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SPECIAL ISSUE

China' s Top Ten S&T Progresses for 2006

China' s top ten S&T progresses for 2006, selected through a voting procedure by 565 academicians of the Chinese Academy of Sciences and Chinese Academy of Engineering, was unveiled on January 21, 2007 in Beijing as follows:

1) Next-generation internet technology. China has established a pure IPv6 trunk network. Having been running smoothly, the system makes the first and largest IPv6 trunk network in the world.
2) A Puguang natural gas field has been discovered in the northeast part of Sichuan Province. It is the largest natural gas field so far registered in China.
3) Chinese scientists designed and developed the world first Experimental Advanced Superconducting Tokomak (EAST).
4) Chinese scientists have observed the resonance state in chemical reactions at the quantum level. The effort provides a solution for addressing an international chemistry puzzle unsolved for more than three decades, and raises the study of chemical reaction to a new height and precision.
5) A green corridor as long as 436 km has been built through the Takelamagan Deserts. It is the world' s first and longest green belt running through moving deserts, and becomes a role model for sand control with biological means.
6) Ocean I, a scientific expedition boat, has completed China' s first global marine scientific investigation in a 297-day journey.
7) No. 3 Military Medical School has achieved key progresses in developing therapeutic hepatitis B vaccines.
8) Beijing Positron and Electron Collider has made key breakthroughs in upgrading.
9) Chinese scientists have, for the first time in the world, realized the teleportation of dual-particle complex quantum state, and manipulation of six-photon entangled state.
10) China has successfully launched a satellite of remote sensing applications.

INTERNATIONAL COOPERATION

China-Canada Accord for S&T Cooperation

XU Guanhua, Chinese Minister of Science and Technology, and David Emerson, Canadian Minister of International Trade jointly inked on January 16, 2007 an agreement for S&T cooperation between the two nations. At the signing ceremony, XU Guanhua and David Emerson made a joint announcement that the Chinese Ministry of Science and Technology and Canadian Minister of International Trade will create a joint fund to support S&T innovations and associated commercial applications under the agreement. Both sides agreed that a joint meeting for S&T cooperation be held in 2007 in Canada.

XU told the audience that intergovernmental accord for S&T cooperation creates a platform for S&T cooperation and exchanges between China and others countries, which widens cooperation channels, and plays an important role in allowing China learning advanced technologies and management experience, fostering high caliber personnel, and promoting the nation' s economic, social and S&T development. During the 11th Five-year plan period, China' s S&T international cooperation will focus on proprietary innovation capacity building, and taking full advantage of international resources. China will enhance its investment in international S&T cooperation, encouraging Chinese S&T personnel to be an active part of bilateral and multilateral collaborations, featured with equality and mutual benefit.

David Emerson expressed that the Canadian side will invest 5.25 million Canadian dollars for implementing the agreement. Both sides will prioritize support to the collaborations in the following areas: energy, biotechnology, health, environment, agrifoods, and bioproducts.

China-Japan-Korea S&T Cooperation

Ministers of science and technology from China, Japan, and the Republic of Korea issued a joint statement on January 12, 2007 in Seoul, announcing three nations will establish a mechanism to promote S&T collaborations among them. XU Guanhua, Chinese Minister of Science and Technology exchanged views with his counterparts KIM WOO-SIK, Korean Vice Premier and Minister of Science and Technology, and Ibuki Bunmei,

Japanese Minister of Education, Culture, Sports, Science and Technology, on the direction, principle, priority, and mechanism of S&T collaborations among them. Three parties agreed that scientific advancement and innovation supports the economic development. As an important integral part of the world economy, China, Japan, and the Republic of Korea shall work together to promote S&T collaborations among them, in the spirit of mutual respect and cooperation. In this context, three parties agreed to establish a range of mechanisms for ministerial meeting, department chief meeting, and coordination meeting, in an attempt to facilitate collaborations.

Three parties agreed to make the following areas the priorities for collaborations: environment, energy, infectious diseases, disaster prevention and preparedness, traditional medicines, traditional technologies, and new energy. They also agreed to promote exchanges of young scientists between three nations through dialogue.

