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# Science and Technology Daily

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## Sci-tech Support to Revitalize Northeast China in New Era

By Staff Reporters

To push for the full revitalization of northeast China, the real economy is the foundation, sci-tech innovation is the key, and industrial upgrading is the direction. That's what President Xi Jinping said at a key meeting on striving for the full revitalization of northeast China in the new era, held recently in Heilongjiang province in northeast China.

Xi also said it is important for the region to push for industrial innovation via sci-tech innovation and accelerate the modernization of its distinctive industrial system.

He stressed the importance of cultivating emerging strategic industries, including new energy, new materials, advanced manufacturing and electronic information, and accelerating the development of clean energy such as wind, photovoltaic and nuclear power.

Sci-tech officials and experts from the three northeast provinces of Heilongjiang, Jilin and Liaoning, and Inner Mongolia autonomous region have expressed their understandings and suggestions on achieving the goals.

"We will go all out to resolve bottlenecks and promote industrial innovation via sci-tech innovation, thus providing sci-tech support for achieving new breakthroughs in revitalizing the region," said Xu Aidong, deputy director of Liaoning's Department of Science and Technology.

Song Boyan, director of the Science and Technology Bureau of Harbin, Heilongjiang, said the city's focus is on transforming and industrializing the sci-tech achievements, and a key task is to attract leading enterprises to settle in the city. Song said thanks to the sound environment for innovation and entrepreneurship, the number of high-tech enterprises has grown rapidly in recent years.

Feng Xiating, president of Northeastern University in Liaoning, said the university will focus on the requirements for industrial transformation and upgrading. It will build high-quality research platforms and train high-level personnel to serve the building of a modern industrial system in the region.

Vehicle engineering is a strength of the College of Automotive Engineering at Jilin University. Gao Zhenhai, dean of the college, said they have been making efforts to develop digital and low-carbon vehicles to support the region's revitalization and the establishment of a robust transportation industry.

Tongliao city in eastern Inner Mongolia has close ties with the three northeastern provinces. Bai Siqin, director of the Science and Technology Bureau of the city, spoke about their focus on producing and processing environmentally friendly agricultural and livestock products, as well as developing new materials. They also aim to promote industry-oriented innovation, upgrading industries through innovation.

The Hangzhou Olympic Sports Centre Stadium (right), nicknamed the "Big Lotus," is the main stadium for Hangzhou Asian Games. (PHOTO: XINHUA)

## Editor's Pick

## Tech-driven Hangzhou Asian Games Coming

By HE Liang & LU Zijian

The 19th Asian Games, set to open on September 23, will showcase layers of advanced technologies, similar to China's previous sporting spectacles of Beijing 2022 Winter Olympics and the 31st FISU Summer World University Games in Chengdu.

***Comfortable stadium***

Nicknamed the "Big Lotus," the Hangzhou Olympic Sports Centre Stadium is a key venue for the Games, and will provide a pleasant environment for athletes, spectators and staff.

Apart from a central air conditioning system, the Big Lotus adjusts its temperature using river water heat pumps. It is estimated that the energy-saving rate of the pump system exceeds 30 percent.

There is a temperature difference between the Qiantang River and the stadium located on the south bank of the river. In summer, the river temperature is lower than the indoor temperature of the stadium. The river water can absorb the heat in the stadium when it's pumped out of and then back to the river. In winter, it's the other way around.

In order to help the spectators hear clearly what is happening in the stadium, it is equipped with loudspeakers in the auditorium, the competition area and the area providing support. Some of the suspended loudspeakers also amplify sound by cleverly making use of the concave shape of the Big Lotus.

In the Jinhua Sports Centre Stadium and Gymnasium, the games venues for sepaktakraw (kick volleyball) and football, there are 288 large lamps used for lighting. Though outdoor light is easy to attract huge numbers of insects in the southern part of China, these lamps don't draw insects.

***Couch spectators***

The games watching experience at home is also well taken care of. Panorama cameras are installed in the venues to capture 8K ultra high definition livestream footage, which will be transmitted to livestream platforms for viewers to watch via high speed and low latency 5G network.

To provide such high-quality broadcasts on television, the illuminance of lights in the venues is crucial. The above mentioned large lamps in the Jinhua Sports Centre Stadium not only have a high illuminance, but also reduce glare in the venues by specially designed lampshades.

A "bullet time" mode is also available for viewers who wish to watch a certain part of the game frame by frame, such as a specific move of the athlete. Multiple panorama cameras are set in the venues to capture such freeze frame moments, to make the viewer feel as if time has stopped.

***See page 2***

## Chinese Scientists Decode Immune Development

By WANG Xiaoxia

Chinese scientists have developed a comprehensive map of the heterogeneity and developmental dynamics of human macrophages and unraveled their diverse functions during development, according to a paper recently published in the journal *Cell*.

Macrophages, as a vital part of the immune system, consist of diverse subtypes and play critical roles in human development and disease, but their diverse function and specification remain inadequately understood during human development.

To unravel these mysteries, the research team has built a single-cell RNA sequencing platform and "decoded" 300,000 developing immune cells. They finally identified 11 major immune cell types and classified each major immune cell type in more detail, resulting in 56 immune cell subtypes (including 15 macrophages), and generated a spatial and temporal molecular roadmap.

