

# China Science & Technology NEWSLETTER

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Department of International Cooperation Ministry of Science and Technology(MOST), P.R.China

2017 Top 10 Breaking News of China's Scientific Advances

**[Developments of International Science and Technology Cooperation]**

China and Italy jointly launch China Seismo-Electromagnetic Satellite (CSES)

Minister Wan Gang Meets Quebec Premier

Vice-Minister Huang Wei Co-chairs 4th Session of China-Serbia Inter-governmental Committee on S&T Cooperation

Sino-French Fusion Energy Center Launched

Sponsor: Department of International Cooperation, Ministry of Science and Technology(MOST), P.R.China

Organizer: China Association for International Science and Technology Cooperation

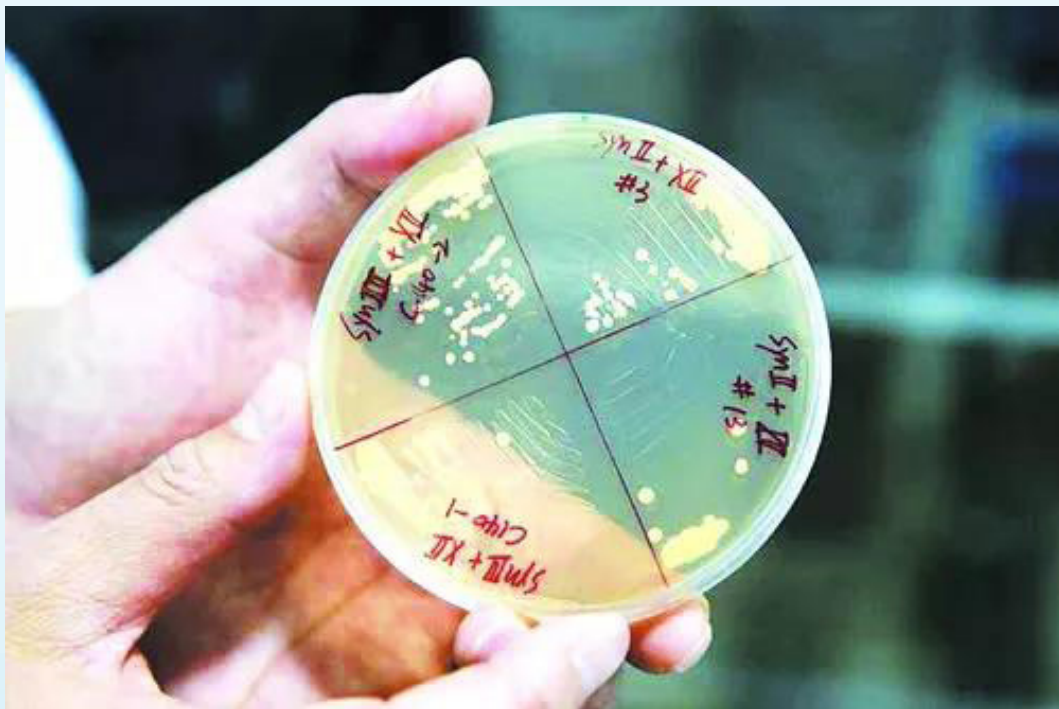
Add: Room 1059, Office Building, 11 B Fuxing Road, Beijing, P.R.China 100038

E-mail: [caistc@126.com](mailto:caistc@126.com)

# 2017 Top 10 Breaking News of China's Scientific Advances

On December 31, the 2017 Top 10 Breaking News of China's Scientific Advances were released in Beijing. The news were chosen by members of Chinese Academy of Sciences (CAS) and Chinese Academy of Engineering (CAE). This annual appraisal has been held for 24 times.

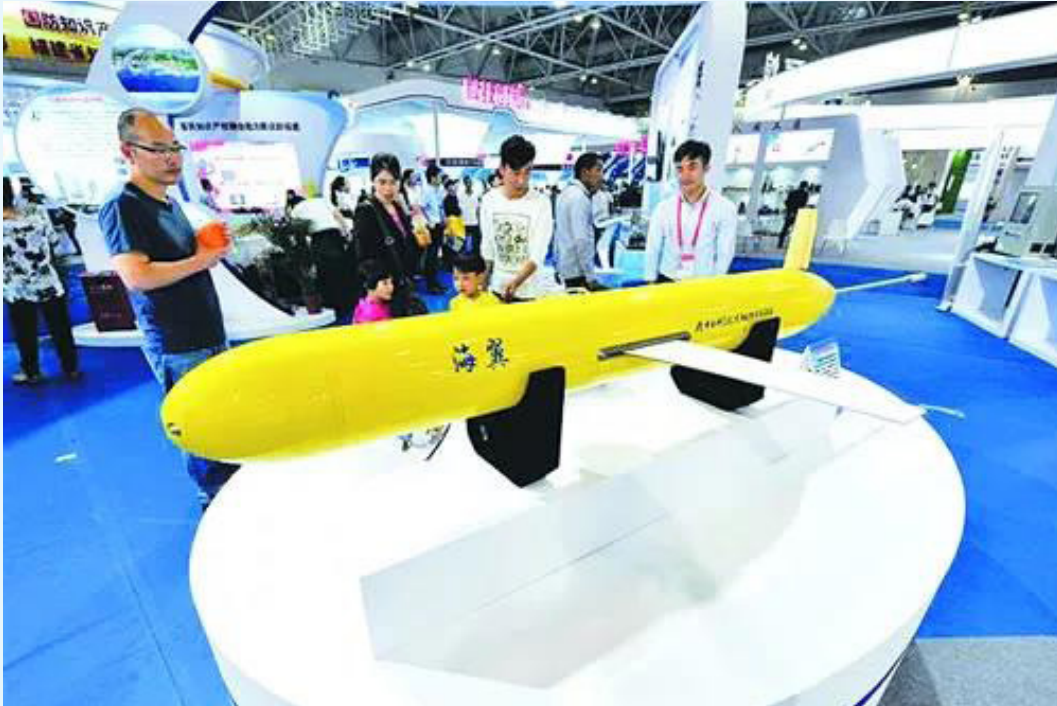
## I. Chinese scientists synthesize complete active chromosomes with chemical compounds



