CHINA

SPACE

NEW LIGHT SHONE ON MOON'S HISTORY

Soil samples returned by Chang'e-6 mission suggest colossal asteroid collision on far side 4b years ago

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The Chang'e-6 lunar mission has yielded groundbreaking findings about the moon's hidden history, revealing evidence that a colossal asteroid strike more than 4 billion years ago could have fundamentally altered the deep interior of its far side.

The research was published as four open-access papers yesterday in Nature, one of the world's most prestigious scientific journals with headquarters in London.

While these papers are available to all readers regardless of subscriber status, Chinese teams are reporting a wave of scientific findings from the country's lunar programme that American government scientists may be locked out of because of a US decision to cancel subscriptions to Nature and other Springer Nature journals.

Officials cited budget concerns and dismissed the journals as "junk science", which could hinder government scientists – including key Nasa researchers – from having access to major discoveries.

The new analysis of the returned far-side rocks suggests that part of the moon's deep interior was stripped of important chemical ingredients more than 4 billion years ago – likely during a giant asteroid impact.

The collision was so powerful it not only carved out a 2,500km-wide crater on the moon's far side – the largest of its kind in the solar system – but also changed the make-up of the moon's mantle hundreds of kilometres below the surface, according to a team led by scientists at the Institute of Geology and Geophysics in Beijing.

Lava later erupted from this damaged mantle and cooled into volcanic rock that is depleted in elements such as titanium and thorium, as well as water. These samples are the most chemically depleted moon rocks ever studied – more so than any returned by the US, Soviet or earlier Chinese missions, which all came from the moon's near side, the team reported in Nature.

Chang'e-6 is the first and only mission to return samples from the moon's far side. It landed in the South Pole-Aitken basin in June 2024 and brought back 1.9kg of soil, mostly from a 2.8 billion-year-old volcanic eruption.

Stephen Elardo, a planetary scientist at the University of Florida, said the Chang'e-6 samples were unique and critical for understanding why the moon's far side looked so different from its near side.

While remote-sensing missions, such as those flown by Nasa, offer global data, "having in-hand samples that can be subjected to a gamut of laboratory measurements will always eclipse observations from afar", he wrote in a Nature commentary published alongside the study.

"Firsts in planetary exploration have long been viewed as politically competitive endeavours," he added, "but they should be celebrated as shared achievements that contribute to humanity's collective scientific knowledge."

This month, the US Department of Health and Human Services announced that it would cancel all its subscriptions to Nature journals.

The decision has affected thousands of federally funded researchers across Nasa and the US departments of energy and agriculture, including those studying lunar geology and planetary evolution, unless they are able to gain access via other institutions or means.

Some scientists warned that the move could hinder access to top-notch global research, especially at a time when Nasa's science budget might be slashed, missions cancelled, and senior expertise lost.

Other researchers said that the impact would be limited, since many US planetary scientists worked at universities and still had access through institutional accounts.

Many research papers are open access, meaning they are free to read – if the authors can afford the publishing fees.

Yuqi Qian, a planetary scientist at the University of Hong Kong, said he worried more about the high price tag to publish.

"These fees can become a real financial burden for young scholars like me," he said.

Springer Nature's website lists an article processing charge of US$12,690 to publish gold open access in Nature.

'Monster' cargo lifter spotted in Bohai Sea

Images reveal China's progress in developing Soviet-era technology that US is also reviving

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A large wing ship has been spotted in the Bohai Sea, revealing Beijing's progress in developing its own version of the maritime cargo lifter while Washington races to revive this Soviet-era technology.

Two pictures purporting to show the mysterious Chinese wing-in-ground-effect (WIG) craft – dubbed the "Bohai Monster" – emerged on social media last week, with one giving a full view of it above the water's surface.

The other image shows the craft sitting on a pier, facing away from the camera. The vehicle has a boat-shaped fuselage with a horizontal stabiliser on top of the joined V-shape tail – a common configuration for WIG craft.

A buoyancy float can be seen fitted to each wingtip and four engines appear to be mounted side by side on top of the wings. The engines are widely considered to be jet-powered but military website The War Zone suggested they could be propeller engines.

A WIG craft – also known as an ekranoplan, as it is called in Russian – works on the "ground effect" principle, which describes an interaction between the underwing airflow and the surface below that produces a rise in static pressure and a reduction in drag.

