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Innovation Pathway

Developing New Quality Productive Forces in Light of Local Conditions

By Staff Reporters

The new issue of the *Qiushi* Journal, a flagship publication of the Communist Party of China (CPC) Central Committee, carried an article based on excerpts from remarks by Chinese President Xi Jinping, who is also the general secretary of the CPC Central Committee, on major occasions between September 2023 and April 2025.

The remarks illuminate promoting the development of new quality productive forces in light of local conditions, a term first put forward by Xi on his inspection tour of Heilongjiang province in northeast China in September 2023.

The term was then highlighted at the Central Economic Work Conference in December of the same year, and in January 2024 was the subject of the group study session of the Political Bureau of the CPC Central Committee.

New quality productive forces mean advanced productivity where innovation plays the leading role and which is free from the traditional economic growth mode and productivity development paths. They are characterized by high technology, high efficiency and high quality, representing an advanced form of productive forces consistent with the new development philosophy.

Xi highlighted the concept again in a deliberation during the second session of the 14th National People's Congress in March 2024, stressing that new quality productive forces should be developed according to local conditions.

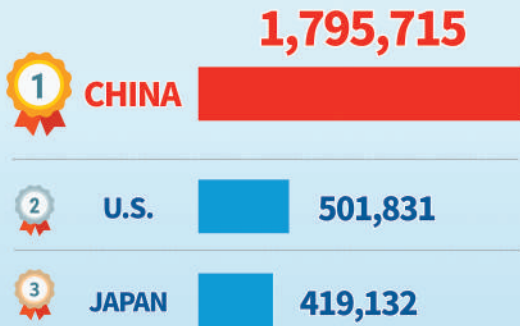
Localities should take into account their own resource endowment, industrial foundation and scientific research conditions to promote new industries, models and growth drivers in a selective manner, and use new technologies to transform and upgrade traditional sectors into high-end, intelligent and green industries.

The integration of sci-tech innovation and industrial innovation requires building platforms, improving systems and mechanisms, and strengthening enterprises' role in innovation. Also, institutional barriers to high-quality development should be resolutely removed.

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New Graphic

CHINA RANKS **NO.1**
IN GLOBAL PATENT FILINGS
IN 2024



Source: World Intellectual Property Organization
Designed by Science and Technology Daily

WECHAT ACCOUNT



E-PAPER



The photo shows Xuelong 2, which is China's first domestically built polar research icebreaker and the world's first icebreaker capable of breaking ice both bow-first and stern-first. (PHOTO:XINHUA)

STI Frontier

Xuelong 2 Enters Southern Ocean on Antarctic Mission

By BI Wenting & LONG Yun

More than two weeks into its voyage to Antarctica for the 42nd national Antarctic expedition, China's polar research icebreaker Xuelong 2 approached the Southern Hemisphere's "Roaring Forties" on November 16.

Antarctica, with an area of 14 million square kilometers, is covered by an ice sheet 2,450 meters thick on average. The continent remains one of the most remote and data-scarce regions on Earth. The ongoing scientific work there contributes directly to understanding global climate patterns, sea-level change and sustainable ocean resource management.

Delivered in 2019, Xuelong 2 is China's first domestically built polar research icebreaker and the world's first capable of breaking ice both bow-first and stern-first. It operates alongside the vessel Xuelong, supporting

scientific research, environmental monitoring and logistics for Chinese stations in polar regions.

Before Xuelong 2 entered service, Xuelong was the nation's only comprehensive polar research vessel for nearly 30 years. While it completed numerous Arctic and Antarctic missions, its ice-breaking capacity limited operations to peak summer months and prevented access to heavily iced areas such as the central Arctic Ocean.

Xuelong 2 was developed to address these constraints. At 122.5 meters long with a design displacement of nearly 14,000 tons, it is equipped with two 7.5-megawatt azimuth thrusters. It can break 1.5 meters of ice plus 0.2 meters of snow continuously at speeds of two to three knots in either direction.

Antarctic Sea ice is generally divided into first-year ice and multiyear ice, which has survived at least one summer

melt. Multiyear ice is mainly found in the western Weddell Sea, Bellingshausen Sea and Amundsen Sea. The other areas are dominated by the thinner first-year ice.

According to Yang Kai, an official working at Xuelong 2, its capabilities allow it to navigate through most Antarctic Sea ice, significantly expanding operational reach. In heavy ice ridges, where conventional bow-only icebreakers often get stuck while turning, the stern-first mode proves critical. The ship's azimuth thrusters rotate 360 degrees, enabling the propellers to cut through thick ridges from behind.

"We use the stern to break up the toughest sections first, then switch to bow mode," Yang said. "Bidirectional ice-breaking saves time and allows us to penetrate thicker ice."