Chinese scientists have synthesized four synthetic yeast chromosomes with chemical compounds, marking a great stride forward in “re-creating life”. Researchers constructed synthetic active eukaryotic chromosomes with small molecule nucleotides. This was the first time to exactly match the synthetic genome with the designed sequence. The synthesized *Saccharomyces* genome has a complete life. The findings were published on *Science* on 10<sup>th</sup>, March 2017, making China the second country after the United States capable of designing and building eukaryotic genomes.

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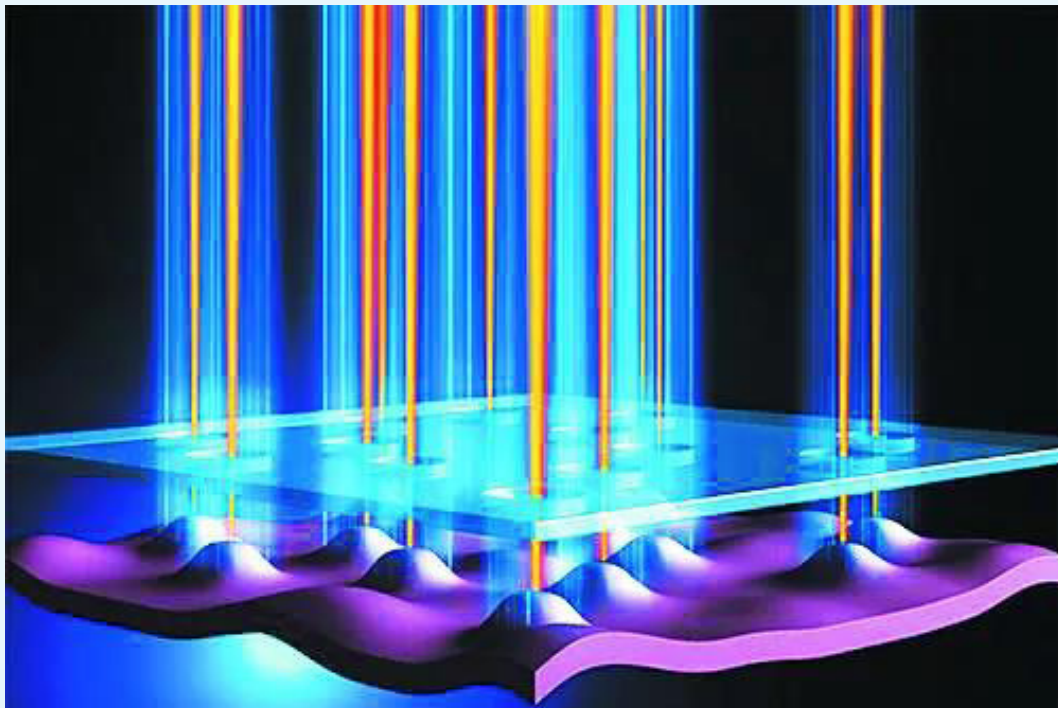
## II. Domestically developed underwater glider sets new world record by reaching 6,329 meters below sea level



In March 2017, Haiyi (or Sea Wing), the independently developed underwater glider, reached great depth and safely returned from the Challenger Deep, Mariana Trench. The glider dived to 6,329 meters, breaking the previous world record for underwater gliders. Haiyi, developed by the Shenyang Institute of Automation CAS under the Special Programs for Strategic Leading Technologies (B), is a new type of underwater monitoring platform with full and independent IPRs. During the recent mission, Haiyi dived down 12 times and travelled more than 134.6 kilometers, collecting high-resolution information of the water body in abyssopelagic zones and offering precious data for the hydrology study of this area.

