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Wisdom from above

Lectures by astronauts inspire younger generations
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TREND

Learning from above the clouds

Space-based lectures, with the aim to popularize science, inspire generations. **Zhao Lei** reports.

Song Guoliang, a spacecraft engineer in Beijing, remembers a special lesson — China's first space-based science lecture — that led him to join the industry.

"I can clearly recall the lecture that took place in June 2013, near the end of my fifth year in middle school. I was most impressed by the experiment using a rotating top that showed us how the law of conservation of angular momentum works. After the lecture, I was still fascinated by the rotating top and went to my physics teacher to discuss details of the interesting experiment," the young researcher said.

The lecture lasted some 45 minutes, but it was long enough to spark Song's interest in spaceflights. He chose to apply for Beijing Institute of Technology's School of Aerospace Engineering the next summer, determined to devote himself to China's space endeavors.

"Studying aerospace engineering made me realize the reason why the rotating-top experiment was selected for the space lecture — it was because the astronauts wanted to show us the physical laws behind a spaceflight," he said. "The lecture injected curiosity and space dreams and explorations in countless students like me and succeeded in spreading space knowledge."

After his graduation, Song landed a job at what appeared to be a most suitable place for a space enthusiast — the China Academy of Space Technology in the northwestern suburb of Beijing. The academy is a major pillar of China's space program and has developed most of the country's satellites and lunar probes, and all manned spaceflights.

Song is not the only one at the academy who has been inspired by space lessons.

Cao Hangchang, also a spacecraft engineer at the academy, said he was in awe when watching astronauts displaying interesting physical phenomena that are possible in microgravity and was motivated to learn more about the universe and space travel.

Like Song, Cao took the national college entrance exam in July 2014. He was admitted by Beijing University in Beijing, the alma mater of many renowned Chinese space scientists and engineers.

"The lecture was a key driving force that made me select Beihang and then this academy. Now, I work with many people to design and build our country's new spacecraft, doing the job I had dreamed of nine years ago," he said.

Educational feat

On June 11, 2013, a Long March 2F carrier rocket blasted off from the Jiuquan Satellite Launch Center in northwestern China's Gobi Desert and soon transported the Shenzhou X spacecraft to a low-Earth orbit at an altitude of about 400 kilometers to dock with the country's first experimental space station module — Tiangong-1.

During their eight-month stay on the Shenzhou X mission crew — Nie Haisheng, Zhang Xiaoguang and Wang Yaping — was to host the country's first educational activity from space.

Nine days later, Wang, the second Chinese woman to enter space,



Top: Students listen to a "Tiangong class" lecture at the China Science and Technology Museum in Beijing last month. **HU LANYUE / FOR CHINA DAILY** **Above:** Students in Lhasa, Tibet autonomous region, conduct scientific experiments following the space class last month. **JIGME DORJI / XINHUA**

delivered a 45-minute science lecture along with her male colleagues.

Watched by more than 60 million Chinese students across the country, the open lesson made China the second nation, after the United States, to have delivered a lesson to schoolchildren from space. So far, only the two countries have accomplished this educational feat.

The idea of hosting science lectures from orbiting spacecraft began to be discussed among Chinese scientists in September 2011, right before the launch of Tiangong-1.

Around the end of that year, the China Association for Science and Technology suggested that the China Manned Space Agency could carry out space-based science lessons for students during the joint flight of Tiangong 1 and Shenzhou IX or the Shenzhou X manned mission. The agency expressed strong interest in the idea and started feasibility study.

In November 2012, a detailed plan of the first space lecture was included in the Shenzhou X mission's flight schedule. Meanwhile, a work team was established with members from the space agency, science association and the Ministry of Education.

To make the lecture a success, more than 20 scientists, spacecraft designers, mission planners and veteran teachers were convened to

offer their thoughts and advice. After rounds of brainstorming and discussions, they decided that the astronauts should conduct some experiments to show unique physical phenomena in space and that such experiments must serve educational purposes and must be easy for students to understand.

