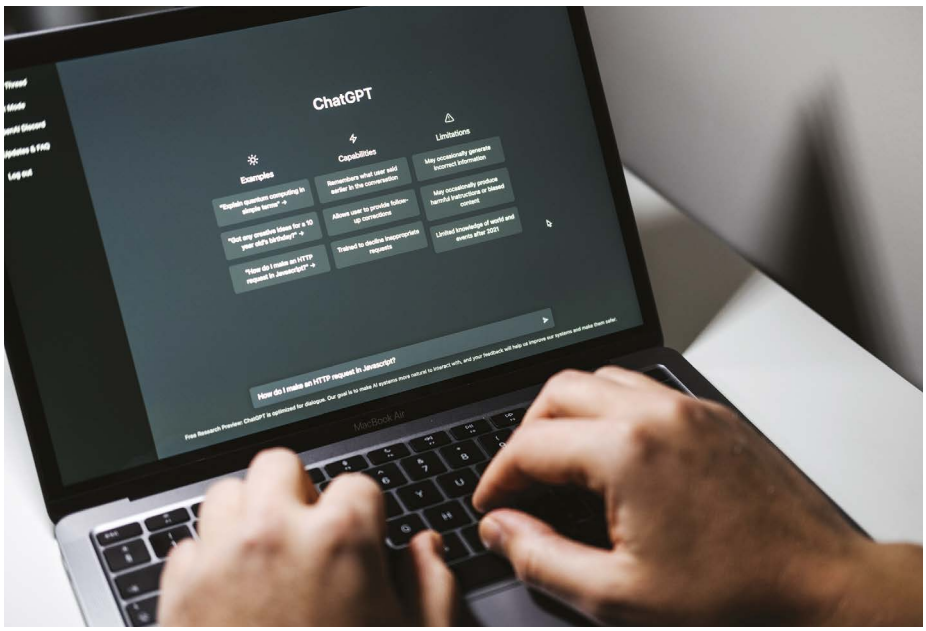

CHUAN CHUAN/SHUTTERSTOCK

The artificial-intelligence chatbot ChatGPT is disrupting many industries, including academia.

CHATGPT LISTED AS AUTHOR ON RESEARCH PAPERS

Many scientists disapprove of articles crediting the AI tool as a co-author.

By Chris Stokel-Walker

The artificial-intelligence (AI) chatbot ChatGPT that has taken the world by storm has made its formal debut in the scientific literature — racking up at least four authorship credits on published papers and preprints.

Journal editors, researchers and publishers are now debating the place of such AI tools in the published literature, and whether it's appropriate to cite the bot as an author. Publishers are racing to create policies for the chatbot, which was released as a free-to-use tool last November by tech company OpenAI in San Francisco, California.

ChatGPT is a large language model (LLM), which generates convincing sentences by mimicking the statistical patterns of language in a huge database of text collated from the Internet. The bot is already disrupting sectors including academia: in particular, it is raising questions about the future of university essays and research production.

Publishers and preprint servers contacted by *Nature*'s news team agree that AIs such as ChatGPT do not fulfil the criteria for a study author, because they cannot take responsibility for the content and integrity of scientific papers. But some publishers say that an AI's contribution to writing papers can be acknowledged in sections other than the author list. (*Nature*'s news team is editorially independent of its journal team and its publisher, Springer Nature.)

In one case, an editor told *Nature* that ChatGPT had been cited as a co-author in error, and that the journal would correct this.

Artificial author

ChatGPT is one of 12 authors on a preprint[1] about using the tool for medical education, posted on the medical repository medRxiv in December last year.

The team behind the repository and its sister site, bioRxiv, are discussing whether it's appropriate to use and credit AI tools such as ChatGPT when writing studies, says co-founder Richard Sever, assistant director of Cold Spring Harbor Laboratory Press in New York. Conventions might change, he adds.

