

News in focus

down the cliff over which it pours, says Bale. “If you want to know the source, you have to get up there and get closer – is it coming from one hole in the ground? From a bunch of seams in the rocks? Is there a sprinkler system up there?”

The Parker Solar Probe measured a portion of the solar wind coming from a small hole in the Sun’s corona near the equator¹. It is the closest look yet at one of the solar wind’s points of origin.

The spacecraft also found that, as the wind streams out into space, parts of it race ahead in high-velocity spikes. “I think of them as rogue waves,” says Justin Kasper, a space scientist at the University of Michigan in Ann Arbor. Within these waves, the speed of the solar wind doubled, and the strong flow temporarily reversed

“We’re seeing terrific new plasma physics in action, right from the beginning.”

the wind’s magnetic field³. The probe flew through more than 1,000 of these spikes each time it zipped past the Sun, Kasper says. Scientists don’t yet understand what causes them.

Another surprising finding is how quickly the solar wind rotates around the Sun as the star spins. Models suggest that the wind flows in this direction at a speed of a few kilometres per second – but the Parker Solar Probe measured it moving at around 35 to 50 kilometres a second.

The discovery has major implications. Knowing that the wind is rotating at a different speed from expected could help researchers to improve predictions of when a dangerous solar outburst might reach Earth. The finding also suggests that the solar wind is transporting more energy away from the Sun than previously thought, so the star’s rotation might be slowing more rapidly than expected. If so, astronomers might need to revise their ideas about how other stars in the Universe age.

So far, the Parker Solar Probe has studied only a small portion of the Sun at close range. More observations are needed to confirm the unexpectedly fast rotation speed of the solar wind, says Adam Finley, an astronomer at the University of Exeter, UK.

There’s plenty more time for discovery. By the end of its mission in 2025, the probe will have had 24 close encounters with the Sun – getting more than three times closer to the star than it has so far.

1. Bale, S. D. et al. *Nature* <https://doi.org/10.1038/s41586-019-1818-7> (2019).
2. Howard, R. A. et al. *Nature* <https://doi.org/10.1038/s41586-019-1807-x> (2019).
3. Kasper, J. C. et al. *Nature* <https://doi.org/10.1038/s41586-019-1813-z> (2019).
4. McComas, D. J. et al. *Nature* <https://doi.org/10.1038/s41586-019-1811-1> (2019).

CHINESE MINISTRY INVESTIGATES IMAGES IN TOP ACADEMIC’S PAPERS

Four journals also say they are examining articles co-authored by university president Cao Xuetao.



Cao Xuetao has been a prominent voice for strengthening research integrity in China.

By Andrew Silver

The Chinese education ministry is investigating scientific articles authored by high-profile immunologist and university president Cao Xuetao, following suggestions that dozens of papers contain potentially problematic images. Four journals also say they are examining papers from Cao.

The scrutiny comes after US microbiologist Elisabeth Bik raised concerns three weeks ago on Twitter and the post-publication peer-discussion site PubPeer about images in papers written by Cao and his group.

Cao is the president of Nankai University in Tianjin, and his team has pioneered the development of cancer immunotherapies in China. He says that his group is investigating the papers in question, and he is confident that the issues raised do not affect the papers’ conclusions. Cao has been a prominent voice for strengthening research integrity in China, and gave a speech on the topic at the prestigious Great Hall of the People in Beijing in November.

Bik has flagged up potential problems in about 50 papers co-authored by Cao on PubPeer, and other users, most of them anonymous, have raised similar issues concerning another handful of papers from the group. As *Nature* went to press, images in 63 papers that the team has published in 28 journals since

2003 have been flagged on the site.

In some papers, Bik says, seemingly identical images are labelled as representing different biomedical experiments. In others, features such as patterns of dots that represent biological data seem to be “unexpectedly” duplicated in the same image, she says.

“That would be the equivalent of someone showing you a photo of the night sky, and you would see two Big Dipper constellations in the same photo,” says Bik, who has developed a reputation for spotting and raising potential problems in scientific images and figures.

During a press conference on 22 November, Xu Mei, a spokesperson from China’s Ministry of Education, said the ministry is investigating the articles in question and the “relevant” institutions. Cao is also director of the Institute of Immunology at the Second Military Medical University in Shanghai, also known as the National Key Laboratory of Medical Immunology. Most of the 63 articles list this affiliation.

Representatives from 4 of the 28 journals concerned – *Science*, *Nature Communications*, *Cardiovascular Research* and *Molecular Immunology* – told *Nature* that they had heard about the potentially problematic papers in their journals and were reviewing them.

