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Innovation Pathway

Zhejiang's Path to Independent Innovation

By WANG Xiaoxia, JIANG Yun & ZHANG Gailun

In 2006, Zhejiang province set itself the goal of "becoming one of China's innovative provinces within 15 years and building a strong province in science and technology." Armed with this blueprint, the province's independent innovation efforts went into overdrive.

By 2020, Zhejiang had established itself as an innovation-driven province. Four years later, the R&D expenditure of large-scale industrial enterprises in Zhejiang reached 372 billion RMB, representing a year-on-year growth of 5.5 percent. The added value of high-tech industries exceeded 1,550 billion RMB, increasing by 8.3 percent year-on-year.

Building tech platforms

At the beginning of the 21st century, Zhejiang had improved its market economy, but it also had the disadvantage of outdated industrial structure and insufficient science and technology expertise to drive economic development.

To make up for the shortcomings, Zhejiang established major research institutions for technology innovation, and a base for scientific and technological achievement transfer.

For example, Zhejiang Provincial Government and Tsinghua University co-founded the Yangtze Delta Region Institute of Tsinghua University, Zhejiang, which is actively involved in technology innovation and services, training and hi-tech commercialization. To date, the institute has achieved remarkable results, establishing five national-level research platforms, undertaking over 1,500 research projects, and obtaining 834 authorized patents.

Based on social and economic development demands, Zhejiang released favorable policies, attracting a number of leading universities including Peking University, Beihang University and Xidian University to establish institutions. By the end of 2024, Zhejiang had recognized 117 provincial-level new research institutions, becoming a major engine for technology innovation and transfer.

Laying solid foundation

Entering the building of the College of Biomedical Engineering and Instrument Science at Zhejiang University, the first thing that catches the eye is a sign on the wall saying, "Try more interdisciplinary research."

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Shougang Park, the venue of the 2025 China International Fair for Trade in Services (CIFTIS), in Beijing, capital of China. This year's CIFTIS is being held here from September 10 to 14. (PHOTO: XINHUA)

STI Frontier

JUNO to Reveal Nature of Matter and Universe

Edited by WANG Xiaoxia

The Jiangmen Underground Neutrino Observatory (JUNO) in south China successfully filled its 20,000-ton liquid scintillator detector and begun data taking on August 26.

Located 700 meters underground in Kaiping, Jiangmen city in Guangdong province, JUNO is the first of a new generation of ultra-large and ultra-precision neutrino experiments to reach this stage and has set multiple world records in technology. Its operation will help answer fundamental questions about the nature of matter and the universe.

Elaborate planning

Proposed in 2008 and approved in 2013, JUNO went through more than a decade of preparation and construction, tackling numerous challenges in designing and engineering.

Back into 2012, the Daya Bay Reactor Neutrino Experiment in Guangdong

discovered an unexpectedly large neutrino oscillation related to the mixing angle, which brought China's neutrino experimental research from scratch to the forefront of the world.

The more advanced and larger-scale JUNO shoulders a greater mission: to tackle one of this decade's major open questions in particle physics -- the ordering of neutrino masses, and thereby exploring the mysteries of the origin of the universe.

Physical sensitivity analysis specified that the experimental site should be within an area 50 to 55 kilometers away from the nuclear reactor and less than 200 meters wide.

Therefore, JUNO has been located 53 kilometers away from the Taishan and Yangjiang nuclear power plants, which is perfect for detecting the antineutrinos produced by them and measuring their energy spectrum with record precision.

The key to revealing the ordering of

neutrino masses lies in the design and construction of the central detector, according to Heng Yuekun, deputy project manager in charge of JUNO's detector.

From 2013 to 2015, after considering various factors such as the detector's performance, cost, construction feasibility, risk, and lifespan, it was ultimately decided to use acrylic spheres to load the liquid scintillator, pure water as the shielding liquid, and a steel grid structure to support the entire structure.

Challenging experiment

After the detector's design was finalized, construction began, with groups of engineers and workers descending to the canyon 700 meters underground from the spring of 2015.

The JUNO experiment hall is the largest-span underground chamber in China. Its top arch has a span of 49.5 meters, making it a world-class extraordinary underground project.

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CIFTIS Puts Cooperation on Fast Track

By LU Zijian & YU Haoyuan

"It's just started, but I'm very excited. There are people from different countries and there are also a lot of different products," Jay Kerekes, head of operations at Haikou Quanlian International Trading Co., told *Science and Technology Daily (S&T Daily)* on September 10, the first day of the China International Fair for Trade in Services (CIFTIS).

Held in Beijing's Shougang Park, a transformed industrial area, this year's CIFTIS, as always, is a grand international gathering, with more than 80 countries and international organizations exhibiting or holding events.

First-timers and old hands

Dairy products from Australia, woolen clothes from Mongolia, hand-made iron kettles from Japan...numerous eye-catching products were on display in Hall 1. The lively music and singing from the Slovakia booth drew *S&T Daily* reporters' attention.

Kerekes from Slovakia said it was his first time at CIFTIS, calling it a great opportunity to promote his company's products as well as his country, learn the preferences of Chinese consumers, and get their response to the products.

"But most importantly, it's to build a bridge," he said. "Many people don't even know what Slovakia is, so this is a great opportunity to put our country on the map."

It was also the first time for Mandefro Shiferaw, minister counselor of the Ethiopian Embassy in Beijing, though the embassy has attended CIFTIS multiple times.

The main goal this year, he said, was to promote coffee from Ethiopia, the birthplace of the beverage. Today, Ethiopia is renowned for its high quality coffee such as Arabica, and China is the fifth largest importer of Ethiopian coffee.

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WEEKLY REVIEW

World's Longest Cable-stayed Bridge Opens to Traffic

On September 9, the Changtai Yangtze River Bridge — the world's longest cable-stayed bridge — officially opened to traffic. Spanning 10.03 kilometers across the river, the bridge integrates expressway, intercity railway and ordinary highway functions. It reportedly holds six world records, including being the longest span cable-stayed bridge.

