Kingdom's future relationship with the EU will look like.

Details on trade and other aspects have yet to be ironed out, while key issues for science – such as the United Kingdom's involvement in Europe's Horizon 2020 research programme, a crucial source of funding and collaboration – have yet to be resolved. "The Conservative manifesto says we will continue to collaborate internationally and with the EU on scientific research, including Horizon," says Sarah Main, executive director for the Campaign for Science and Engineering in London. "But it's not quite 100% clear how that's going to be enabled to happen."

Brexit will also bring changes to the free movement of EU citizens in and out of the United Kingdom, which could affect overseas recruitment at UK universities and research institutions. The Conservatives promised in their manifesto to introduce "new rules for those of exceptional talent" in a post-Brexit immigration system.

It's now necessary to ensure that non-British, European researchers who currently benefit from freedom of movement can still come to the United Kingdom, says Beth Thompson, head of UK and EU policy at Wellcome, a biomedical-research charity in London. "It's important that we send a signal to the rest of the world that the UK is open for business, and that we want to participate in internationally competitive and collaborative science."

### Manifesto pledges

Whether the government can fulfil the science promises laid out in the Conservative manifesto is also unknown. The party has committed to raising UK spending on science and research to 2.4% of gross domestic product (GDP) by 2027, up from 1.7%.

But the Conservatives have so far failed to make much progress towards this target, warns Kieron Flanagan, a science-policy researcher at the University of Manchester, UK. The pledge to increase research spending to 2.4% of GDP was made in the run-up to the 2017 general election. "It's been an objective for a few years now," says Flanagan, "But we haven't seen much activity." He adds that roughly two-thirds of research funding currently comes from the private sector, so both private and public spending increases will be needed to reach the 2.4% target.

Thompson says that the Conservative manifesto has some "very strong commitments to science", but at the moment we "don't have detail on how that will be implemented".

Other Conservative pledges will also come under scrutiny, such as the proposal to develop "a new agency for high-risk, high-payoff research", thought to be modelled on the US Defense Advanced Research Projects Agency. At the moment, it is still unclear how the agency would actually operate and how it would improve science in the United Kingdom. "We can all rally around those aims," says Wilsdon. "But I've not seen anything yet that makes a clear, evidence-informed case for why we need a new institution."

As the new government settles in, researchers will have to wait and see whether the ruling party can fulfil its manifesto pledges, and how negotiations with the EU progress. "We've got a government that is driving an aggressive and ambitious science agenda, but it also has a mandate to leave the EU," says Main. "And that raises questions for the science community."

# CHINA SPENDS MILLIONS TO BOOST HOME-GROWN JOURNALS

US$29-million investment aims to boost the country's status as an international scientific powerhouse.

**By David Cyranoski**

China is taking dramatic steps to improve the quality and international reputation of its home-grown science journals. Publishers of hundreds of Chinese titles will receive generous government funding as part of a major five-year plan to elevate the country's publications to among the world's best.

The government said in August that it wants to publish more of the world's breakthrough discoveries in Chinese journals. On 25 November, it revealed that it will spend more than 200 million yuan (US$29 million) per year for 5 years to help improve the standards of some 280 journals – most of which publish in English – and to increase submissions from international researchers.

**"There is no such thing as Chinese chemistry, American biology or German physics."**

China has launched several initiatives over the past 5 years to improve the quality and international submission rates of its roughly 500 English-language science journals, following growing concerns that some were publishing a lot of low quality, even fraudulent, research. The initiatives have helped to improve some publications, but editors say that few manuscripts are submitted from top researchers in China or abroad.

The latest initiative is the largest and most comprehensive attempt yet to transform the country's scientific-publishing landscape, says Tao Tao, an independent consultant on Chinese academic publications who is based in Washington DC. "The new programme, given its scale, will be successful," she says.

It also marks a turning point in a long-running debate about how China should raise its status as an international scientific powerhouse, says Tang Li, who researches science policy at Fudan University in Shanghai. Many Chinese-born scientists who have returned after training overseas think the country's research heft is already reflected in the increasing number of Chinese scientists publishing in prominent foreign-owned journals. But Chinese journal editors and publishers think that more highly regarded domestically owned publications are needed to burnish the country's reputation. The latest investment signals that the government is backing the latter strategy, says Tang.

The investment is being overseen by a committee of representatives from seven high-profile organizations: the finance, science and education ministries; the General Administration of Press and Publication, a powerful Communist Party propaganda agency; the Chinese science and engineering academies; and the Chinese Association for Science and Technology, a non-governmental science organization.

To determine how funds will be allocated, the committee has ranked 250 journals into 3 tiers on the basis of quality, although it has not released details about how the ranks were decided. Twenty-two 'tier one' journals, which publish in English, will each receive between 1 million and 5.2 million yuan per year to help them attract submissions from researchers around the world. Another 29 'tier two' English-language journals will each receive between 600,000 and 1 million yuan per year. Four hundred thousand yuan will be invested in each of another 199 'tier three' journals, half of which publish in Chinese. An additional 30 journals that have not been ranked will be selected each year to share 500,000 yuan to

improve their quality.

The government has not yet revealed how the programme's success will be measured, but Tao thinks that journal impact factors might be used to gauge improving quality.

The investment is understandable, given that publications don't have a lot of money to boost quality themselves, says Cao Cong, a science-policy researcher at the University of Nottingham Ningbo China. But he notes that the country has mostly succeeded in becoming a research powerhouse without such publications. Science is international and researchers want to publish in the best journals regardless of where they're based, says Cao. "There is no such thing as Chinese chemistry, American biology or German physics," he says.

