination of scientific discoveries.

Sonja A. Kotz, Maastricht, The Netherlands

8. The market philosophy is hindering scientific publication

After the Second World War, the British Labour government took inspiration from William Beveridge and J.M. Keynes, founded the National Health Service, implemented the 1944 Education Act, and nationalised public utilities. Subsequent Conservative governments fostered the creation of 'new' universities with high academic aspirations, and preserved free tuition fees and student maintenance grants. Between 1945 and 1979, inequalities were reduced, incrementally slowly, but things were at least heading in the right direction.

When I first visited U.S. hospitals in the early 1980s, I was astounded to see rows of gleaming offices with doorplates indicating the Chief Executive, Chief Operating Officer, Chief Finance Director, Head Marketing Manager, Contracts' Director, and many others. "Who are all these people?" I asked myself, "We don't have them in the NHS." At that time, your GP could refer you to any specialist in the country, which fostered the development of unique expertise and research in novel or rare conditions. Likewise, UK universities seemed far less trammelled by financial arrangements and bureaucracy than were their U.S. counterparts. Grant applications were so much simpler, and Britain did disproportionately well in health, education, and research.

All that changed in the 1980s. The market philosophy ruled all. An 'internal market' was introduced into the NHS, the vision of a prominent supermarket salesman. Tuition fees eventually replaced grant funding in tertiary education, currently reported to be £59,000 for overseas' students at Oxford (see *The Guardian*, 21/09/2024). Seldom discussed, however, is the huge cost of 'running the market', employing high-salaried executives to operate the system, monitor the finances, 'market' the 'product', and fix the contracts. Inflexibility is in-built. NHS referrals are now constrained to local (sometimes inexpert) 'providers'. 'Contracting out' (including to management consultants) absolves management of responsibility, destroys long-serving loyalty to the team, and ultimately drains the system of resources.

What has this to do with scientific publication? We are now moving into a world where publication is by payment, and your financial assets, or your institution's wealth, may soon determine whether and where your paper will be published. Reviewer comments are at risk of being relegated to a secondary (face-saving?) contribution, despite their valuable role in improving most articles and eliminating many duds. Sergio is absolutely right to protest against these developments. His suggestion that universities should take over the role of scientific publication is a good one, but can one really see university heads, many of whom enjoy the salaries and adornments of international business people, embracing such an opportunity? The prospect is bleak indeed.

Michael D. Kopelman, London, UK

9. Breaking the paywalls: a bottom-up approach for transparent science publishing

The open science approach, introduced to improve replicability, reliability and easy access to scientific findings, has evolved troublingly within the publishing sector. While the intent was to democratise research, the rise of "pay-to-publish" models has twisted this goal. These models impose significant article processing charges (APCs) that authors or their institutions must cover, raising ethical concerns about the commodification of scientific knowledge. This model fosters an inequitable environment where wealthier researchers can publish more efficiently while those with limited funding struggle to disseminate their findings.

Equally concerning is that many established publishing companies, including predatory journals, prioritise quantity and profit over scientific rigour. This leads to superficial quality control, undermining scientific progress, which should focus on discovery and validation. The exponential growth of publications is saturating any field of knowledge, leaving many papers with little visibility or impact. This makes it increasingly difficult for researchers to stay informed about the latest, empirically sound advancements, fragmenting academic discourse.

The question, then, is how to fix this broken system. One proposed solution is to return the publishing process to university presses. However, this approach risks creating an academic hierarchy where prestigious institutions dominate, reinforcing existing cliques that lobby for control over scientific dissemination. An alternative is to consider a bottom-up, community-driven model for scholarly publishing inspired by platforms like Wikipedia and GitHub. In such a model, research articles, data, and reviews would be freely accessible, with the scientific community collaboratively managing the process. Peer reviews would be transparent, with reviewers' identities and comments made public, fostering accountability and constructive feedback. Additionally, a continuous post-publication review process, similar to open-source development, would allow for ongoing improvements and updates to research. This could create a more dynamic, accurate representation of scientific knowledge.