Brain-inspired Large Models Issued

Researchers from the Institute of Automation, Chinese Academy of Sciences, released SpikingBrain, a family of brain-inspired models designed for efficient long-context training and inference. The model achieves performance comparable to open-source Transformer baselines while using only about 150B tokens for continual pre-training. The full training and inference process of the model was done on a domestic GPU computing platform.

AI-powered BCI Helps Paralysis Patients Use Devices

Researchers from the University of California, Los Angeles have developed a brain-computer interface (BCI) using AI as a co-pilot to help people with paralysis to complete tasks. The BCI helps infer user intent and complete tasks by moving a robotic arm or a computer cursor. It could pave the way for a variety of assistive technologies that would enable people with limited physical capabilities to handle and move objects more easily and precisely.

First Complete Animal Brain Activity Map Unveiled

A large international collaboration of neuroscientists unveiled the first complete activity map of decision-making in the animal brain. The findings were published in two papers in *Nature*, revealing how decision-making unfolds across the entire brain in mice at the resolution of single cells. This brain-wide activity map challenges the traditional hierarchical view of information processing and demonstrates that decision-making is distributed across multiple regions in a highly coordinated manner.

New Graphic

China, for the 3rd consecutive year, leads with the most clusters (24) among the world's top 100 innovation clusters.

WECHAT ACCOUNT



E-PAPER



By Staff Reporters

In a major step toward reimagining urban life, China has unveiled a comprehensive blueprint for high-quality city development, setting a vision for innovation, sustainability, resilience, and inclusivity.

As urbanization accelerates, policymakers and urban planners are turning to technology and regional collaboration to shape the future of Chinese cities. From the bustling Yangtze River Delta to the innovation hubs of Shenzhen and Wuhan, a new urban paradigm is emerging where technology serves people, heri-

tage is preserved, and cities grow not just bigger, but better.

Powering growth through regional synergy

The future of Chinese cities isn't confined by borders. In the Yangtze River Delta, home to Shanghai, Jiangsu, Zhejiang, and Anhui provinces, cities are no longer operating separately. Instead, they're forming a tightly integrated network where innovation, talent, and services flow seamlessly across regions.

Take Yunxi Quantum Technology, a Hefei-based company that partners with research institutions in Shanghai and en-

terprises in Hangzhou and Lianyungang to turn breakthroughs into real-world applications. This kind of cross-provincial collaboration is now the norm, thanks to platforms like the Yangtze Delta's "One-Stop Online Service," which enables businesses to handle administrative tasks across jurisdictions with ease.

"We're connecting cities and integrating their strengths into a unified engine of growth," said Zeng Gang, director of the Urban Development Research Institute and the Center for Modern Chinese City Studies of East China Normal University.

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New Era of High-quality Urbanization

Policy Express

By LIN Yuchen

A new policy that outlines the vision for China's urbanization, shifting the focus from rapid expansion to stable and efficient growth, with an emphasis on improving existing urban structures and enhancing the quality of life, was issued recently by the Central Committee of the Communist Party of China and the State Council.

The policy aims to transform cities into engines of modernization and key spaces for people's well-being. By 2030, China intends to make substantial progress in building "modernized people's cities," focusing on improving living conditions, sustainable growth, and governance. By 2035, these cities should be largely completed, with advanced urban systems and social services.

A central theme of the policy is transitioning urban development from a phase of rapid expansion to one of making better use of existing urban structures. This includes urban renewal, energy transformation, and focusing on people-centered policies. The plan calls for a tailored approach based on local conditions, emphasizing inclusivity and



An aerial view of the central business area of Zhengzhou city, Henan province. (PHOTO: XINHUA)

livability in urban planning.

Also emphasized is the integration of urban agglomerations and metropolitan areas, aiming to create well-connected, efficient urban networks. Areas such as Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Guangdong-Hong Kong-Macao Greater Bay Area are prioritized to become world-class urban clusters.

The policy focuses on the simulta-

neous development of second-tier and smaller cities, improving their infrastructure, public services, and economic functions.

Additionally, the policy calls for the enhancement of megacities' competitiveness by refining their functions and supporting technological innovation, particularly in high-tech industries. These cities will be encouraged to improve their allocation of global

resources, develop cutting-edge technology platforms, and drive industrial transformation.

To encourage new growth drivers, a push for innovation in manufacturing, services, and green industries has been stressed, along with highlighting revitalization of underutilized urban assets, such as old buildings and inefficient land, to maximize space efficiency and stimulate local economies.

A key aspect of the policy is promoting sustainable urban development. In this regard, cities will focus on increasing energy efficiency, adopting green building practices, and reducing environmental pollution. Additionally, sustainable living practices, including water conservation, waste reduction, and low-carbon transportation systems form part of the plan.

Urban planning is a strategic framework for reshaping China's urban landscape. By prioritizing innovation, sustainability, and efficient resource use, the framework aims to improve people's quality of life and enhance the global competitiveness of China's cities. Through urban renewal and sustainability efforts, China is poised for a new era of high-quality, people-centered urbanization.



Push for Unified Carbon Market by 2030

By LIN Yuchen

China recently released a policy aimed at accelerating the green, low-carbon transformation of its economy, emphasizing the importance of building a unified and highly efficient national carbon market.

The policy stresses China's commitment to confronting climate change head on, while driving sustainable economic development with a focus on upgrading the role of carbon markets to

control greenhouse gas emissions.

The policy's core objective is to establish a comprehensive carbon market that integrates mandatory carbon emissions trading and voluntary greenhouse gas reduction trading. By 2027, the mandatory carbon emissions market is expected to expand to include key industrial sectors, while the voluntary market should cover all critical areas.

By 2030, China aims to build a robust, transparent, and internationally aligned carbon trading system, setting

up a pricing mechanism that is genuinely reflective of environmental costs.

The policy sets out clear priorities to accelerate the carbon market's development. The national carbon emissions trading market is to be expanded gradually across all industries, with a focus on sectors that offer substantial emissions reduction potential.

The government initially plans to implement a quota system for carbon emissions, combining both free and paid allocation methods, and progressively shift towards a total cap on emissions. A market adjustment mechanism will also be created to ensure stability, enhance liquidity, and balance supply and demand.

