

status,” says co-author Barnaby Young, an infectious-disease clinician at the National Centre for Infectious Diseases in Singapore.

One massive analysis of Delta transmission comes from the UK REACT-1 programme, led by a team at Imperial College London, which tests more than 100,000 UK volunteers every few weeks. The team ran Ct analyses for samples received in May, June and July, when Delta was rapidly replacing other variants to become the dominant driver of COVID-19. The results suggested that among people testing positive, those who had been vaccinated had a lower viral load on average than did unvaccinated people. Paul Elliott, an epidemiologist at Imperial, says that these results differ from other Ct studies because this study sampled

the population at random and included people who tested positive without showing symptoms.

These findings – along with increasing cases in younger people who have not yet received both jabs – underscore the effectiveness of double vaccination, Elliott says. “We think it’s really, really important to get as many people double vaccinated, and particularly those younger groups, as soon as possible.”

1. Riemersma, K. K. et al. Preprint at medRxiv <https://doi.org/10.1101/2021.07.31.21261387> (2021).
2. Brown, C. M. et al. *MMWR Morb. Mortal. Wkly. Rep.* **70**, 1059–1062 (2021).
3. Musser, J. M. et al. Preprint at medRxiv <https://doi.org/10.1101/2021.07.19.21260808> (2021).
4. Chia, P. Y. et al. Preprint at medRxiv <https://doi.org/10.1101/2021.07.28.21261295> (2021).

‘TORTURED PHRASES’ GIVE AWAY FABRICATED RESEARCH PAPERS

Analysis reveals that strange turns of phrase might indicate foul play in science.

By Holly Else

In April 2021, a series of strange phrases in journal articles piqued the interest of a group of computer scientists. The researchers could not understand why authors would use the terms ‘counterfeit consciousness’, ‘profound neural organization’ and ‘colossal information’ in place of the more widely recognized terms ‘artificial intelligence’, ‘deep neural network’ and ‘big data’.

Further investigation revealed that these strange terms – which the researchers dub “tortured phrases” – are probably the result of automated translation or software that attempts to disguise plagiarism. And they seem to be rife in computer-science papers (see ‘Tortured phrases found in computer-science papers’).

Research-integrity sleuths say that the team has uncovered a new type of fabricated research paper, and that its work, posted in a preprint on arXiv on 12 July, might expose only the tip of the iceberg when it comes to the literature affected (G. Cabanac et al. Preprint at arXiv <https://arxiv.org/abs/2107.06751>; 2021).

To get a sense of how many papers are affected, the researchers ran a search for several tortured phrases in journal articles indexed in Dimensions, the citation database. They found more than 860 publications that included at least one of the phrases, 31 of which were published in a single journal:

Microprocessors and Microsystems.

“It harms science. You cannot trust these papers, so we need to find them and retract them,” says Guillaume Cabanac, a computer scientist at the University of Toulouse, France, who worked on the study.

Suspecting that the tortured phrases are the result of automated translation or software that rewrites existing text, Cabanac and colleagues ran a selection of abstracts from *Microprocessors and Microsystems* and other journals through a tool that can identify whether texts have been generated by the artificial-intelligence tool GPT. Of the *Microprocessors and Microsystems* papers flagged by the tool, manual checks revealed “critical flaws” in some of them, such as nonsensical text, as well as plagiarized text and images.

TORTURED PHRASES FOUND IN COMPUTER-SCIENCE PAPERS

Scientific term	Tortured phrase
Big data	Colossal information
Artificial intelligence	Counterfeit consciousness
Deep neural network	Profound neural organization
Remaining energy	Leftover vitality
Cloud computing	Haze figuring
Signal to noise	Flag to commotion
Random value	Irregular esteem

To dig deeper, the group downloaded all papers published in *Microprocessors and Microsystems* between 2018 and 2021, a time frame they chose because an upgraded version of GPT was released in 2019. They identified around 500 “questionable articles” based on various factors. Their analysis revealed that papers published after February 2021 had an acceptance time that was five times shorter, on average, than those published before that date. And a subset of papers had identical submission, revision and acceptance dates, the majority of which were published in special issues of the journal. This is suspicious, the authors say. Unlike standard issues, overseen by the editor-in-chief, special issues are usually proposed and overseen by a guest editor, and focus on a specific area of research.

Microprocessors and Microsystems was not the only affected title – the researchers found evidence of tortured phrases in hundreds of other journals. “Preliminary probes show that several thousands of papers with tortured phrases are indexed in major databases,” they write, adding that “other tortured phrases related to the concepts of other scientific fields are yet to be exposed.”

Special-issue investigation

Around the time that Cabanac and his colleagues first noticed the tortured phrases, and unbeknown to them, the editor of *Microprocessors and Microsystems* began having concerns about the integrity and rigour of peer review for papers that had been published in some of the journal’s special issues.

The journal’s publisher, Elsevier, launched an investigation. This is still under way, but in mid-July the publisher added expressions of concern to more than 400 papers that had been published across six special issues of the journal.