Such a system could reduce the influence of traditional gatekeepers, such as journals and publishing companies, allowing merit to be determined by community engagement and contribution rather than metrics like impact factors or the ability to pay APCs. However, this approach is not without challenges. One key issue is evaluating the expertise of reviewers—who watches the watchers? Ideally, continuous scientific dialogue would naturally filter out less competent reviewers, as seen in other folksonomy systems. Another challenge is encouraging researchers to actively participate in reviewing others' work. This is already a problem in the current system, but it could be addressed by requiring that authors who publish also review the work of others, promoting a "give and take" culture.

A final concern is ensuring the visibility of research in such an open system. Without traditional gatekeepers, how can impactful work be recognised? Ideally, with all research openly available, the community would assess the quality and

importance of studies independently, without relying on artificial metrics like journal rankings or impact factors.

In conclusion, while the current publishing landscape faces significant issues—such as the rise of pay-to-publish models and a flood of low-impact papers—it is also a time of opportunity. A shift towards a more open, collaborative, and community-driven system could align academic publishing with the principles of accessibility and inclusivity, fostering genuine scientific progress.

Moreno I. Coco, Rome, Italy

10. Disseminating science in a time of proliferating journals

As an Associate Editor for *Cortex* for nearly a decade, I saw my role as part of a team whose goal is to ensure that the process of scientific dissemination meets the highest standards of rigor and research reliability. That team includes all the reviewers and editorial staff who work tirelessly to ensure that research published in *Cortex* does not include erroneous or inaccurate results. Everybody involved in the process is diligent, thorough, and I am confident that we achieve the goal of ensuring accuracy in the research that gets published.

However, when I am in my other role of teaching university undergraduates research methodology, I encounter a problem instructing my students how to carry out their background research. The students quickly learn how to run an online search for published research, but they have no idea how to evaluate whether the publication outlet is one that rigorously enforces the high standards of accuracy that guide our peer review process at *Cortex*. The problem is worsening due to an increasing proliferation of journals with reasonable sounding titles that may be prioritizing publication fees from authors over scientific rigor.

Experienced, well-trained scientists read the literature knowing the journals, the high-reputation publishing companies and often are familiar with the authors and the evolution of the theoretical ideas across publications. We can hope our students learn from us, but outside our universities, it appears that the populace is increasingly relying on scientifically credentialed influencers driving attention to some research findings. These influencers may claim to understand science but may also have alternate motivations.

Unfortunately, incentives to bring attention to scientific content, to put out more published work more quickly are not well-aligned with dissemination of careful, rigorous research. This creates a real risk of a race to the bottom as competition between existing and emerging publication outlets creates pressures inconsistent with thorough peer review.

What this problem seems to require is organization among scientists to help identify or even certify reliable publication outlets that adhere to rigorous review standards. Much of the current push to increase reliability and rigor in science puts certification of procedures in the hands of the publishing outlets, but no current oversight exists on whether journals apply these accurately. Instead, we rely on indirect measures of journal quality such as impact factor or inclusion in standard indexing systems, which may not always reflect accuracy of published content. It is not immediately obvious where the responsibility for certifying journal quality should occur, but national or international organizations for supporting scientific research would be a natural place to start. It would be necessary to establish certification procedures related to rigorous peer-review and an oversight body that verifies effective application. New journals aimed at evolving research areas could be assessed within this framework to identify those with a commitment to reliable, accurate scientific publication.

Advocating for additional oversight is often an unpopular position, but the potential for journal proliferation to undercut accuracy and effective dissemination of science highlights how rigor cannot be solely enforced at the journal level. Broader collaboration across the scientific community to establish and enforce standards across publications will be necessary to protect the integrity of the scientific publishing process.