## 2017 Top 10 Breaking News of China's Scientific Advances

### III. Chinese scientists build world's first quantum computing machine excelling early classical computers.



On May 3, 2017, CAS Member Pan Jianwei from University of Science and Technology of China and his team announced success of building the quantum computer. Pan's team has been leading the world for years in studying multi-photon entanglement. The team independently developed the world's best single photon source. They used the high-performance source and electronically programmable photonic circuit to build a multi-photon quantum computing prototype for the Boson sampling task. Experimental results showed that the sampling rate of this prototype was at least 24,000 times faster than international counterparts. In comparison with the classical algorithm, this prototype is 10 to 100 times faster than the first vacuum tube computer (ENIAC) and the first transistor computer (TRADIC).

## 2017 Top 10 Breaking News of China's Scientific Advances

### IV. Domestically-built large passenger jet completes first flight



The C919, China's first large airliner domestically designed and built, took off at May 5, 2017 from Shanghai Pudong International Airport. C919, or COMAC 919, enjoys complete and independent IPRs, and is a symbol of the drive to build an innovative country. The best design and engineering personnel in China worked on this airliner and achieved breakthroughs in 102 key technologies in terms of aerodynamic configuration, structural material and on-board systems. The breakthroughs included an integrated design of engines, control law design of the fly-by-wire flight control system and active control technology.

## 2017 Top 10 Breaking News of China's Scientific Advances

### V. China's first trial exploration of natural gas hydrate (NGH) at sea



On May 18, 2017, China had its first success in mining NGH, or flammable gas. The trial mining in the Shenhu area, South China Sea achieved a stable gas extraction for 187 consecutive hours, a milestone of combining “Chinese theory”, “Chinese technology” and “Chinese equipment”. It was the first time for China and the world to mine flammable ice in the sandy seabed strata which accounted for 90% of total resources and represented the gravest difficulty in extraction. China's trial mining of flammable gas started from the Blue Whale I drilling platform. This effort is essential to China's energy security and optimized energy mix. It may also change the energy R&D in the world.

## 2017 Top 10 Breaking News of China's Scientific Advances

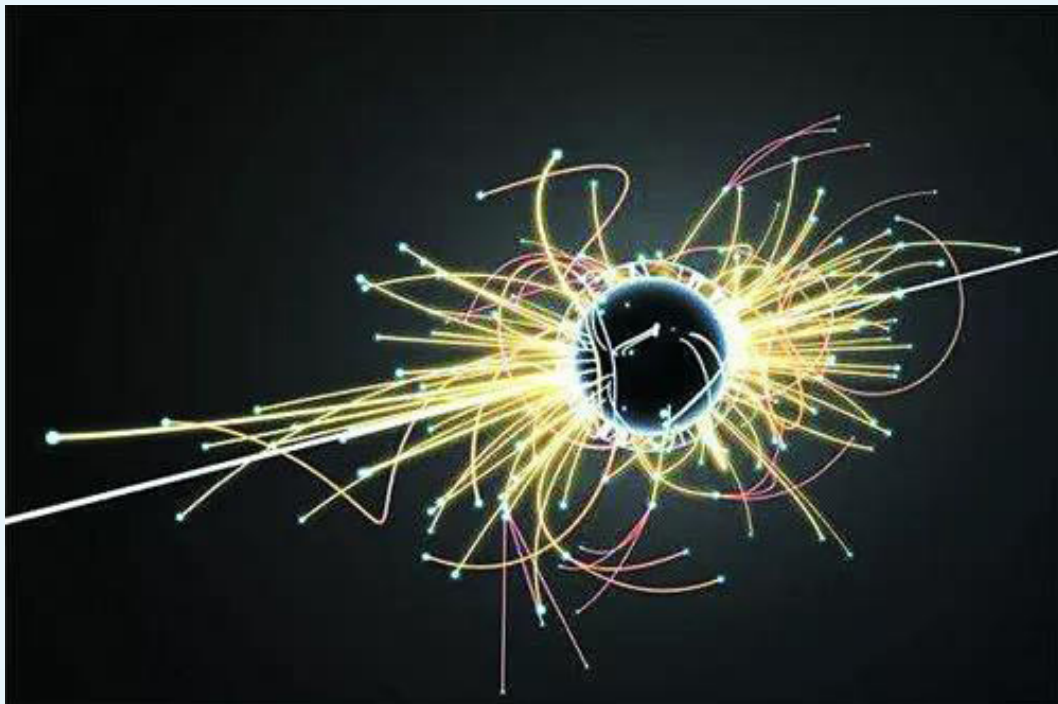
### VI. China's "Man-made Sun" makes world record



The Experimental Advanced Superconducting Tokamak (EAST) fusion device, a major scientific apparatus for China, made a 101.2-second long-pulse high-confinement (H-mode) plasma discharge and created a world record. The breakthrough represented that China continued to lead the world in the physics and engineering of steady-state operation of magnetic confinement fusion. EAST is the first Tokamak fusion device that can sustain steady-state, H-mode operation for 100 seconds. The success of EAST meant a lot to the International Thermonuclear Experimental Reactor (ITER) project. EAST will offer critical scientific and experimental support for future long-pulse high-confinement ITER operation. It will also lay the foundation for the preliminary study, construction, operation and talents nurturing of the China Fusion Engineering Testing Reactor, China's next-generation of fusion device.

