Li Chunlai
Moon-rock guardian

"Sample, I finally got you."



JIN LIWANG/XINHUA NEWS AGENCY

A geologist is leading efforts to study the rock samples that China's Chang'e-6 mission collected from the Moon's far side.

By Smriti Mallapaty

On 25 June, Li Chunlai watched eagerly as a capsule carrying the first pieces of the far side of the Moon landed on Earth. "Sample, I finally got you," he thought, as if speaking to an adversary he had spent years trying to outwit.

That moment capped decades of hard work for Li, deputy chief designer for China's Chang'e-6 mission, which blasted off to the Moon on 3 May. The 3,200-kilogram lander — about as heavy as a pickup truck — spent two days drilling and scooping material on the lunar surface before sending the samples back to Earth.

Li was central to deciding where on the Moon the spacecraft would land and was among the first to analyse the rocks it ferried back. He and his team of 70 or so staff members oversee the data collected during China's space missions, and that includes storing and distributing samples. "What he is really good at, is coordination," says James Head, a planetary geoscientist at Brown University in Providence, Rhode Island, who has collaborated extensively with Li.

When he was a young researcher studying geology and cosmic chemistry, Li says he never imagined holding samples from the Moon. But he has been involved in determining the science objectives of China's lunar exploration programme since its inception, when Chang'e-1 was sent to orbit the Moon in 2007. This is Li's second sample-return mission for the China National Space Administration. He had a similar role during the Chang'e-5 mission, which brought back soil and rock from the Moon's near side.

The latest shipment, containing almost two kilograms of lunar material from the hemisphere hidden from Earth's view, could unravel many mysteries about the Moon's early evolution, and the planets beyond, say researchers.

"We have been dreaming of having samples from the far side of the Moon," says Patrick Pinet, a planetary scientist at the Research Institute in Astrophysics and Planetology in Toulouse, France.

One day after arriving on Earth, the capsule was in Li's laboratory at the National Astronomical Observatories in Beijing. It took Li and his team several days of banging, twisting and clanging to release the precious material from its sealed vault, using various tools. To protect the material, they stored it in a nitrogen-filled box. The powder within was "fluffy" and "very fresh", says Li. The samples are lighter in colour than are those from the Moon's near side. "It's very special," says Li.

The rocks and dust were collected from the deepest part of the South Pole–Aitken Basin, which is assumed to be the largest and oldest impact crater on the Moon. The site was chosen because of the diversity of the material it might contain, such as lava flows and fragments of the lunar crust or even the mantle beneath. The samples are "like a recorder of all these historical events", says Yi Xu, a planetary scientist at Macau University of Science and Technology.

Studying them will help to uncover "lots of secrets of the Moon", says Yuqi Qian, a planetary geologist at the University of Hong Kong.

Top among them is why the lunar far side looks so different from the near side — the crust is thicker and not as enriched with radioactive elements. Understanding the Moon's history is crucial to deciphering the pasts of other planets such as Mars, Venus and Mercury, says Head. "The Moon is a keystone to planetary evolution in general."

In September, Li and his colleagues published a preliminary description of the samples (C. Li *et al. Natl Sci. Rev.* **11**, nwae328; 2024). And two papers published in November reported that the lunar far side was volcanically active as recently as 2.8 billion years ago (Q. W. L. Zhang *et al. Nature* https://doi.org/g8rffr (2024); Z. Cui *et al. Science* https://doi.org/ns2w; 2024).

Planetary scientists all over the world now want to get their gloves on the samples. Li's laboratory has distributed some morsels to teams across China. But it will be a few years before researchers outside the country get access, says Li, to give Chinese researchers priority. A torrent of scientific findings are expected in the coming months. Li is already looking ahead to China's next sample-return missions — to a near-Earth asteroid in 2025, and to Mars several years later. The insight generated so far from this year's Moon mission, he says, "is just the beginning".