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Innovation Pathway

New Quality Productive Forces Rely on Innovation

By Staff Reporters

China's efforts to highlight the leading role of scientific and technological innovation in fostering new quality productive forces were clearly signaled in the *Recommendations of the Central Committee of the Communist Party of China (CPC) for Formulating the 15th Five-Year Plan for National Economic and Social Development*, adopted at the fourth plenary session of the 20th Central Committee of the CPC.

To advance Chinese modernization, science and technology must take the lead. The Recommendations' emphasis on innovation resonates strongly with academicians at the forefront of research, who see the next five years as a decisive period for building China into a science and technology powerhouse. They stress strengthening basic research, tackling key core technologies, and integrating scientific and industrial innovation to unleash new drivers of growth.

Strengthening the foundations

The scope of scientific innovation and research is vast. Examples are vital questions such as, where does lunar water come from and could materials from the outer solar system reach Earth?

Recent findings from Chang'e-6 lunar samples, reported in the top scientific journal *Proceedings of the National Academy of Sciences (PNAS)* on October 21, offer crucial clues. Chinese scientists discovered rare impact residues that confirm asteroid fragments can travel from the outer to the inner solar system — providing new insights into the Moon's water origins.

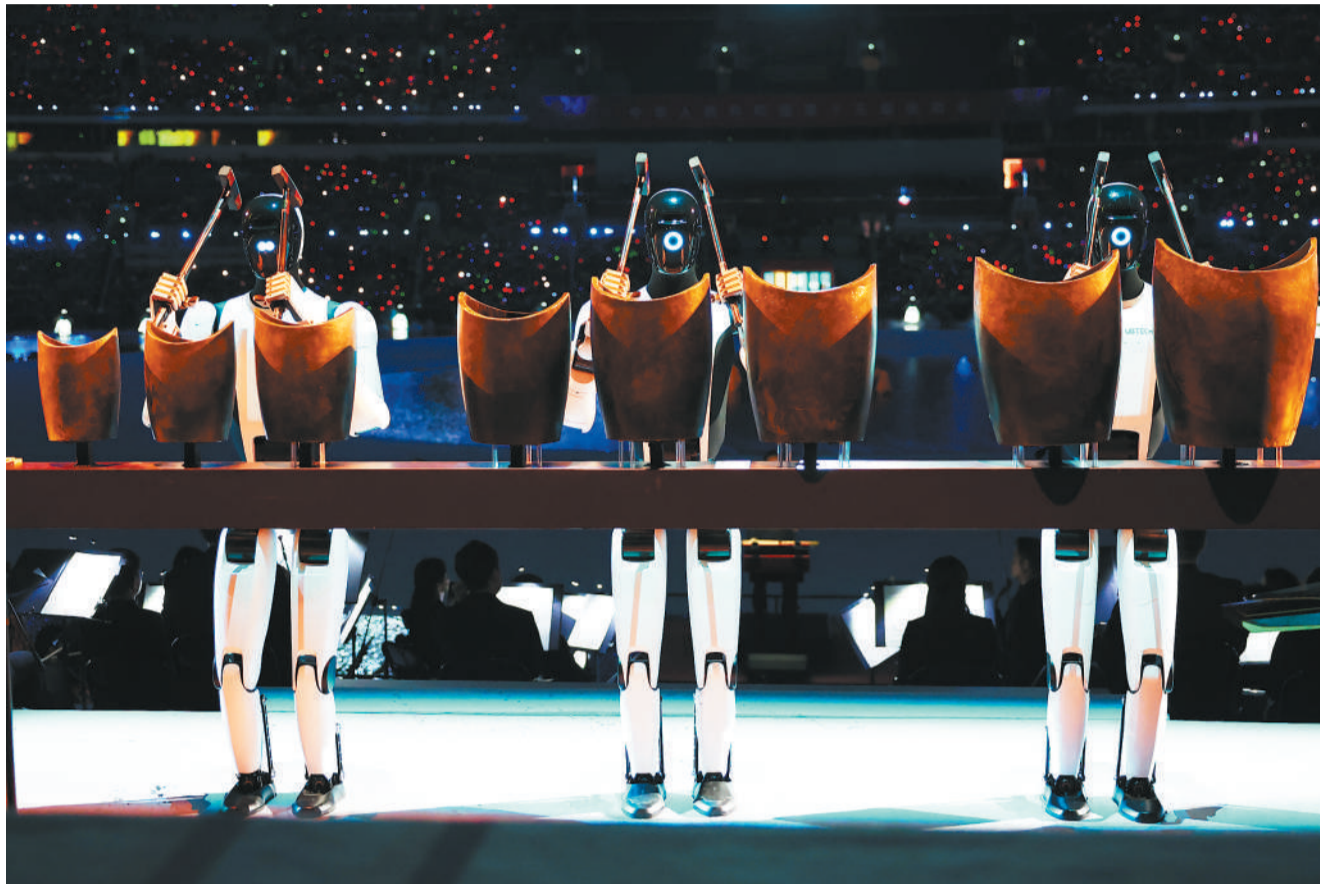
Such breakthroughs reflect China's steady advances in basic research. "Neglecting basic research is equivalent to stifling innovation's future," said Wang Chi, academican of the Chinese Academy of Sciences (CAS).