Notably, in 15 macrophage subtypes, the research team identified a microglia-like population and a proangiogenic population, proving that the two groups of immune cells play different functions in human development.

The microglia-like cell is similar to microglia, but the former is present in the fetal skin, testicle and heart, while the latter only exists in the central nervous system. Microglia-like cells are the major immune population in the early fetal skin, and interact with and regulate neural crest cells. Through spatial and differentiation trajectory analysis, researchers also showed that proangiogenic macrophages are perivascular across fetal organs.

"This study expands people's knowledge of human immune development, especially macrophage diversity, differentiation and function. A deeper understanding of the immune system's function and regulatory mechanism will be an important foundation for disease diagnosis, immunotherapy and new therapeutic development," said Han Jiahuai, academician of the Chinese Academy of Sciences (CAS) and professor of Xiamen University.

The study was carried out by Li Hanjie's research team at Shenzhen Institute of Advanced Technology, CAS, in collaboration with Shenzhen Bao'an District Maternal and Child Health Care Hospital, Shenzhen University, Shanghai Jiao Tong University and Fudan University.

## International Cooperation

## Vocational School Empowers African Youth

By WANG Jianguo, ZHAO Jiuchun, CHEN Yu & LIANG Yilian

In the past, Kapata, a village in Lualaba province in the Democratic Republic of the Congo, didn't have any reputed vocational school. Village young people had to travel to the city of Kolwezi 18 km away or to even more distant places for vocational education so that they could acquire skills and get good jobs.

Many students used to end their education and opt to look for work after completing junior high school, which meant they had to settle for lower wages and limited career prospects as they were unskilled.

***Making dreams come true***

But things changed in 2021. La Sino-Congolaise des Mines S.A.(Sicomines S.A.), a joint venture (JV) with Chinese majority shares which includes enterprises like the China Railway Group and Power Construction Corporation of China as well as DRC mining companies, has been helping out the village. When Sicomines learned that Kapata wanted a vocational school of its own, it pledged to build the Kapata Industrial Technical School as a priority project as part of its "Code of Duties."

The project started in October 2021. In the first phase, completed in 10 months, 1.25 million USD was invested. In the second phase, 200,000 USD has been earmarked to provide equipment for the school.

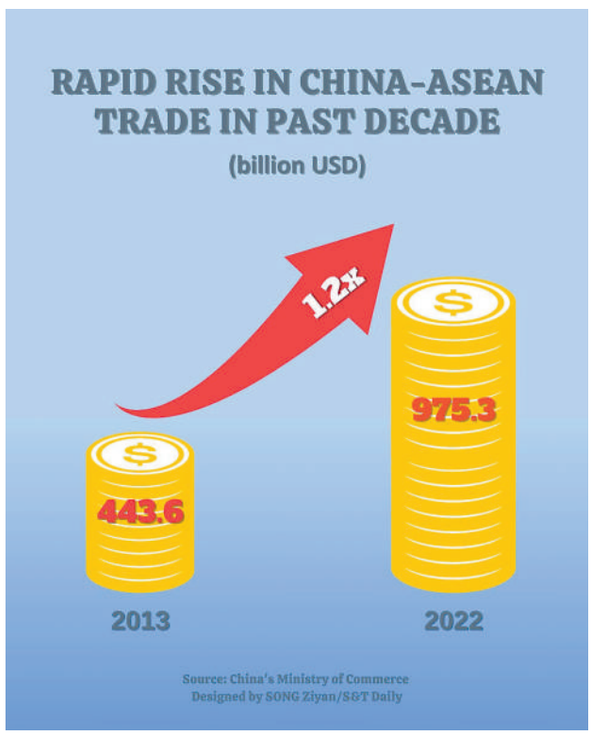
"Thank you, Chinese friends, for such a good school," a village youngster, Ngoie said. "After graduation, I can find a good job with the skills I have learned."

Enrollment started in August 2022 and there are over 200 students now. Today, the school is an important technical skill cultivation base for the village.

***Providing hands-on training***

Sicomines carries out regular interactions with the school to share technical skills and knowledge. Teachers and students of the school visit the JV's substation and auto repair factory for hands-on learning. The school principal says students can learn a lot from Sicomine's site, which improves their professional skills. ***See page 2***

## New Graphic




## WEEKLY REVIEW

***19th Asian Games to Initiate Digital Ignition Ceremony***

The 19th Asian Games will initiate a historical digital ignition ceremony. Over the past three months, more than one million netizens from around the world became digital torchbearers of the Games.

***The WFST Begins to Operate***

The Wide Field Survey Telescope (WFST) began to operate on September 17. It aims to provide the deepest high-precision, large-area, multicolor photometric and positional catalogs, which can be used for the identification and systematic study of various types of celestial bodies in the universe in the coming decades.

***Yaogan-39 Remote Sensing Satellite Launched***

Using a Long March-2D carrier rocket, China launched a new remote sensing satellite Yaogan-39 on September 17. This is the 488th mission undertaken by the Long March rocket series.

***New Radio Telescope to Support Deep-space Missions***

The construction of a 40-meter-aperture radio telescope in Shigatse of southwest China's Xizang autonomous region, was launched officially on September 17, in order to offer technical support for China's lunar and deep-space probe missions in the future.

