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Innovation Pathway

Editor's Note:

Science, technology and innovation (STI) are undoubtedly among the most talked-about topics in China and around the world. Celebrating our 200th issue, we bring you a new column: Innovation Pathway, aiming to introduce China's remarkable practices in STI, offering Chinese solutions to the world.

New Blueprint for Urban Development

Edited by WANG Xiaoxia

Chinese President Xi Jinping laid out the overall requirements, key principles and priority tasks for urban work at the Central Urban Work Conference held in Beijing from July 14 to 15.

It was emphasized at the meeting that the important expositions of President Xi on urban development must be thoroughly implemented, with a continued focus on strengthening the Party's overall leadership and faithfully practicing the vision of developing people-centered cities. The general principle of pursuing progress while maintaining stability must be upheld, and a policy of tailored approaches and differentiated guidance must be followed, with the aim to build modern, people-centered cities that are innovative, livable, beautiful, resilient, culturally vibrant, and smart. Efforts should center on promoting high-quality urban development, with a focus on quality-oriented growth. Urban renewal should be an important lever for optimizing urban structures, transforming growth drivers, improving quality, advancing green development, preserving cultural heritage, and enhancing governance efficiency. The red line of urban safety should never be crossed. With all these, a new path will be blazed for urban modernization with Chinese characteristics.

Since the 18th National Congress of the Communist Party of China (CPC) in 2012, the CPC Central Committee has adhered to developing cities of the people, for the people, and by the people. Historic achievements have been made in urban development.

Beijing, the capital, was once plagued with the "big city disease" due to its dense population, traffic congestion and air pollution. In recent years, the mega city has explored fundamental paths and effective methods to eradicate the root causes of those problems by refining its urban space, solving traffic problems, and protecting green spaces.

The meeting required the construction of modern, people-centered cities that are innovative, livable, beautiful, resilient, culturally vibrant, and smart, setting a goal for the Xiongan New Area, said Yang Song, director of the construction and transportation administration bureau of Xiongan.

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WEEKLY REVIEW

China's Largest Uranium Project Produces First Batch

On July 12, China's "National No.1 Uranium" demonstration project in Ordos, Inner Mongolia autonomous region, produced its first barrel of natural uranium, marking a shift toward greener and more efficient uranium extraction. The country's largest and most advanced uranium production site, the project uses cutting-edge in-situ leaching and intelligent mining technologies.

World's 1st Single-Cell Multi-Omics Map of Rice Unveiled

Chinese scientists have created the world's first multi-organ, single-cell multi-omics map of rice, covering 112,000 cells across eight organs and identifying 54 distinct cell types. The study enables high-precision gene targeting, laying a molecular foundation for the precise design of improved yield, quality and resilience traits.

Bio AI System Developed to Evolve Molecules Pronto

Researchers at the University of Sydney developed PROTEUS, a new bio-AI system that rapidly evolves molecules in mammalian cells. Capable of developing novel molecules in just a few weeks, PROTEUS mimics natural evolution and promises breakthroughs in personalized medicine and drug development.



China's Xixia Imperial Tombs were inscribed on the World Heritage List on July 11 during the 47th session of UNESCO's World Heritage Committee. The photo shows two Xixia imperial tombs in northwest China's Ningxia Hui autonomous region. (PHOTO: XINHUA)

STI Frontier

Space Freight System Sets New Record

By Staff Reporters

On July 15, China's Tianzhou-9 cargo spacecraft was successfully launched with over six tonnes of supplies, setting a new record for payload capacity among Chinese cargo missions.

Catapulted on a Long March-7 Y10 carrier rocket from the Wenchang Space Launch Site in southern China, it docked with the rear port of the Tianhe core module of the Chinese space station later, marking another milestone in China's rapidly advancing space logistics system.

Tianzhou- 9 is the fourth cargo spacecraft produced in batches during the application and development phase of China's space station. It carries essential supplies for Shenzhou-20 and the upcoming Shenzhou- 21 crewed missions

and is now part of the orbital assembly where astronauts will soon begin transferring cargo for long-term operations.

Record-breaking scale cargo mission

The supplies include consumables for astronauts, propellants and an array of scientific equipment. Among the most notable items are two upgraded extravehicular activity suits, which have extended operational lifespans — up from the previous "three years/15 missions" to "four years/20 missions." This improvement significantly boosts the sustainability of spacewalk operations.

In terms of daily life, the menu onboard just got a lot more exciting. The mission introduced nearly 30 new space food items, increasing the total to over 190 varieties. This culinary upgrade extends astronauts' meal cycle from seven days to 10, providing better nutrition.