The most famous WIG craft was a Soviet prototype developed in the 1960s, the "Caspian Sea Monster", which was the biggest and heaviest aircraft in the world of its time. It was 92 metres long and had a maximum take-off weight of 544 tonnes.

By travelling over flat surfaces – ground or water – at low altitudes, WIG craft can take advantage of the reduced drag to travel more efficiently in terms of fuel and payload capacity than higher-flying aircraft.

They are much faster than ships, so ideal for fast maritime cargo transport. WIG craft can also endure tougher weather and sea conditions than helicopters.

And as they move only metres above the surface WIG craft can avoid common radar detection and are out of the range of many traditional air defence weapons.

Since the crash of the Caspian Sea Monster in 1980 there have been some WIG projects developed by other countries, but none that has been even close to matching it in terms of size.

A prototype WIG craft developed by the China Ship Scientific Research Centre, a subsidiary of state-owned China State Shipbuilding Corporation, was revealed in 2023. Described as suitable for search and rescue and inter-island passenger transport in the South China Sea, it has a top speed of 240km/h and can travel for six hours non-stop, with a full take-off weight of 4.5 tonnes.

China has also been developing conventional amphibious aircraft that can fly normally as well as take off and land on runways and water. Its AG600 – the world's largest amphibious plane with a maximum take-off weight of 60 tonnes and payload capacity of 12 tonnes – has recently entered mass production.

The WIG craft spotted last week appeared to be similar in scale to the AG600. It could play a larger role than its smaller predecessor in terms of fast delivery of equipment and resupply at sea.

Meanwhile, the US announced a plan in April named Liberty Lifter, which aims to develop a WIG craft with a lift weight of 25 tonnes.

TAIWAN

Realistic combat the aim of island's biggest war games

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Taiwan's largest and longest-ever annual military drills kicked off yesterday with a simulation of mainland Chinese grey-zone tactics as the opening move in a round-the-clock war game designed to reflect a realistic and protracted cross-strait conflict scenario.

The 41st edition of the Han Kuang Exercise marks a significant departure from previous years, both in scale and duration. Doubled in length to 10 days, this year's drills are being conducted without scripts or fixed timelines to mimic battlefield unpredictability, according to Taiwan's defence ministry.

Ministry officials said the change reflected an increasingly volatile threat environment, especially amid stepped-up pressure from mainland China's People's Liberation Army (PLA).

"This is the most intensive Han Kuang ever conducted," Major General Tung Chi-hsing, head of the defence ministry's joint operation planning division, said last week. He said the training

> **This is the most intensive Han Kuang [annual military drill] ever conducted**
>
> MAJOR GENERAL TUNG CHI-HSING

was focused not just on a single attack, but on "a drawn-out war that played out in stages – on beaches, in cities and across society".

Unlike previous Han Kuang iterations, which typically have begun with a scripted scenario involving the evacuation of fighter jets to eastern Taiwan for force preservation, this year's opening day focused instead on confronting Beijing's grey-zone tactics – operations that fall just under the threshold of open conflict but are instead aimed at intimidating and exhausting Taiwan's defences.

The drills simulated incursions by mainland Chinese maritime militia and coastguard vessels operating just short of the unofficial median line in the Taiwan Strait that separates the island from the mainland.

In response, Taiwan's navy scrambled various warships after completing rapid resupply operations, while mobile radar and missile units were deployed to tactical positions across the coastline, according to the ministry.

To prepare for a potential escalation from grey-zone to full-scale conflict, engineering units were dispatched to reinforce key coastal areas known as "Red Beaches" – likely PLA landing zones – by installing obstacles and fortifications, the ministry said.

This year's Han Kuang is also featuring several recently acquired US systems: Himars multiple-launch rocket systems, upgraded TOW anti-tank missiles, and Stinger missiles.

While no live-fire drills are planned on Taiwan proper due to safety constraints, ministry officials said the US-procured M1A2T Abrams tanks – currently undergoing acceptance training – will live-stream a live-fire demonstration today at a new army tank training ground in Kengzihkou, near the northern Taiwanese city of Hsinchu.

The ministry has also confirmed that this year's drills will, for the first time, extend from shoreline defences into full-scale urban combat, simulating house-to-house fighting in the event that PLA forces penetrate inland.

