



CHINA'S ECONOMY SUSTAINING SOUND, STEADY GROWTH

PAGE 3 | INSIGHTS



RABE: PASSING ON LEGACY OF HUMANITY DILIGENTLY

PAGE 4 | LIFE IN CHINA

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# Macao's Remarkable Development in 25 Years

By LIANG Yilian

This year marks the 25th anniversary of Macao's return to the motherland. Over the past quarter century, Macao has been transformed into one of Asia's wealthiest cities, showcasing remarkable progress.

Since 1999, Macao has thrived under the "one country, two systems" policy. With robust support from the central government and the mainland, the special administrative region (SAR)'s economy has experienced unprecedented growth.

#### Robust economic growth

In 1999, Macao's GDP stood at 51.9 billion Macao pataca (MOP). By 2023, it had skyrocketed to nearly 379.5 billion MOP. By the end of last year, the total savings of Macao residents surpassed 700 billion MOP, an eightfold increase compared to 1999. This year, *Forbes* magazine ranked Macao the second richest place on Earth, trailing only Luxembourg

Since the launch of the Guangdong-Macao In-Depth Cooperation Zone in Hengqin in 2021, the integration between Hengqin and Macao has accelerated. This development continues to inject new momentum and expand opportunities for Macao's future

A milestone in Macao's regional integration was the opening of the Hengqin line of the Macao Light Rapid Transit in December. The 2.2-kilometer line connects Macao's Lotus Station with Hengqin Station, linking Macao to the one-hour living circle of the Guangdong-Hong Kong-Macao Greater Bay Area.

See page 3

## **WEEKLY REVIEW**

Chinese Internet Satellite Group Launched

China sent the first group of low Earth orbit satellites for a satellite Internet constellation from the Wenchang Space Launch Site in south China's Hainan province on December 16. The launch marked the 552nd mission of the Long March series carrier rockets.

#### $New\ Pattern\ in\ Virus\ Transmission\ Uncovered$

A Chinese research team has uncovered a new pattern in virus transmission through synthetic biology techniques. The research discovered that the faster the directional movement of bacterial populations, the more easily infected bacteria are discarded by the moving group, eventually leading to a population composed entirely of healthy bacteria.

#### Cancer-fighting Nuclides from Rare Earth Minerals

Chinese researchers have extracted high-purity lead-212 and bismuth-212 nuclides from rare earth minerals, which are known for their potential in treating various cancers. The breakthrough holds significant importance for achieving self-sufficiency in the production of critical medical nuclides in China.

#### Complex History of Human Gene Flow Revealed

An international team has estimated the genomes of 300 modern and ancient humans, including 59 individuals who lived between 2,000 and 45,000 years ago. The research helps to understand the effects of gene function and gene flow on human ancestors, and the results provide more precise details of the complex history of gene flow from the Neanderthals, an extinct species of archaic humans to modern humans.

### of archaic humans, to modern humans. First Proof of Heaviest Antimatter Hypernucleus

The first ever evidence of antihyperhelium-4, which is composed of two antiprotons, an antineutron and an antilambda, has been discovered by an international team. The result represents the first evidence of the heaviest antimatter hypernucleus at the Large Hadron Collider, the world's largest particle accelerator, according to the European Organization for Nuclear Research. It provides new clues for scientists to further uncover the mystery of the matter-antimatter imbalance in the universe.



An aerial drone photo taken in Hengqin of Zhuhai city, south China's Guangdong province, shows a view of south China's Macao.

### **Editor's Pick**

# BeiDou Navigates an Innovative Future

By LIN Yuchen

Epitomizing China's journey of innovation in satellite navigation, the BeiDou Navigation Satellite System (BDS) was officially launched in 1994, aiming to meet domestic navigation needs and support economic and societal development.

#### From regional to global coverage

The journey began with BeiDou-1, a regional system providing limited services through a dual-satellite configuration. The next leap came in 2004 with BeiDou-2, which expanded coverage to the Asia-Pacific region. By 2012, BeiDou-2 operated with 14 satellites, utilizing a hybrid constellation design comprising geostationary, inclined geosynchronous and medium earth orbits.

This mixed constellation design improved service accuracy and reliability, supporting a range of applications from transportation to disaster relief. These advancements positioned BeiDou-2 as a critical regional navigation system.

The most significant leap came with BeiDou-3, which achieved global coverage in 2020. Consisting of 30 satellites, BeiDou-3 marked China's establishment

of an independent, globally operational navigation system on par with GPS, GLONASS and Galileo.

