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The unseen scaffolding of science – Why review articles are the bedrock of progress?

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Abstract

Scientific review articles are often overlooked as simple summaries. This view redefines them as essential frameworks for progress, the necessary structures that turn scattered data and findings into shared knowledge. By combining information, encouraging open discussion, and providing guidance for future research, a well-crafted review does not just depict a field; it actively influences and guides its direction.

Keywords: Review articles, Knowledge.

> *If I have seen further, it is by standing on the shoulders of giants.*
>
> Sir Isaac Newton

1. Journey from data-to-wisdom

In the broad landscape of scientific discovery, where original research papers serve as the critical building blocks, the review article acts as a vital framework and plan. It is the combining force that turns a growing collection of knowledge into a clear, stable, and forward-looking structure (Figure 1). Although the excitement of a breakthrough moment comes from original research, deep understanding of what that moment signifies usually develops in the careful, integrative process of the review. This perspective argues that writing a strong scientific review is not a minor academic task but a key act of scholarly leadership. It is a shared duty that shapes fields, educates future generations, and guides the overall direction of human inquiry (Figure 1).

Science in the 21st century faces a challenge of abundance. The amount of published research is increasing rapidly, with millions of papers added each year in various fields (Fortunato et al., 2018). Amid this flood of information, there is a risk of fragmentation, redundancy, and collective societal memory loss. The primary research article offers a deep but narrow perspective. It addresses a specific question but rarely places its findings within the broader scope of knowledge. This is where the review article performs its first and most crucial service – "synthesis". This process involves identifying patterns across many studies, separating solid consensus from outlier results, and weaving different threads into a cohesive story. Philosopher of science Thomas Kuhn, in his groundbreaking work "The Structure of Scientific Revolutions", discussed the role of shared frameworks in routine scientific practice (Kuhn, 1997). Review articles are living documents that define, refine, and sometimes challenge these frameworks. They guide the scientific community from raw data to understood relationships and towards informed judgments about future directions (Ziman, 1970). Without this synthesizing layer, scientific progress seems incomplete.