Equally significant is the delivery of a core muscle training device designed for in-orbit use. This cutting-edge equipment will assist astronauts in maintaining physical fitness in microgravity conditions.

The spacecraft also transported 776.5 kilograms of scientific payloads for 23 experiments, according to experts at the Technology and Engineering Center for Space Utilization, Chinese Academy of Sciences.

Advanced autonomous docking

Tianzhou- 9 successfully performed a fully autonomous three-hour rendezvous and docking, now the new standard for China's cargo missions. This method, developed by the China Academy of Space Technology, offers a balance between speed and operational flexibility.

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Harnessing Sci-tech Cooperation for Civilizational Exchanges

By LI Linxu & WANG Manxi

From conducting research to composing poetry... AI's range of abilities grows ever broader. As silicon-based intelligence increasingly intertwines with carbon-based life, how can we better ensure steady and sustainable development of human civilization?

Centering on the opportunities and challenges for human civilization in the age of AI, a parallel sub-forum themed "Inter-civilization Exchanges and Mutual Learning: Innovative Development of Science and Technology" was held during the recent Global Civilizations Dialogue Ministerial Meeting in Beijing.

The participants widely agreed that only through exchange and cooperation can we bridge the digital and intelligent divides, transcend estrangement and conflict, and share the fruits of sci-tech innovation and civilizational prosperity.

Championing cooperation and inclusiveness

"Science and technology serve as a crucial bond for inter-civilization exchange and mutual learning, while civilization plays the role of a 'moral compass' during sci-tech advancement," Malaysia's Minister of Science, Technology and Innovation Chang Lih Kang said.

He noted that the Global Civilization Initiative proposed by China responds to the pressing concerns of the times and represents a vivid practice of the concept of a community with a shared future for mankind. Malaysia looks forward to strengthening sci-tech cooperation and people-to-people exchanges with China, especially in fields like AI and cultural heritage preservation.

From the knowledge exchange of astronomical calendars and mathematical algorithms along the ancient Silk Road, to the collaborative efforts today in joint

archaeology and digital infrastructure under the Belt and Road Initiative, sci-tech cooperation has transcended the confines of time, space and cognition, drawing different civilizations closer.

"Roll out the mat so the family can dialogue," Lord Vaea, chairman of the Committee on Tongan Traditions, invoked this local proverb to underscore the importance of resolving differences through dialogue. He said the forum provided an important platform for diverse civilizations to exchange ideas, which is crucial for exploring how to narrow development gaps in the AI era and achieve shared civilizational flourishing.

"Technology is a catalyst for civilizational progress, while civilization serves as the guardrail steering technology for good," according to Liu He, academician of the Chinese Academy of Engineering, and professor at the Research Institute of Petroleum Exploration & Development.

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China's Digital Tech Helps SCO Countries Transform

International Cooperation

Edited by WANG Xiaoxia

In a modern chemical industrial park in the vast Gobi Desert in southern Kazakhstan, engineers monitor the real-time operation data of the equipment on screen. This is a co-operation project between China's Tianjin Cement Industry Design & Research Institute Co., Ltd. (TCDRI) and a counterpart in Kazakhstan, which used digital twin technology to complete the factory modeling.

This project promotes digital intelligent technologies and standards, provides application scenarios for Kazakhstan, and has achieved win-win cooperation, said Liu Tao, general manager of TCDRI.

Together, the 10 member states of the Shanghai Cooperation Organization (SCO) account for nearly half of the world's total population and their economic output makes up about a quarter of the global total. China has been sharing its digital technologies to assist the "intelligent manufacturing" upgrade of fellow SCO countries.

China's huge population, market demand and rich scenarios have enabled its digital economy to develop rapidly. Data from China's Ministry of Industry and Information Technology shows China has built over 30,000 basic-level smart factories. In the first quarter of this year, China's digital industry achieved business revenue of 8.5 trillion RMB, a year-on-year increase of 9.4 percent. On the other hand, the online retail market size of the SCO members exceeded 3.2 trillion USD in 2024.

The benefits of the digital economy are magnified through cooperation. China's achievements and experiences in the digital economy can assist the development of other countries. In recent years, China and other SCO countries have achieved remarkable results in digital economy cooperation, giving rise to a large number of "small but beautiful" projects.

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New Graphic

China's Economic Strength Increases Significantly

During the 14th Five-Year Plan Period



China's GDP is expected to see an increment of over

35 trillion RMB

It has contributed around **30%** to global economic growth annually in recent years.

