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Editorial

Preserving Rigour in Modern Science: Challenges and the Path Ahead in the Age of AI

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Today's scientific landscape is fast-paced, highly competitive, and increasingly demanding. Researchers are expected to balance teaching, supervision, grant writing, publications, and administrative responsibilities while staying current in their fields. Amidst these pressures, early-career researchers, students, and junior academics in particular, carry out much of the groundwork in research, including study design, data collection, laboratory evaluations, analysis, and drafting. Their work forms the foundation of new scientific knowledge. However, this work requires critical review and guidance by senior academics to ensure accuracy, robustness, and meaningful contribution.

In many cases, overcommitted senior researchers may not always be able to provide the in-depth mentorship necessary for rigorous academic development. With numerous competing priorities, the internal review process often becomes rushed or superficial. Consequently, manuscripts may reach journals without adequate refinement. The next layer of evaluation, peer review, is similarly strained by increasing demands. Journals rely heavily on unpaid, voluntary reviewers who themselves face similar constraints. As a result, peer reviews are often delayed, brief, or inconsistent in quality, undermining the reliability of what is intended to be a key quality assurance step.

Editorial teams, which deal with large submission volumes, typically rely on reviewer feedback when making decisions. When that feedback lacks depth, editorial judgment may also be affected. This has led to increasing concerns about the robustness of the scientific process, even a decade ago [1]. Even high-impact journals may publish studies that are poorly interpreted or insufficiently validated. With the mushrooming of open-access journals that follow rapid peer-review policies, the situation worsens. In fields such as medicine, environmental science, and public health, such publications can have real-world implications, contributing to misinformation, policy errors, and clinical misguidance.

To address these challenges, the use of Artificial Intelligence (AI) has gained attention as a potential support mechanism in the publication process. AI tools already assist with tasks such as grammar checking and plagiarism detection. More advanced tools can screen for data inconsistencies, detect image manipulation, assess methodological soundness, and evaluate textual coherence. These capabilities can support researchers by offering early feedback, reviewers by helping prioritise critical content, and editors by streamlining manuscript triage and quality checks.

However, AI must be used judiciously. While it can assist with efficiency and standardisation, such as in specific tasks of reference checking and statistical rigour, it still cannot replace the insight and contextual understanding provided by experienced human reviewers. Still, the scientific world is trying to learn how to apply AI to peer review responsibly [2]. Any integration of AI should be transparent, ethically guided, and validated through careful inspection of the user. Rather than acting as a substitute, AI should be seen as an adjunct, supporting quality assurance without compromising scientific integrity.

Beyond technological solutions, structural reform is essential [3]. Institutions must re-evaluate incentive systems that emphasise quantity over quality. Mentorship and internal peer review should be recognised and resourced. Journals, in turn, should improve support for reviewers and editorial processes, potentially through training, recognition, or compensation. Scientific publishing must shift toward a

model that values rigour and clarity over speed or volume. A balanced approach, combining institutional reform with AI-assisted tools, can help sustain the quality of research outputs and safeguard the credibility of science.

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