

NO.607

CHINA SCIENCE AND TECHNOLOGY

NEWSLETTER

The Ministry of Science and Technology
People's Republic of China

NO.607

January 20, 2011

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SPECIAL ISSUES

China's Top Ten S&T News Events in 2010

Top ten S&T news events in China, voted out by 557 academicians at Chinese Academy of Sciences and Chinese Academy of Engineering for 2010, were announced on January 19, 2011 in Beijing. They are:

1. Successful launch of Chang'e-II, a lunar probe satellite, and the start of China's moon probe project. At 18:59:57, October 1, 2010, Chang'e II was blasted off at the Xichang Satellite Launch Center. The lunar satellite is designed to test some key technologies that will help Chang'e-III make a soft landing on the lunar surface, along with a range of lunar probe missions. On October 9, it entered a 100 km orbit circling the moon, after the third brake operation, working on its scientific missions and in-orbit tests. Then, it shot the images of the lunar rainbow bay area at a reduced height. The rainbow bay area, 43 degrees north and 31 degrees west, running 300 km from the south to the north, and

100km from the east to the west, is a pre-selected landing area for Chang'e-III. On October 28, the lunar satellite sent back to the earth the images of the rainbow bay area with a resolution of 1.3 meters, heralding the complete success of the probe mission.

2. China's Tianhe-1 becomes the fastest supercomputer in the world. TOP500, an international organization for supercomputers, released on November 17, 2010 its 36th list of the world's top 500 supercomputers. Tianhe-1 supercomputer, developed and installed by the National University of Defense Technology at a supercomputing center in Tianjin, has registered a peak speed of 4700 trillion floating-point operations per second, and a sustained floating-point operations at 2566 trillion floating-point operations per second, hallmarking a historic breakthrough that allows China to sit in the internationally advanced rank in supercomputing. Tianhe-1 is driven to work by Chinese made proprietary high-speed interconnected chips, with a greatly enhanced communication speed between the CPUs. China's proprietary "FT-1000" chips became part of the central processors. The supercomputer is run by a unicorn operating system developed by Chinese scientists.

3. China's manned deep-water submersible hit the record of 3,700m. Thank to 6-year concerted efforts of some 100 research institutes and enterprises, a Chinese made manned submersible, named "Dragon", tested its 3,000m level diving capability from May 31 to July 18, 2010 in the South China Sea. The submersible reached a maximum depth of 3,759m, making China the fifth country mastering the 3,500m level diving capability, after the United States, France, Russia, and Japan. China's manned submersible is designed with a maximum diving depth up to 7,000m, a cutting-edge depth allowing diving applications in 99.8% of the world's oceanic areas.

4. Beijing-Shanghai high-speed rail laid. The Beijing-Shanghai high speed rail line that catches world attention completed the rail laying part on November 15, 2010. The next thing Chinese engineers will do is to work on the integration of traction power supply, communication, signal, and power supply components, and the construction of station structures, along with a full-fledged joint testing. The high-speed line, once completed, will allow Shanghai passengers to reach Beijing in 4 hours. The Beijing-Shanghai line, 1,318 km long for a top speed up to 380 km and a design speed at 350 km, is the longest and most advanced high-speed rail line in the world. A preliminary partial test was made on December 3, to run from Zaozhuang to Bengbu. During the test, the "Harmony" 380A high-speed EMU, developed by the CSR, hit a speed of 486.1 kilometers per hour at 11:28 a.m., the fastest speed China High Speed Rail has so far achieved.

5. Breakthrough in genetic rice breeding. A study, led by LI Jiayang at CAS Institute of Genetics and Developmental Biology and QIAN Qian of Chinese Academy of Agricultural Sciences Institute of Rice, published its breakthrough on molecular regulation of rice tillering in the May 23 issue of journal *Nature Genetics*. Chinese scientists successfully cloned a key gene that regulates rice yield. The gene, when mutated, can reduce the numbers of tillers, while allowing an increased number of grains and grain weight, and a thicker stem desirable for lodging resistance. Researchers bred out new rice varieties, using combined genetic analysis and traditional breeding technique, enjoying a yield increase by 10%. The development marks an important step made by Chinese scientists in revealing the molecular secrets of rice yield.