# 2017 Top 10 Breaking News of China's Scientific Advances

## VII. Chinese scientists discovered a new type of fermion

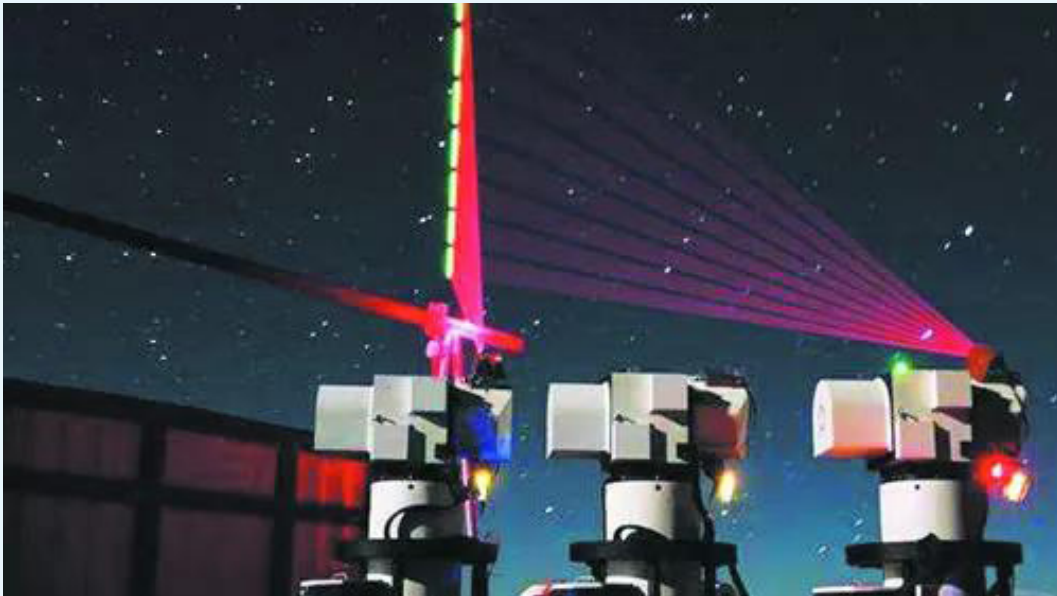


Scientists of the Institute of Physics CAS discovered for the first time a new type of fermion that goes beyond conventional classifications – fermion with a triply degenerate point, pointing a new direction in studying the electron topology in solid materials. On June 19, 2017, the research outcome was published in the online version of *Nature*. Chinese scientists independently put forward propositions, prepared samples and observed results. The research represented a breakthrough in the condensed matter theory of solid state physics. The findings are of great importance for people to understand electron topology, discover new physical phenomena, develop new electronic devices and gain in-depth understanding of the characteristics of elementary particles.



# 2017 Top 10 Breaking News of China's Scientific Advances

## VIII. Quantum communication: from ideal to reality



On January 18, 2017, Mozi, the world's first quantum satellite independently developed by China, was officially put into use after 4 months of in-orbit test. On June 16, 2017, the research team of Pan Jianwei and Peng Chengzhi of University of Science and Technology of China announced that they led the world in achieving 1000-km bi-directional distribution of quantum entanglement and fulfilling the quantum non-locality test that strictly satisfies Einstein's localized condition. The Beijing-Shanghai Link, the world's first link of secured quantum communication, was launched on September 29. Using Mozi, Chinese scientists made the world's first international quantum video call with their Austrian counterparts. Mozi has successfully fulfilled its three pre-set goals and in Pan Jianwei's words, space-ground 1000-km bi-directional quantum communication have emerged from ideal to reality.

