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G20 Ministers Meet to Promote Open, Inclusive Innovation

International Cooperation

By ZHONG Jianli & FENG Zhiwen

Science, technology and innovation (STI) ministers and senior officials from G20 member states and invited countries gathered in Tshwane, South Africa, on September 23 for the G20 Research and Innovation Ministerial Meeting.

The meeting, under the theme "Science, Technology and Innovation for Solidarity, Equality and Sustainability," emphasized the central role of international cooperation in science and technology in addressing shared global challenges.

China's Minister of Science and Technology Yin Hejun, who led the Chinese delegation, said that open, inclusive and people-centered international scientific cooperation is essential for promoting sustainable development and narrowing global development gaps.

Yin outlined China's recent efforts to foster an open innovation environment, including launching the International Science and Technology Cooperation Initiative and the Initiative on International Cooperation in Open Science.

China is also participating in and spearheading international big science projects and engineering efforts, implementing *the Belt and Road Science, Technology and Innovation Action Plan*, and expanding shared access to research infrastructure and large scientific instruments.

Besides, it is promoting broader civil scientific exchanges and talent cooperation, and engaging in global governance on topics such as AI and research ethics.

The meeting approved the Tshwane Package, a suite of recommendations and initiatives for strengthened science engagement to foster public trust, participation and literacy in science.

The package also calls for the creation of a multi-platform G20 open innovation architecture to facilitate voluntary cross-border knowledge sharing; an open- innovation demonstration project focused on disaster risk reduction and water security; and support for global biodiversity data cooperation, including the development of a catalogue of life.

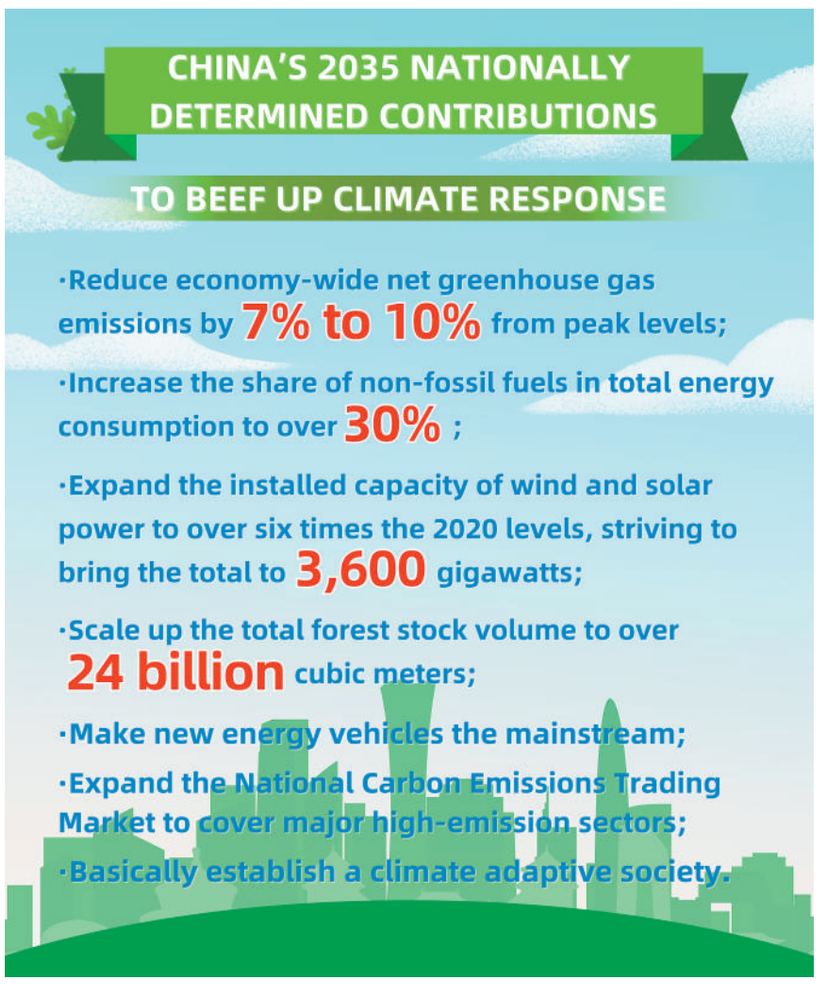
In addition, the package seeks to promote gender equality and the empowerment of women and girls in STI; and a compendium of good practices and a thematic portal to advance diversity, equity, inclusion and accessibility in STI.

The meeting featured wide-ranging discussions on open innovation, the role of biodiversity information in sustainable development, and policies to improve diversity, equity, inclusion and accessibility in science and technology.

Representatives from UNESCO, the OECD and other international organizations joined G20 ministers and guest-country delegates in stressing that no country can tackle urgent global problems alone. Building an inclusive, sustainable global innovation ecosystem is key to shared prosperity.

As the current G20 presidency, South Africa has convened a series of science and innovation meetings addressing climate, food, water, energy and soils, and has held focused sessions on the bioeconomy, using AI for sustainable development, and human genetic diversity in Africa.

