



### Familiar tragedy

Teen suspect in US to be tried as adult; victims mourned

WORLD, PAGE 10

### CIIE cements role as platform for green technologies

BUSINESS, PAGE 15

### Higher calling

Great Wall rangers tackle difficult protection work

LIFE, PAGE 18



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## Crew to offer live lecture from China's orbiting space station

Heavenly Palace Class to be broadcast live around the globe in coming days

By ZHAO LEI  
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Crew members of China's Shenzhou XIII mission will soon give a space-based lecture from the orbiting Tiangong space station to students around the world, the China Manned Space Agency said on Thursday.

It said the lecture will take place in the coming days and will be broadcast live to audiences around the globe. It will mark the launch of the Heavenly Palace Class, China's first extraterrestrial lecture series to popularize space science, it added.

Heavenly Palace is the English translation of Tiangong, the most sophisticated endeavor in China's manned space program, which aims to build a massive space station about 400 kilometers above Earth.

The Heavenly Palace Class lectures will be based on the country's manned spaceflights and will be presented by Chinese astronauts.

Featuring interactive teaching, the activities will be mainly targeted at youngsters.

The statement issued by the agency on Thursday did not mention which member of the crew — Major General Zhai Zhigang, Senior Colonel Wang Yaping and Senior Colonel Ye Guangfu — will host the lecture, but Lin Xiqiang, the agency's deputy director, told a news conference in mid-October, right before Shenzhou XIII's launch, that "Teacher Wang will soon bring her second space lecture to you".

In June 2013, Wang took part in the Shenzhou X mission that lasted nearly 15 days. During that mission, she carried out the nation's first space-based lecture inside an experimental space station module to more than 60 million Chinese students. The activity made China the second country, following the United States, to have held a space-based class for students.

The agency said that as a national space-based laboratory, the Tian-

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Wang Yanan, editor-in-chief of Aerospace Knowledge magazine

gong station is also tasked with promoting and propagating science and technology knowledge. The orbiting outpost has abundant, unique educational resources and boasts special advantages when it comes to encouraging the public, especially young people, to embrace science and space exploration, it said.

Members of the public are welcome to submit questions, suggestions or requests for the kind of content they would like to see

shared through the lectures, the agency said, adding that they can contact it via its media partners or its own website.

Wang Yanan, editor-in-chief of Aerospace Knowledge magazine, said the Heavenly Palace Class will inspire more young people to study science and technology and explore the universe and will arouse a sense of patriotism among them.

"I think the astronauts will display the space station and their scientific experiments to the students, and will show some interesting physical phenomena to them," he said.

The Shenzhou XIII mission was launched on Oct. 16 by a Long March 2F carrier rocket that blasted off from the Jiuquan Satellite Launch Center in northwestern China's Gobi Desert, with the crew soon entering the Tiangong station. They are scheduled to spend six months working in the station, making it China's longest manned space mission.

Early last month, Wang Yaping, 41, became China's first female spacewalker when she took part in the Shenzhou XIII mission's first extravehicular activity.

## Meteorite remnants on moon may reveal water

By ZHAO LEI

Chinese scientists have found remnants of meteorites on the far side of the moon that might reveal a major source of water.

A group of researchers at the State Key Laboratory of Space Weather — which is operated by the Chinese Academy of Sciences' National Space Science Center — said it had recently identified some "glassy materials" inside a two-meter crater in the South Pole-Aitken Basin on the far side of the moon as remnants of a piece of carbonaceous chondrite that was not entirely vaporized when it struck the lunar surface.

Carbonaceous chondrites are meteorites originating in the asteroid belt near Jupiter and are believed to be among the oldest objects in the solar system. Their existence on the moon may act as a

source of water on the barren sphere, according to the research team, headed by Liu Yang.

It published the finding in the November issue of Nature Astronomy, explaining that although carbonaceous chondrite fragments have been found in samples returned by the United States' Apollo missions, "no carbonaceous chondrite remnants were directly observed on the lunar surface by remote-sensing exploration".