6. Protein's new cancer-causing mechanism revealed. ZHANG Yi, FU Xiangdong and

coworkers at Wuhan University School of Life Sciences found that PTB proteins are not only able to directly inhibit the alternative splicing of target genes, but are also able to directly facilitate the alternative splicing of target genes. The finding overthrew the textbook doctrine that a PTB protein is a protein to inhibit. The finding was published in *Molecular Cell* under the journal of *Cell* as a cover story. A commentary says the finding makes a leader in post-transcriptional gene regulation studies, and is important for understanding PTB proteins' carcinogenic mechanism and for developing anti-cancer drugs.

7. Experimental fast reactor became critical for the first time. China's first fast neutron reactor, developed by China Institute of Atomic Energy, became critical for the first time at 9:50, July 21, 2010. The development marks a major breakthrough of China's fourth generation nuclear energy system, making China one of the few countries in the world mastering fast reactor technologies. The Experimental Fast Reactor is designed with a thermal power of 65 MW, and an electrical power at 20 MW. Fast neutron reactor makes a key link in the closed nuclear fuel cycle, enabling a raised uranium utilization up to 60% or more, along with a minimized production of nuclear and radioactive wastes.

8. 16km free-space quantum teleportation achieved. A joint study team, made up of the scientists from Tsinghua University and China University of Science and Technology, built a 16 km long free-space quantum channel between Badaling in Beijing and Huailai in Hebei, and achieved a range of technological breakthroughs. The 16km channel made the longest quantum state teleportation in the world possible. The channel beats the current world record by more than 20 times in length. The experiment confirmed for the first time the feasibility of a long-range free space quantum teleportation, an important step that will lead to the establishment of a global quantum communication network. The finding was published in *Nature Photonics* as a cover story.

9. Giant panda's genome released. Giant panda genome sequencing and assembly, a project initiated by Beijing Genomics Institute (Shenzhen), CAS Kunming Institute of Zoology, CAS Institute of Zoology, Chengdu Giant Panda Breeding and Research Center, and China Giant Panda Protection Center, reported its findings in the January 21, 2010 issue of journal *Nature* as a cover story. The findings show that giant panda has 21 pairs of chromosomes, and a genome of 2.4G in size, with 36% of the sequences being repetitive and more than 20,000 genes. As giant panda's first genome sequence map derived from a brand new sequencing technique, the finding will serve as an international standard for genome mapping.

10. Commercial application of olefin coal gasification technology. CAS Dalian Institute of Chemical Physics inked on October 26, 2010 a commercial application permit in Beijing for the new generation industrial methanol to light olefins technology (DMTO-II). Shaanxi Coal Chemical Group, CAS Dalian Institute of Chemical Physics, and Sinopec Luoyang Petrochemical Engineering Corporation (technology licensor), inked the world's first DMTO-II technology licensing contract with Shaanxi Pucheng Clean Energy Chemical Co., Ltd. (Licensee). The event marks a key step made by China in spinning off its advanced proprietary olefin coal gasification technology. According to the accord, Pucheng will build a production line able to produce 1.8 million tons of coal methanol and 700,000 tons of methanol to olefins a year.