Brigade-level reserve mobilisation will be included for the first time. The army's 206th infantry brigade has been fully activated for pre-battle training and combat readiness assessments. A total of 22,000 reservists have been called up under a separate "Tung Hsin 35" order, reflecting Taiwan's growing emphasis on total defence and US pressure to reform its reserve system.

Ministry officials said this year's format was based on a "scenario-driven, no-spoiler" approach, where units are given only minimal warning and must react in real time to evolving situations. Any unexpected incidents – such as vehicle breakdowns or communication failures – will be treated as part of the exercise, helping soldiers gain experience under stress and uncertainty.

In Beijing, the mainland's defence ministry called the Han Kuang drill "nothing but a bluffing and self-deceiving trick" played by the island's Democratic Progressive Party authorities "to hijack Taiwan compatriots on board its 'Taiwan Independence' war chariot".

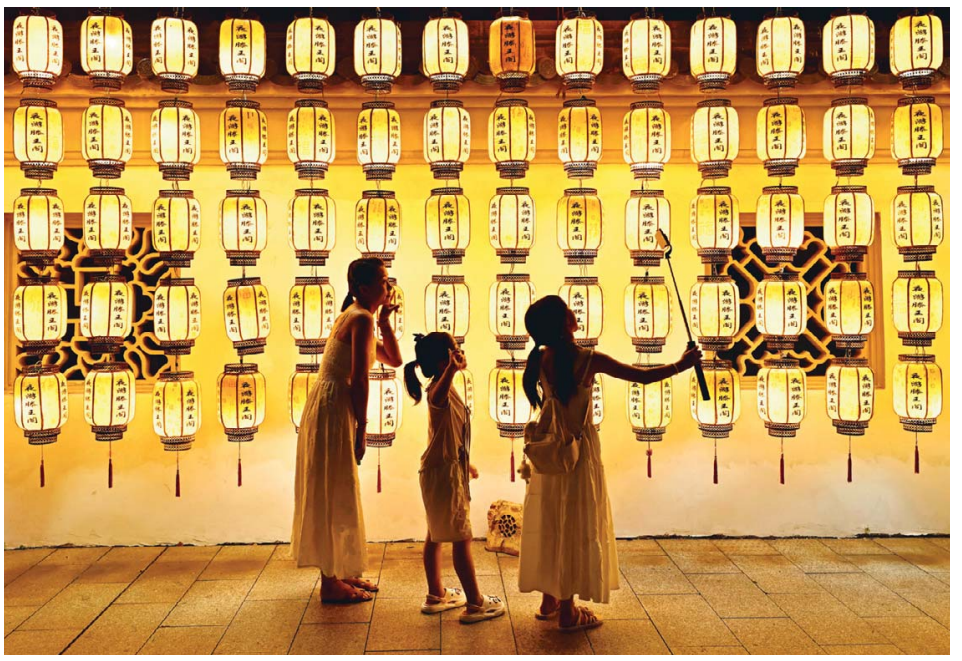
Beijing regards Taiwan as part of China to be reunited by force if necessary. It has boosted military activities around Taiwan since Lai took office as the island's leader last year and provoked the mainland by calling it a "foreign hostile force", insisting that the two sides of the Taiwan Strait "are not subordinate to each other".

Like most countries, the United States does not recognise self-governed Taiwan as an independent state, but it opposes any forcible change to the cross-strait status quo and is legally obliged under the Taiwan Relations Act to help the island defend itself.



Military reservists conduct pre-combat training during the annual Han Kuang drill yesterday in Miaoli County, Taiwan. Photo: EPA

Positively glowing



Tourists pose for selfies on a visit to Tengwang Pavilion at Nanchang, Jiangxi province. The 1,400-year-old structure boasts intricately carved beams and vibrantly painted rafters, and sits on the banks of the Ganjiang River. It is celebrated as the setting for *Preface to the Tengwang Pavilion* by Tang dynasty (618-907) poet Wang Bo, a classic of Chinese literature. Photo: Xinhua

SCIENCE

Data expert leaves US for job in Zhejiang

Award-winning statistician's research covers areas like machine learning

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Award-winning data scientist She Yiyuan has left the United States to take up a full-time position at Westlake University in Zhejiang province.