This capability was demonstrated during China's 40th Antarctic expedition. See page 4

Moon Samples Reveal Oxidation Theory Breakthrough

By Staff Reporters

Chinese scientists have achieved a major breakthrough in lunar science by identifying micrometer-scale hematite and maghemite crystals in the samples China's Chang'e-6 mission brought from the far side of Moon in 2024.

The discovery reveals a previously unknown oxidation mechanism linked to large impact events and provides sample-based evidence on the impact origin of magnetic anomalies around the South Pole-Aitken Basin, according to the China National Space Administration.

The Chang'e-6 mission collected the samples from within the South Pole-Aitken Basin, the largest and oldest known impact basin on any rocky body in the solar system. It was the first time

that samples were obtained from Moon's far side.

Shandong University's planetary science team, in collaboration with researchers from the Institute of Geochemistry of the Chinese Academy of Sciences and Yunnan University, discovered hematite and maghemite in the samples. The formation of these high-valence iron oxides on Moon is extremely unexpected due to the satellite's highly reducing environment as it has no protective atmosphere or liquid water.

Using a combination of micro-area electron microscopy, electron energy loss spectroscopy, and Raman spectroscopy, the team confirmed the crystalline lattice structure and distinctive occurrence features of these native lunar hematite grains.

The study proposes that the formation of the hematite is closely associated with ancient large-scale impact events. Such impacts could have generated transient vapor environments with high oxygen fugacity, enabling iron to oxidize.

Under these conditions, troilite, a common iron sulfide in lunar rocks, may have undergone desulfurization, followed by vapor-phase deposition to produce micrometer-sized crystalline hematite particles.

The study suggests that magnetite and maghemite, both magnetic minerals, were intermediate products in this reaction pathway. They could serve as the mineral carriers responsible for the magnetic anomalies observed along the margins of the South Pole-Aitken Basin.

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International Cooperation

Innovation Corridor Across Lancang-Mekong Region

By LU Zijian & ZHAO Hanbin

An initiative of sci-tech cooperation on cross-border data flow among Lancang-Mekong countries was released during the Second Workshop on the Lancang-Mekong Cooperation (LMC) Innovation Corridor Development held in Kunming, southwest China's Yunnan province on November 11, injecting new impetus into the construction of this regional innovation corridor.

In December 2023, the Joint Initiatives on the LMC Innovation Corridor Development was issued during the Fourth LMC Leaders' Meeting, noting that further improving the framework of science, technology and innovation (STI) cooperation will promote the economic development and social progress, and build a community of shared future of peace and prosperity among Lancang-Mekong countries.

One year later, the First Senior Officials' Meeting on the LMC Innovation Corridor Development was held in Kunming, adopting a charter of the mechanisms for this meeting.

However, STI cooperation among the Lancang-Mekong countries extends beyond this framework. Mechanisms like China-ASEAN Science and Technology Partnership Program and China-ASEAN Technology Transfer Center have provided strong support.

In recent years, more than 100 joint research projects in fields such as agriculture, energy and public health have been conducted among these countries, training a large pool of science and technology professionals.

According to the China Railway Kunming Group, as of October 28, the China-Laos Railway had operated a cumulative total of 63,000 freight trains, transporting over 70 million tonnes of cargo, including 16 million tonnes of cross-border freight to 19 countries and regions.

As a pioneer zone for LMC, Yunnan has built 34 international joint innovation platforms with the other five countries, according to Shang Chaoqiu, deputy director general of Yunnan Province Science and Technology Department.

In 2024, Yunnan dispatched 68 science and technology commissioners to the five countries to conduct sci-tech services. A special program launched in 2021 continues to support joint research projects by young scientists.

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WEEKLY REVIEW

LHAASO Uncovers Formation of Cosmic Ray

Scientists using LHAASO — China's Large High Altitude Air Shower Observatory — found that black holes, devouring material from their companion stars and producing jets, act as powerful particle accelerators and may play a key role in the production of high-energy cosmic rays in the Milky Way.

Chinese Cities Dominate Nature Global Science Ranking

The newly released "Nature Index 2025 Science Cities" supplement shows that the number of Chinese cities in the global top 10 rose from five in 2023 to six in 2024, marking the first time China holds a majority in the rankings.

New Fusion Device Exceeds Highest Plasma Pressures

Zap Energy's new fusion device FuZE-3 has achieved plasmas with electron pressures as high as 830 MPa, or 1.6 GPa total, comparable to the pressures found deep below Earth's crust. The results are the highest pressure performance to date in a sheared-flow-stabilized Z pinch and an important marker on the path to scientific energy gain.

AI Creates 100-bln-star Milky Way Tracking Model

Combining deep learning with high-resolution physics, researchers from Japan and Spain created the first Milky Way model that can track more than 100 billion individual stars across 10,000 years of evolution. The simulation is hundreds of times faster than current methods.