China's Top Ten Major Scientific Progresses in 2010

The Basic Research Management Center, part of Ministry of Science and Technology, *Science and Technology Review*, *Bulletin of Chinese Academy of Sciences*, *China Science Foundation*, and *China Basic Sciences*, jointly launched a review to select top ten basic research news events for 2010. The sponsors, however, have changed their mind by renaming the review for top ten major scientific progresses achieved in 2010, in an attempt to make the public more comfortable with understanding the content and importance of the activity. The top ten major scientific progresses achieved by China in 2010 are: 1. topological insulator study made an important progress; 2. an anti-hyperparticle, or anti-hypertriton, was for the first time discovered in a Relativistic Heavy Ion Collider; 3. scientists unveiled the molecular mechanism of arsenic trioxide and all-trans retinoic acids in treating acute promyelocytic leukemia; 4. Chinese scientists unearthed fossilized early modern humans dating back to 100,000 years ago; 5. a genome wide study unveiled the susceptibility genes for psoriasis, vitiligo, and leprosy; 6. a molecular mechanism that leads to an ideal plant of rice was revealed; 7. magnetotelluric measurements revealed two crustal material flows in the east part of the Tibetan Plateau; 8. Chinese scientists unveiled the role played by protein lysine acetylation in regulating cellular metabolism; 9. metamaterial based three-dimensional microwave stealth and electromagnetic black holes realized; and 10. long-range free space quantum teleportation materialized.

RESEARCH AND DEVELOPMENT

Deicing Robot

A high-voltage power line deicing robot, developed by Harbin Engineering University, is able to clear the ice on power lines, sustaining power supply, keeping workers from high-risk operations, and raising the efficiency of disaster relief and rescue. Researchers are currently collecting the latest data on freezing rain and snow in the southern part of China, in an attempt to improve the robot's adaptability.

The robot, 44cm long and 24cm wide, looks like a small model tank hanging from metal wires. When switched on, it would clamp the wires, moving forward steadily. It breaks the ice on the metal wires using the two crescent-shaped deicing knives in front.

The robot is designed to get rid of the icicles of a diameter of 60mm on the cables of 8-15 mm in diameter, at a speed up to 750m per hour. Researchers also developed a range of mechanisms, including dynamic obstacle crossing fan wheels, centering institution, and dish chain drive, allowing the robot to pass through obstacles on the Tower Bridge cables without slowing down. Additionally, it is designed to climb a 30-degree slope, and withstand a grade 8 wind.

The deicing robot is equipped with a remote control module, allowing the operator to control the robot indoor. Its wireless video capability helps the operator monitor deicing operations and cable damages through dynamic video. The robot wears a night vision light on its upper part, in case it works during night or in fog and haze weathers.

Robotic Hand

A novel robotic hand, developed by Shandong University of Science and Technology, recently made its debut in Qingdao. The robotic hand can be controlled by computer, or voice, or pressing buttons, to move the joints, and guide the hand to move towards the target. The robotic hand wearer can switch to different control modes at will, in line with the needs for different occasions.

The robotic hand is designed to perform actions that facilitate the wearer's daily life. The laser sensor in the hand is able to tell the distance from the target. The three-dimensional attitude sensor allows a real-time 3-D positioning of the wearer's attitude, guiding the hand moving towards the target, through an advanced intelligent control system. The novel robotic hand enjoys numerous merits, including enhanced signal recognition accuracy, fast response, flexible control modes, scalability, and intelligent. The system can be also scaled for more control modes.

NEWS BRIEF

Study of Astronauts In-Space Operation Capability

Chinese scientists have embarked on a project, approved by the Chinese Ministry of Science and Technology, to study astronauts' long-term in-space operation capability and associated variation and mechanisms at China Astronaut Center, the first of its kind as a major national research activity.

Scientists will study a range of factors that may affect astronauts' operation capability, including gravitation loss, quick shifts between day and night, and limited interior space, in an attempt to understand the variation of astronauts' operation capability and associated mechanisms, ensuring astronauts working effectively in a safe and healthy manner. Aiming at major scientific issues that have to be tackled with in a manned space project, the study will play an important role in promoting the development of aerospace medical engineering, and in implementing the manned space station project.

The study will last for five years (2011-2015), participated by the scientists from 8 renowned research institutes in the area of aerospace and life sciences. The development marks a new research direction opened in China's major basic research domain, which will raise China's aerospace related basic medical research to a new level.

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