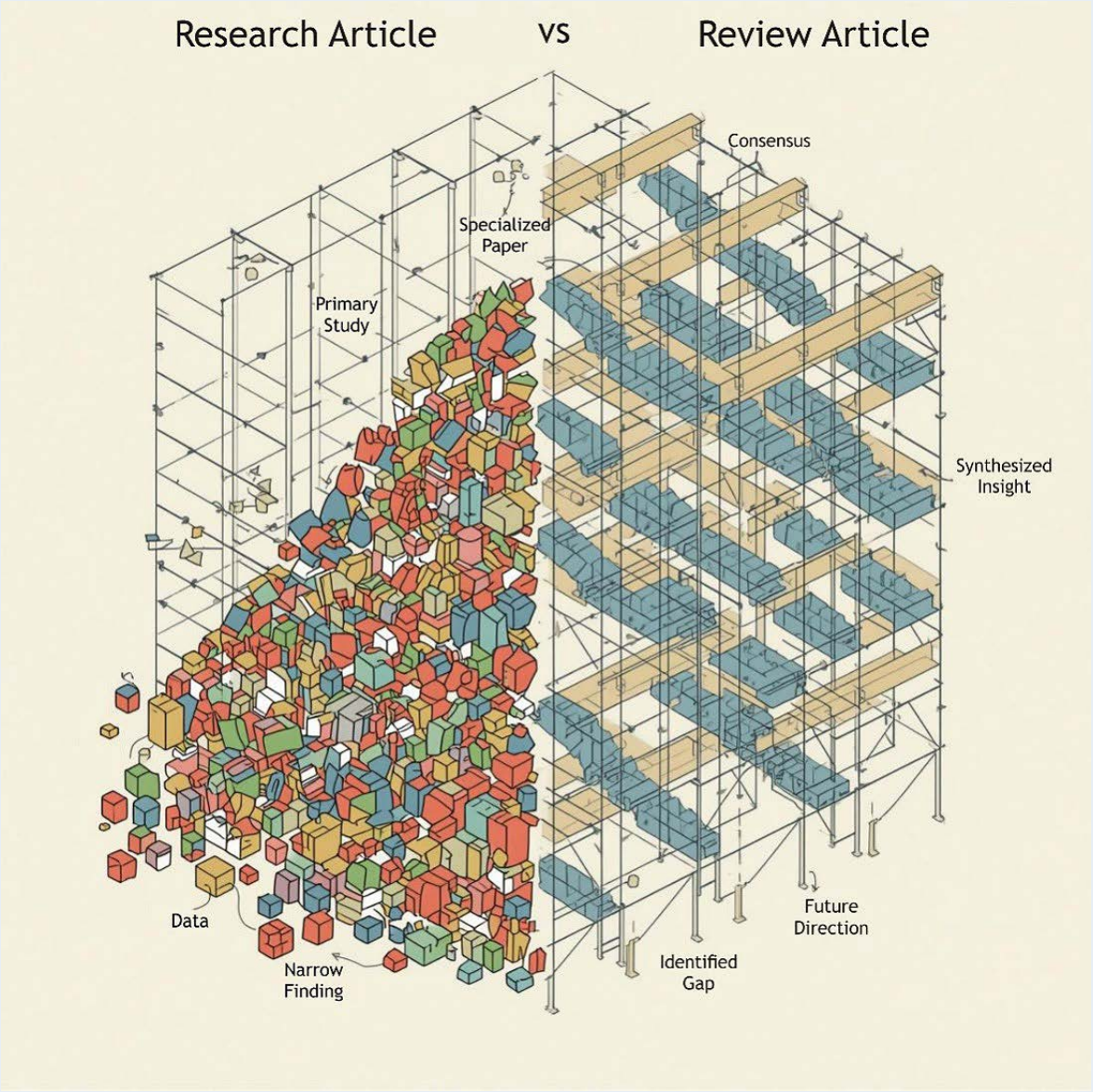

Figure 1. *The synthesizing role of the review article. Primary research article (left) generates vital but fragmented knowledge. The review article (right) acts as intellectual scaffolding, organizing, connecting, and structuring these pieces into a coherent, navigable, and extensible edifice of understanding, from which future progress can be launched.*

2. Cultivating community

Beyond knowledge creation, review articles play an important social role in the scientific community. First, they serve as equalisers and educators. For early-career researchers, students, or experts exploring a new field, a well-structured review provides an accessible entry point. It lowers entry barriers by offering historical context, foundational concepts, and ongoing debates essential for becoming informed participants. This process democratizes access to specialized knowledge and promotes a more inclusive research environment. Second, reviews support "citation justice and diversity." A thorough review can address citation biases – the habit of frequently citing well-known figures from well-funded institutions while neglecting innovative work from smaller labs, early-career researchers, or underrepresented areas. By exploring the entire range of literature, a careful and unbiased review author can highlight significant yet overlooked contributions. This inclusive synthesis, as noted in initiatives like the "citation diversity statement", strengthens the integrity of the field by ensuring its narrative is grounded in a representative foundation rather than a biased selection (Zurn et al., 2020).

3. The strategic compass and hallmarks of excellence

The most influential reviews aren't just backward-looking; they also look ahead. A strong review goes beyond just listing past achievements. It conducts a thorough analysis of gaps and points the way forward. By comparing and contrasting methods, results, and theoretical frameworks, it uncovers contradictions, methodological challenges, and untapped areas. It asks: Where do findings align, and where do they conflict? What assumptions lack testing? Which connections between fundamental discovery and practical solutions (the "translational gaps") are most urgent? This evaluation offers a strategic plan for the entire field. Funding agencies use it to find key areas of interest. Research leaders rely on it to create innovative projects. Collaborative groups use it to identify compatible partners. In practical fields like bioengineering, medicine, or climate science, this role is essential. A review that clearly outlines steps from research to real-world applications accelerates innovation by minimizing wasted efforts on redundant questions and highlighting the most promising paths ahead.

Given their importance, what defines excellence in writing reviews? It goes beyond simple compilation. Let me explain it logically:

1) An excellent review has a clear main argument. It isn't just a list of sources but a compelling story with a central thesis – such as "The convergence of AI and

CRISPR screening is shifting drug discovery from a target-based to a systems-based approach" (Dara et al., 2024), or "Geodynamic complexity of the Indo-Burmese Arc region" (Panda and Kundu, 2022) or "How brittle detachments form and evolve through space and time" (Zuccari et al., 2024). This narrative path leads the reader through the evidence to a well-supported conclusion.

