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Protecting Mother River: Xiaolangdi Project Turns 30

By FU Lili, CHEN Qin & LIANG Yilian

The Yellow River, stretching over 5,000 kilometers, is regarded as the mother river of the Chinese nation.

The Xiaolangdi water conservancy project is one with the longest dam, the largest storage capacity, and the most difficult construction on the Yellow River. The main project started in September 1994.

This massive project has played a crucial role in stabilizing the Yellow River. It has helped control floods, reduced siltation and provided water for people's daily needs as well as irrigation. It has also supported ecological protection and high-quality development throughout the Yellow River basin.

One of Xiaolangdi's contributions is balancing the water-sand relationship. It controls 92.3 percent of the river's basin area, 90 percent of its water volume, and nearly 100 percent of its sand load. This is essential for reducing downstream sedimentation and preventing flooding.

Since the start of water and sand regulation in 2002, the effect is obvious. "The project's maximum capacity to store water and prevent floods has increased from less than 1,800 cubic meters per second to about 5,000 cubic meters per second," said Li Peng, director of the water dispatching department of the Xiaolangdi Project Construction and Management Center.

For three decades, the Xiaolangdi project has ensured spring irrigation, drought resistance and water for ecological needs.

Xiaolangdi now has a digital twin platform for real-time monitoring of its water level, storage volume, water flow rate, and sediment content.

This is a comprehensive application platform which can monitor more than 2,700 instruments deployed inside and on the surface of the Xiaolangdi project in real time. The system's functions include forecasts, providing early warnings, and rehearsals and preplanning for analysis, judgment and scheduling decisions, said Dong Zeliang, a senior engineer of the Xiaolangdi Project Construction and Management Center.

Over 700 million data items have armed the system to ensure flood control, reservoir management, and engineering safety.

During the flood season this August, Xiaolangdi once again demonstrated its capabilities by ensuring safe water and sand transfers, using the digital twin platform to precisely manage the operations.

For three decades, the Xiaolangdi project has ensured the stability of the Yellow River, fulfilling the centuries-old Chinese aspiration to control floods.



Aerial photo shows a water and sediment regulating operation carried out at Xiaolangdi Reservoir on the Yellow River in Jiyuan, Henan province, central China. (PHOTO: XINHUA)

Editor's Pick

Time Travels Through Sci-tech

By Staff Reporters

Fifty years ago, one of the most important archaeological discoveries of the 20th century was made — the "underground army" of Emperor Qin Shi Huang, the founder of the Qin Dynasty, in a vast subterranean tomb in Shaanxi province. Buried for over two millennia, this life-size terracotta replica of an entire army, including chariots and horses, attracted global attention.

"When I first saw the Terracotta Warriors, I felt I was looking at real warriors from the Qin Dynasty," exclaimed Xu Weihong, a researcher at the Shaanxi Provincial Institute of Archaeology.

Since the discovery of the first warrior figures in 1974, generations of archaeologists, aided by advanced technology, have worked to excavate, preserve and understand these historical treasures.

Unraveling the color code

When they were first unearthed, the

Terracotta Warriors were a striking sight, painted in vivid reds, greens and purples. Unfortunately, these pigments degraded rapidly upon exposure to air, fading within minutes.

For decades, scientists have been trying to restore the original colors. Chinese and international experts have collaborated on conservation techniques, studying the pigment layers and developing treatments to stabilize the restored colors.

A particularly exciting discovery was a purple pigment, barium copper silicate. This compound doesn't occur in nature. So the conclusion is that the ancient Chinese artisans developed a synthetic coloring pigment, which adds to people's understanding of ancient Chinese painting techniques.

Modern technology has been pushing the boundaries of knowledge. Today, high-spectrum color analysis is used to diagnose the damage to artifacts, while

3D modeling technology gives an accurate assessment of the scale and layout of the Terracotta Army's excavation site. Recently, an emergency protection lab was established on-site. Now, excavation, analysis, and preservation work can be done simultaneously.

Exploration without limit

The story of the Terracotta Warriors is just one chapter in "sci-tech archaeology decoding history." Sci-tech now plays a pivotal role in the archaeological process, from excavation and documentation to preservation and analysis.

On July 23, an ancient workshop was discovered at the Sanxingdui site, a striking Bronze Age culture site in Sichuan province, southwest China. Carbon dating placed the culture in the mid-Shang Dynasty, around 3,500 years ago, providing evidence of the diverse Chinese civilization.