The development of the voluntary carbon market is another key initiative. The government plans to establish a comprehensive strategy for voluntary emissions reduction projects, focusing on sectors with significant ecological and social benefits. The use of certified voluntary reductions in carbon trading will be encouraged, with government and state-owned enterprises leading by example in integrating these reductions

into their operations.

In addition, the policy focuses on improving the market's competitiveness by diversifying trading products, promoting green financial instruments, and expanding the range of market participants, including financial institutions and individual traders. Regulatory measures will be strengthened to ensure market transparency and prevent any form of manipulation.

To ensure the carbon market's success, China will also improve its management systems, including implementation of a nationwide digital platform for trading and emissions reporting. High-quality carbon data and rigorous oversight to maintain the integrity of the market is another area of importance.

In the international arena, China aims to contribute to global efforts to combat climate change by aligning its carbon market practices with international standards, and engaging in collaborative efforts to develop a fair and equitable global low-carbon transition.



An UAV equipped with lithium battery is tested. (PHOTO: XINHUA)

A Course for Modern, People-centered Urban Development

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The strategy is paying off: 19 urban agglomerations now house 75 percent of China's population and account for approximately 85 percent of its GDP. As emphasized in the new policy, the goal is to build networked, cluster-based urban systems.

"A city cluster isn't just a group of cities," said Wu Zhixiang, a member of the Chinese Academy of Engineering from Tongji University. "It's an organic whole, linked by transportation, information, innovation and industrial networks."

Where ideas take flight

In Anyang, Henan province in central China, a drone recently delivered a business license and company seal just 10 minutes after the request was filed, symbolizing the city's push into the low-altitude economy.

Backed by the Lantian Laboratory, Anyang's drone industry reached 1.65 billion yuan in output in 2024, a 30 percent year-on-year increase.

This is innovation in action, where science meets society. Across the country, cities are cultivating ecosystems for innovation, nurturing everything from startups to tech giants.

In Shenzhen, policymakers are rolling out new support for high-growth firms, aiming to create a landscape where "leading enterprises dominate the skyline, SMEs blanket the ground, and innovators open new frontiers."

"It's about creating the right soil for ideas to take root and scale," said Cao Zhongxiong, assistant director at the China (Shenzhen) Institute of Comprehensive Development.

Preserving the past, embracing the future

As cities modernize, there's a growing emphasis on preserving cultural identity. In Pingyao, Shanxi province in north China, a UNESCO World Heritage site with over 1,000 protected cultural relics, local officials are using AI and big data to map historical patterns and guide urban planning.

The city's "separate governance for old and new" model ensures that while modern infrastructure expands beyond the ancient walls, the historical core remains intact.

"Heritage must not be frozen in time," said Professor He Yun'ao of Nanjing University. "With digital tools, we can help ancient culture speak to modern audiences, bridging past and present."

Cities that 'think' and adapt

When Typhoon Wipha lashed Wuhan in July, the city did not suffer waterlogging. Thanks to its "sponge city" infrastructure and smart flood control systems, streets that once used to be flooded now drain efficiently.

"Resilience means being prepared and anticipating (disasters)," said Peng Chong, deputy dean of the School of Architecture and Urban Planning, Huazhong University of Science and Technology.

Leveraging the Internet of Things and big data, cities like Wuhan are

building all-encompassing monitoring systems that track risks from the sky to the soil.

Chongqing — a mountainous megacity — is using AI to manage urban operations at scale. Its "City Brain" connects with 41 districts and over 1,000 township centers, monitoring everything from traffic to public safety in real time.

In Qingdao, Shandong province in the east, a smart community app brings services at residents' fingertips — whether it's booking a doctor, ordering groceries, or repairing appliances. "Smart cities are not showing flashy tech," said a local official. "They're about making life easier, one click at a time."

At its core, China's urban transformation is about people. These initiatives converge on a single goal: improving quality of life. With science and technology as the foundation, and human well-being as the compass, China's cities are growing and evolving.

Vibrant China

Sichuan's Unique Heritage-Consumption Synergy

By LIN Yuchen, LIU Xia, WANG Shanshan, DAI Xiaopei & FANG Linlin

Sichuan, a province renowned for its cultural heritage and diverse landscapes, is embracing a new era of growth by integrating its cultural and tourism resources with a broader range of industries. This integration aims to boost both the local economy and people's quality of life, creating a unique synergy between heritage and modern consumption.

Since January, Sichuan's tourism sector has seen remarkable growth. For example, the night cruise on the Jinjiang river project generated around 24.88 million RMB, while the scenic Emei Mountain welcomed over 4.65 million visitors.

The service sector in Leshan city in the south surpassed 100 billion RMB in added value during the 14th Five-Year Plan period (2021-25). These figures reflect the success of a broader strategy to combine traditional culture with modern tourism, forging a dynamic model for development.

One key aspect of this transformation is the adaptation of historical sites into vibrant tourism hubs. In the ancient town of Suji in Leshan, for instance, more than 400 million RMB has been invested in the renovation of the town's heritage sites and the development of new cultural tourism products. As a result, Suji saw 4.65 million visitors and generated 502 million RMB in tourism revenue from January to May.

Other initiatives, such as the Shibaihe Tourism Area in Weiyuan county, have also pioneered new tourism experiences, including educational

tourism courses and large-scale live performances that highlight the region's unique cultural heritage.

Sichuan's modern urban developments are equally vibrant, with new retail and entertainment spaces springing up across cities. For example, the "Naxi Silk Factory — Micro Buzz Energy Station" in Luzhou combines a variety of business models, including local food, entertainment, and social spaces, to create a dynamic new consumption environment.

Similarly, the Luhui CPI Commercial Park in Chengdu is leveraging its natural surroundings to create a relaxed and stylish shopping experience, attracting a unique crowd and achieving significant foot traffic.

At the same time, cutting-edge technologies are being introduced to enhance tourism experiences. In Chengdu, the Jinjiang night cruise offers an immersive experience using Mixed Reality technology, so that visitors experience ancient Sichuan as if they were stepping into a historical scene.

In Emei Mountain, an "exoskeleton hiking assistant robot" was introduced to help tourists conserve energy during hikes, further blending technology with cultural exploration.