"We need to distinguish the formal role of an author of a scholarly manuscript from the more general notion of an author as the writer of a document," says Sever. Authors take on legal responsibility for their work, so only people should be listed, he adds. "Of course, people may try to sneak it in — this already happened at medRxiv — much as people have listed pets, fictional people, etc. as authors on journal articles in the past, but that's a checking issue rather than a policy issue." (Victor Tseng, the preprint's corresponding author and medical director of Ansible Health in Mountain View, California, did not respond to a request for comment.)

An editorial[2] in the journal *Nurse Education in Practice* this month credits the AI as a co-author, alongside Siobhan O'Connor, a health-technology researcher at the University of Manchester, UK. Roger Watson, the journal's editor-in-chief, says that this credit slipped through in error and will soon be corrected. "That was an oversight on my part," he says, because editorials go through a different management system from research papers.

And Alex Zhavoronkov, chief executive of Insilico Medicine, an AI-powered drug-discovery company in Hong Kong, credited ChatGPT as a co-author of a perspective article[3] in the journal *Oncoscience* last month. He says that his company has published more than 80 papers produced by generative AI tools. "We are not new to this field," he adds.

He says that *Oncoscience* peer reviewed this paper after he asked its editor to do so. The journal did not respond to *Nature*'s request for comment.

A fourth article[4], co-written by an earlier chatbot called GPT-3 and posted on French preprint server HAL in June 2022, will soon be published in a peer-reviewed journal, says co-author Almira Osmanovic Thunström, a neurobiologist at Sahlgrenska University Hospital in Gothenburg, Sweden. She says one journal rejected the paper after review, but a second accepted it with GPT-3 as an author after she rewrote the article in response to reviewer requests.

Publisher policies

The editors-in-chief of *Nature* and *Science* told *Nature*'s news team that ChatGPT doesn't meet the standard for authorship. "An attribution of authorship carries with it accountability for the work, which cannot be effectively applied to LLMs," says Magdalena Skipper, editor-in-chief of *Nature* in London (see also page 612). Authors who use LLMs in any way while developing a paper should document this in the methods or acknowledgements sections, if appropriate, she says.

"We would not allow AI to be listed as an author on a paper we published, and use of AI-generated text without proper citation could be considered plagiarism," says Holden Thorp, editor-in-chief of the Science family of journals in Washington DC.

The publisher Taylor & Francis in London is reviewing its policy, says director of publishing ethics and integrity Sabina Alam. She agrees that authors are responsible for the validity and integrity of their work, and should cite any use of LLMs in the acknowledgements section.

Taylor & Francis hasn't yet received any submissions that credit ChatGPT as a co-author.

The board of the physical-sciences preprint server arXiv has had internal discussions and is beginning to converge on an approach to the use of generative AIs, says scientific director Steinn Sigurdsson, an astronomer at Pennsylvania State University in University Park. He agrees that a software tool cannot be an author of a submission, in part because it cannot consent to terms of use and the right to distribute content. Sigurdsson isn't aware of any arXiv preprints that list ChatGPT as a co-author, and says guidance for authors is coming soon.

The ethics of generative AI

There are already clear authorship guidelines that mean ChatGPT shouldn't be credited as a co-author, says Matt Hodgkinson, a research-integrity manager at the UK Research Integrity Office in London, speaking in a personal capacity.

One guideline is that a co-author needs to make a "significant scholarly contribution" to the article — which might be possible with tools such as ChatGPT, he says. But it must also have the capacity to agree to be a co-author, and to take responsibility for a study — or, at least, the part it contributed to. "It's really that second part on which the idea of giving an AI tool co-authorship really hits a roadblock," he says.

1. Kung, T. H. *et al*. Preprint at medRxiv https://doi.org/10.1101/2022.12.19.22283643 (2022).
2. O'Connor, S. & ChatGPT *Nurse Educ. Pract.* **66**, 103537 (2023).
3. ChatGPT & Zhavoronkov, A. *Oncoscience* **9**, 82–84 (2022).
4. GPT, Osmanovic Thunström, A. & Steingrimsson, S. Preprint at HAL https://hal.science/hal-03701250 (2022).