Source: China's State Council Information Office
Designed by SONG Ziyao / Science and Technology Daily

WECHAT ACCOUNT



E-PAPER



Forging Partnerships for Engineering Education

Dialogue

By Staff Reporters

In 2024, Sergey V. Korshunov, vice-rector of Bauman Moscow State Technical University (BMSTU), was presented with the Chinese Government Friendship Award for his contribution to promoting international educational exchanges. In a recent interview with *Science and Technology Daily* (*S&T Daily*), he reflected on his extensive career and the pivotal role that BMSTU has played in his journey and the broader landscape of engineering education.

S&T Daily: Could you share how your academic career began?

Korshunov: At school, I had a keen interest in geography and participated in geography Olympiads. I considered enrolling in the Moscow Institute of Geodesy, Aerial Surveying and Cartography.

However, my neighbor, who was a year older than me, told me he wanted to study at the Bauman Moscow Higher Technical School (the former name of BMSTU). I became intrigued by this institution and started looking into it. I was struck by the history of this esteemed university and impressed by its modern scientific directions and achievements in technology.

I began to prepare and, in 1970, I enrolled at BMSTU. I can honestly say that I am happy I chose this university. There I studied and worked as an engineer, a research fellow, an assistant dean for research, and a lecturer. I later became the pro-rector for academic and methodological work. These were different roles and types of work, but all were aimed at the development of the university.



Professor Sergey V. Korshunov. (COURTESY PHOTO)

S&T Daily: In the context of rapid global technological advancements, how should engineering education adapt to new trends and technological revolutions? What measures has BMSTU taken to address these changes?

Korshunov: Science, technology and techniques are developing rapidly, and it is crucial for universities to incorporate this into their educational programs and the organization and conduct of scientific research. We must not remain stagnant; we should constantly seek out and monitor trends in science and technology, tackle emerging engineering and technology challenges, and overcome obstacles in science and the economy.

It is also vital to blend the experience and knowledge of seasoned scientists and professors with the bravery of young researchers. At BMSTU, under the leadership of Rector Professor A. A. Alexandrov, several well-equipped scientific and educational centers have been

established, featuring unique designs in the most promising scientific fields. These centers not only organize scientific research but also host conferences, publish articles, and prepare dissertations. The key aspect is the harmonious integration of the wisdom of established scholars with the audacity of young professionals. In addition, the engineering research centers collaborate with leading manufacturing and scientific enterprises in Russia.

S&T Daily: How do you view the recent cooperation between China and Russia in the field of education?

Korshunov: Over the years, Russia and China have collaborated extensively and fruitfully in the field of education. In 2007, the rectors of BMSTU, academician Igor Borisovich Fyodorov, and the former president of Harbin Institute of Technology (HIT), Professor Wang Shu-guo, established the International Scientific and Methodological Centre for Engineering Education.

In 2011, the Association of Sino-Russian Technical Universities (ASRTU) was founded. The Association, which now includes 75 universities from our countries, has accomplished a great deal in the fields of education and science. Academic exchanges for students and educators, joint research projects, student activities, and humanitarian initiatives are the results of ASRTU's work. Importantly, the member universities of the Association have come to understand each other better, fostering trust and mutual understanding. This allows for hope in further successful progress in joint scientific endeavors.

BMSTU has been actively promoting international exchanges and cooperation. In 2011, the China-Russia Alliance of Engineering Universities was jointly initiated by HIT and BMSTU.

S&T Daily: What were the goals behind founding this alliance, and how would you evaluate its achievements in recent years?

Korshunov: The ASRTU, initially comprising 30 universities, aims to expand academic exchanges between students, postgraduates, and faculty members of Russian and Chinese universities. The Association planned to organize scientific conferences on key research areas, including robotic systems, rocket and space technology, remotely operated underwater vehicles, composite materials and technologies, information technology and AI. Summer student schools were held in universities across China and Russia, collaborative research projects were carried out, and the first student satellite, "Friendship ASRTU," was launched. Humanitarian projects also played a significant role. A series of books are being published, including the touching Landscapes of ASRTU, featuring artistic works by students and faculty about their universities and cities.

Why Weather in North Feels Like a Sauna Recently

Science Outreach

By Staff Reporters

Recently, many areas in northern China have been experiencing unusually high temperatures coupled with extreme humidity, leaving residents feeling as if they've been transported to the muggy south. Complaints about a weather resembling southern China's Hui Nan Tian, the period of high humidity and dampness between winter and spring, have flooded social media. Beijing, in particular, has been struck hard by this oppressive weather.