Through a combination of policies, activities, and diverse tourism products, Sichuan is redefining its identity as the place where life is easy. By merging culture, tourism, and industry, the province is not only creating new economic growth but also offering a model for sustainable, high-quality development that benefits both locals and visitors alike.



A child has fun in Chengdu, Sichuan province. (PHOTO: XINHUA)

JUNO to Reveal Nature of Matter and Universe

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Li Xiaonan, director of JUNO at the Institute of High Energy Physics (IHEP), Chinese Academy of Sciences (CAS), has been living in Kaiping since 2013 and is in charge of infrastructure. Although Li majored in particle physics, during the seven years of construction, he also studied multiple fields such as geology, hydrology, measurement and control, and fire protection, to communicate smoothly with the contractors and overcome ensuing difficulties.

JUNO is the most challenging project I have ever conducted, Wang Yifang, a renowned high-energy physicist and an academician of the CAS, frankly stated. The challenges were not only in engineering, but also in the development of the detector's key core component.

The acrylic spheres used in JUNO were 20 times larger than the largest SNO experimental acrylic sphere in the world when the project was proposed.

The Donchamp company set up a dedicated production line and worked closely with the IHEP, breaking through multiple technical barriers to develop acrylic spheres qualified for JUNO.

Independent and collaborative innovation

The photomultiplier tube (PMT) is the most crucial component of the detector. A total of 20,000 PMTs operate simultaneously to capture scintillation light from neutrino interactions and convert it to electrical signals.

However, the technology was monopolized by Japan and acquiring it was very costly. Therefore, independent R&D of PMT was put on the agenda and in 2009, Wang and his team proposed a novel PMT solution.

After 11 years of verification, they successfully developed a PMT with independent intellectual property rights and the highest photon detection efficiency in the world. They also obtained patent license from the European Union, the United States, Japan and other countries.

In 2020, 15,000 20-inch domestically produced PMTs were delivered. Compared with imported PMTs, this saved two-thirds of the cost and rescued the domestic PMT industry, which was on the verge of bankruptcy.

While hosted by the IHEP, JUNO is a collaborative innovation of over 700 scientists from 74 research institutions in 17 countries and regions, along with thousands from the industrial sector.

The landmark achievement is the result of the international cooperation among many research groups outside China, who have brought to JUNO their expertise from previous liquid scintillator set-ups.

Marco Beretta, an Italian expert, arrived at the experimental site in July 2023 and became one of the heads of liquid scintillation. When Beretta saw the light inside the detector for the first time, his excitement knew no bound. "The birth of such a huge detector is like a paean, so wonderful," he said in eulogy.

Anthropic's Ban Fails to Curb China's Booming AI Industry



By LIANG Yilian & HU Dingkun

Editor's Note: In today's world, co-operation and mutual benefit have become mainstream concepts. International collaboration in science and technology, along with talent exchange, has become a vital pathway for advancing sci-tech progress as well as industrial development. However, some countries have been politicizing, stigmatizing, and demonizing international sci-tech cooperation. Science and Technology Daily launches "Clear Voice," a new column to clarify misconceptions and set the record straight.

Recently, U.S. AI giant Anthropic announced a ban on Chinese-controlled enterprises from using its services, including the Claude model, a family of large language models (LLMs) developed by it.

This is not limited to China alone; overseas companies with direct or indirect Chinese ownership exceeding 50 percent are also within the scope of the ban. Furthermore, the announcement was heavily charged ideologically, falsely accusing foreign entities of leveraging U.S. technology to serve their military and intelligence sectors.

Previously, U.S. AI developers such as Anthropic and OpenAI had already restricted entities within China from using their services. Anthropic's move marks the first time a prominent U.S. AI company has imposed restrictions on overseas Chinese-controlled enterprises.

Against the backdrop of escalating



U.S. technological suppression of China, it is hardly surprising that U.S. AI giants like Anthropic are tightening restrictions on Chinese companies — whether driven by "corporate self-awareness" or underlying political forces.

But in today's China, where domestic models like DeepSeek and Qwen are flourishing and the concept of "technological self-reliance" is deeply ingrained, forward-thinking tech companies will not pin their future on U.S. AI technology.

Banning Chinese users will not stifle the development of China's AI industry. On the U.S. social platform Reddit, under a post about Anthropic's ban, the vast majority of comments viewed it as positive news for China's domestic AI models.

One particularly telling comment was: "Remember what happened after the chip sanctions were announced? What was the long-term impact on

China? It only spurred China to innovate around chips. This is just another identical 'nothingburger.'"

The future path of U.S. AI technology may grow narrower.

Currently, to maintain a unilateral technological advantage and prevent other countries from leveraging its achievements, the vast majority of U.S. AI models have adopted a closed-source development approach.

In July, *The New York Times* reported that even Meta, which had previously adhered to open-source development, would shift to developing closed-source AI models. Renowned U.S. AI policy expert Ethan Mollick lamented on social media that with this, the U.S. is mostly out of the frontier open source large LLM race.

Compared to open-source, closed-source inevitably hampers technological iteration and innovation. As one of the world's largest AI markets, China boasts

the most comprehensive industrial categories and the richest AI application scenarios. By "voluntarily withdrawing" from the Chinese market, Anthropic is not only losing "hundreds of millions of dollars," but also a crucial source of experience and momentum for driving technological iteration and development.

In contrast to the U.S., China's AI models have consistently adhered to an open-source development philosophy, continuously achieving technological breakthroughs.

In July, multiple foreign media outlets reported that according to the rankings by "LMarena," a benchmark testing platform created by University of California researchers, Chinese open-source AI models such as Kimi K2 by Moonlit AI, DeepSeek R1 by DeepSeek, and Qwen3 by Alibaba had outperformed similar products from U.S. giants Google and Meta.

According to Tech Wire Asia, the future of AI may indeed be open — and increasingly shaped by Chinese innovation.

In April, Anthropic accused China of smuggling chips. At the time, a spokesperson for U.S. chip company Nvidia criticized the allegation, saying: "American firms should focus on innovation and rise to the challenge, rather than tell tall tales..." This criticism equally applies to Anthropic's recent restrictions on Chinese users.