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# Rich Aquatic Products on Dining Tables in Xinjiang

## Case Study

By ZHONG Jianli & WEI Yichen

When you think of Xinjiang Uygur autonomous region, the farthest inland region in northwest China, which foods typically come to mind? Lamb and sweet fruit, perhaps? However, now salmon, shrimp and crab may catch your attention.

Seafood has not only become a delicacy on dining tables in Xinjiang homes, but also across the nation and even around the globe.

But just how is it possible to cultivate seafood in landlocked Xinjiang?

On one hand, the salinized land in many parts of Xinjiang and the region's natural lakes provide a sound environment for producing aquatic products.

Hongqi Farm is located in the eastern part of Pamir Plateau. Due to the low-lying terrain, its groundwater level is relatively high, and the water contains a large amount of salt and alkali.

Taking advantage of the saline-alkali water resources, local people have blended the water and simulated the marine environment, which is suitable for the breeding of shrimps and other seafood.

On the other hand, the cold, clear freshwater from melting glaciers in Xinjiang makes it conducive to cultivating fish.

Rainbow trouts are raised in a reservoir in Xinjiang's Nilka county. (COURTESY PHOTO)

Nilka county, located in the upper reaches of Ili River whose source is from melting snow on Tianshan Mountain, offers a unique ecological environment for raising the rainbow trout, a species of the salmonidae family.

The water temperature in reservoirs is maintained at 8℃ to 13℃ all year round, while the water flow is slow, and very suitable for cold water fish breeding.

"We have pioneered a semi-closed recirculating aquaculture system to raise cold water fish," according to a spokesperson of Xinjiang Tianyun Organic Agriculture Company, adding that the system helps solve the problem of higher temperature in summer which curbs the appetite of fish, and with this system, the growth period of fish is shortened from 36 months to 26 months.

"Our company can breed eight million trout fry every year, and the annual production of high-quality trout is about 12,000 tons. We have built a whole industrial chain integrating research and development, fry breeding, intelligent farming, intensive processing and sales," said Wang Yuan, assistant to chairman of Tianyun, adding that the company has obtained the Best Aquaculture Practices certification by Global Aquaculture Alliance.

Relying on the advanced processing equipment, the rainbow trout can be processed, packaged and transported to market within 24 hours. Some products are exported to Russia, Malaysia and other countries.

The aquatic food business has also brought benefits to local people. According to official data, the total output value of Xinjiang's fishery industry reached 4.2 billion RMB in 2022, an increase of 921 million RMB over 2019. The per capita net income of fishermen in Xinjiang is 19,960 RMB, 3,410 RMB higher than the per capita disposable income of rural residents.

# Qingdao FTZ Drives Innovation with Optimized Services

By SONG Yingying
CHEN Chunyou

The Qingdao Area of the China (Shandong) Pilot Free Trade Zone, also known as the Qingdao FTZ, celebrated its fourth anniversary on August 30. Over the past four years, the Qingdao FTZ has made significant advancements through bold explorations and innovative reforms.

At the Sino-German Park, Qingdao MGI Tech Co. Ltd.(Qingdao MGI), a provider dedicated to leading life science through intelligent innovation, is actively engaged in the R&D of new products.

Gene sequencing requires importing biological samples, which previously involved a complex and time-consuming application process. However, biological samples have high requirements for time, temperature and humidity. It is crucial, therefore, to avoid any delays at the port, a researcher of Qingdao MGI told *Science and Technology Daily*.

A view of the Qingdao FTZ in east China's Shandong province. (PHOTO: VCG)

Recognizing the enterprise's needs, the administrative committee of the Qingdao area (ACDA), in collaboration with relevant customs and port departments, implemented a new supervision model for importing biological samples.

The previous batch-by-batch application process has been replaced with an annual centralized application. This model has provided a streamlined and efficient channel for importing samples for the entire gene technology industry.

Thanks to the institutional innovation in the Qingdao FTZ, Qingdao MGI has achieved remarkable progress in cutting-edge science and advanced manufacturing. Its rapid development reflects the surging momentum of high-quality development in the Qingdao FTZ.

"As a testing ground for institutional innovation, the Qingdao FTZ has formed 285 innovation cases over the past four years, in which 52 cases have been promoted across Shandong, stimulating strong momentum for high-quality development of the province," said Sui Bin, deputy director of ACDA.

With the full empowerment of institutional innovation, enterprises in Qingdao experienced a surge in innovation. CP Pharmaceutical (Qingdao) Co., Ltd. developed the "BG136," which became the first anti-tumor marine drug to enter clinical trials in China. Additionally, Biomarker Biotechnology Co., Ltd. introduced an automated sequencing test platform. Furthermore, Qingyuan Resistant Weeds Control Co., Ltd. independently developed and commercialized four patented herbicides, which filled the gap in the application of non-invasive herbicides in China's main grain crop fields and was recognized with second prize in the National Science and Technology Progress Awards.

Qingdao FTZ places a strong emphasis on the real economy, consolidates the foundation of the advanced manufacturing industry, and builds new advantages around low-carbon and digital industries. To date, it has gathered more than 150 world's top 500 domestic and foreign investment projects, and formed an advanced manufacturing industry chain cluster represented by intelligent home appliances and gene technology, according to Wang Li, deputy director of ACDA.

