

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.

News in focus

climate report released on 26 November warns that the Paris agreement's 2°C goal might soon be out of reach as emissions continue to rise.

Unfinished business

At last year's conference, nations agreed on a set of rules for tracking and reporting greenhouse-gas emissions and for reviewing collective progress. However, they failed to establish clear rules for carbon markets through which emissions made in one country can be offset by investing in low-carbon technologies elsewhere. Article 6 of the Paris agreement – which aims to promote voluntary international cooperation between nations – is a central point on the agenda, and offsetting will almost certainly be discussed.

Voluntary offsetting schemes are already in use to make certain goods and services, such as passenger flights, 'carbon neutral'. Many countries, including New Zealand, Sweden and the United Kingdom, rely on offsetting to achieve their emission-reduction goals.

Critics say that offsetting schemes allow rich countries to dodge responsibility for cutting their own emissions. But a well-organized international carbon market with clear, practical rules could save up to US\$250 billion in climate-mitigation costs, says Stefano De Clara, a policy adviser at the International Emissions Trading Association in Brussels. "It would engage businesses in climate action and facilitate the linkage of existing carbon pricing systems," he says. "In the end, everyone could be better off through collaboration."

Analysts have warned that poorly planned offsetting schemes could actually hinder efforts to curb global emissions. Under the Paris agreement, countries must adjust their emission-reduction pledges every five years, in line with the latest scientific evidence about what will be required to stabilize the climate. Without proper rules and bookkeeping, offsetting could simply move emission-reduction efforts around the world, instead of reducing overall emissions, says Gilles Dufrasne, an environmental economist with the Brussels-based international climate-policy watchdog Carbon Market Watch.

Jacob Werksman, a climate-policy adviser at the European Commission, warns that there are some sticking points that negotiators in Madrid might not be able to resolve. For example, some countries expect that excess carbon credits from the expiring 1997 Kyoto Protocol, the previous international climate treaty, will remain eligible for use under the Paris agreement. Such a concession would "severely undermine" the agreement, Werksman says.

This year's talks are also facing intense public scrutiny. The rapidly growing climate-protest movement is shifting the overall conversation on climate change, says Valérie Masson-Delmotte, a co-chair of the Intergovernmental

Panel on Climate Change.

Politics are shifting, too. The United States' official withdrawal from the Paris agreement puts the nation in a strange position for this year's talks. It will remain a member of the UN Framework Convention on Climate Change, an international treaty under which both the Kyoto Protocol and the Paris agreement were negotiated. And US representatives will still attend future COP meetings – including next year's meeting in Glasgow, UK. But unless a future US government revokes the decision to quit the Paris agreement, the country will no longer participate in negotiations concerning

the rules and implementation of the accord.

There is some hope that the European Union will provide new leadership, says Oliver Geden, a policy researcher at the German Institute for International and Security Affairs in Berlin. On 28 November, the European Parliament voted to declare a 'climate and environmental emergency', which will put pressure on EU member states to approve the European Commission's plans to cut emissions by 55% by 2030, and to achieve net-zero emissions by 2050.

"At this time it's up to the EU to demonstrate that the Paris agreement can deliver after all," says Geden. "That's a tough nut to crack."

TARGETED ATTACKS COULD MAKE BLOOD-STEM-CELL TRANSPLANTS SAFER

Such procedures show promise for genetic and immune disorders, but are currently risky.



Physicians prepare to take a sample of a patient's bone marrow.

By Heidi Ledford

Scientists are experimenting with ways to selectively target the body's blood-making cells for destruction. Early studies in animals and people suggest that the approach could make blood-stem-cell transplants – powerful but dangerous procedures that are used mainly to treat blood cancers – safer, and thereby broaden their use. The studies come as evidence piles up that such transplants can also be used to treat some autoimmune

disorders and genetic diseases.

The work, to be presented at the forthcoming annual meeting of the American Society of Hematology in Orlando, Florida, harnesses an understanding of the proteins made by different types of blood stem cell, the cells in the bone marrow that produce the various cellular components of blood.

Blood-stem-cell transplants work by replacing defective blood-making cells – which can give rise to blood cancer, as well as to genetic and autoimmune diseases – with healthy ones, either from donors or from the patients