Banning Chinese users is a loss for U.S. AI companies. Instead of becoming pawns in the politicization, instrumentalization, and weaponization of technological issues, tech companies like Anthropic should focus on technological innovation and their own development.

biomaterials experts then take control, inventing functional contact lenses that bring numerous benefits to humanity.

Nanotechnology's promising future

According to the *China Nanotechnology Industry White Paper (2025)*, the global nanotechnology market is expected to reach \$1.5 trillion by the end of 2025, with an estimated compound annual growth rate of over 17 percent between 2018 and 2025. China's nanotechnology patent transfer and licensing rate has exceeded 8 percent, and the efficiency of technology transfer continues to improve. In the future, more nanotechnology is expected to move from the laboratory to industrialisation, and its applications are diverse and numerous.

Professor Wang Bo, vice president of the Beijing Institute of Technology and editor-in-chief of *APL Materials*, believes that nanotechnology holds great promise for the future, notably through the application of novel nanoporous materials and biomimetic open frameworks in fields such as biomedicine and energy.

With its micro power able to impact the macro world, nanotechnology will continue to expand, providing unending momentum for building a smarter, greener and healthier future society and turning what was once "impossible" into a "real reality" that benefits people everywhere.

ideas and reach a better understanding of future research directions.

At the 2025 E-commerce Convention, a parallel forum of CIFTIS, Dorothy Tembo, deputy executive director of the International Trade Center, said the center has been collaborating with China's Ministry of Commerce to build the capacity of policymakers in developing countries.

Hundreds of policymakers have come to China to learn how to regulate e-commerce, increase logistics efficiency, ensure consumer protection and develop rural e-commerce. "It's international collaborations like these that are making it possible to put more countries on the digital fast track," she said.

Voice of the World

China's Rising Role in Novel Drug Research

By GONG Qian

China's pharmaceutical industry now ranks second largest in the world, accounting for about 30 percent of the global total of innovative drugs being researched, said Yang Sheng, deputy head of the National Medical Products Administration at a press conference on August 22. Since the start of the 14th Five-Year Plan (2021-25), China has approved 204 innovative drugs and 265 innovative medical devices, Yang said.

China's growing role in biotechnological innovation has received increasingly more global attention, with its innovative drug development making great strides in quantity and quality.

According to Bloomberg, in 2015, the year China began reforming its drug regulatory system, it contributed only 160 compounds — less than 6 percent of the world's pipeline of innovative drugs. Over the following decade, however, China's presence in global drug research surged. By 2024, more than 1,250 novel medicines — including those for cancer and weight-loss — entered development in China, far surpassing the European Union and close to the U.S.' total of about 1,440.

From 2020 to 2024, 20 of the world's top 50 producers of innovative drug candidates were Chinese companies, compared with only five in the previous five years, Bloomberg reported.

The statistics support *The Economist's* observation that Chinese pharmaceutical companies are at the cutting edge of development, creating innovative drugs at lower costs than their rivals, and making China the second-largest developer of new drugs after the U.S.

Beyond the numbers, the more important progress lies in the rising quality of Chinese biotech innovation. Now, the pace of deals between Western biopharma and China's biotech laboratories has accelerated rapidly. One reason

is the improving quality of the drug compounds being developed, Andy Plump, head of research at Takeda Pharmaceutical, told *BioPharma Dive*, a leading industry publication. For example, China-based drugmaker BeiGene's blood cancer drug Brukinsa outperformed established treatments of the same type in 2024.

Analysts attribute China's rapid progress to several factors. One key factor behind the rise of China's novel medicines is its faster and cheaper clinical trials.

The Economist said China's biotech boom has been propelled by a vast patient pool that simplifies recruitment, along with government incentives encouraging hospitals and doctors to back research, adding that, "Faster trials have made Chinese drugs even more attractive to global drugmakers."

"Not only is China becoming a larger contributor to global clinical trials, but the cost of trials is not rising and the per patient trial cost is less than that in the U.S.," said Clinicaltrialsarena website, a part of global data analytics company GlobalData. To further accelerate novel drug development, China posted a draft policy this June, proposing to reduce the clinical trial review waiting period for novel medicines from the current 60 working days to 30 working days.

Another key driver is the inflow of capital and expertise. *The Economist* said China's vast domestic market attracts big drugmakers, bringing know-how and talent. Meanwhile, the Center for Strategic and International Studies said China has been bolstering intellectual property protections and investing heavily in both basic and applied research.

From policy support to global partnerships, China's biotech industry is on a strong growth trajectory. As innovation rises, the country is becoming a major player, destined to shape the future of global drug development.

Macro Potential of Micro Nanotechnology

Opinion

By BI Weizi

"Nanotechnology is a driving force behind breakthroughs in strategic areas such as green energy, biomedicine and information technology, accelerating the formation of new quality productive forces," said Bai Chunli, academician of the Chinese Academy of Sciences and chair of the ChinaNANO 2025 Conference.

Speaking at the conference launch on August 30, Bai said that China has become a major contributor to global nanotechnology and a leader in cutting-edge industries. The rise of artificial intelligence has brought revolutionary opportunities to the field of nanoscience and is profoundly reshaping its research paradigm, he added.

Founded in 2005, ChinaNANO is an international conference held biennially that has grown into a major platform for sharing global nanoscience knowledge and stimulating collaboration. During the conference, *Science and Technology Daily* spoke with several domestic and

international experts about the rapid development of nanotechnology in China and its prospective wide range of applications.

China leads global nano patents count

The *China Nanotechnology Industry White Paper (2025)*, which was released at the conference, shows that China is leading the way in nanotechnology patents and that the industry continues to grow. From 2000 to 2025, the total number of authorised nanotechnology patents worldwide exceeded 1.078 million, 464,000 of which were from China, ranking it first in the world.

Matteo Cavalleri, publisher, portfolio strategy at AIP Publishing, said China's rise to the top in nanotechnology patents reflects the success of China's scientific research transformation paradigm. It demonstrates China's commitment to valuing the quality and quantity of scientific research and reveals the commitment of the Chinese government and scientists to basic scientific research, he said.

Interdisciplinary research key to advancing nanotechnology

According to Bai Chunli, innovations in cutting-edge fields often emerge

from the intersection of disciplines. "It isn't a single, isolated discipline, but is intertwined with physics, chemistry, materials science, electronics, life sciences and more," said Bai.