# Vocational School Empowers African Youth

*From page 1*

The company also sends experienced technicians to the school to give lectures and practical demonstrations, and discuss the problems the teachers and students face during the course to solve them. Dikumbi, head of Kapata, is full of praise for Sicomines. "Whenever we need help, Sicomines always responds positively," he told the media. "We have implemented many projects. Sicomines is our friend forever."

# Tech-driven Hangzhou Asian Games Coming

*From page 1*

The viewers can also experience different points of view via augmented reality (AR). For example, watching a game from the angle of the coaches, the audience or the players when there is a volleyball game on. In addition, multilingual commentary is indispensable for an international event like this. What's interesting is that commentary in local dialects is also an option this time around.

***Smart operation***

A complicated event like the Hangzhou Asian Games cannot run smoothly without smart systems and mechanisms.

Many of the venues have their "smart brain," a central control system that connects the facilities, terminals, games and people, enabling the operation staff and organizers to have a grasp of real time situations.

In Huanglong Sports Centre, there are about 4,000 facilities in operation, and through the smart brain, the staff can know immediately when there is a malfunction. The smart brain can also monitor human and vehicle traffic, thus conducting real time diversions.

As to the key venue, a 3D model of Big Lotus was created on the cloud based on building information modeling, AR and VR technologies, to help the staff grasp every detail.

The smart brain of Big Lotus, and the nearby Aquatic Sports Arena and Gymnasium, can offer support for facial recognition, and guidance for toilets and parking.

Meanwhile, a one-stop digital game watching platform was developed to offer smart and comprehensive service for participants and spectators in 18 scenarios from six aspects, including tickets, food, accommodation, transport, travel and shopping, greatly enhancing the efficiency of service provision.

The Hangzhou Asian Games are almost here, and the adopted advanced technologies are set to provide wonderful experiences for everyone involved.

## Policy

# China Fortifies Support for Metaverse Industry

By CHEN Chunyou

The metaverse has begun to integrate with people's lives and production, and has a positive role in enhancing people's access to quality education and healthcare, as well as in some disaster management, such as earthquake monitoring and response.

As a new move to drive innovative development of the metaverse industry, a three-year action plan was released by the Ministry of Industry and Information Technology and four other departments on September 8, with an aim of making the metaverse industry become a significant growth pillar of the digital economy before 2025.

The plan maps out a blueprint covering 2023 to 2025, and specifies five tasks to boost the growth of this sector. These include developing advanced technology and industrial systems, creating a 3D interactive industrial metaverse, designing immersive and interactive digital life applications, establishing comprehensive industrial support systems, and implementing a secure and credible industrial governance framework.

Meanwhile, the plan calls for cultivating three to five metaverse companies with global influence, and building three to five industry clusters by 2025, and breakthroughs in metaverse technologies, industries and applications are anticipated.

To address the challenges such as limited core technologies, insufficient product supply and weak industrial scale, the plan proposes leveraging the integrated advantages of artificial intelligence, blockchain, cloud computing, virtual reality and other related technologies to drive industrial innovation. The plan advocates cultivating leading and specialized enterprises, as well as building pilot areas, sci-tech parks and industrial parks for innovative applications of the metaverse.

Furthermore, the plan encourages enterprises to explore new models and formats of technological innovation and content production in which users participate. As an incentive, tax and fee reduction policies will also be introduced for the metaverse enterprises.

In addition, the plan vows to promote the application of the metaverse in various sectors, such as home appliances, automotive and aerospace. Procedures- oriented manufacturing industries, such as steel and textiles, are encouraged to adopt related technologies to optimize production processes, like scheduling and material calculation.

Efforts will also be made to enhance the quality of metaverse products and services, and the protection of intellectual property rights in this sector will be strengthened.

As a necessary support for all of these initiatives, key laboratories, manufacturing innovation centers, and content production bases will be constructed to support technology research and development as well as new product testing.

China is expected to actively engage in formulating metaverse international governance rules and standards, and see that domestic standards are in line with international standards, according to the plan.

A visitor experiences a visually immersive device at a metaverse hall in Nanjing city, Jiangsu province. (PHOTO: VCG)

# Leveraging IPR for Industrial Growth

By CHEN Chunyou

China will enhance intellectual property rights (IPR) protection by 2027 to promote synergistic development of IP and the development of industrial technology, and enhance the resilience of the industrial supply chain.

That's according to an action plan jointly released by the Ministry of Industry and Information Technology and the China National Intellectual Property Administration, which also aims to see a major improvement in the ability to create high-value patents in key industries.

The number of high-value patents per 100 million RMB (13.72 million USD) of the business income of enterprises above designated size in key areas of the manufacturing industry will be close to four. The proportion of patent-intensive industries' added value in the GDP should record a substantial rise.

The extraction, utilization and in-depth integration of industrial and IP information will be strengthened to give a clear direction for industrial development.

The quality of IP creation will be improved. Various types of innovation bodies will be guided to cultivate high-value patents with industrial competitiveness and market benefits. Leading enterprises in key industrial chains will be encouraged to strengthen their overseas IP layout and transform independent IPRs into technical standards.

To deepen the transformation and application of IPR in key industries, public service platforms are expected to improve IPR services for enterprises. The concerned government departments will work to enhance industrial enterprises' IP management and application capacity, carry out pilot work on the application of IP in selected industrial enterprises, and strengthen IP training for key industrial chain enterprises.