#### Breaking technological barriers

One of BeiDou's defining features is its cutting- edge inter- satellite link technology. Unlike traditional systems that rely heavily on ground stations, BeiDou satellites communicate directly, ensuring robust real-time operations. This innovation was driven by researchers like Kang Chengbin, who led efforts to overcome the challenges of linking satellites up to 70,000 kilometers apart. The system ensures precise measurements, enabling seamless global connectivity.

Another hallmark is BeiDou's short message communication service, which sets it apart from other navigation systems. While GPS provides location data, BeiDou enables users to send location and status updates. This feature is very useful in disaster scenarios, such as earthquakes or maritime accidents, where traditional communication networks fail. For example, the system supports up to 1,000 Chinese characters in a single message, making it an indispensable tool for

emergency services.

Underpinning these breakthroughs is a commitment to innovation and risk-taking. One example is the first experimental BeiDou-3 satellite in 2015 integrating more new technologies than usual. This approach ensured that BeiDou-3's technology remained cutting- edge throughout its operational lifespan.

#### Aiming for universal connectivity

As BeiDou-3 reached its final deployment in 2023 with the launch of its 59th and 60th satellites, the system's impact extended far beyond navigation.

BeiDou has become a critical infrastructure supporting diverse sectors, from transportation and agriculture to disaster management and urban planning.

More than 10 million shared bicycles equipped with BeiDou chips operate across China, and over 2,500 water reservoirs leverage BeiDou's short-message capabilities for hydrological monitoring.

Looking forward, China has set its sights on developing BeiDou- 4, aiming for a more intelligent, integrated and ubiquitous positioning system by 2035.

See page 2

# China, US Extend Agreement on Sci-tech Cooperation

#### By Staff Reporters

On December 13, the representatives of the Chinese and US governments signed a protocol in Beijing to amend the Agreement Between the United States and China on Cooperation in Science and Technology (STA) and extend it for an additional five years, effective from August 27, 2024.

"Scientific cooperation between China and the US benefits both sides," Chinese foreign ministry spokesperson Lin Jian said on Monday. The STA is one of the first government-to-government agreements signed between the two countries after establishment of diplomatic ties, and has been a strong buttress for scientific exchange and cooperation between the two countries.

According to Lin, the extension is in the interest of both peoples, and what the international community hopes to see. It will not only contribute to both countries' science and technology advancement and socioeconomic development, but also enable China and the US to respond to global challenges together, which will in turn benefit people around the world.

"We hope the US will work with China to earnestly implement the agreement so that the two sides' cooperation in science and technology can truly deliver for both countries and the world," Lin said.

# Strengthening Sino-Swiss Aerospace Ties

### **International Cooperation**

#### By Staff Reporters

To enhance Sino-European and Sino-Swiss scientific dialogue and cultural exchange in the aerospace field, the China Science and Technology Exchange Center (CSTEC) and Swissnex jointly hosted a workshop on space sustainability and the second Sino-Swiss astronaut dialogue in Shanghai on December 9.

Nearly 100 representatives, including Chinese astronaut Jing Haipeng, Swiss astronaut Claude Nicollier, CSTEC Deputy Director General Yang Xuemei, and Swissnex Director Philippe Roesle attended the event.

CSTEC Director General Gao Xiang delivered a video address. Gao said that the aerospace field is a key area for Sino-Swiss cooperation, yielding outstanding scientific achievements. In November, China, Brazil, South Africa and the African Union jointly launched the Initiative on International Cooperation in Open Science. CSTEC is committed to working with Switzerland to uphold the spirit of "equality, innovation and mutual benefit," carry on the tradition of collaboration in the aerospace field, and promote sustainable sci-tech development.

Roesle said that next year marks the 75th anniversary of diplomatic ties between China and Switzerland and expressed a willingness to strengthen collaboration with CSTEC to foster more outcomes in sci-tech cooperation.

Both Jing and Nicollier encouraged deeper Sino-Swiss and Sino-European collaboration in aerospace research and exchange to advance the sustainable utilization of space.

Experts and scholars from China and Switzerland shared the latest progress in fields such as astronomical observation, dark-sky preservation and space art exploration. They also discussed potential areas for future collaboration.

In July, CSTEC and Swissnex officially signed a memorandum of understanding on cooperation. The workshop will further advance Sino- Swiss and Sino- European scientific exchange and innovation collaboration.

### **New Graphic**

China's 2024 Grain Output
Hit a Record High

706.5

The total grain output

million tonnes

rising by 1.6 % y/y

### The sown area of grain

1.79 billion mu

increasing by 5.258 million mu from last year

Source: National Bureau of Statistics
Designed by SONG Ziyan / Science and Technology Daily

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