But why is northern China suddenly so hot and humid? Is this normal? To answer these questions, *Science and*

Technology Daily spoke with several meteorological experts.

According to Sun Jun, chief forecaster at the China Meteorological Administration (CMA), the current heat and humidity are closely tied to the northward shift of the Western Pacific Subtropical High. This high-pressure system now dominates much of eastern and central China, pushing the summer monsoon further north than usual. The monsoon's leading edge has reached southern northeast China, central-southern north China, and eastern northwest China, bringing with it abundant moisture and heat.

"Although temperatures in most parts of northern China haven't reached the official 'high temperature' threshold of 35°C, the high humidity significantly amplifies the perceived heat," Sun explained. "When relative humidity is high, the body feels much

warmer than the actual air temperature."

Xu Xiaofeng, president of the China Meteorological Service Association, echoed this explanation, comparing Beijing's recent conditions to a steam bath due to the warm, moisture-laden air masses transported by the subtropical high. He clarified that official temperature readings are taken in shaded, ventilated instrument shelters 1.5 meters above ground, a global standard ensuring comparability across regions. However, perceived temperature varies greatly depending on factors like sunlight, wind, and humidity. Studies show that at 32°C, 50 percent humidity can make it feel like a scorching 35°C, while 100 percent humidity can push perceived temperatures beyond 50°C.

Li Yi, deputy chief of the CMA's Public Meteorological Service Center, warned that high heat and humidity

impair the body's ability to cool itself, raising risks of dehydration, electrolyte imbalance and heatstroke.

As climate patterns evolve, understanding and adapting to these "sauna days" will be crucial for public health and comfort in northern China. Experts recommend that people stay indoors during peak heat as far as possible, hydrate frequently with electrolyte-rich fluids, and use air conditioning to reduce humidity. High-risk groups such as the elderly, children and pregnant women should prioritize cooling, avoid outdoor activity, and seek medical help if symptoms arise. Patients with chronic diseases are advised to monitor health indicators closely and follow medical advice. Outdoor workers should schedule tasks for cooler hours, wear protective gear, and replenish fluids regularly to mitigate heat-related risks.

Tech+Culture

Zhouyuan: Origin of China's Ritual-Music Civilization

By WANG Yuhan & LONG Yun

The Zhouyuan site, named one of China's "Top 10 Archaeological Discoveries of 2024," offers new insights into the origins and evolution of China's ritual and music civilization.

Described in the *Book of Songs* as a vast and fertile land, Zhouyuan was the cradle of Western Zhou culture (1046-771 BC). Broadly defined, it stretches over 70 kilometers across the Wei River while it covers about 30 square kilometers across more than 20 villages in Fufeng and Qishan counties in a narrow sense. This densely populated area has long been a focal point for archaeologists.

"Previously, scholars believed that major Western Zhou settlements had no city walls," said Chong Jianrong, head of the Zhouyuan excavation project and director of the Shaanxi Academy of Archaeology. "But the discovery of triple-layered fortifications — a palace enclosure, an inner city, and an outer city — has completely reshaped our understanding," he added. These walls, visible in aerial photographs as compacted-earth traces, reveal the Zhou people's sophisticated urban planning.

Through targeted excavations, the archaeological team confirmed Zhouyuan's status as a pre-Zhou capital. A 2,500-square-meter architectural complex at Wangjiazui, with its orderly layout of gates, halls and chambers, matches descriptions in the *Book of Songs*. Using aerial photography, researchers divided the site into 124 functional zones, analyzing how surface vegetation relates to underground relics, finding a new approach in archaeological surveys.

As the cradle of the Western Zhou Dynasty, the Zhouyuan site provides rich archaeological evidence that this was the origin of China's "ritual and musical civilization." The discoveries, including large rammed-earth foundations (hangtu: layered and compacted earth construction), hoards of bronze ritual vessels, and oracle bones, offer a comprehensive view of

Zhou dynasty rituals.

Among the most treasured artifacts are world-famous bronzes like the *He Zun* (a ritual wine vessel) and the *Mao Gong Ding* (a ceremonial cauldron). The *He Zun* bears the earliest known inscription of the term *Zhongguo* (China). These artifacts systematically reflect how the Zhou people formalized social practices, from dining to worship, into a structured ritual framework, laying the foundation for Chinese ceremonial culture.

The bronzes unearthed at Zhouyuan narrate the evolution and splendor of Zhou rituals. Their exquisite casting techniques and precise material compositions showcase ancient artisans' creativity and invaluable case studies for modern researchers.