## 2017 Top 10 Breaking News of China's Scientific Advances

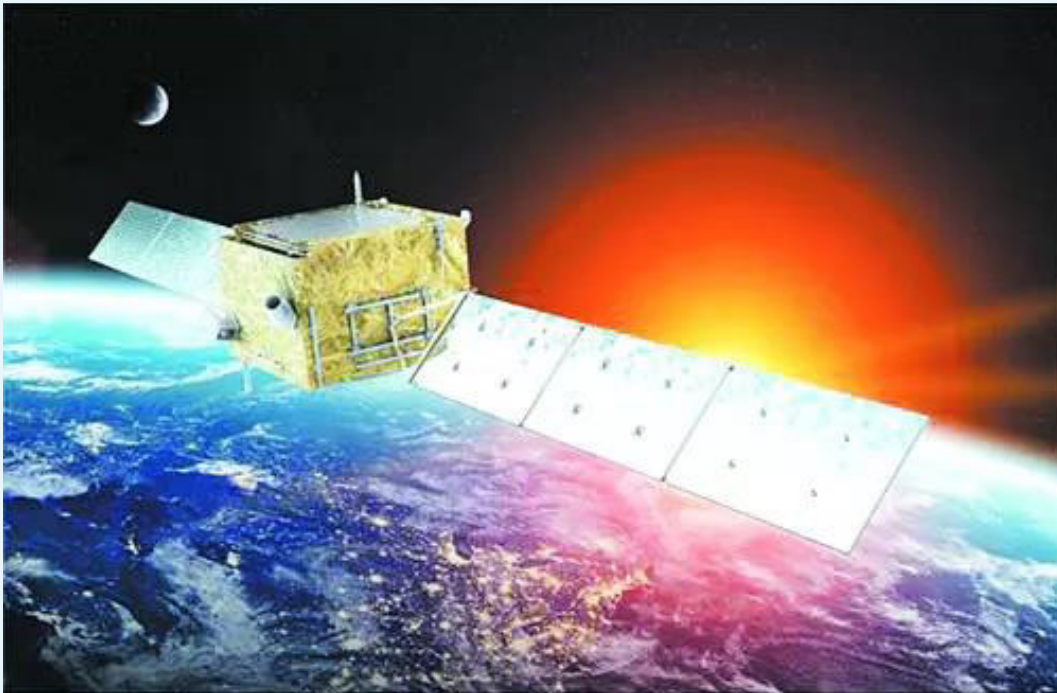
### IX. China Academy of Science found a new high-yield rice variety



Xia Xinjie, research fellow of the Institute of Subtropical Agriculture CAS, and his rice breeding team announced on October 16, 2017 that after more than 10 years' research, the team has nurtured a new type of "giant rice" with extremely high yield and quality. The "giant rice" can grow as high as 2.2 meters with a yield of 800 kilograms per *mu*. The giant rice is high-yield, lodging-resistant, disease- and pest- resistant and flood-tolerant. The giant rice is confirmed as a new variety by the DNA fingerprinting of the New Plant Variety Test Center, Ministry of Agriculture and the DNA profiling using SNP gene chip of 56k rice by Huazhi Rice Bio-tech Company. The giant rice is highly effective in photosynthesis and enjoys a per unit yield 50 percent higher than that of ordinary rice. Each stalk can effectively support 40 tillers and each tiller, 500 grains. Yield per quarter exceeds 800 kilograms per *mu*. Scientists have used a series of new technologies to cultivate this new variety including mutation induction, hybridization between different kinds of wild rice and molecular marker and marker-assisted selection.

## 2017 Top 10 Breaking News of China's Scientific Advances

### X. China's dark matter space probe detects tantalizing signal for dark matter



On November 30, 2017, the exploration results of Wukong, China's Dark Matter Particle Explorer (DAMPE) were published on *Nature*. The DAMPE found a "special fluctuation" at 1.4 trillion electron volt (TeV) of the energy spectrum of cosmic ray. This was the first time for such a mysterious signal to be observed by human beings, meaning that Chinese scientists achieved a ground-breaking result. If follow-up studies show that this special fluctuation is related to dark matter, it would be an epoch-making achievement. Human beings can follow "Wukong" to explore the 95% unknown part of the universe, a progress beyond our imagination. Even if the observation is not related to dark matter, it may also lead to breakthroughs in current scientific theories. With relatively low cost, "Wukong" leads the world in two key indicators: accurately detecting high-energy electron and gamma-ray and discriminating different particles.

(Source: MOST, January 3, 2018)



## [Developments of International Science and Technology Cooperation]

### ➤➤ China and Italy jointly launch China Seismo-Electromagnetic Satellite (CSES)

At 15:51, February 2, a Long March rocket, launched at the Jiuquan Satellite Launch Center, carried Zhang Heng I, a seismo-electromagnetic satellite jointly developed by China and Italy, into a sun-synchronous orbit. Chinese President Xi Jinping and Italian President Mattarella exchanged congratulatory messages on the successful launch of Zhang Heng I.

In his congratulations, President Xi pointed out that the success in jointly building the CSES is a symbol for the China-Italy comprehensive strategic partnership and will greatly improve both countries' capacity in using space technology to monitor the electromagnetic environment of the Earth. The satellite will play an important role in warning earthquakes and preventing and mitigating disasters. The success will contribute to economic and social development of both countries. China attaches great importance to the bilateral relationship and is willing to join hands with Italy and enhance exchanges and cooperation in all areas. In doing so, we could push forward the in-depth development of the comprehensive strategic partnership and better serve both countries and peoples.

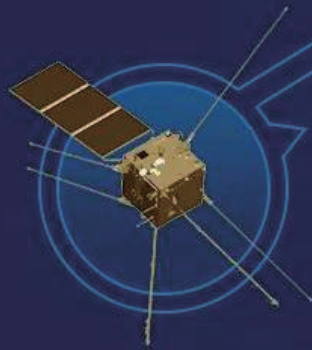
President Mattarella stated that the successful launch is a key achievement for bilateral cooperation and represents strong partnership in scientific research. Italy is willing to work with China and push for more results on various fronts.