Paul Reber, Illinois, USA

11. The impact of social media fragmentation on science communication

Many institutions have recently admitted to grappling with a social media identity crisis driven by algorithm changes and shifting user behaviour. This raises a critical question: are we still on the right path? A recent survey by the European Research Council revealed that the exodus from the Twitterverse has left researchers dispersed across multiple platforms—13% moving to Threads, 18% to Mastodon, 29% to Bluesky, and 40% scattered across various other platforms. A *Nature* survey reported a similar pattern last year (Fig. 1). This fragmentation is more than a mere inconvenience; it fractures scientific discourse, dilutes engagement, and makes it increasingly difficult to unify and reach our intended audiences, thereby undermining the effectiveness of science communication at a time when it is most crucial. This scientific dispersion across multiple platforms creates information silos, which can be advantageous for right-wing political parties as it weakens the unified dissemination of evidence-based research, making it easier for misinformation and alternative narratives to spread unchecked.

The migration from Twitter/X has brought widespread uncertainty. Many scholars are concerned that the evolving social media landscape may undo Twitter's progress in promoting diversity, equity, and inclusion within academia. Twitter had become a critical platform for giving underrepresented voices visibility and fostering open dialogue on equity in the academic space. As researchers scatter across various platforms, there is a risk that these critical gains may be lost.

When we at *Cortex* first embarked on our social media journey, our goal was straightforward: to enhance the visibility and accessibility of research, diversify scientific conversations, and form an inclusive space for scientific discussion and debate. Social media transformed collaboration, making it easier for researchers to connect directly with their audiences through dynamic exchanges such as retweets, comments, and shared threads. Additionally, these platforms provided early-career researchers with opportunities for