The experts designed specific plans for the experiments and produced tools to be used in the lecture. They also helped the mission crew practice and rehearse each step of the lesson. Their efforts paid off — the lecture was very popular among Chinese students and is regarded as one of the most memorable moments in the history of China's manned spaceflights.

For Zhang Zan, a university student in Shanghai who majors in law, watching the lecture at the age of 12, not only intrigued her about "magical physics in outer space," it also gave her the then-schoolgirl a role model — Wang.

"I once dreamed of becoming an astronaut like Wang (Yaping) and I did think about joining the air force because all our astronauts were selected from air force pilots. However, my body conditions did not meet the required criteria," she said. "But I still followed Wang through her public speeches and media

reports. I also read a lot about China's space programs."

Zhang said she has great respect and admiration for Wang and other Chinese astronauts and learned perseverance and diligence from them.

"They helped me know about the power of science and technology and showed me the capability and strength of our motherland. I am now a grown person, and it is my generation's turn to use our knowledge and skills to build the country into a better place," Zhang said.

Ping-pong experiment

On Oct 16, "Teacher Wang," as called by many Chinese students who have watched the astronaut's lecture, embarked on her second space journey that would be much longer than the first. Inside the Shenzhou XIII spacecraft that was lifted by a Long March 2F rocket from the Jiuquan launch center, Wang and two male astronauts, Zhai Zhigang and Ye Guangfu — soon arrived in the core module of China's Tiangong space station orbiting Earth from about 400 km above.

In November, Wang, 41 at the time, became China's first female spacewalker as she took part in the Shenzhou XIII mission's first extravehicular activity.

In early December, the China Manned Space Agency announced that the Shenzhou XIII crew would hold a science lesson for students across the world from the Tiangong station. It would be the second open lecture delivered by Chinese astronauts and the first of the "Tiangong class," China's first extraterrestrial lecture series that aims to popularize space science.

The agency said such 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.

It noted that as a Chinese space-based laboratory, besides its scientific tasks, Tiangong will also be tasked with promoting and propagating science and technology knowledge. The orbiting outpost has abundant, unique educational resources and boasts advantages when it comes to encouraging the public, especially young people, to

embrace science and space exploration, it said.

On Dec 9, Wang and other crew members appeared on television screens watched by millions of students across China. They showed viewers how they live and work inside the space station, and displayed their exercise equipment and a specially designed spacesuit. During the lesson, Wang carried out experiments to display physical phenomena in microgravity such as disappearing buoyancy and a water ball.

Ye, who is on his first spaceflight, showed how to turn a body in the weightless environment.

During the hour-long activity, the astronauts also answered questions from students invited to "ground class venues" in Beijing, Nanning, capital of the Guangxi Zhuang autonomous region, Wenchuan in Sichuan province, and Hong Kong and Macao special administrative regions.

Vincent Wong Wai-shing, deputy principal of Hong Kong's Pui Kiu College, said after watching the lecture that the event gave Hong Kong students an opportunity to communicate with the astronauts and stimulate their interest in space and science.

"It also helped to enhance their sense of national identity as they saw the rapid development of our country's space technology," he said.

Yalie Fung, a student of Pui Kiu College, said, "What impressed me the most was the buoyancy experiment done with a ping-pong ball. It was amazing to see that the environment of space is very different from that of Earth."

Two space labs

On March 23, the Shenzhou XIII crew delivered their second science lecture, in which the astronauts also carried out experiments to show physical phenomena only possible in microgravity, including liquid crystallization and a water bridge.

In one experiment, Wang used a toy of Bing Dwen Dwen, the popular

mascot of the 2022 Beijing Winter Olympics, to display how objects fly in a weightless environment. They also showed students two pieces of cutting-edge scientific equipment inside the space station.

Hundreds of students in Beijing, Lhasa, capital of the Tibet autonomous region, and Urumqi, capital of the Xinjiang Uygur autonomous region, watched the event at the "ground class venues".