## Introduction of Zhang Heng I

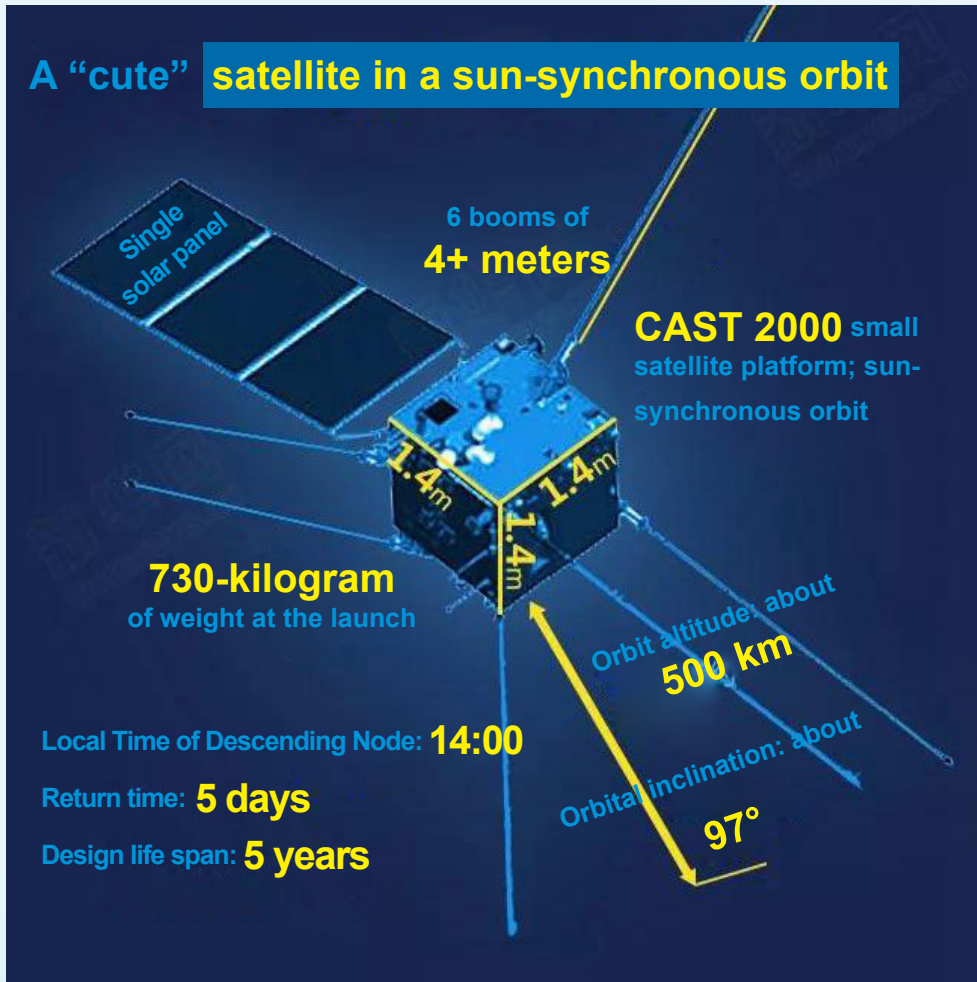


The CSES is named after **Zhang Heng**, a scientist in ancient China.

In 132 A.D., Zhang Heng invented the world's first seismoscope called **Didongyi**, becoming a world pioneer in seismic detection and research.

