way to delay the onset of neurodegenerative disease. Vaccines exist for many of these viruses, van Duijn says. Because multiple types of dementia are diagnosed late in life — close to the average life expectancy — if clinicians could postpone disease onset by even a couple of years, that could mean that many people might never develop the disease, she adds.

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HAS EARTH'S INNER CORE STOPPED ITS STRANGE SPIN?

Data hint that the inner core no longer rotates faster than the rest of the planet, but not all researchers agree.

By Alexandra Witze

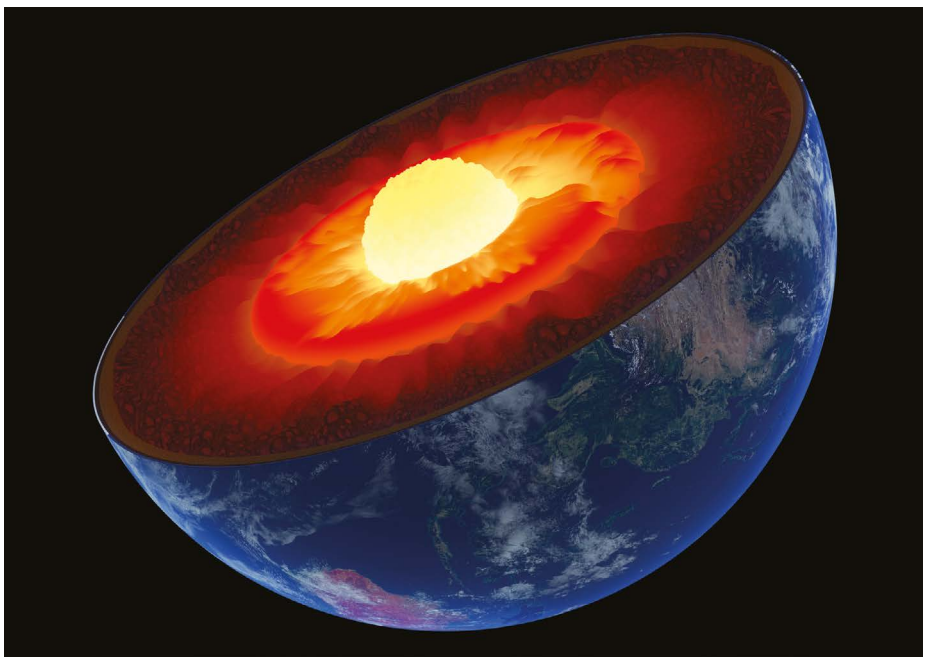
Thousands of kilometres beneath your feet, Earth's interior might be doing something very weird. Many scientists think that the inner core spins faster than the rest of the planet — but sometime in the past decade, according to a study, it apparently stopped doing so.

"We were quite surprised," say Yi Yang and Xiaodong Song, seismologists at Peking University in Beijing who reported the findings in *Nature Geoscience*[1].

The results could help to shine light on the many mysteries of the deep Earth, including what part the inner core plays in maintaining the planet's magnetic field and in affecting the speed of the whole planet's rotation — and thus the length of a day. But they are just the latest instalment in a long-running effort to explain the inner core's unusual rotation, and might not be the final word on the matter.

"I keep thinking we're on the verge of figuring this out," says John Vidale, a seismologist at the University of Southern California in Los Angeles. "But I'm not sure."

Researchers discovered the inner core in 1936, after studying how seismic waves from earthquakes travel through the planet. Changes in the speed of the waves revealed that Earth's core, which is about 7,000 kilometres wide, consists of a solid centre, made mostly of iron, inside a shell of liquid iron and other elements.



JOHAN SWANEPOEL/SPL

Earth's inner core can rotate separately from the outer parts of the planet.

The liquid outer core essentially decouples the 2,400-kilometre-wide inner core from the rest of the planet, so the inner core can spin at its own pace. In 1996, Song and another researcher reported[2] studying earthquakes that originated in the same region over three decades, whose energy was detected by the same monitoring station thousands of kilometres away. Since the 1960s, the scientists said, the travel time of seismic waves from those earthquakes had changed, indicating that the inner core rotates faster than the planet's mantle, the layer just beyond the outer core.

Later studies refined estimates of the rate of that 'super-rotation', to conclude that the inner core rotates faster than the mantle by about one-tenth of a degree per year. But not everyone agrees. Other work has suggested that super-rotation happens mostly in distinct periods, one of which occurred in the early 2000s, rather than being a continuous, steady phenomenon[3]. Some scientists even argue that super-rotation does not exist[4].

Last June, Vidale and Wei Wang, an Earth scientist also at the University of Southern California, threw another spanner into the works. Using data on seismic waves generated by US nuclear test blasts in 1969 and 1971, they reported that between those years, Earth's inner core had 'subrotated', or rotated more slowly than the mantle[5]. Only after 1971, they say, did it speed up and begin to super-rotate.

A rotational shift

Now, Yang and Song say that the inner core has halted its spin relative to the mantle. They studied earthquakes mostly from between 1995 and 2021, and found that the inner core's super-rotation had stopped in about 2009. They observed the change at various points around the globe, which the researchers say confirms it is a true planet-wide phenomenon related to core rotation.

The data hint that the inner core might even be in the process of shifting back towards sub-rotation. If so, something is probably happening to the magnetic and gravitational forces that drive the inner core's rotation.

Still, many questions remain, such as how to reconcile the slow pace of the changes that Yang and Song report with some of the faster changes reported by others. The only way out of the morass is to wait for more earthquakes to happen. A "long history of continuous recording of seismic data is critical for monitoring the motion of the heart of the planet", say Yang and Song.

"We just have to wait," Vidale adds.

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