The expressions of concern say that the papers in the affected special issues of *Microprocessors and Microsystems* are being “independently re-assessed” one by one, and the journal will give further updates on their status once the investigations have concluded.

The publisher adds that a “configuration error in the editorial system” at the journal meant that neither the editor-in-chief nor the editor designated to handle the papers received them for approval as they should have. “This configuration error was a temporary issue due to system migration and was corrected as soon as it was discovered,” says the notice.

A spokesperson for Elsevier told *Nature* in a statement that the *Microprocessors and Microsystems* investigation has found that the authors probably used reverse-translation software to disguise plagiarism, and that this is the likely source of the tortured phrases.

The investigation has also revealed that 49 papers flagged as suspicious by Cabanac

and his colleagues and published in standard issues of the journal were originally submitted to its special issues and were accepted by guest editors, “but were subsequently published in regular issues, at the authors’ request”, the statement says. These papers are already part of Elsevier’s investigation, it adds.

Elisabeth Bik, a research-integrity analyst in California known for her skill in spotting duplicated images in papers, says that the findings of Cabanac’s research are “shocking”. “This is

a very new and disturbing type of fabricated paper,” she adds.

Jennifer Byrne, a molecular-oncology researcher at the University of Sydney, Australia, who also works on spotting fabricated papers, says that this is probably the tip of the iceberg because the researchers looked in depth at only one journal from one publisher. “There could be more plausible AI-generated papers within the literature that are harder to detect,” she adds.

ever-growing tusks, creating a permanent record of the animals’ whereabouts with almost daily resolution.

Until now, no one had analysed these chemical GPS tags across the full length of a tusk, which reflects the mammoth’s entire life. “This is by far the largest and most comprehensive study of its kind,” says Matthew Wooller, a palaeoecologist at the University of Alaska Fairbanks, who co-led the study with geoscientist Clement Bataille at the University of Ottawa in Canada and colleagues.

Their findings provide a glimpse of the life and death of a single woolly mammoth during the last ice age (M.J. Wooller *et al.* *Science* <https://doi.org/grbz>; 2021).

Previous analysis of the 1.7-metre-long tusk had shown that it belonged to a male mammoth that died around 17,100 years ago, when it was at least 28 years old. The researchers split the tusk down the middle to reveal the layers of growth, and used lasers to sample the chemical composition at approximately 340,000 points along the tusk’s full length. They then compared the isotopic profiles at each of these data points with a geological map of Alaska and northwest Canada, and used a computer algorithm to map out the most probable routes for the mammoth to have travelled, backtracking from where its remains were found.

“It’s a total soap opera, all the way up to the day it died,” Wooller says.

The bull spent much of its early life in the Yukon River basin and wider Alaskan interior, where it made repeated, long-distance journeys between smaller territories. The migratory behaviour is similar to that of modern elephant groups, which suggests that the young mammoth was moving with a herd.

At about 16 years old, the isotopic pattern in the tusk becomes more variable. The mammoth seems to have wandered over longer distances in less regular patterns than during its juvenile years. This could indicate that it left its herd to roam freely, as has been observed in mature male elephants. For around a decade, it travelled widely, sometimes visiting areas where mammoth remains have been found.

In the last year and a half of the animal’s life, its stamping grounds shrank to a single region near the northern coast of Alaska. A distinctive isotope pattern recorded at the base of the tusk showed the “telltale hallmark of starvation in mammals”, which was probably what caused its death, says Wooller.

“The fact that this study presents an ‘iso-biography’ for a single individual is part of what makes it so exciting,” says Kate Britton, an archaeological scientist at the University of Aberdeen, UK. “We are gaining individual insight into the behaviour of an animal that roamed Alaska more than 17,000 years ago, and the strontium isotopes allow us to follow in its footsteps.”

WOOLLY MAMMOTH’S EPIC WANDERINGS PRESERVED IN TUSK

Chemical analysis of ice-age mammoth’s tusk reveals the huge distances it travelled during its lifetime.

By Ariana Remmel

Researchers have reconstructed the geographical movements of a single woolly mammoth (*Mammuthus primigenius*) using chemical ‘GPS tags’ preserved in one of its tusks. The findings show that the animal travelled so widely across what is now Alaska that it could have circled Earth almost twice.

Although researchers know a fair amount about the diet, genetics and ecology of woolly mammoths, insights into the life histories of individual animals are scarce.

“We can’t go back and watch these things like a modern ecologist might, but we can use chemistry to come up with good proxies,” says Chris Widga, a palaeontologist at East Tennessee State University in Johnson City.

Every place on Earth has a distinct chemical signature based on differences in its geology. The ratios of various isotopes of elements such as strontium and oxygen in the bedrock and water create a unique profile specific to that location that remains consistent over millennia, and is incorporated into soil and plants. As mammoths grazed on the Arctic plains, these isotopic signatures were integrated into their



Woolly mammoths (illustration) roamed throughout the Arctic Circle during the last ice age.

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