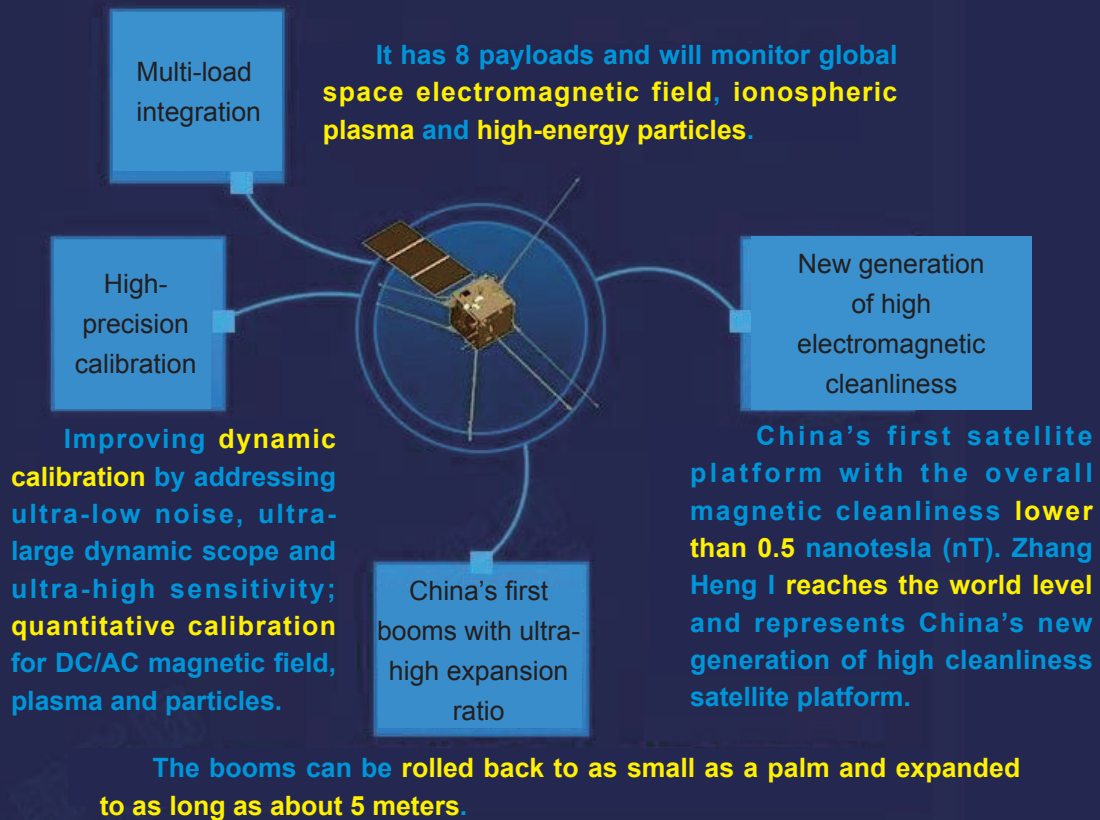


Today, Zhang Heng I satellite will record and analyze electromagnetic data associated with earthquakes above magnitude 6 in China and those above magnitude 7 around the world, offering valuable precursor information for seismic monitoring and evaluation.

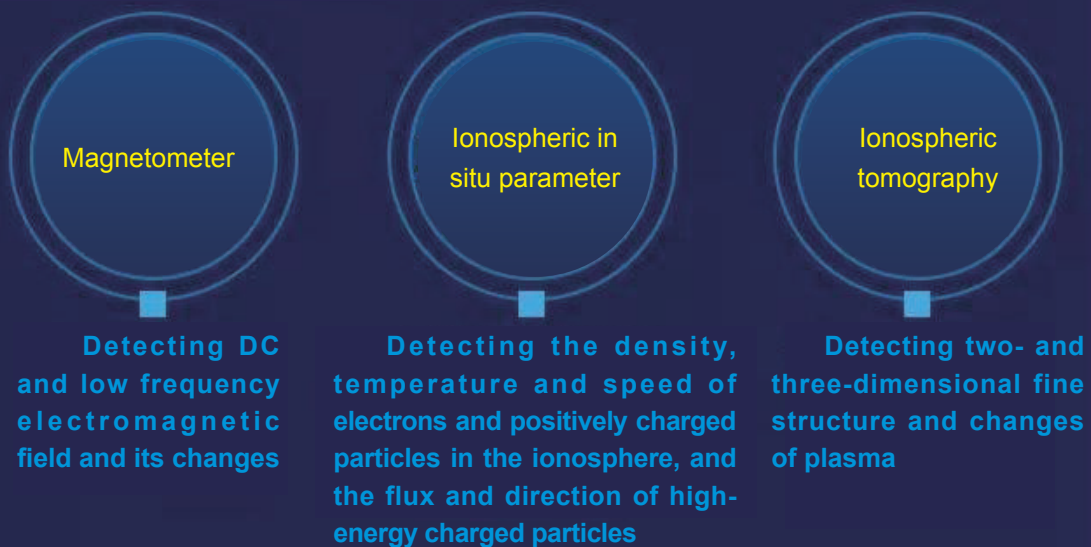


# [Developments of International Science and Technology Cooperation]

## Four unique expertise



## Three kinds of payloads



# [Developments of International Science and Technology Cooperation]



(Source: Xinhua, February 2, 2018)





## [Developments of International Science and Technology Cooperation] >>

### >>> Minister Wan Gang Meets Quebec Premier

On January 23, 2018, Minister of Science and Technology Wan Gang met with the delegation led by Philippe Couillard, Premier of Quebec, Canada.

He briefed Philippe Couillard on China's *Next Generation Artificial Intelligence Development Plan* which outlines China's guiding principles, strategic goals, major tasks and safeguards regarding the development of next-generation artificial intelligence by 2030, and highlighted the huge potential of cooperation between the two sides in artificial intelligence. Minister Wan pointed out that the two sides should continue to promote R&D and industrial cooperation in fields of common interests such as NEV, quantum technology and health, and provide strong support for mass innovation and entrepreneurship by the young.

Premier Couillard agreed with Minister's suggestions and spoke highly of the bilateral joint R&D projects being implemented for years. He stated that the government of Quebec, Canada, has a strong interest in cooperation with China in such fields as clean energy, quantum science and technology and artificial intelligence and is ready to discuss with China about possibility of greater support in priority areas.