Before ending the lecture, the astronauts answered questions taken from members of the public and raised by students at the ground venues. The questions covered various facets of life and work in space, such as how to take care of their skin, whether hot water is available, if the moon looks different from the Tiangong station, and how tears move in a microgravitational environment.

At the end of the class, Wang told the audience that in the coming months, two large labs — Wentian, or "quest for the heavens," and Mengtian, or "dreaming of the heavens" — will be launched into space to dock with the Tianhe module to complete the Tiangong station, and then China will have stronger capability in terms of space-based scientific experimentation and the "Tiangong class" will become more interesting.

Peng Zhuo, a retired spaceflight researcher from the China Academy of Space Technology and author of several space-themed books, said the class will be an "eye-opener" for youngsters, especially students, by implanting the pursuit of science and innovation in them.

"Many distinguished scientists were created by their interest and curiosity about 'strange things'. The experiments done by the astronauts will put 'question marks' in our students' mind, and the youngsters will then move to find answers and explore more places unknown to humankind," he said.

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sudoku

By Professor TSO Wong-Wai 譚宏威

Game rules: Every column, row and box (3x3 marked by heavier lines) must contain all the digits from 1 to 9.

Game:

0-0-1C7-0-024

			6	9				1
			8	4				2
			5		3	8		
	6	2			9	4		
	7	1		3				
5			7	4				
8		9	5					
3								



Readers may obtain this coded answer of each game by quoting the serial number and send email to tsoww@tsoww.com. Professor Tso will introduce a tetrad-code system to explain how each empty square should logically house its unique numerical figure.

Solution:

9	4	5	2	6	8	1	3	7
2	6	1	7	9	5	6	7	8
8	5	1	3	6	2	1	5	9
6	9	7	8	1	5	7	1	5
5	1	4	6	1	7	9	8	5
1	8	1	5	7	9	7	2	6
3	9	6	8	1	5	6	7	2
1	5	9	2	8	3	1	6	7
4	1	8	5	2	6	1	9	7

Astronauts share teaching experiences in space

By ZHAO LEI

The Teacher in Space Project of NASA, announced by the late US president Ronald Reagan in 1984, was the world's first attempt to send teachers to orbiting spacecraft and give lessons to students.

However, the program was suspended following the death of its first participant, Christa McAuliffe, in the space shuttle Challenger tragedy in January 1986 and the plan was canceled in 1990.

More than 21 years after McAuliffe's passing, her backup in the Teacher in Space Project — Barbara Morgan, who spent most of her teaching career at the McCall-Donnelly Elementary School in McCall, Idaho, the United States — complet-

ed the world's first space-based educational activity on Aug 14, 2007, while on board the International Space Station. She flew to the ISS during the STS-118 mission in the Endeavour space shuttle and served as a robotic arm operator.

During the 25-minute event, Morgan answered questions from students, showed them how to exercise and drink water in space and told them that being an astronaut was similar to being a teacher to an extent, both were excellent jobs and about exploring, learning, discovering and sharing.

One week before Chinese astronaut Wang Yaping hosted her first lesson from space in June 2013, Morgan wrote a letter to her.

"On behalf of teachers and stu-



US astronaut Barbara Morgan before a space mission in 2007. She gave an educational lecture from the International Space Station during that mission. **NASA**

dents around the world, I send you greetings of honor and love as you orbit our Earth and prepare to teach your lessons from space. We are proud of you," the US astronaut wrote. "You will be very busy up

there, but please remember to take time to look out the window. China and all the world are beautiful."

Wang replied to Morgan in an e-mail from her spacecraft soon after she finished the lecture.

"Today we successfully completed a science lecture from space. We shared the wonders and beauties of the universe with tens of millions of Chinese students and gained knowledge and joy. I hope that you and other teachers and students around the world like it," the letter read. "This space contains humankind's magnificent aspirations while knowledge is the ladder toward outer space. We wish that we could work together with you to inspire youngsters around the globe to pursue science and truth about the universe."