Cao doubts that the investment in Chinese-language journals will lead to international acclaim, because non-Chinese-speaking scientists are unlikely to publish in them.

But having more Chinese-owned publications could save Chinese institutions money, says Tao, because – unlike international journals – domestic publishers are likely to offer reduced publication charges for Chinese researchers, she says.

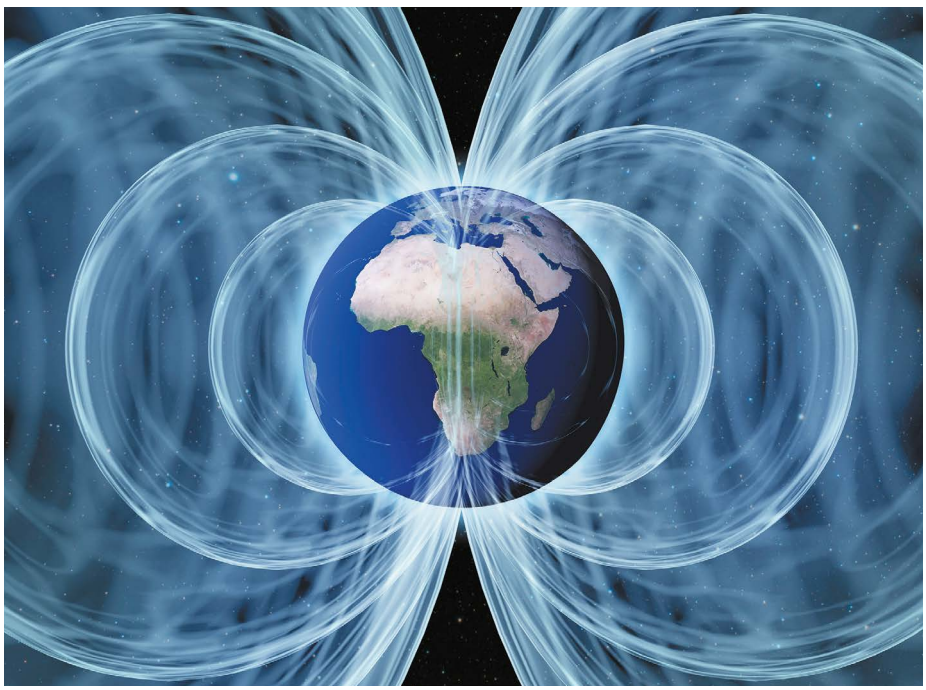
# EARTH'S MAGNETIC FIELD IS OLDER THAN SCIENTISTS THOUGHT

## Analysis finds planet's protective shield was in place by at least 3.7 billion years ago, as early life arose.

**By Alexandra Witze, San Francisco, California**

Magnetic minerals in ancient Greenlandic rocks suggest that Earth's magnetic field arose at least 3.7 billion years ago. The finding pushes back the time of the magnetic field's birth to about 200 million years earlier than the commonly accepted estimate – around the time life first appeared on Earth.

Scientists think that having a magnetic field makes Earth more hospitable to life. The field, which is generated by liquid iron sloshing about in the planet's core, shields Earth from energetic particles flowing from the Sun. It helps the planet hold on to its atmosphere and maintain liquid water on its surface.



SPL

**Earth's magnetic field, shown here as white lines, helps the planet hold on to its atmosphere.**

But very few rocks that are billions of years old, and thus could preserve evidence of when the magnetic field arose, have survived to the present day. The new report is a rare glimpse at what Earth was like billions of years ago.

"I hope you are as excited as I am," Claire Nichols, a palaeomagnetist at the Massachusetts Institute of Technology in Cambridge, told a meeting of the American Geophysical Union in San Francisco, California, on 9 December.

### Rare rocks

Nichols led two expeditions to western Greenland in the summers of 2018 and 2019. She was targeting a set of ancient rocks in the Isua region, north of the capital city Nuuk, that researchers have long studied in search of clues to early life. The Isua rocks have inspired fierce debates, including whether they contain fossils of complex organisms from 3.7 billion years ago.

Geological forces have squeezed and heated the rocks so much over the past few billion years that most scientists thought the rocks had lost most of their magnetism. But Nichols and her team travelled to the northernmost part of Isua to study rocks that had been least affected by this squeezing and heating.

Iron minerals in those rocks yielded information on the direction of Earth's magnetic field when the minerals formed. Because the rocks are 3.7 billion years old, the magnetic signal must be, too, Nichols said.

Her team ran various tests to try to confirm that the signal was real and not some sort of weak magnetism introduced later as the rocks were heated and squeezed.

"It does sound super-exciting," says Nicholas Swanson-Hysell, a geoscientist at the University of California, Berkeley, who was in the audience at Nichols's talk. He met up with her afterwards to brainstorm ideas about how to confirm her team's finding. One idea might be to look at rocks from parts of northeastern North America that were connected to Greenland in the past, to see whether they can illuminate more of the geological history of the Isua rocks, he says.

John Tarduno, a palaeomagnetist at the University of Rochester in New York, is more sceptical of Nichols's claim. "I'd like it to be true, but I'd like to see more," he says.

In 2015, Tarduno and his colleagues reported finding signs of Earth's magnetic field from more than 4 billion years ago, inside zircon crystals from Australia. Other scientists recently challenged that paper, saying the magnetic minerals inside the zircons could not be accurately dated (F. Tang *et al. Proc. Natl Acad. Sci. USA* **116**, 407–412; 2019).

Aside from those contested Australian zircons, the oldest-known evidence of Earth's magnetic field – rocks in South Africa – dates to around 3.5 billion years ago.