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Luban Workshops Bridge Skills Gap in Africa

International Cooperation

By Staff Reporters

Since the launch of Africa's first Luban Workshop in Djibouti in March 2019, China has established 17 such vocational training initiatives across the continent. The workshops have developed numerous China-Africa cooperative programs, trained over 10,000 young Africans, and significantly contributed to the economic and social development of African nations.

Practical training

At the Luban Workshop in Addis Ababa, Ethiopia, students receive hands-on training in automation equipment through a mechatronics control platform.

What we pay attention to in Luban workshops is to let students solve practical problems in a real engineering environment by applying the theories they have learned, so that the trainees can meet the demands of the vocational market, according to Jiang Jiang, head of the Ethiopian Luban Workshop.

The Luban workshops focus on four key areas: industrial sensors, mechatronics, industrial control and industrial robots. These fields are essential to the local workforce, as they support the rapid modernization of Africa's industries. The program is called Lu Ban after a renowned carpenter, craftsman and engineer in ancient China.

"After receiving training here, I am more confident in applying for high-tech positions related to automation and robotics," said a local workshop student.

Passing on knowledge

In addition to cultivating skilled professionals, the Luban Workshops also train local African teachers, further extending the reach of vocational and technical education.

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WEEKLY REVIEW

12 Nuclear Research Facilities Open to Global Scientists

China will open 12 nuclear research facilities and testing platforms to international scientists and institutions to enhance global cooperation. These include the China Advanced Research Reactor, the new-generation tokamak device Huanliu-3, and the Beishan Underground Research Laboratory, the China Atomic Energy Authority said on September 16.

Chang'e-6 Lunar Sample Composition Revealed

A research team from several Chinese institutions have published the first research paper on the nature of the lunar samples brought by the Chang'e-6 mission. Published in the journal *National Science Review* on September 17, the paper fills a historical gap in the study of the moon's far side and also provides direct evidence on its early evolution.

Space Telescope Transmits X-ray Images of Moon

The Einstein Probe X-ray astronomical satellite transmitted X-ray images of the moon back to Earth on September 17. This was the first time that Chinese scientists obtained a complete X-ray image of the moon using a self-developed space telescope.

Longest Jets from a Supermassive Black Hole Found

Scientists have discovered the longest pair of jets streaming from a black hole in a distant galaxy. The jets shooting hot plasma are the largest ever spotted, stretching for around 23 million light-years, according to *Nature*.

Antibiotic Resistance Poses Threat to Global Health

Between 1990 and 2021, more than one million people died from drug-resistant infections each year, and this could increase to nearly two million by 2050, according to a paper recently published in *The Lancet*. The researchers have pointed out that antibiotic resistance has become a major global public health challenge, and decisive actions must be taken to cope with the threat.

New Graphic

China-Laos Railway Speeds Up
Cargo Transport

Over 10 million tonnes of goods



Valued at 40.77 billion RMB



Varieties 3000+

Source: Kunming Customs
Designed by SONG Ziyun & YAO Yilin / Science and Technology Daily

WECHAT ACCOUNT



E-PAPER



By WANG Jing

The crew of the U.S. Polaris Dawn mission returned to Earth on September 15, conducting the first commercial spacewalk from a commercial spacecraft, according to SpaceX.

SpaceX's Dragon spacecraft splashed down in the Gulf of Mexico near Florida's Dry Tortugas, carrying the four-member crew, which comprised tech entrepreneur and commercial astronaut Jared Isaacman, who funded and commanded the operation, two SpaceX engineers and a former Air Force Thunderbird pilot.

The spacecraft hit a peak altitude of 1,408 kilometers on September 11, the farthest that humans have traveled since

the Apollo moon landing, and it was the highest orbit around Earth ever achieved, besting the record set in 1966 by NASA's Gemini 11 mission, which reached 1,372 kilometers.

The four pulled off the first private spacewalk while orbiting nearly 740 kilometers above Earth on September 12, higher than the International Space Station and Hubble Space Telescope.

During their spacewalk, Isaacman emerged only up to his waist to briefly test SpaceX's brand new spacesuit, followed by SpaceX engineer Sarah Gillis, who was knee-high as she flexed her arms and legs for several minutes, according to AP.

Each took around 10 minutes out in

the vacuum of space, spending the spacewalk conducting mobility tests in their newly designed spacesuits.

The crew also conducted a number of studies and experiments to obtain valuable data during their mission, including essential health and human performance research for NASA's Human Research Program.

Although conducting a spacewalk is nothing new, SpaceX demonstrated that it is a task that can be performed by the industrial sector. In doing so, it took a major step toward commercializing those capabilities.

First announced in 2022, Polaris Dawn is the first of three testing and development missions under the Polaris program.