Industrial organizations and alliances and professional institutions will be encouraged to carry out research on data IPR protection strategies, and explore IPR protection in data production, circulation, utilization and sharing.

To enhance the IP service capacity of key industries, industrial parks and various pilot zones should introduce professional IP transfer and transformation institutions. In this way, public IPR services will be enhanced, and regional industrial policies, industrial planning and talent exchanges better supported, according to the plan.

# Dragon Programme Takes Remote Sensing to New Level

By QI Liming

Young scientists at a session of the 2023 Dragon 5 symposium. (PHOTO: ZHOU Weihai/S&T Daily)

In 2004, China's Ministry of Science and Technology (MOST) and the European Space Agency (ESA) launched the Dragon Programme, a science and technology research cooperation in the field of Earth observation.

Implemented by the National Remote Sensing Center of China (NRSCC) and the European Space Research Institute (ESRIN), four phases of the Dragon Programme have been completed so far, each phase lasting four years. Dragon 5 was launched in 2020. The 2023 Dragon 5 Symposium held in Hohhot, north China's Inner Mongolia autonomous region, from September 11 to 15, summarized the results of three years of the Dragon 5.

***Long history of cooperation***

Today the Dragon Programme is the platform with the largest number of participating countries, teams and personnel in China-EU remote sensing sci-tech cooperation, with the broadest coverage of research fields.

Josef Aschbacher, director general of ESA, said in his video address that advancing science and finding common solutions to common problems and global issues can only be done through global cooperation. "ESA and its member states are therefore strong supporters of initiatives like the Dragon Programme, ... pulling leading researchers from Europe and China to work together to find common solutions benefiting scientists both in China and in Europe," he said.

Zhang Yudong, Chinese vice minister of science and technology, said in his video address, "Scientific and technological cooperation between China and Europe has a long history in extensive areas. The Dragon Programme is an important part of the China-EU comprehensive strategic partnership of cooperation. I hope that we both take this opportunity to broaden the fields and channels of cooperation, promote further exchanges between researchers from both sides, and continuously improve mechanisms and platforms for scientific and technological cooperation."

Under the Dragon Programme, China and the EU have carried out extensive and in-depth cooperation in remote sensing applications, technical training, academic exchanges and data sharing. They have explored a scientific and technological cooperation mechanism for governments to build platforms and scientists to participate independently and share Earth observation data. This has not only enhanced the technical level and capabilities of both sides in remote sensing applications, but also become a model of scientific and technological cooperation between them.

***An important model of reference***

Since its launch 19 years ago, the Dragon Programme has witnessed the participation of over 1,100 Chinese scientists and nearly 1,000 scientists from European countries.

Simonetta Cheli, head of ESRIN and director of Earth Observation Programme, called international cooperation essential for ESA. "It is also essential to be able to address the concerns, such as climate issues," she said via video, adding, "The Dragon Programme, since 2004, has shown to be a very important model of reference in achieving these subjects. In this light, I believe the cooperation will continue between ESA and MOST, and the Dragon 6 will continue as scheduled."

Xu Jie, deputy director general of the International Cooperation Department of MOST, said at the symposium, "After 19 years of collaboration, the Dragon Programme has proved to be a platform for China and Europe to collaborate on academic exchange, technical training and joint research, and has been highly valued by the involved scientists."

Scientists from both sides have carried out joint research on remote sensing applications in the fields of solid earth, ocean and coastal zones, and atmospheric sciences, creating a unique platform for China-EU high-tech cooperation in remote sensing.

***Cultivating young researchers***

Nearly 80 percent of the Chinese experts participating in Dragon Programme are under the age of 45. Through cooperative research with many top international scientists in Europe, a large number of them have become technical leaders.

Rune Floberghagen, head of the Science, Applications and Climate Department at ESA, called "the Dragon cooperation" a success. "I personally would like to make a particular welcome to the young scientists here in the audience," he added. "Not only are you the future of science, but in the preparation of this symposium. From the perspective of the Dragon offices of ESA and NRSCC, we actually want to highlight the important role that young scientists have within the Dragon Programme."

Liu Zhichun, deputy director general of NRSCC, said "through the Dragon Programme, China and Europe have established a joint research team on Earth observation, which has achieved a large number of research results and greatly promoted the improvement of Earth observation technology." Liu hoped the meeting would promote the development of remote sensing technology for application.

# Advancing Sci-tech Cooperation Among BRI Countries

**Voice of the World**

By TANG Zhexiao & LONG Yun

Organized by the Chinese Academy of Science and Technology for Development (CASTED) and the Shanghai Institute of Science & Technology Management, as a side event of the 2023 Pujiang Innovation Forum, a forum on building an open and high- quality innovation ecosystem along the Belt and Road was held in Shanghai on September 9.

In the decade since its inception, the Belt and Road Initiative (BRI) has evolved from a Chinese initiative into a global consensus. It has transformed from an aspiration for cooperation into a tangible platform for international development, becoming a widely embraced international public product.

The core principles of the BRI—openness, inclusiveness, mutual benefit, and win- win cooperation have not only resonated with other countries, but also led to flourishing sci- tech cooperation among the Belt and Road countries, with deals inked and joint labs established.

***Sci- tech cooperation for sustainability***

A focus of the forum was on strengthening scientific and technological cooperation within the BRI.