Professor Monica Lira-Cantu, full professor and group leader of Nanostructured Materials for Photovoltaic Energy at ICN2, Barcelona, echoed Bai's sentiments, emphasizing the indispensable role of interdisciplinary collaboration in stimulating innovative ideas and advancing innovative products. As an expert in nanostructured materials and photovoltaic energy, Lira-Cantu used artificial retinal lenses as an example to demonstrate the important role of interdisciplinary research in solving practical problems.

When light enters the eye, it passes through the cornea and lens, focusing on the retina. This process converts the light signal into neural signals and transmits them to the brain for processing. The retina is like a high-tech 'photosensitive film', and its 'light sensors' are crucial, she said. These cells are specifically responsible for sensing light intensity and colour. Without these cells, we would be unable to see. While optics experts are solely responsible for collecting the light,

brought together different segments from the creative design industry, to the building engineering industry, and to the manufacturing industry. All the service and supply chain industries also came together. "Because of that, we're able to create new collaborations and new opportunities with these companies," he said.

Paulo Debiagi, an assistant professor at the University of Nottingham Ningbo China, has been working in China for more than two years. He has collaborated with institutions like Tsinghua University, Harbin Institute of Technology and Northwestern Polytechnical University, and expected to promote networking at CIFTIS with people from different companies and research institutions, exchange

or conference attendees, the consensus was that cooperation was an indispensable part of CIFTIS.

Mohammad Miri, advisor to the CEO of Iran's Chabahar Free Zone on International Affairs and Foreign Investment Attraction, said CIFTIS was a very good platform for bringing different service sectors together to help each other enhance the economy.

Satoshi Ohashi, director of Zaha Hadid Architects China, said CIFTIS provides a platform for all the companies and industries to connect. It

CIFTIS Puts Cooperation on Fast Track

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Mikio Arai, head of a Japanese company selling hand-made iron kettles, was on his fourth mission at CIFTIS. He was a little worried the number of visitors would decrease due to the change in the venue, but the waves of people on the first day of the exhibition made him relieved. Arai said he wanted to introduce Japanese handicrafts to Chinese consumers, and would be very happy if the handicrafts were welcomed.

Creating new collaborations

Be it exhibitors, purchasers, visitors

Hi-Tech

By GONG Qian

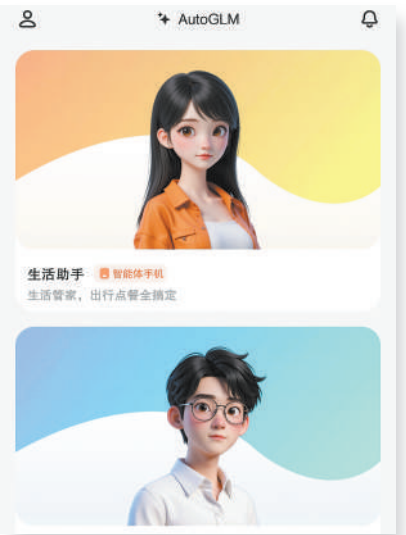
Chinese tech company Zhipu Huazhang Technology has released the world's first mobile phone agent, AutoGLM 2.0. Powered by the domestically developed open-source models GLM-4.5 and GLM-4.5V, the app is now available for download on a mobile phone or computer for the general public.

Simply put, an AI agent is capable of autonomously executing tasks. Traditional AI (such as ChatGPT) primarily relies on user-input instructions, while an AI agent can think, make decisions and carry out complex tasks on its own — acting like an AI assistant that performs a range of functions independently.

What can it actually do? In AutoGLM 1.0, the agent could replace users in handling some mobile operations, but only within limited scenarios. AutoGLM 2.0 has evolved into an execution-oriented assistant, capable of independently completing a wide variety of tasks in the cloud.

In daily scenarios, users only need to give a single voice command, and AutoGLM 2.0 can operate dozens of apps to order food, book flights, or check housing listings.

In workplace scenarios, it can also operate platforms such as NetEase Mail, Zhihu, and Weibo to handle information search, content writing, video generation, and creation of powerpoint presentations. This means AI is no longer just a "chat tool" but a versatile agent that



Zhipu unveils mobile agent AutoGLM 2.0. (PHOTO: SCREENSHOT)

not only provides solutions but also executes tasks, helping users save both time and energy.

One major technical upgrade in AutoGLM 2.0 is the integration of local devices with the cloud. Previous mobile agents often occupied the user's screen and computing power. AutoGLM 2.0 equips AI with dedicated agent mobile phones/agent computers, enabling the AI to directly call app services in the cloud to complete tasks without occupying the user's local device. During this process, users can freely use other apps, such as playing mobile games.

However, it should be noted that issues such as AI agent stability, account security and privacy authorization are still challenges that all tech companies, including AutoGLM, need to focus on and address sooner, rather than later.

Unlocking Deep Secrets of Earth

Dialogue

By LONG Yun & CAO Xiuying

Imagine peering into Earth as if it were a patient undergoing a CT scan. That's essentially what Danish geophysicist Hans Thybo does, except that instead of X-rays, he uses seismic waves and other advanced imaging techniques to explore the planet's deep secrets.

As a full-time distinguished professor at the Chinese Academy of Geological Sciences (CAGS) and a member of both the Danish Royal Academy of Sciences and the European Academy of Sciences, Thybo has made groundbreaking contributions to our understanding of Earth's structure. He discovered the mid-lithospheric discontinuity and was the first to identify deep structures linked to over 1.5 billion years of plate tectonics. With more than 60 international projects under his belt and a long-standing collaboration with Chinese scientists, Thybo's work spans continents and minds.

A curious mind's journey
Thybo's scientific journey began in the classroom of a passionate natural history teacher who taught him how to observe nature closely. Yet, despite his early interest in biology and geology, he initially pursued mathematics and physics, acquiring a PhD in theoretical seismology. It wasn't until his postdoctoral research that he applied this theoretical knowledge to image Earth's crust and lithosphere, which he calls "the wonders of tectonics."

"I've made a long journey regarding scientific interest," he says reflectively. "My experience tells me that science improves when we maintain a broad overview while mastering technical skills."