2) It must evaluate evidence, not just document it. This means discussing null results, failed replications, and contentious studies with the same intellectual rigor as major breakthroughs (Devor et al., 2024). Pointing out what didn't work can often provide more scientific value than listing successes, as it helps avoid dead ends and tackles the issue of the reliability of published findings (Ioannidis, 2019).
3) Novel insights often emerge at the intersections between disciplines. A forward-thinking review actively seeks connections, showing how a technique from physics revolutionizes biology or how an idea from computer science reshapes chemistry problems. This synthesis encourages the exchange of ideas that fosters true innovation.
4) Confusion impedes progress. Writing clearly, avoiding unnecessary jargon, and explaining concepts with relatable analogies and original diagrams are not just stylistic choices; they are commitments to sharing knowledge. An accessible review broadens its impact and teaches more effectively.
5) The conclusion should look ahead. It must suggest specific, testable hypotheses and identify concrete goals for the next 5-10 years. This final section transforms the review from a historical account into a call to action, inviting the community to build on the foundation it has established.

4. Concluding remarks

In a time of information overload and increasing specialisation, the role of the review article and its author is more important than ever. Writing a useful review is an act of scholarly responsibility. It demands humility to fairly represent a field, courage to critique it honestly, and insight to guide it effectively (Figure 1). It is a time-consuming, challenging task that lacks the immediate glory of a discovery, yet it increases the value of all prior findings. Therefore, the academic community must recognise and appropriately reward this effort. Institutions, including administrations should place value on authoritative reviews alongside influential primary research in tenure and promotion decisions. Funding agencies should specifically allocate resources for comprehensive, critical scholarship. As stressed in broader discussions about research integrity, maintaining a strong ecosystem of knowledge synthesis

is essential for the health of science (National Academies of Sciences, Engineering, and Medicine, 2017).

As we continue to face the challenges of the 21st century – from pandemics to climate change to the ethics of AI – our ability to piece together what we know and map a clear path to what we need to know may be our greatest intellectual asset. Therefore, crafting high-quality review articles is how we sharpen that asset, ensuring that the scientific endeavour remains productive, insightful, inclusive, and constantly focused on the future.

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References

Dara M., Dianatpour M., Azarpira N., and Omidifar N. (2024). Convergence of CRISPR and artificial intelligence: A paradigm shift in biotechnology. Human Gene, 41, 201297. https://doi.org/10.1016/j.humgen.2024.201297.

Devor A., Abdalmalak A., Akkin T., Aponte Y., Augustine G.J., et al., (2024). On the Power of Constructive Criticism. Neurophotonics, 11(4), 040101. https://doi.org/10.1117/1.NPh.11.4.040101.

Fortunato S., Bergstrom C.T., Börner K., Evans J.A., Helbing D., et al., (2018). Science of science. Science, 359(6379). https://doi.org/10.1126/science.aao0185.

Ioannidis J.P.A., (2005). Why Most Published Research Findings Are False. PLoS Medicine, 2(8). https://doi.org/10.1371/journal.pmed.0020124.

Kuhn T.S., (1997). The Structure of Scientific Revolutions. University of Chicago press, Chicago.

National Academies of Sciences, Engineering, and Medicine, (2017). Fostering Integrity in Research. The National Academies Press, Washington, DC, https://www.nationalacademies.org/projects/PGA-DSC%20B-09-02/publication/21896 (accessed 3 March 2026).

Panda D., and Kundu B., (2022). Geodynamic complexity of the Indo-Burmese Arc region and its interaction with Northeast Himalaya. Earth-Science Reviews, 226, 103959. https://doi.org/10.1016/j.earscirev.2022.103959.

Ziman J., (2001). Real Science: What It Is, and What It Means. Public Understanding of Science, 10(1). https://doi.org/10.1088/0963-6625/10/1/701.

Zuccari C., Mazzarini F., Tavarnelli E., Viola G., Aldega L., et al. (2024). How brittle detachments form and evolve through space and time. Earth and Planetary Science Letters, 648, 119108. http://doi.org/10.1016/j.epsl.2024.119108.

Zurn P., Bassett D.S., and Rust N.C., (2020). The Citation Diversity Statement: A Practice of Transparency, A Way of Life. Trends in Cognitive Sciences, 24(9), 669-672. https://doi.org/10.1016/j.tics.2020.06.009.

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