"Artisans of this era had mastered the principle of 'uniform wall thickness' in design," explains Yang Huan, an associate professor at Northwestern Polytechnical University. Using the modern solidification theory, she quantitatively reconstructed ancient bronze-casting methods. Her research reveals that Western Zhou craftsmen optimized casting performance by adjusting the composition of clay moulds (taofan: ceramic moulds used in bronze casting) to minimize defects.

By measuring quantitative parameters of Zhouyuan's clay moulds, Yang's team developed complex mathematical models to calculate the "interfacial heat transfer coefficient" between moulds and molten bronze. This computational approach has unlocked the "casting secrets" hidden in ancient clay for millennia.

"This explains why the ancients could mass-produce enormous, intricately decorated bronze vessels even with different regional clays and various artisans," Yang notes.

She believes that this developed casting system represents not only an ancient technological development but also offers millennia-old wisdom with potential applications in modern science.



The Zhouyuan site in Baoji city, northwest China's Shaanxi province. (COURTESY PHOTO)

New Blueprint for Urban Development

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China's urbanization is shifting from rapid growth to stable development, and urban development is shifting from the stage of large-scale expansion to one focused on improving the quality and efficiency of existing urban areas.

According to the meeting, the priorities for urban development include optimizing the modern urban system, building vibrant cities powered by innovation, and creating comfortable and convenient living environments, as well as promoting green, low-carbon and beautiful urban spaces.

The priorities also include enhancing urban safety and resilience, fostering cities that uphold moral integrity and social civility, and advancing the development of convenient, efficient and smart cities.

It is important for Nanshan district in Shenzhen city to play a leading role in developing cluster-based, networked modern urban agglomerations and metropolitan areas, said Huang Xiangyue, secretary of the Nanshan District Committee, adding that the district will promote coordinated regional development

by enhancing cooperation with cities in the Guangdong-Hong Kong-Macao Greater Bay Area in terms of industry, sci-tech innovation, culture and tourism.

With the rapid development of big data and AI, making cities smarter and more intelligent is an important path to promoting the modernization of urban governance.

Port city Qingdao in eastern Shandong province has integrated data from 18 industries and 32 departments across the city to establish digital identity cards for 3.5 million urban management components such as roads, bus stations and schools, and optimize the urban management and service platform.

Urban development should be supported by innovation as well as nurtured by tradition. Jingdezhen, China's porcelain capital, will coordinate the protection of historical and cultural relics, ecological development, as well as people's livelihood, so as to bring new vitality to ceramic culture.

Looking ahead, a modern urban development picture that is livable, business-friendly, green, low-carbon, smart and efficient is gradually unfolding.

Harnessing Sci-tech Cooperation for Civilizational Exchanges

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Liu stressed that global challenges such as energy issues cannot be solved by any single nation or civilization alone. Sci-tech cooperation and intercivilization exchange should seek common ground while reserving differences, building consensus through dialogue, and advancing cooperation through mutual learning. He called for establishing an open, inclusive, and universally beneficial cooperative ecosystem to ensure sci-tech achievements better benefit all.

Path to harmonious coexistence

Standing at the crossroads of AI

development, the attendees emphasized the need to fully leverage the bridge-building role of sci-tech cooperation to broaden the depth and breadth of intercivilization exchange and mutual learning.

"Science is a common language shared by the entire world, and also one of the most effective tools for fostering international cooperation and exchanges," according to Jiao Nianzhi, academician of the Chinese Academy of Sciences, and chair professor at Xiamen University.

Jiao deeply believes that big science programs are not just platforms

for sci-tech cooperation and exchanges, but also windows for intercivilization dialogue. Faced with existential issues like global climate change, dialogue and cooperation are the only path forward.

Javier García-Martínez, past president of the International Union of Pure and Applied Chemistry, pointed out that AI is now involved in the most exciting scientific research underway. Addressing ensuing ethical, fairness and inclusiveness issues requires pooling wisdom and efforts to ensure AI contributes to sustainable development and human civilizational progress.

"Engineers and scientists are not just building tools, but building the next chapters of civilization," Navinchandra B. Vasoya, executive council member of the World Federation of Engineering Organizations, said. He stressed that in the shared journey of human and technological co-evolution, the role of intercivilization empathy, learning and collaboration becomes paramount. It must reflect not the dominance of a single worldview, but the harmony of many.

The consensus forged through this dialogue will provide valuable insights for the exchange and mutual learning of human civilizations.