

Translation



The following announcement by a Chinese Communist Party-run association for scientists names 28 questions as China's outstanding S&T issues and challenges of 2023. The questions span a wide range of topics, including microchips, sustainable agriculture, renewable energy, rail transit, coal mining, manned Mars exploration, and many more.

Title

CAST Announces its Major Scientific Questions, Engineering Technology Challenges, and Industrial Technology Questions for 2023 | CAST 25th Annual Conference
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China Association for Science and Technology (CAST; 中国科学技术协会; 中国科协). CAST is a Chinese Communist Party (CCP)-run professional association for scientists.

Source

CAST website, October 23, 2023.

The Chinese source text is available online at:

https://www.cast.org.cn/xw/BWTJ/art/2023/art_32e91b9e6bdd45d5aa8c1dd01b6c72aa.html

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CAST Announces its Major Scientific Questions, Engineering Technology Challenges, and Industrial Technology Questions of 2023 | CAST 25th Annual Conference

On October 22 [2023], at the main forum of the 25th Annual Conference of the China Association for Science and Technology (CAST), CAST unveiled the major scientific questions, engineering technology challenges, and industrial technology questions of 2023. Major questions in the fields of artificial intelligence (AI), new energy, high-performance materials, and life sciences received attention.

Cutting-edge scientific questions include:

How can low-energy AI be achieved?

How can flight vehicle maneuvering in the upper atmosphere be achieved?

Can novel coincidence counting techniques be used to search for the existence of magnetic monopoles and axion dark matter?

Do nonlinear effects vary with scale?

What are the fundamental scientific issues affecting the development of high-performance fibers?

How are crops adapting to the soil environment in the context of global climate change?

How did modern terrestrial ecosystems originate?

What are the triggering and delaying mechanisms of reproductive aging?

How can steady-state combustion in controlled nuclear fusion be achieved?

How can the coupling mechanisms and energy field distribution characteristics of higher-speed wheel-rail systems be explored and verified?

Engineering technology challenges include:

Achieving real-time and real-space imaging of micro-dynamics at atomic and electronic intrinsic scales (本征尺度).

Solving the problem of efficient separation of trace impurities in rare earth matrix, and making breakthroughs in engineering preparation technology and equipment for high-purity rare earth materials.

What long-term energy storage methods are suitable for new-type power systems?

How to achieve unmanned cultivation technology for green, high-quality, and high-yield field crops.

How to overcome the technical problems of long-term risk assessment and performance maintenance of ultra-high and wide-station roadbeds (超高宽幅站场路基) of major national railways in difficult mountainous areas affected by multiple types of disasters.

How to make breakthroughs in clean and high-value utilization of new energy waste.

How to make breakthroughs in the key technology of low-platinum, low-cost automotive fuel cell stacks.

How to achieve rapid, round-trip, nuclear-powered manned Mars exploration.

How to apply brain-computer interface technology in clinical medical treatment.

Industrial technology questions include:

How to achieve breakthroughs in the application of carbon fiber composites in China's future ultra-high-speed rail transit vehicle equipment.

How to develop high-end technology for petroleum-based carbon materials.

How to use flexible thin-film technology to achieve lightweight, satellite-borne deployable array antennas.

How to achieve the wide application of germline stem cell precision transplantation technology in the creation of monosexual (单性) germplasm of farmed fish.

How to realize the joint optimization and control of flood limit water levels in cascade reservoir groups (梯级水库群).

How to achieve high-value utilization of chemical waste salt in organic pollution so as to promote the high-quality development of the chemical industry.

How to build a new ten-million-kilowatt energy base in the Gobi desert region and achieve safe and stable transmission.

How to develop independently controllable (自主可控) system on a chip (SoC) chips aimed at high-performance and low-cost industrial upgrading.

How to achieve intelligent, safe, and efficient mining of coal seams under impact pressure (冲击地压).

CAST implements General Secretary Xi Jinping's instruction that "scientific and technological research should be problem-oriented." With its focus on the "four be oriented towards,"¹ CAST leads the ranks of science and technology (S&T) workers in studying the trends, distilling out the issues, and seeking breakthroughs. For this year's collection and announcement activities, a total of 590 suggested issues and challenges were received from 89 national scholarly societies and society associations, and from some corporate associations of science and technology. They covered ten major fields: the basic sciences of mathematics, physics, and chemistry; earth sciences; ecology and the environment; manufacturing S&T; information S&T; advanced materials; resources and energy; agricultural S&T; life and health; and aerospace S&T. There was a more extensive mobilization during the collection process. Through targeted invitations and

¹ Translator's note: The "four be oriented towards" (“四个面向”) are Xi Jinping's ideas about the purposes of China's S&T development. They are: Persist in (1) being oriented toward the cutting edge of world S&T, (2) being oriented toward the main battleground, namely the economy, (3) being oriented toward the major needs of the nation, and (4) being oriented toward the lives and health of the people (坚持面向世界科技前沿、面向经济主战场、面向国家重大需求、面向人民生命健康).

other means, well-known academicians and experts and overseas S&T organizations were called upon to participate in distilling the suggested questions and challenges. The selection process further highlighted evaluation and guidance by high-level experts. Some 117 academicians and experts, including members of the CAST Special Committee for Scholarly Exchange and Periodicals Publishing, carried out rigorous deliberation and gatekeeping through a number of steps, from re-selection to final selection.

Over the past six years, more than 150 national scholarly societies, leading corporate associations of science and technology, and other organizations have selected and recommended 3,362 forward-looking, innovative, and envelope-pushing questions and challenges. A number of national societies have set up mechanisms for announcing the questions and challenges in their fields, and have carried out academic exchanges, think-tank advising, interpretations for science popularization, and collaborative breakthroughs centered around the announced issues. CAST will continue to follow up on the announced questions and challenges, and guide the ranks of S&T workers in conducting original and leading research, in order to accelerate the achievement of high-level scientific and technological self-reliance (自主自強).

CAST's Science and Technology Innovation Division and the Service Center for Societies of CAST contributed to this draft.