New Graphic



The flame lighting ceremony for China's 15th National Games, 12th National Games for Persons with Disabilities and 9th National Special Olympic Games is held in Guangzhou, capital of south China's Guangdong province, on Thursday. ① The photo shows the Ocean Geology 2 research vessel sailing to the Haima Cold Seep area in the northern South China Sea to extract the "source flame" in September. ② The "source flame" is extracted and ignited from combustible ice lying over 1,500 meters beneath the surface of the South China Sea. This ceremony presented a stunning sci-tech spectacle of "the harmony of water and fire."

STI Frontier

China's Space Rendezvous and Docking Tech Evolution

By WANG Xiaoxia & FU Yifei

Imagine trying to thread a needle at a distance of over 16,000 km. That's what scientists compare the technique of space rendezvous and docking to, due to its large spatial distance and high degree of accuracy.

After three decades of arduous effort in manned spaceflight and deep space exploration, China has realized the vision of independently completing space rendezvous and docking and become one of the leading countries in terms of this technology, ensuring the implementation of major future missions such as manned spaceflight and lunar exploration.

Starting from scratch

In the 1980s, the National High- tech R&D Program, namely the 863 Program, was approved, laying the foundation for China's manned space program. Experts at the 502 Institute of the China Academy of Space Technology (CAST), affiliated to China Aerospace Science and Technology Corporation (CASC), recognized the strategic significance of developing space rendezvous and docking technology.

Starting from scratch, Wu Hongxin, renowned expert in control theory and control engineering and academician at the Chinese Academy of Sciences (CAS), led the researchers to develop the full-coefficient adaptive control theory in their humble laboratory.

In 1999, Wu's student, CASC scientist Xie Yongchun took over the baton, and prioritized the application of engineering theory as the top mission of her team.

She led the team to begin the derivation from basic dynamic equations, calculate from circular orbits to elliptical orbits, and integrate the previous achievements in orbital dynamics and relative motion dynamics, successfully solving the fundamental problems of long-distance guidance.

Xie applied the "golden section coefficient" theory from her doctoral dissertation to the design of Shenzhou- 8 spacecraft control parameters. In November 2011, Shenzhou-8 successfully completed its first automatic docking with Tiangong-1 in less than 44 hours after its launch, marking a major advancement for China's space program.

Fast-tracking development

In the following two years, China successively launched Shenzhou- 9 and Shenzhou- 10 spacecraft, which conducted rendezvous and docking with Tiangong- 1, using both automatic and manual operations, comprehensively verifying the homegrown technology.

However, during the same period, Russia achieved rendezvous and docking of cargo spacecraft and manned spacecraft with the International Space Station within six hours.

"We cannot rest on our laurels, and must keep innovating and breaking through," said Xie. Scientists optimized the complex calculation process, and moved the process from ground telemetry and remote control to the spacecraft for autonomous execution, so as to realize autonomous rendezvous rapidly and significantly improve the efficiency of long- distance guidance.

To meet the high-frequency rendezvous and docking requirements during the construction and operation phases of the space station, the team launched a research and development program on the "initial all-phase" technology.

After more than 3,000 tests and analysis of more than 200 extreme conditions, the spacecraft is enabled to precisely complete the docking within the stipulated time, regardless of the phase difference with the space station when entering orbit, said Xie.

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Great Discoveries of 2025 Nobel Prize in Science

Edited by WANG Xiaoxia

The Nobel Prizes in Physiology or Medicine, Physics and Chemistry, the most prestigious awards given for scientific achievements in the world, have been announced to honor great discoveries in science. Let's have a look at the feats recognized this year.

Physiology or Medicine Award

This year's Nobel Prize in Physiology or Medicine goes to U.S. scientists Mary E. Brunkow and Fred Ramsdell, and Shimon Sakaguchi from Japan, for their discoveries concerning peripheral immune tolerance.

Every day, our immune system protects us from thousands of different microbes trying to invade our bodies. Many of them have developed similarities with human cells as a form of camouflage. So how does the immune system determine what it should attack and what it should defend?

The laureates identified the immune system's security guards, regulatory T cells, which prevent immune cells from attacking the body. Their discoveries have laid the foundation for a new field of research and spurred the development of new treatments, for example for cancer and autoimmune diseases.

Physics Award

The Royal Swedish Academy of Sciences has decided to award the 2025 Nobel Prize in Physics to three scientists based in the U.S. — John Clarke, Michel H. Devoret and John M. Martinis — for the discovery of macroscopic quantum mechanical tunneling and energy quantization in an electric circuit.

A major question in physics is the maximum size of a system that can demonstrate quantum mechanical effects. This year's Nobel laureates conducted experiments with an electrical circuit in which they demonstrated both quantum mechanical tunneling and quantized energy levels in a system big enough to be held in hand.

As quantum mechanics is the foundation of all digital technology, this finding is enormously useful, and can help develop the next generation of quantum technology, including quantum cryptography, quantum computers, and quantum sensors.

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