She, who taught at Florida State University for almost two decades, will conduct research at his new institution as a chair professor at the school of science and the Institute for Theoretical Sciences, according to a July 1 social media post by the Chinese university.

She has won the Career Award, the most prestigious award from the US National Science Foundation to support early career scholars. He is a fellow of some of the world's most prominent communities of statisticians, including the American Statistical Association and the Institute of Mathematical Statistics. He is also an elected member of the International Statistical Institute.

The statistician's move is set to boost China's position in emerging hi-tech sectors, such as AI and medical sciences, amid fierce competition with the West.

Statistics, as the foundation of data science, is "an indispensable supporting discipline in fields such as machine learning and artificial intelligence", according to Westlake University. The discipline underpins a wide range of fields, including the natural sciences, engineering, technology and social sciences.

According to the university's website, She's research focuses on high-dimensional statistics, machine learning, optimisation techniques, big data analysis and robust statistics, among other areas. His research takes a cross-disciplinary approach, integrating the theories, methods, and applications of statistics, mathematics and computer science.

Westlake University said She's research not only provided new methods for machine learning to discover patterns in complex data, but also offered effective tools and innovative approaches for data analysis in disciplines such as biomedicine and economics.

Large language models, the technology that underpins generative AI, are advanced machine learning models with vast numbers of parameters that enable them to process and generate humanlike text, code and other data types.

However, the number of parameters in these models now far exceeds human cognitive capacity.

To tackle this challenge, She has been working to explore the intrinsic relationships behind data, with the aim of making seemingly chaotic and complex data clear and interpretable using advanced algorithms.



She Yiyuan has joined Westlake University in Zhejiang province.

He obtained his bachelor's and master's degrees from Peking University, where he received training in mathematics and computer science, before moving to the US to study statistics.

In 2008, She received his doctorate from Stanford University. He then began his faculty career in the statistics department at Florida State University, where he was promoted to full professor in 2018.

A growing number of high-profile mathematicians have chosen to return to China after decades-long careers in the US.

At the end of June, mathematician Yitang Zhang left the US to become a full-time professor at Sun Yat-sen University. The 70-year-old number theorist has been appointed to the university's new Institute of Advanced Studies Hong Kong, and he will live and work in the Greater Bay Area.

Shen Zhongwei, formerly a distinguished professor at the University of Kentucky, joined Westlake University full time as a chair professor of mathematics this month. Shen received his PhD from the University of Chicago in 1989 and began teaching at the University of Kentucky in 1995.

MIDDLE EAST

Beijing denies giving air defence systems to Iran

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China has denied transferring surface-to-air missile batteries to Iran following Israel's attacks on the Islamic Republic last month.

Citing an Arab official familiar with the intelligence, the British-based platform Middle East Eye on Monday reported that Chinese air defence equipment had been sent to Iran after it struck a truce with Israel last month.

One source told the platform that China – the biggest recipient of Iran's oil exports – had received payment in oil shipments, but the report did not say how many surface-to-air missile systems Tehran had received since the end of the fighting.

China's embassy in Israel denied the report on Tuesday, telling the Hebrew-language newspaper Israel Hayom it "never exports weapons to countries engaged in warfare and maintains strict controls on the export of dual-use items".

It added: "China firmly opposes the proliferation of weapons of mass destruction and their delivery systems, and continuously strengthens its enforcement capabilities regarding non-proliferation."

China's defence ministry has been asked for comment.

The 12-day conflict began after Israel attacked Iranian nuclear facilities, military commanders and scientists.

Both sides claimed victory after agreeing a ceasefire mediated by Qatar and the United States, but the conflict is believed to have depleted Iranian ballistic missile stocks and launchers.

Israel said it had destroyed over half of the 400 launchers that Iran had before the conflict.

It also estimated Iran had between 2,000 and 2,500 ballistic missiles at the beginning of the war, 500 of which were used during the conflict.

China condemned Israel for initiating the attack and offered to play a "constructive role" in peacemaking, but largely avoided direct involvement.

Some analysts say the conflict has shown the limits of China's influence and its lack of interest in providing direct support to Iran.

Last month, when asked about whether it would aid Iran militarily if requested, a spokesman for China's defence ministry said it had expressed its views and would "continue playing a constructive role in securing the stability of the Middle East".

China and Iran have held regular naval exercises with Russia, with the latest drill taking place in March.

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