Looking ahead to the next five years, Wang Yifang, a CAS academican, believes that strengthening fundamental research and fostering original innovation should start with ensuring stable support and encouraging free exploration.

Securing core technologies

During the 14th Five-Year Plan period (2021-2025), China built 33 national manufacturing innovation centers and made nearly 700 breakthroughs in critical technologies.

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Robots play a replica of the ancient bronze percussion instrument known as Goudiao during the opening ceremony of China's 15th National Games in Guangzhou, south China's Guangdong province, November 9. (PHOTO: XINHUA)

STI Frontier

Thorium-uranium Conversion Makes Breakthrough

By QI Liming

In early November, the experimental operation of a 2-megawatt liquid-fuel thorium-based molten salt reactor (TMSR), led by the Shanghai Institute of Applied Physics, Chinese Academy of Sciences (CAS), achieved the world's first thorium-uranium nuclear fuel conversion in Wuwei, Gansu province.

This landmark breakthrough has provided core technical support and feasible solutions for the future large-scale exploration and utilization of thorium resources in China, as well as for the development of fourth-generation advanced nuclear energy systems.

Abundant thorium resources

Energy security is a fundamental and strategic issue that affects the overall development of a country's economy

and society. The shortage of energy supply caused by the rapid growth in electricity demand means that nuclear energy has become an important new energy option for resolving the energy crisis.

At present, the main fissile isotopes used as nuclear fuel in reactors include uranium-235, plutonium-239, and uranium-233. Although these resources are limited, thorium — a fertile rather than fissile element — is more abundant in nature and can be converted into uranium-233 for use in nuclear power generation. China possesses significant thorium reserves, largely associated with its rare-earth mining industry. The TMSR is a fourth-generation nuclear energy system that uses thorium fuel and high-temperature molten salt as the coolant. It operates at near-atmospheric pressure

without the need for water cooling and offers high thermal efficiency and enhanced safety features.

This technology is designed to integrate with industries such as solar and wind power, high-temperature molten salt energy storage, hydrogen production, and coal-to-chemical processes. By doing so, it aims to form a multi-energy complementary, low-carbon composite energy system that enhances efficiency and reduces emissions.

TMSR convenient and safe

Most conventional nuclear power plants are located along the coast, because a large amount of water is needed for cooling the reactor core. "Unlike the currently widely used pressurized water reactors, the TMSR uses high-temperature liquid molten salt as the coolant.

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Brand-new Technology Better Serves Events and Lives

By QI Liming, HE Liang & LONG Yuemei

The 15th National Games, hosted for the first time across three areas—Guangdong, Hong Kong and Macao in south China, one of China's most dynamic economic regions collectively known as the Greater Bay Area, highlight China's technological prowess.

Spectacular opening

The opening ceremony in the Guangdong Olympic Sports Center Stadium in Guangzhou city on November 9 showcased the beauty of technology in motion, integrating seamlessly the unique characteristics of the Greater Bay Area.

The "Dialogue Between Past and Present" blended traditional southern China culture with modern technology, exemplified by a spectacular lion dance performance interwoven with AI-generated content. A performance of the Yingge Dance, a dynamic folk dance blending martial arts, opera, and dance with gongs and drums, was accompanied by holographic projections, and a dragon boat race was enacted "rowing" into the audience seats through augmented reality technology.