Hu Zhijian, chief researcher and former president at the CASTED, spoke about the potential for scientific and technological cooperation within the BRI framework. According to Hu, there are significant opportunities in developing digitalization and intelligent technologies. They can catalyze economic growth and support the global shift towards green development, championed by the United Nations' sustainable development goals.

Hu also underscored the importance of broad collaboration beyond governments. While governmental cooperation has been robust, there is great potential for connections across multiple sectors, including universities, research institutions, scientists, businesses, industries and risk investment companies.

At a parallel seminar that focused on green transformation, Erik Solheim, former executive director of the UN Environment Programme and convener of the BRI International Green Development Coalition Advisory Committee, hailed China's green development in recent years, citing the saying "Lucid waters and lush mountains are invaluable assets."

He said high- tech methods have replaced the old ones nowadays. For example, drones are now used to plant trees in many parts of China. These techniques and experiences are worth sharing with other BRI countries.

***BRI for international collaborations***

Foreign experts talked about maximizing the role of BRI in promoting international cooperation and local development. Adriano Proença, senior fellow at the Brazilian Center of International Relations based in Rio de Janeiro, highlighted opportunities for local entrepreneurs within the BRI and stressed the potential of the Digital Silk Road and the Knowledge Silk Road, urging intelligent utilization of BRI infrastructure and knowledge flow. He suggested constructing an open innovation ecosystem to harness the opportunities in the BRI and enhance competitiveness.

Mlungisi Cele, acting head of the National Advisory Council on Innovation of South Africa, expressed gratitude for China's support in infrastructure investment, which has boosted South Africa's competitiveness. He stressed the need for enhanced coordination in African domestic and regional policies and governance.

Exploring the theme of building an innovation ecosystem for agriculture under the BRI, Ana Célia Castro, director of the Institute for Advanced Studies at the Federal University of Rio de Janeiro, emphasized the significance of knowledge- sharing networks and knowledge governance.

**Hi-tech Asian Games**

# Technologies Make Asian Games Smarter

***Editor's Note:*** *The 19th Asian Games will be held in Hangzhou, east China's Zhejiang province, from September 23 to October 8. From venue constructions to event services, a number of hi-tech products reflect the concept of Smart Asian Games.*

## Intelligent Grass Care System Maintains Turf

The Wenzhou Sports Center Stadium, one of the football venues for the Hangzhou Asian Games, is using an intelligent grass care system to maintain its turf.

The turf has 18 sensors installed underneath to collect data on the temperature, humidity, acidity, nitrogen, phosphorus and potassium content of the roots of the grass, as well as the light intensity, sunshine hours and solar radiation of the grass surface.

The data is transmitted to a cloud platform data center, from which it can be viewed directly on mobile phones, computers and other visual terminal displays.

The intelligent grass care system records the maintenance work and manages the entire lifecycle of the turf, making maintenance convenient.

Staff maintain the turf in Jinhua Sports Center Stadium, where football group matches take place. (PHOTO: VCG)

An operator uses the acoustic imager. (PHOTO: XINHUA)

## Acoustic Imager Ensures Gas Safety

In order to ensure safe operations, the Hangzhou Asian Games Village Athlete's Restaurant uses an acoustic imager, a device to detect, locate and visualize gas leaks.

The acoustic imager uses both acoustic and optical technology to help maintenance personnel work accurately and quickly. It locates the sound source emitted by the fault through an array of 64 microphones, and overlaps the image captured by a high-definition camera to confirm the fault location on its screen.

The device also has built-in algorithms to eliminate interference factors. Since both gas leakage and normal airflow in vents cause air vibrations that produce sounds, it is imperative to detect which of the two is causing the sounds.

Gas leak sounds tend to be high frequency and low volume, while the sound caused by airflows in vents is the opposite. By using built- in algorithms to help determine what's causing the sound, the device can pinpoint the location of the leak, improving inspection efficiency.

## Intelligent Robots Save Manpower

As a competition venue for table tennis and break dancing, the Gongshu Canal Sports Park Gymnasium uses intelligent robots to save manpower and improve efficiency.

As the world's first medium- free holographic AI robot, the guide robot can present the image of the Asian Games mascot Chen Chen in the air in the form of holograms, and interact with the audience face-to-face, providing corresponding information about the venues, traffic, food and other queries.

Patrol robots, based on advanced artificial intelligence technology, have the capability of facial and motion recognition, voice interaction and environmental perception. They can identify suspicious behaviors in crowds and convey the information to security personnel.

Robots are also used for air purification, delivering objects, playing the piano and cleaning, making services more convenient and fun.

An intelligent robot plays the piano. (PHOTO: VCG)

A self-driving bus on the road. (PHOTO: VCG)

## Self-driving Buses Connect Smart Roads

The adoption of self-driving buses at the Hangzhou Asian Games makes the connection between various venues and subway stations, improving transportation efficiency.

The outer four corners of the buses have millimeter-wave radar, Lidar, ultrasonic radar, visual cameras and other equipment, which can achieve precise perception of the surrounding environment and identify vehicles, pedestrians, traffic lights and obstacles.

The interior of the buses is equipped with three smart screens. The front screen displays driving information including the vehicle speed and a roadmap, while the two side screens display route stops and current location.

The bus is also equipped with a robot called Xiaoyu, which can adjust the lighting and temperature of the bus with simple voice commands.