Impactors are believed to be a major contributor of water and ice on the moon. Compared with other types of small celestial bodies, carbonaceous asteroids have a higher water content, meaning water carried by such asteroids is more likely to survive vaporization and remain on the moon.

The remnants were spotted in hyperspectral images in the visible and near-infrared range taken by

China's Yutu 2 lunar rover as it observed the crater, the Chinese researchers said.

Liu said the finding also indicated the possible existence of meteorite remnants in younger substances on the lunar surface, such as the dirt brought back by China's Chang'e 5 mission. Analyzing the remnants will help scientists advance their study of the composition and evolution of impactors in the Earth-moon system, and will expand their knowledge of the history of impacts in the solar system, he said.

Liu said that in the near future, remote-sensing spectral data with higher spatial resolution will provide scientists with the opportunity to find similar remnants at other places on the moon, allowing them to deepen their research on the origin and distribution of water on our closest neighbor in space.

The second Chinese rover on the moon, Yutu 2 has been operating for 1,065 Earth days, cementing its status as the longest-working rover on the moon. The record was previously held by its predecessor — Yutu — which worked on the moon for 972 days, far outliving its designed life span of three months.

Yutu 2 is part of the ongoing Chang'e 4 lunar probe mission, humanity's first endeavor to land on and closely observe the far side of the moon. The mission was launched by a Long March 3B carrier rocket in December 2018 at the Xichang Satellite Launch Center in Sichuan province.

The probe made a soft landing on the far side of the moon on Jan 3, 2019, and then released Yutu 2 to roam and survey the landing site in the South Pole-Aitken Basin, the moon's largest and oldest recognized impact basin.

## Mars rover transmits data via European orbiter

By ZHAO LEI

China's Zhurong Mars rover and the European Space Agency's Mars Express orbiter recently performed an in-orbit relay communication test, the China National Space Administration and the ESA announced on Wednesday.

The test took place on the morning of Nov 21 and lasted 10 minutes. Zhurong sent up testing data to the Mars Express that was traveling in a Mars orbit about 4,000 kilometers from the rover. The European satellite then transmitted the data to a European Space Operations Center ground station via deep-space communication antennas. After receiving the data, the operations center

in Darmstadt, Germany, sent it to the Beijing Aerospace Control Center in the Chinese capital, where Chinese mission controllers confirmed its data's accuracy.

"Normally, an orbiter like ESA's Mars Express first sends down a hail signal to a rover as a 'hello'. The rover then sends back a response to establish stable communications and begin the two-way exchange of information. But this relies on the rover's radio system being compatible with the orbiter's," an ESA statement quoted James Godfrey, Mars Express spacecraft operations manager, as saying.

As the European orbiter transmits its "hello" signal using different communication frequencies than

the Chinese rover receives, two-way communication is not possible either in the other direction, Zhurong can transmit a signal using a frequency that Mars Express can receive. The relay radio on Mars Express has a mode that allows one-way "in the blind" communication where the sender can't be sure if its signal is being received, but the technique hadn't been tested on the spacecraft, he explained.

In November, the Chinese and European teams carried out a series of experimental communication tests in which Mars Express used this "in the blind" mode to listen for signals sent to it by Zhurong. The test finally succeeded on Nov 21. Zhurong is the core component of

the Tianwen 1 mission, China's first interplanetary adventure, and is the sixth rover on the Red Planet, following five from the United States. It is tasked with surveying Mars' landforms, geological structures, soil characteristics, potential locations of water and ice, and atmospheric and environmental characteristics, as well as magnetic, gravitational and other physical fields.

As of Wednesday, the rover had worked on Mars for 196 Martian days and had traveled 1,297 meters and obtained about 10 gigabytes of data. It has sufficient energy and is in good condition, the China National Space Administration said.