Three parties also emphasized the roles played by small and medium-sized tech and venture businesses in spurring up the economic development, and agreed to work together to establish innovation parks, especially the tech parks combining industry, research institutes, and universities. Three parties also agreed that the second S&T ministerial meeting of three nations be held in 2009 in Japan.

China in 270 108Hs Synthesis

According to a briefing issued by the Institute of Modern Physics, part of the Chinese Academy of Sciences, an international research team made up of 24 nuclear chemists from seven countries, including Germany, Russia and China, has successfully synthesized the isotopes of element 270 108Hs (proton number=108 and neutron number=162) in the periodic table, using a "chemical separator" on the particle accelerator at the Institute for Heavy Ion Research (GSI) in Darmstadt, Germany. The development heralds a major step made by humans towards the socalled "island of stability". The finding was published in the recent issue of Physical Review Letters.

After successfully synthesized and identified the element named 259105Db in 2001, the Institute became part of an international research team made up of nuclear chemists from Germany and Russia, working on the chemical properties of element 108Hs. Researchers created a 269108Hs that lasted for 9 seconds by slamming magnesium-26 ions at high speed into a target of curium-248 at the Institute for Heavy Ion Research. After that, researchers started to work on the decaying properties near Hs having 108 protons and 162 neutrons, looking for doubly magic nucleus 270108Hs.

RESEARCH AND DEVELOPMENT

Enhanced Bathymetric Sidescan Sonar

During the 10th Five-year period (2001-2005), two research topics "High Resolution Bathymetric Sidescan Sonar", and "R&D of High Resolution Bathymetric Sidescan Sonar for Shallow Waters" were initiated under the National 863 Program technical component for marine resources development. The former was contracted to the Institute of Acoustics, part of the Chinese Academy of Sciences, and No. 702 Institute under China State Shipbuilding Corporation. Thanks to 5-year painstaking efforts, researchers have successfully rolled out an acoustic deep-tow system equipped with a bathymetric sidescan sonar enjoying a resolution of 4000m, the first of its kind in the country. The system is able to see the terrains and contours at a range close to the sea floor in a deep sea environment. The latter, assigned to the Institute of Acoustics, is an attempt to allow the high resolution bathymetric sidescan sonar working in a shallow water environment. Both projects have produced solutions to addressing the poor precision and inaccuracy of regular bathymetric sidescan sonar in depicting rough sea floor terrains, and disturbance caused by shallow water environment. The new system is able to produce high resolution images of sea floor terrains and contours that cannot be produced by a regular system.

The deep-tow system equipped with high resolution bathymetric sidescan sonar was put into experimental operation on October 2006 in the South China Sea. It is proved able to work under a sea condition not beyond class 4, with a maximum depth up to 3690m. With a laudable stability, the system collected high resolution data of sea floor terrains and contours, with a precision surpassing the IHO standard.

S&T Support for Key Equipment Making

To develop proprietary key and generic technologies needed for major equipment making, the Chinese Ministry of Science and Technology has initiated a project to develop key technologies and equipment for heavy cast and forged parts making, under a national S&T support program for the 11th Five-year period (2006-2010). The project is designed with the following objectives:

1) Develop key technologies and techniques for making heavy cast and forged parts of hydro turbine runners, in an attempt to meet the urgent needs of building 700MW hydro-power generators, and other large hydro-power works.
2) Develop key technologies and techniques for making heavy cast and forged parts of nuclear power generators at the mega kilowatt level, and realize supply-oriented applications of these parts.
3) Develop key technologies and techniques for making low, medium and high pressure rotors of supercritical gas turbines at a level of 600~1000MW, and associated high purity technologies and techniques for heavy casting and forging. Efforts will be made to work out optimized technical parameters and quality control process. Other efforts will include heat treatment and simulation experiment of forged compartment for low and high pressure rotor complex in gas-steam co-generators; and technologies and techniques for high purity steel casting, heat treatment, and quality control for turbine cylinders.
4) Develop and master key technologies and techniques of crank casting for large ships. Develop a capacity for bulk production, with a technical performance up to the application in large diesel-powered ships.
5) Develop generic technologies for heavy cast and forged parts, especially the technologies or techniques concerning metal refining, casting, forging, quality control, numerical modeling, and associated technical procedures and rules.
6) Develop and master key technologies for manufacturing free forge press with a capacity of 150~165MN, striving to break up the bottlenecks restricting key equipment and facilities making, and raising China's proprietary capacity of heavy free parts making.