***(Edited by ZONG Shihan)***

# BRI's Transformative Potential in Collaboration

## Dialogue

By LONG Yun & BI Weizi

"As a scientist, our main task is to solve community problems and improve life quality," said a Pakistani researcher Muhammad Kashif, in a recent interview with *Science and Technology Daily*.

As an associate professor at the School of Electrical and Information Engineering at Tianjin University (TJU), Kashif has been fascinated by the world of electronics and other technologies since childhood. He recalled his excitement in seeing personal computers that were new and rapidly evolving in the 1990s. It was a time when possibilities seemed endless, and he was inspired by the groundbreaking inventions of that era. This early exposure to high-tech fueled his passion to contribute to sci-tech development.

Professor Muhammad Kashif. (COURTESY PHOTO)

***Benefiting the community***

Kashif believes that the primary goal of maximizing the effect of science is to tackle real-world problems faced by humans.

One of his primary research areas focuses on developing gas sensors and their applications. With gas being all around us, some are hazardous to our health. Due to gas cylinders still being used in many communities/countries, accidents can occur when cylinders are left open, leading to devastating consequences. Kashif's gas sensors are designed to detect flammable/explosive gases at room temperature, reducing the risk of explosions and accidents.

Furthermore, his research extends to sensors that can detect gases at lower limits. These advancements ensure not only personal safety, but also have significant implications for industries that require precision and safety.

At the same time, Kashif values sharing discoveries with worldwide counterparts through writing and publishing articles in scientific journals. "It's a collaborative effort to drive scientific progress," he said.

***Sci-tech progress generating global benefits***

In recent decades, China's rapid progress in science and technology has been evident on the global stage. Kashif sees China as a frontrunner in fields like telecommunications and 5G technology, which have the potential to transform the world in many positive ways.

Kashif said the implications of this technology transfer are profound. With 5G, China has not only revolutionized its own telecommunications infrastructure, but is also exporting this cutting-edge technology to other countries.

As countries adopt and implement 5G, they experience a leap in efficiency and connectivity and are able to carry out industrial upgrading, from manufacturing and education to healthcare and entertainment.

Moreover, it facilitates greater international collaboration, enabling nations to work more closely on shared experiences of innovation and discoveries. This collaborative approach also fosters a deeper understanding of cultural diversity.

From his perspective, China's strategy of sharing its technological advancement with the world not only benefits the scientific community, but also has a profound impact on the world.

***BRI's far-reaching influence***

This year marks the 10th anniversary of the Belt and Road Initiative (BRI). With joint efforts of all parties, this important initiative has progressed with vitality and benefited the world.

Kashif specifically mentioned the China-Pakistan Economic Corridor (CPEC), a flagship project under the initiative. According to him, CPEC is regarded as a "game changer" for Pakistan's economy, and the BRI shares this transformative potential on a global scale.

He said that the BRI can accelerate trade between China and other countries by enhancing connectivity. For example, the initiative seeks to facilitate the flow of goods, services, and people-to-people exchanges by developing efficient transportation routes, including railways and roads. "This not only reduces transportation costs but also improves the quality of life for those living in areas connected to these routes," he said.

Additionally, the BRI fosters stronger economic ties between nations, creating opportunities for collaboration, mutual growth, and shared prosperity. Kashif highlighted the importance of scholarships and exchange programs, and applauded the Chinese government's efforts in this regard.

He believes that collaborative efforts and knowledge-sharing are essential for driving innovation and progress, noting that various countries can excel in technologies, and by fostering collaborations, China can bridge the technological gap more effectively.

*This article has been contributed by TJU.*

## China Impression

# International Employees Witness Chinese Modernization

By CAO Xiuying & LONG Yun

To mark the 10th anniversary of the Belt and Road Initiative (BRI) as well as the 30th anniversary of China National Petroleum Corporation (CNPC)'s going global, Petroleum Engineering and Construction Corporation (CPECC), a subsidiary of CNPC, organized the "International Employees in China" event, which invited international employees from nine countries to have a journey through China.

During the trip, they were immersed in the rich Chinese history and culture while witnessing the extraordinary achievements of Chinese modernization.

Korganbayev Abror, an employee of CPECC's Kazakhstan branch, was captivated by the number of new energy vehicles in Beijing. As a Chinese speaker, Abror felt that China's development is incredibly rapid and its beauty is breathtaking.

The visitors' China exploration started with a visit to the CNPC's petrochemical project in Guangdong province in southeast China.

Babylova Venera, chief engineer of the Earthwork Department at the CPECC's southwest branch in Turkmenistan, called the petrochemical plant exceptional and indescribably magnificent.

The visitors were also taken to the Guangdong petrochemical project of the CNPC.

Lennie Thomas, deputy director of the Rumaila Project in CPECC's Middle East division, said, "CNPC should take immense pride. These dedicated employees ensure the secure operations of the facility, which is remarkable."

Also, the foreign employees embarked on an insightful journey to the Reform and Opening-up Exhibition Hall of Shenzhen, the industrial hub in Guangdong, illustrating China's transformation during its 40-plus years of reform and opening-up.

The journey continued to the Hong Kong-Zhuhai-Macao Bridge connecting three cities, and Huawei Technologies' headquarters in Shenzhen.

The CPECC, one of the pioneering Chinese petroleum engineering companies, has five regional markets overseas and operates in 30 countries and regions.