To many, studying Earth's interior might seem abstract or even fantastical.



Professor Hans Thybo. (COURTESY PHOTO)

But Thybo emphasizes its "profound societal importance": "All geoscience ultimately has importance for society." His imaging techniques are not just academic exercises. They are tools used to locate natural resources, understand earthquake mechanisms, and reduce the risks of volcanic eruptions.

"Imaging fault planes helps us understand earthquakes," he explains. "And the same methods used to study one geological phenomenon often lead to insights into another. That's the beauty of science, it connects everything."

Power of international collaboration

Having initiated over 60 large-scale international projects, Thybo is a great collaborator. His secret? Ask the right questions and find the right people.

"Geological processes don't stop at national borders," he says. "International collaboration is essential." For him, successful global projects hinge on creating a shared identity among the team members. "When collaborators feel they belong to one large team with a

common goal, they can overcome any challenge."

His latest endeavor, EarthProbe (formerly known as Earth CT), embodies this collaborative spirit. Initiated in 2017 and inspired by China's SinoProbe program, EarthProbe aims to bring together scientists from every continent to address major geoscientific questions through integrated geophysical, geological, and geochemical studies.

"The pandemic was frustrating. We couldn't meet in person," he admits. "But it gave us time to rethink and plan better." Now, EarthProbe is ready to launch a new organizational framework, enabling large-scale, cross-continental projects that will train a new generation of scientists and deliver insights with global relevance.

Thybo speaks highly of his experience in working with CAGS. "CAGS is a wonderful place for doing research," he says. "The facilities are top-notch, and the funding for SinoProbe is unprecedented on an international scale."

He also praises the focus and

efficiency of Chinese scientists. "They're very well prepared and come to discussions with clear ideas," he observes. Over the past two decades, he has witnessed a dramatic shift in China's scientific landscape from publishing mostly in domestic journals to leading in international publications. "It's a fascinating transformation," he adds. "China's scientific community has taken a huge step forward."

Building bridges

Beyond research, Thybo values mentorship deeply. He has personally mentored many Chinese PhD students, fostering a culture of mutual trust and intellectual curiosity.

"I treat all my students the same way, whether they're from Europe or China," he says. "It's only when a young colleague finds something out for themselves that the learning lasts."

"Each student is unique. Mentoring is about building on their strengths and asking questions that help them reach their conclusions," he says. For him, mentoring "must always be in a pleasant atmosphere of mutual trust." He still maintains contact and collaboration with all his former Chinese students who are now playing an active role in the sci-tech field.

Even during the pandemic, when regular travel came to a halt, Thybo maintained weekly virtual meetings with his former students across China. Today, those meetings continue to maintain the academic bond.

As EarthProbe gains momentum and CAGS continues to push the boundaries of deep Earth exploration, Thybo remains optimistic. "I'm confident that this new organization will allow us to initiate new large-scale integrated geoscientific projects on all continents," he says.

The CAGS also contributed to this article.

Another key aspect of the stimulation is the use of moxibustion. Moxibustion is typically categorized into direct and indirect types, where burning moxa cones are directly placed on specific points on the body, or burning moxa sticks are held away from the skin to heat the targeted region. Moxa cones and sticks are created from dried leaves of mugwort.

Acupuncture and moxibustion are learned via spoken guidance and demonstrations, passed down through master-disciple relationships or by clan members. The skills of acupuncture and moxibustion are now also taught through official academic programs. In 2010, acupuncture and moxibustion from traditional Chinese medicine were included on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity.

high temperatures during re-entry. For example, the Chang'e-6 returner reached a speed of 11 km/s when entering the atmosphere. If it were to pass directly through the atmosphere and land, the maximum temperature could reach 10,000°C — twice the temperature of the Sun's surface — and the return capsule would likely be severely damaged. Therefore, engineers optimized the flight path using a method similar to skipping stones on water, slowing the returner to 7 km/s before passing through the atmosphere. This design significantly reduced the severity of the heat and ultimately ensured a safe landing.

Addressing the thermal protection problem for aircraft may seem as simple as improving the heat resistance of materials, but in reality it requires the coordinated efforts of various disciplines, including structural and trajectory design. This is the beauty of aerospace systems engineering: every system and every discipline interacts with and relies on each other to ultimately achieve system optimisation, said Yuan.

Tech+Culture

Ancient Treasures at Mabucuo Site in Xizang

By Staff Reporters

Over 4,000 years ago, a small lakeside settlement thrived in what is now Kangma in Xizang autonomous region, southwest China. Its people fished in clear lakes, hunted along the shore and led a life following the cycle of nature. Today, their story is re-emerging through fish bones, ancient DNA, and rare imported treasures thanks to one of the most significant archaeological discoveries of 2024.

At Lanzhou University, Professor Yang Xiaoyan and her team are using advanced instruments to analyze growth patterns in fish bones found in this ancient site, reconstructing how early people fished across the seasons.

"The spring growth ring is about 0.1 millimeter wide, corresponding to a period of rapid fish growth," Yang told *Science and Technology Daily*. "This suggests spring was likely a peak fishing season."

The Mabucuo site has yielded over a thousand fish bones, from which researchers infer that the early inhabitants engaged in year-round fishing and hunting along the lakeshore.

Further insights come from ancient DNA (aDNA) research led by Professor Fu Qiaomei from the Institute of Vertebrate Paleontology and Paleoanthropology at the Chinese Academy of Sciences (CAS).

Professor Fu's team found that individuals from the early Mabucuo period, dating between 4,400 and 4,000 years ago — shared key genetic traits with later populations in the southern highland regions. This indicates that distinct highland populations were already widely distributed along the Yarlung Zangbo River basin by this time.

Some individuals also carried minor genetic contributions from the lowland populations in northern East Asia, revealing complex genetic interactions between highland groups and outside communities.

Located on the northern slope of the central Himalayas, the Mabucuo site

was discovered in 2019. Since 2020, a joint archaeological team led by the Institute for Cultural Relic Conservation of the Xizang autonomous region and including Lanzhou University, the Institute of Tibetan Plateau Research of CAS, the National Archaeological Research Center, and Peking University, has conducted five consecutive seasons of scientific excavation.