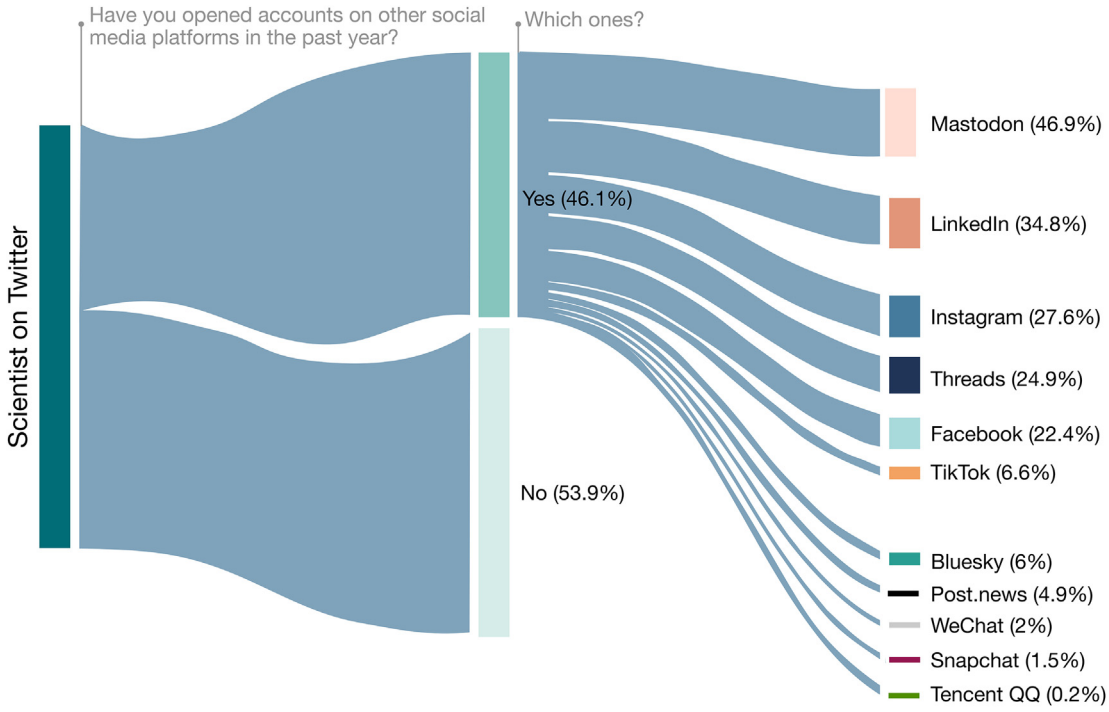

Fig. 1 – Migration of Scientists from Twitter/X to Other Social Media Platforms by August 2023. This figure shows the percentage of scientists who opened new accounts on various platforms, highlighting the fragmentation of the scientific conversation across multiple outlets. As scientists spread out to platforms like Mastodon, LinkedIn, Instagram, and Threads, this dispersion risks diluting the central scientific dialogue and public debate. The figure is a reworking from data published in *Nature* based on a survey of the scientific community (Myriam Vidal Valero. Thousands of scientists are cutting back on Twitter, seeding angst and uncertainty. *Nature*, 2023).

visibility that traditional channels, often dominated by senior voices, could not offer.

The benefits were clear. *Cortex*'s posts regularly reached up to 7,000 impressions—far exceeding the journal's typical readership, demonstrating social media's ability to amplify scientific reach. However, new challenges have emerged as platforms shift. Questions remain about whether sharing research on social media boosts citation rates and the broader social impact of disseminating knowledge. Recent changes, like putting analytics behind paywalls, have further limited our ability to track engagement.

In an era where effective scientific communication is paramount, these shifts in platform dynamics force us to rethink our strategies. We must explore new avenues to maintain professional and impactful communication. The stakes are high: successful science communication not only amplifies academic visibility but also preserves the integrity and relevance of research itself. In a time of fragmented discourse and rising misinformation, we commit to being a unified voice for science, engaging across platforms to ensure that evidence-based research reaches the public, policy-makers, and educators—wherever they are. Science must lead the conversation, not follow it.

Stephanie J Forkel, Nijmegen, The Netherlands

12. Science dissemination in times of social media

I believe most editorial board members with sufficient time-on-job feel that their – typically voluntary – roles have become more challenging over the past 20 years: Decreasing basic funding for science, together with increasing pressure to publish to achieve a position to apply for competitive research funds may have led researchers to prioritize towards publishing their own work (and attracting attention to it), and away from serving the scientific community as reviewers. Finding competent and reliable reviewers is an ever-increasing challenge to the job of most editors. However, I here wish to focus on the enhanced (real or imagined) pressure of authors to direct more attention to their own work, and accordingly to use multiple channels beyond traditional journal paper publications.

Today, communicating science via social media has become natural for many researchers, and discussing research in social media or internet communities sometimes appears to complement or even replace scientific discussion in peer-reviewed journals. While this undoubtedly can have some positive effects, a real danger is that it may promote

speed in scientific discussion at the expense of accuracy and careful deliberation. At worst, this can have extremely adverse consequences for authors, and even for scientific editors when they become the target of critical discussions in social media or internet channels. The speed of such discussions alone typically stands in stark contrast to that of careful scientific investigation, critical discussion, and deliberation of the kind that rightly characterizes the justification of important new scientific conclusions, let alone their transfer into application.

Twitter (now X) was launched in 2006, and while not nearly the biggest social media platform today, X remains a prevalent platform for science communication via social media. Given its vast societal relevance, research on how information (and disinformation) is spread via social media and how it affects the brain and behavior of platform users is becoming ever more important. Unfortunately, Elon Musk's takeover of the platform triggered several policy changes, with the most serious one being that researcher access to platform data was effectively cut off. Nevertheless, our social media research has already shown that (negative) emotions are highly attention-grabbing, and that measures to reduce the speed of communication over social media benefits accuracy, and ultimately the validity of our conclusions. As a scientific community in a world of accelerating change, we should be careful to foster the quality not only of science, but also of our critical and careful discussion of scientific findings. Basically, this takes time.

Stefan R. Schweinberger, Jena, Germany