Over the past decade, it has enjoyed unparalleled growth, achieving seamless integration across its supply chain. Contracts with BRI countries now contribute 70 percent of its total contract value.

Through the concerted efforts of Chinese and international personnel, numerous flagship projects shine like precious pearls.

According to Li Xiaoning, the CPECC's executive director, the organization will maintain an even more open and inclusive mindset and continue to go global, seizing the opportunities presented by the BRI.

The CPECC's international employees visit the Great Wall. (PHOTO: CPECC)

# Ambassadors: China Will Reach Its Climate Goal

Edited by TANG Zhexiao

Ambassadors to China who attended the 2023 Taiyuan Energy Low Carbon Development Forum in September called for closer cooperation between countries in tackling the challenges brought by climate change.

A photovoltaic power station in Ruicheng county, Shanxi province. (PHOTO: XINHUA)

Iceland's Ambassador to China Thorir Ibsen, said he was quite confident that China would reach its goal in 2060. "We need more and stronger commitments from all the countries in the world."

Climate change today is affecting all sectors, said Ambassador of Tunisia to China Adel Elarbi. "We are speaking about [an] energy crisis, and some countries are speaking about energy sovereignty," he said. Elarbi also believes climate change is a global problem, and we should collectively find international and multilateral cooperation solutions.

Meanwhile, Michael Campbell, Nicaragua's Ambassador to China, said he was impressed by his visit to Tashan coal mine in Shanxi province, which is now a fully automatic mine that is focused on low carbon emissions. "It is using state-of-the-art technology to make sure the process of generating energy," said the ambassador.

Campbell also shared his observations about the cooperation of the Belt and Road Initiatives (BRI), saying, "Initiatives such as the BRI allow us to cooperate, collaborate, share technologies, experiences and best practices. The BRI and Global Development Initiative (GDI) provide countries such as Nicaragua and other developing countries in the world the opportunities to develop our technology and put policies into practice that will help us in the long term to address."

As the report released by the International Renewable Energy Agency notes, to get on track for the 1.5 ℃ climate goal, countries must accelerate international collaboration on technologies and markets for sectors such as power, transport, industry, buildings and agriculture.

## Traditional Eastern Wisdom

# Ancient Chinese Vertical Axis Windmill

By BI Weizi

Early records of China's wind-powered water-lifting devices were first discovered in *Jinlouzi*, written in the 12th century.

In the Ming Dynasty (1368-1644), windmills became popular in the southeastern part of the country with its abundant wind resources.

At that time, windmills could be divided into two types, the vertical-axis windmill, also known as the vertical-sail windmill, and the horizontal-axis windmill. They had blades like the cloth sail of a Chinese sailboat and were mainly used to drive water-lifting devices.

The vertical axis windmill is made of wood and shaped like a revolving lantern. The construction principle of the sail is the same as that of a Chinese sail, with a faceted Chinese-style rigid balanced foresail.

There is a fixed square frame on the outside, while the wind wheel is an octagonal prism with a vertical axis in the center. Eight prisms are installed on the axis, with sails attached to them. The prism is used as an axis to deflect the wind. The large transverse gear meshes with the vertical shaft gear and is connected to the sail.

When the wind hits the vertical shaft wind wheel, the sail is driven to rotate together with the vertical shaft, and the force is transmitted laterally through the gear, thereby starting the connected water-lifting tool and converting wind energy into mechanical energy.

Compared with the Persian vertical axis windmill and the Dutch horizontal axis windmill, the Chinese vertical axis windmill has two major advantages:

First, it is influenced by the wind from all directions. Second, the speed can be controlled by adjusting the height of the sail. The ingenious design of the vertical axis windmill still has great significance in the field of mechanical machinery.

## Service Info

# Beijing Takes Steps to Attract Foreign Talents

By Staff Reporters

Foreign professionals, looking to work and live in Beijing, have more reasons to make the city home after the Beijing Municipal Bureau of Human Resources and Social Security unveiled new measures to attract expats at the China International Fair for Trade in Services 2023.

The latest edition of the Beijing Foreign Vocational Qualifications Approval Catalogue (BFVQAC) (Version 3.0) covers 122 international vocational qualifications. Notably, seven of these qualifications fall under the "Urgent Shortage Catalogue."

In addition, the "Catalogue of Human Resources Development for the National Integrated Demonstration Zone for Expanding Opening-up in the Services Sector and the China (Beijing) Pilot Free Trade Zone (Version 2023)" identifies 15 important sectors, including chip design and financial technology services. It also identified 18 occupations, such as pharmaceutical industry workers and optical instrument testers.

Originally introduced in 2021, the BFVQAC has undergone two revisions. Version 3.0 expands its coverage to 12 key areas, including science and technology, finance, and new-generation information technology.

These certificates are recognized in 15 countries and regions, including UK, the U.S., international organizations and renowned industry associations.

In Version 3.0, the age limit for work permit applications has been raised to 65 years, regardless of education, degree or work experience. In some advanced industries, this age limit is further extended to 70 years.

Meanwhile, the city offers six upgraded services for individuals with skills listed as urgently needed in the catalogue. Foreigners can apply for a "Confirmation Letter for High-Level Foreign Talents," which grants entry and exit privileges. They can also apply for visa documents and permanent residence based on their high-level talent status.

◀ For further information, please scan the QR code.