"In the past, large-scale events like this required many performers," said Meng Ke, executive director of the opening ceremony. "With technological advances, we can now create powerful effects with far fewer people and greater efficiency."

Robots play ancient bronze musical instrument

Three fully autonomous humanoid robots with embodied intelligence, the Walker S2 models, struck bronze musical instrument modeled on their historical prototypes unearthed from the nearby 2,000-year-old tomb of the king of an ancient kingdom, creating a harmonious resonance that spanned over two millennia.

It was the first time a national sports event used humanoid robots as opening ceremony performers, and also the first time in the world that humanoid robots played millennia-old bronze ritual music. See page 2

WEEKLY REVIEW

Perovskite Solar Cell with Over 27% Conversion Efficiency Developed

Researchers from the Institute of Semiconductors, Chinese Academy of Sciences, have developed a prototype perovskite solar cell with a photovoltaic conversion efficiency of 27.2 percent and significantly enhanced its operational stability. Regarding stability, the cell maintained 86.3 percent of its initial efficiency after continuous operation for 1,529 hours. The research findings were published online in *Science*.

Breakthrough Made in Saline-Alkali Soil Technology

A plant-based nano-silica technology for saline-alkali soil improvement has successfully undergone field trials in Jinpu New Area in Dalian, Liaoning province in northeast China. It was used on medium-to-heavily saline coastal soils with pH 10.54 and a salt content exceeding 5 percent to achieve a major breakthrough from zero corn yield per mu to 603.1 kg per mu in the same year.

Quantum Computer Interconnection Reaches 2,000 Km

A research team from the Pritzker School of Molecular Engineering at the University of Chicago has theoretically extended the connection distance between quantum computers to 2,000 kilometers. Based on this advancement, the university's quantum computer can now establish connections with equipment located as far away as the outskirts of Salt Lake City, Utah. The team stated that the technology for building a global-scale quantum Internet is now truly "within reach" for the first time.

Lab System Grows Materials on Its Own

A U.S. research team has developed a self-driving lab system which can autonomously "grow" materials. It is capable of independently completing the entire material synthesis and optimization process without continuous human intervention. Integrating robotic automation with machine learning algorithms, the system autonomously determines subsequent experimental steps, achieving fully closed-loop operation from experiment execution and performance measurement to result analysis.

New Graphic



China Charts Green Course Toward Carbon Neutrality

By Staff Reporters

China has built one of the world's most comprehensive carbon reduction policy frameworks and developed the largest, fastest-growing renewable energy system. It contributes about one-fourth of the world's newly added green areas and ranks among the countries with the fastest decline in energy consumption intensity, making major contributions to global climate action and sustainable development, according to a white paper released by the State Council Information Office on November 8.

Titled "*Carbon Peaking and Carbon Neutrality: China's Plans and Solutions*," the white paper reviews the nation's major achievements over the past five years and outlines its approaches, actions, and experience in pursuing its carbon goals.

Five years after announcing its carbon peaking and carbon neutrality commitments, China has made historic progress in advancing a green and low-carbon transition, guided by the principle that lucid waters and lush mountains are invaluable assets.

Peaking carbon and carbon neutrality is a national strategy, with extensive and in-depth initiatives launched, accelerating full-scale green transition of the economy and society.

As energy consumption is the main source of carbon emissions, China has prioritized green energy transition by taking vigorous measures to substitute renewables for fossil fuels and promoting a new energy and power system. These efforts provide strong support for achieving the dual carbon goal.

Industry, transport, construction, and daily life remain key sources of

emissions. China has incorporated carbon targets into overall social and economic development, accelerating the establishment of green industries, low-carbon lifestyles, and high-quality development models.

It is promoting innovation in both traditional and emerging industries, upgrading its industrial structure, and fostering green and low-carbon sectors.

The development of low-carbon transport vehicles and equipment has accelerated, gradually optimizing the overall transport structure. Transport infrastructure has been upgraded for green development with the construction of green highways, airways and waterways, green and smart development of newly built stations, airports and ports, and improving new energy transport infrastructure.

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WECHAT ACCOUNT



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