THE PLAN TO 'TRUMP-PROOF' US SCIENCE AGAINST MEDDLING

Guidance document calls on agencies to draft protective scientific-integrity policies.

By Jeff Tollefson

The administration of US President Joe Biden has unveiled its plan to protect government science from political interference. Guidance released by the White House on 12 January lays out the standards for policies that federal agencies have been asked to develop in the coming months.

"Upholding the highest standards of scientific integrity across the Federal government is of vital importance for keeping all of America safe, healthy, and secure," Arati Prabhakar, Biden's science adviser and director of the White House Office of Science and Technology Policy (OSTP), wrote in an accompanying memorandum to federal agencies. "Scientists must have a seat at the table and scientific information must reach decisionmakers without inappropriate influence."

Arriving at the beginning of Biden's third year in the White House, the document was crafted partly in response to the downplaying of science and sidelining of scientists at multiple federal agencies during the administration of former president Donald Trump. It also arrives in the wake of controversy in Biden's own administration. Eric Lander, the president's former science adviser and OSTP director, stepped down in February 2022 following media reports that he mistreated staff. And in August last year, the US National Academy of Sciences penalized Jane Lubchenco, the OSTP's deputy director for climate and the environment, for violating conflict-of-interest rules by editing a paper in the journal *Proceedings of the National Academy of Sciences* that was co-authored by a former student, who is now her brother-in-law.

> **"Scientific information must reach decisionmakers without inappropriate influence."**

The OSTP did not immediately respond to requests for comment. Lubchenco has apologized for the "error in judgement", which occurred before she joined the White House.

Government watchdogs praised the White House's 66-page guidance document as a major — and long-overdue — step forward. However, they say, further steps will be needed to secure the role of scientists and science in government decision-making and to prevent the type of political meddling that occurred under Trump.

"This should really be heralded as a great achievement for federal science, but there is always room for improvement," says Jacob Carter, research director for the Center for Science and Democracy at the Union of Concerned Scientists, an advocacy group based in Cambridge, Massachusetts.

Restoring trust

Biden began his tenure in the White House with a promise to restore scientific integrity across the federal government. He wanted to prevent the kind of meddling that had occurred under Trump, including altering public-health recommendations from the US Centers for Disease Control and Prevention during the COVID-19 pandemic, and an incident in which Trump's false statements about a 2020 hurricane forecast were backed up by officials he had appointed to the US National Oceanic and Atmospheric Administration.

After an initial report issued in January 2022, on how to protect scientific integrity in the government, the OSTP has now released a framework that outlines ways to strengthen, expand and, to a degree, standardize scientific-integrity policies across agencies.

It's not the first time that the White House has taken action on scientific integrity: the administration of former president Barack Obama made a similar push in 2010, and 24 federal agencies crafted their own policies at that time. However, the policies varied greatly in terms of quality and detail, and some observers have said the Obama administration didn't do enough to bolster and guide implementation after that initial push.

"It's only now in this administration that we are really seeing the follow-through that this issue needs," says Francesca Grifo, who is in charge of scientific-integrity policy at the US Environmental Protection Agency. "This is really new territory."

John Holdren, who led the effort under Obama as OSTP director, said in an e-mail to *Nature* that the agency worked hard around 2010 to ensure that strong scientific-integrity policies were crafted and properly implemented — efforts that subsequently stalled under the Trump administration. "It's great that the Biden administration has restored the proper focus on scientific integrity that good government requires," he added.

The new guidance includes a model scientific-integrity policy for federal agencies to use as a template. Agencies now have 60 days to submit their own policies for review by the OSTP, and are expected to post their proposed policies for public comment within 6 months. The plan also calls for the National Science and Technology Council to establish a panel, composed of scientific-integrity officials from various agencies, as well as White House officials, which would have the authority to review agencies' policies. The panel would also investigate potential violations by senior officials and political appointees.