Bik told *Nature* that she cannot comment on whether the issues she’s flagged up are the result of research misconduct. “It is up to the affiliated institutions to investigate and conclude,” she

says. Although Cao's name is on the papers, often as the corresponding author, it is not clear how closely he was involved in the work.

On 17 November, Cao responded on PubPeer to Bik's comments, saying that his team and collaborators have made it their priority to re-examine the identified manuscripts, raw data and lab records. "We'll work with the relevant journal editorial office(s) immediately if our investigation indicates any risk to the highest degree of accuracy of the published records," he wrote.

He also said he is confident that the conclusions in those papers remain valid and the work reproducible. He apologized for "any oversight on my part" in his role as a mentor, supervisor and lab leader, and added that there is no excuse for a lapse in his supervision or leadership. "I'll use this as an invaluable learning opportunity to do better not only in advancing science, but also in safeguarding the accuracy and integrity of science," he wrote.

Cao did not respond to requests for comment on the issues raised about his team's papers on PubPeer. Nankai University directed *Nature* to Cao's statement on PubPeer.

Individuals, including some who seem to be Cao's co-authors, have responded on PubPeer to some of Bik's queries. In at least one case, a co-author acknowledges that the wrong photograph has been published. In another case, commentators suggest that images flagged as duplicates by Bik were, in fact, pictures of the same cells taken over time, but that the figure's labels were unclear. The explanations given in those cases have been satisfactory, says Bik.

In comments about a few other papers, Bik questions images that the authors have already acknowledged in published errata.

But the authors have not yet responded to questions raised about other papers, in which features such as bars or patterns of dots occur multiple times in the same image, she says.

Several researchers who have not collaborated with Cao or Bik have told *Nature* that the figures she has flagged up seem suspicious. Nicole La Gruta, a molecular biologist at Monash University in Melbourne, Australia, says that, in her opinion: "It is clear from the multiple images that I have seen that these are definitely manipulated."

Wouter Masselink, a postdoctoral molecular biologist at the Vienna BioCenter in Austria, agrees that some of the images require explanation. "I hope the institutions and universities that Cao is associated with launch a formal and independent investigation to find out how and where these artefacts ended up in the published manuscripts," he says.

Bik says she plans to contact the journals that published the papers she has identified. But the comments on Twitter and PubPeer have already caught the attention of some journals. Megan Phelan, a spokesperson for

Science's publisher, the American Association for the Advancement of Science in Washington DC, says *Science* is reviewing an article in the journal that Bik flagged up. She added that it's up to institutions to investigate any possible misconduct, which would inform any decisions the journal made.

Elisa De Ranieri, the editor-in-chief of *Nature Communications* in London, says the journal saw posts on Twitter and PubPeer that raised issues over potential image manipulation and will examine any relevant papers as part of their usual research-integrity processes.

Cao received a *Nature* Award in 2015 for excellence in mentoring, and he is co-editor-in-chief of *Cellular & Molecular*

Immunology, a journal published by Springer Nature, which also publishes *Nature* (*Nature's* news and comment team is editorially independent of its publisher, and of other Nature-branded journals). A spokesperson for the company says it does not appoint the journal's editorial committee. They said the company is aware that concerns have been raised around some Cao papers but has no further comment.

On 22 November, *Nature Immunology* posted an 'Editor's Note' on two of Cao's papers. One says the authors had flagged up a duplicated image before publication but it was not corrected in time; in the other, the journal says a duplicated image was "inadvertently introduced during the production process".

UN CLIMATE SUMMIT SET TO TACKLE CARBON MARKETS

Negotiations take place amid uncertain geopolitics and intensifying public pressure.

By Quirin Schiermeier

Four years after pledging to limit global warming to no more than 2°C above pre-industrial levels, representatives of nearly 200 countries are meeting to put the finishing touches to the 2015 Paris climate accord.

Discussions at the annual United Nations' climate conference, COP25, are expected to focus on international carbon markets, which have the potential to reduce the overall cost of

global climate-mitigation efforts.

But the talks, which started on 2 December in Madrid and last until 13 December, take place against a backdrop of shifting geopolitics that has created uncertainty over who will lead global efforts to tackle climate change, and of intensifying public pressure on governments to take action.

Despite pledges to curb emissions, atmospheric greenhouse-gas concentrations reached a new peak in 2018, the World Meteorological Organization said last week. A UN



Protesters gather in London as part of the Global Climate Strike in November.