Heavy Ion Beam Therapy for Cancer Patients

In collaboration with the General Hospital of Lanzhou Garrison, and Gansu Provincial Hospital for Tumors, the Institute of Modern Physics, part of the Chinese Academy of Sciences, has successfully performed the heavy ion beam therapy for treating superficial malignant tumors. The development makes China fourth country in the world treating cancer patients using heavy ion beams, following the United States, Germany, and Japan.

In November 2006, researchers made clinical treatment of four patients with tumors of a skin depth less than 1.5cm using the heavy ion beam device, at the General Hospital of Lanzhou Garrison. The 10-day treatment has shrunk the tumor size by 40%~60%. In January 2007, researchers performed another clinical treatment of 10 patients carrying tumors of a skin depth less than 2.5cm using the same device, though with a slightly raised daily dosage. The 8-day treatment has cut down the size of tumors by 40%~60%.

Researchers told reporters that the two clinical trials were made to the patients who could not be treated using others means, such as surgery, chemotherapy, or radiotherapy. The entire therapy works only with heavy ion beams. The treated patients have so far produced no side effects. Three patients in the first clinical treatment have reported the total disappearance of tumors two months after the 10-day heavy ion beam therapy.

FY-II D Cloud Images Received

At 14:00 January 12, 2007, the China Meteorological Administration successfully received the first batch of cloud images sent from FY-II D, a Chinese made weather satellite. The event applauds the successful connection between FY-II D satellite and the ground receiving system. As an operational satellite, FY-II D will, in collaboration with in-orbit FY-II C, make a consecutive coverage of China once every 15 minutes, with an expanded observational horizon by some 20 longitudes in the west. This makes China second country following the United States making weather observations using two satellites.

According to a briefing, after being put into operation, FY-II D satellite has furthered its watchful border to the east part of Africa and Red Sea areas, which helps Chinese forecasters to detect severe weather systems in an earlier manner. The high-frequency continuous coverage of China' s territories allows an enhanced tracking of the genesis, development, and change of severe weather systems, including typhoon, torrential rains, and severe convective weathers.

Outbreak of summer monsoons in China bears a close relationship with the weather systems arising from the Indian Ocean. The data collected by FY-II D satellite will cover the west part of the Indian Ocean, which is extremely important for improving the forecast of summer monsoons. The data on mid-level clouds and distributions of large circulation systems, also provided by dual satellites, makes an important tool for climate analysis and prediction, and for medium term weather forecast, as it unveils interactions between ocean and atmosphere.

Observational products derived from the dual-satellite system, including cloud types, dust and sand, heavy fogs, haze, and aerosols, will make important evidences for weather modification and studying atmospheric composites. Other information, including distribution of fires, vegetation coverage, and surface air temperature, will enhance the capability of ecological environment monitoring for forest and pasture fires, floods, droughts, and plant growth.

Monkey Genes in Rodent

Not long ago, the Zhongshan Ophthalmologic Center, part of Zhongshan University, has produced the rats carrying the genes of female Rhesus monkey. The event suggests that monkey' s epidermal stem cell has the potential for multi-directional differentiations that may lead to the formation of corneal epithelial cells, neurons, and blood cells.

Researchers placed the female monkey' s epidermal stem cells into rat embryos through micro injection. 13 rats were born in June and July 2006. 12 of them have carried monkey genes, distributed in the tissues of cornea, retina, skin, liver, blood, and nervous system. Of the 3 rats still alive, 2 have carried monkey genes in their skin and blood.

The experiment has produced seed cells for making cornea, retina and optic nerve through tissue engineering, and created a solid basis for producing regenerative cells, tissues, and organs. It makes a new technical line for studying the genesis of glaucoma, diabetes, and dementia.

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