Minister Wan and Premier Couillard signed *the Joint Statement between the Ministry of Science and Technology of the People's Republic of China and the Government of Quebec on Science and Technology Cooperation*.

(Source: Ministry of Science and Technology, January 30, 2018)



## [Developments of International Science and Technology Cooperation]

### ➤➤ Vice-Minister Huang Wei Co-chairs 4th Session of China-Serbia Inter-governmental Committee on S&T Cooperation

On January 18, 2018, the Fourth Session of China-Serbia Inter-governmental Committee on Science and Technology Cooperation was held in Beijing. Huang Wei, Vice Minister of Science and Technology of China, and Vladimir Popović, State Secretary of the Ministry of Education, Science and Technological Development of Serbia, co-chaired the meeting. During the meeting, Vice-Minister Huang Wei briefed the Serbian side on the strategic plan adopted at the 19th CPC National Congress on accelerating the building of an innovative country, and China's policy on science, technology and innovation, its current development and China's participation in relevant international cooperation, especially the four action plans on science, technology and innovation proposed at the Belt and Road Forum for International Cooperation and the China-CEEC Conference on Innovation Cooperation held within the framework of "16+1 Cooperation". The Serbian side expressed its admiration for China's achievements in science, technology and innovation, introduced its own R&D and innovation policy, scientific research management system, major organizations involved in scientific research and innovation activities and the achievements made. It also gave a briefing on its participation in international cooperation, especially in the Horizon 2020 of the EU.

Both sides agreed that scientific and technological cooperation is a key component of China-Serbia relations. *The Memorandum of Understanding between the Ministry of Science and Technology of the People's Republic of China and the Ministry of Education, Science and Technological Development of the Republic of Serbia on Jointly Funding Sino-Serbian Scientific Research Cooperation Projects* signed in 2016 opened a new chapter for China-Serbia science and technology cooperation. The two sides should take full advantage of the coordinating and guiding role of the Inter-governmental Committee on Science and Technology Cooperation, and seize the opportunity provided by the Belt and Road Initiative and "16+1 cooperation" to deepen scientific and technological innovation cooperation, strengthen the exchange of science and technology personnel, explore the possibility of holding joint seminars, and encourage young Serbian scientists to come to China for short-term research through the "Talented Young Scientist Program"; implement the first batch of joint R&D projects with ground-breaking significance, promote the building of joint research centers and joint laboratories in the fields of biomedicine, agriculture and food, and develop a long-term cooperation platform; encourage cooperation between industrial clusters from both sides, and work for win-win results based on mutual complementarity; promote scientific and technological cooperation in broader areas, at deeper levels and with more extensive participation, and make new contributions to the development of bilateral relations.

The two sides reviewed the implementation of the projects approved at the third session of the committee, discussed and approved the first batch of 6 bilateral inter-governmental R&D projects and 19 personnel exchange projects of the fourth regular session, which covered agriculture and food technology, biomedicine, environmental protection, material science, robotics, renewable energy and other fields. After the meeting, the two sides signed *the Protocol of the Fourth Session of China-Serbia Inter-governmental Committee on Science and Technology Cooperation*.

(Source: MOST, January 25, 2018)

## ➤➤ Sino-French Fusion Energy Center Launched

From January 11 to 12, 2018, the launching ceremony of Sino-French Fusion Energy Center was held respectively in Hefei and Chengdu, which marked the official establishment of the center. Founded in line with the agreement signed between Chinese Ministry of Science and Technology and French CEA, the center has four member organizations: China International Nuclear Fusion Energy Program Execution Center, Institute of Plasma Physics CAS, Southwestern Institute of Physics and CEA Fusion Research Center. The Sino-French Fusion Energy Center is dedicated to providing support to ITER Organization and members, developing and verifying major components and technologies of magnetic confinement fusion devices, jointly bidding for projects of common interests and cooperating in priority areas of fusion science & experimental physics research, fusion energy security norms and technical standards and next-generation fusion device.

Since 1980s the two sides have cooperated in fusion-related areas of microwave heating and plasma discharge. For furthering pragmatic fusion cooperation, the two countries decided to establish Sino-French Fusion Energy Center. During the meeting between Chinese Premier and French Prime Minister in February 21 2017, MOST and CEA signed a letter of intent on scientific research and technology development, which identified the joint development of the Center. Thanks to efforts in about one year, the Chinese side and CEA agreed on relevant agreements concerning the Center. During the 4<sup>th</sup> China-France High-level Mechanism for Dialogue on People-to-people Exchanges, Party Secretary and Vice Minister Wang Zhigang and French Ambassador in China signed the inter-governmental declaration on establishment of the Center under the witness of Chinese Vice Premier Liu Yandong and French Foreign Minister Le Drian. Director General of Department of International Cooperation of MOST signed with CEA a framework agreement on the establishment of the Center, and the four member organizations jointly signed an implementation agreement.

(Source: MOST, January 19, 2018)