

Writing is thinking



On the value of human-generated scientific writing in the age of large-language models.

Writing scientific articles is an integral part of the scientific method and common practice to communicate research findings. However, writing is not only about reporting results; it also provides a tool to uncover new thoughts and ideas. Writing compels us to think – not in the chaotic, non-linear way our minds typically wander, but in a structured, intentional manner. By writing it down, we can sort years of research, data and analysis into an actual story, thereby identifying our main message and the influence of our work. This is not merely a philosophical observation; it is backed by scientific evidence. For example, handwriting can lead to widespread brain connectivity¹ and [has positive effects on learning and memory](#).

This is a call to continue recognizing the importance of human-generated scientific writing.

This call may seem anachronistic in the age of large-language models (LLMs), which, with the right prompts, can create entire scientific articles² (and peer-review reports³) in a few minutes, seemingly saving time and effort in getting results out once the hard research work is done. However, [LLMs are not considered authors as they lack accountability](#), and thus, we would not consider publishing manuscripts written entirely by LLMs (using LLMs for copy-editing is allowed but should be declared). Importantly, if writing is thinking, are we not then reading the ‘thoughts’ of the LLM rather than those of the researchers behind the paper?

Current LLMs might also be wrong, a phenomenon called hallucination⁴. Therefore, LLM-generated text needs to be thoroughly checked and verified (including every reference as it might be made up⁵). It thus remains questionable how much time current LLMs really save. It might be more difficult and time-consuming to edit

an LLM-generated text than to write an article or peer-review report from scratch, partly because one needs to understand the reasoning to be able to edit it. Some of these issues might be addressed by LLMs trained only on scientific databases, such as those outlined in a [Review article](#) by Fenglin Liu and team in this issue. Time will tell.

All that is not to say LLMs cannot serve as valuable tools in scientific writing. For example, LLMs can aid in improving readability and grammar, which might be particularly useful to those for which English is not their first language. LLMs might also be valuable for searching and summarizing diverse scientific literature⁶, and they can provide bullet points and assist in the brainstorming of ideas. In addition, LLMs can be beneficial in overcoming writer’s block, provide alternative explanations for findings or identify connections between seemingly unrelated subjects, thereby sparking new ideas.

Nevertheless, outsourcing the entire writing process to LLMs may deprive us of the opportunity to reflect on our field and engage in the creative, essential task of shaping research findings into a compelling narrative – a skill that is certainly important beyond scholarly writing and publishing.

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