The team applied a multidisciplinary approach: analyzing aDNA, identifying animal bones through morphology and aDNA, conducting carbon and nitrogen stable isotope studies, and examining plant remains. This comprehensive research has been published in *Nature Ecology & Evolution*.

Professor Yang said the findings reveal the indigenous populations of the Qinghai-Xizang Plateau had established a settled lifestyle centered on lake resources at Mabucuo as early as 4,400 years ago. This discovery provides crucial evidence about the timing and nature of human adaptation to high-altitude environments, underscoring the importance of interdisciplinary collaboration in environmental archaeology.

Shargan Wangdue, deputy head of the Institute for Cultural Relic Conservation of Xizang autonomous region and field director of the Mabucuo excavation, who oversaw the entire project, said radiocarbon dating has established a continuous chronological sequence across different excavation areas, indicating that the early settlements were deliberately planned.

Due to its location at the crossroads between the Qinghai-Xizang Plateau and South Asia, the Mabucuo site served as a vital cultural exchange hub. Excavations uncovered a range of foreign artifacts in well-defined archaeological layers, including rice, seashells, ivory, sheep, bronze items and red carnelian. These finds fill critical gaps in our understanding of long-distance cultural interactions and offer valuable context for studying the development and continuity of local cultures.



The Mabucuo site in Xizang autonomous region. (PHOTO: XINHUA)

TCM Restores Health Through Balanced Qi

Traditional Eastern Wisdom

By BI Weizi

Acupuncture and moxibustion are traditional Chinese medicine (TCM) practices commonly used in China, representing a healthcare system that has developed over millennia for disease prevention, diagnosis, and treatment. The principles of acupuncture and moxibustion suggest that the human body functions like a miniature universe linked through energy channels or meridians, and that by physically stimulating these

channels, the practitioner can enhance the body's self-regulating abilities and restore health to the patient.

This stimulation includes inserting needles at specific points along these channels or using moxa or moxibustion, intended to bring back the body's equilibrium and both prevent and address illness.

In acupuncture, sterile stainless needles are inserted into the skin to deal with health issues, such as lower back pain and fatigue. The needles can be adjusted by hand or activated with minor electrical impulses.

TCM holds that the body's essential energy, known as qi, moves through

designated pathways or meridians. When the qi is in harmony, the individual experiences spiritual, emotional, and physical well-being. However, when the qi is out of balance, illness can arise. Qi may be obstructed, leading to an imbalance between yin and yang — opposing but interconnected forces. Acupuncture is a method of restoring balance between yin and yang. Acupuncturists assert that the human body contains over 2,000 acupuncture points, interconnected via different meridians. Applying acupuncture to specific points along the meridians is thought to enhance the circulation of obstructed or stagnant qi.

How Spacecraft Reenter into Space

Science Outreach

By Staff Reporters

China recently launched the Tianzhou-9 cargo spacecraft to deliver supplies to its Tiangong space station in orbit. This routine yet crucial "delivery" mission has once again captured the public's attention.

During its journey into space and back to Earth, the spacecraft travels through the atmosphere at speeds exceeding 7 km/s — 30 times faster than a civilian airliner. These astonishing speeds cause air currents to cascade over the spacecraft's surface, rapidly increasing its temperature to between 2,000°C and 3,000°C. So how did Tian-

zhou-9 complete its mission in space and land safely back on Earth under such extreme circumstances?

According to Yuan Yuan, an engineer at the China Academy of Launch Vehicle Technology, Tianzhou-9's safe re-entry from the Tiangong space station is ensured by a combination of thermal protection systems and controlled atmospheric entry.

Generally, this involves a three-step approach: a heat shield, an aerodynamic design to provide stability, and precise trajectory control to manage heat loads and avoid structural damage during atmospheric passage. To begin with, heat shields made of specialised materials that can withstand extreme temperatures during atmospheric re-entry are attached to the metal hull of the spacecraft. These materials are designed to burn away in a controlled manner, dissipating heat and protecting

the interior of the spacecraft.

However, this passive heat shielding approach has its limitations. Although a thicker heat shield offers better thermal protection, it also increases the weight of the spacecraft. Therefore, engineers have considered active heat dissipation. They designed the spacecraft's structure to have numerous tiny holes, similar to human pores, and filled it with a special liquid. When the temperature rises, the liquid absorbs heat and evaporates, dissipating some of the heat — the same principle that makes us feel cool when we sweat. This biomimetic heat dissipation method enables the spacecraft to regulate its temperature more effectively in high-temperature environments.

In addition to heat shielding and dissipation, the spacecraft's trajectory is meticulously planned to minimize the duration and intensity of exposure to

Zhejiang's Path to Independent Innovation

From page 1

Living up to this saying, Zhejiang University was one of the first universities in the country to conduct research on implantable brain-computer interfaces. In April 2024, the university established the Institute of Basic Interdisciplinary Studies and gathered over 20 disciplinary fields.

Over the years, Zhejiang has continuously made efforts in developing talent, consolidated the foundation of sci-tech innovation, and injected strong impetus into promoting high-quality development.

In 2024, the total number of professionals in Zhejiang exceeded 15 million, with the number of R&D personnel per 10,000 laborers reaching 165.3 person-years, and the proportion of highly skilled personnel among skilled workers reached 33.7 percent.

Technology transfer is key

Adhering to the integrated development of education, sci-tech innovation, and developing talent, Zhejiang has

achieved impressive results in fields such as AI, carbon reduction, new materials, and shield equipment, and has become a major force for China's participation in the global market.

The in-depth integration of sci-tech innovation and industrial innovation has generated a series of prominent products such as the X30 quadruped robot, the Qwen3 coder, and high-conductivity graphene-copper composite materials.

Meanwhile, Zhejiang has given full autonomy to the leading role of enterprises in innovation. By the end of 2024, it had 47,500 national high-tech enterprises, ranking third in the country. A number of technology enterprises such as Wanxiang Group, Alibaba, Hikvision and Deep Robotics have emerged, becoming a solid foundation for Zhejiang's high-quality development.

From slow beginnings, Zhejiang has now become a shining example of independent innovation, ensuring this remains among the province's most important modernization efforts.