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SPECIAL ISSUES

China's Top 10 S&T Progresses for 2005

China's top 10 S&T progresses for 2005, selected by 580 academicians of both the Chinese Academy of Sciences and the Chinese Academy of Engineering through voting, was unveiled on January 16, 2006 as follows:

- 1) Shenzhou 6 Capsule completes its first manned space flight mission. At 0433, October 17, 2005, the Capsule successfully returned to Earth, after completing all prescribed space experiments with human involvement during the 115-hour-32-minute space tour. Astronauts FEI Junlong and NIE Haisheng literally walked out of the Capsule on their own.
- 2) Qinghai-Tibet railway runs through. Engineers, technicians, and construction workers have completed the installation of rails throughout a planned rail line between Qinghai and Tibet. In a plateau area covered by snow with numerous engineering difficulties beyond imaginations, builders have overcome three major technical barriers for laying a plateau railway, namely permafrost, extreme coldness and oxygen scarcity, and fragile ecosystem, and successfully completed the mission.
- 3) China rolled out its first 64-bit high performance CPU chip for general applications. Dragon Chip II, developed by the Institute of Computing Technology, a part of the Chinese Academy of Sciences, renders a single accuracy peak floating point operation at 2 billion times per second, with the double accuracy speed at 1 billion times per second. Having a maximum frequency up to 500MHz and a power consumption (3 to 5 watts) much lower than its overseas counterparts, the chip works 2 to 3 times efficient than VIA's 1.3GHz processor. In the meantime, a high tech industrial chain headed by ChongKe Menglong, an industrial manufacturing base for Dragon chips has been preliminarily shaped up.
- 4) Chinese Antarctic Expedition Team made its first landing on the Ice Cap of the Antarctic Pole. At 0316, January 18, 2005, a Chinese expedition team climbed up the highest point of the Antarctic Ice Cap (80° 22' 00" south latitude, and 77° 21' 11" east longitude, at a sea level of 4,093m), after a long journey of more than 1,200 km over the pole's inland ice areas. The expedition team established an observatory for climate and environment watch, radar based ice thickness measuring, high accuracy GPS operations, and

comprehensive meteorological observations.

- 5) *Flora of China*, with the most flora entries in the world, was published. Compared with its counterparts in the world, the 126-volume Flora of China collects the most flora species in the world. High caliber compiling efforts has made it the nation's most complete and systematic flora publication in the last century. Flora of China contains a comprehensive, systematic, and scientific summary of Fascicular plants, including Pteridophytes and Spemaiophyla. The plant atlas has over 30,000 entries with descriptions in some 50 million words and illustrations in more than 9,000 pictures.
- 6) Chinese scientists have realized the first self-spin of single molecules. Researchers of the University of Science and Technology of China performed an "operation" on cobalt phthalocyanine molecules that sit flat on the metal surface, using a scanning tunneling microscope, which successfully placed single molecules' self-spin behavior under control. The effort constitutes the world's first chemical reaction within a single molecule. The local chemical reaction is also utilized to change and control the molecule's physical properties. The development unveils a broad perspective for single molecular studies, and will eventually lead to a major physical reaction that may create new molecular device applications.
- 7) China remeasures the peak height of the Mount Everest. The Chinese State Bureau of Surveying and Mapping announced in 2005 that the new data on the peak height of the Mount Everest collected in the year calculated out a new height of 8844.43 meters, with an allowed plus and minus error of 0.21m. The ice and snow depth on the top of the peak is 3.50m. The new readout makes the most detailed and accurate data derived from a range of domestic or international measuring activities aiming at the Peak.
- 8) China's scientific continental drilling reached 5158m. Thanks to some 4-year painstaking efforts, Kezuan Well I has completed its construction under a scientific continental drilling project. Physically located at the Maobei Village, Donghai County, Jiangsu Province with an underground depth of 5158m, the well, the deepest among some 20 other continental drilling wells in the world, has produced a range of scientific findings. The development marks a major progress in China's digging-in efforts.
- 9) China developed a molecular drug delivering vehicle that can travel through blood vessels. Shanghai Institute of Ceramics, part of the Chinese Academy of Sciences, has developed a nano-pharmaceutical

delivering vehicle with a diameter of 200 nanometers. Able to send drug loads to a destination without leakage, the delivering vehicle proves a therapeutic effect by releasing its contents only when needed. Researchers have so far completed the experiments on controlled releases and directional delivering of drugs treating inflammations, pains, and cancers.

- 10) High resolution digital man. Southern Medical University has rolled out a digital man carrying a high performance digital camera of 22 million pixels, with a 4040 × 5880 resolution. Equipped with a 540-gigabit database containing 0.2 mm virtual human sections of the highest resolution in the world, the digital man releases 60-megabit pictures.

China's S&T Activities for 11th Five-Year Period

At a national S&T directors' meeting held not long ago, proprietary innovation capacity building has been made the core of future S&T activities. According to Chinese S&T authorities, the following will become the focuses of the nation's S&T activities: 1) organizing the implementation of major special S&T projects, and raising the nation's overall innovation capacity in key areas; 2) strengthening the weak links in public good research activities, and increasing the input in projects, human resources, and infrastructures for such activities, in an attempt to break up technical bottleneck constraints on the sustainable development; 3) visionary deployments for basic and cutting edge scientific and technological studies, with an enhanced steady support for infrastructure and contingent construction. Disciplinary blanks shall be filled up, and a range of high caliber national research bases be established, along with the nation's needs.

System innovation will become a major leverage in spurring up S&T innovations: 1) strengthening a unified coordination, and optimizing the distributions of S&T resources; 2) accelerating the construction of a technological innovation system headed by industrial enterprises, in collaboration with production and research activities; 3) initiating technological innovation projects, in an attempt to create a range of new businesses having proprietary products and sustainable innovation capacity. Establishing a technological innovation system headed by industrial enterprises, guided by market needs, in collaboration with production and research activities. Enhancing the original innovation capacity of strategic industries and the integrated innovation capacity of major areas.

RESEARCH AND DEVELOPMENT

National Permanent Cellular Bank Established

Thanks to its more than 10-year painstaking efforts, the Chinese Academy of Medical Sciences has completed the construction of a permanent cellular bank for Chinese. The cellular bank has collected 3,119 permanent cell lines strains and 6,010 DNA samples from 58 ethnic groups, under strict collecting standards and under donors' permission.

China is a country with numerous ethnic groups. Its human genome research activities has made an endeavor to preserve the genomes of different ethnic groups on a permanent basis, study the structural differences between these genomes, analyze their genetic implications, and understand the distributions of major diseases causing genes and vulnerable genes. The efforts will create a theoretical ground for studying the genesis of these diseases and associated genetic therapeutic techniques. It also creates necessary conditions for sharing international findings on human genomes.

While creating the cellular bank, researchers also developed an improved technique to turn B lymphocytes into permanent cells. The research team has made its cell lines and DNA samples available to domestic human genome research institutes. In the area of international cooperation, the project has rendered 149 permanent cell lines to the European Research Center for Human Genome Diversity, and made its DNA samples available for a number of international research institutes. The research team has produced more than a hundred papers, and its research findings has won second prize of the National Natural Science Award in 2005.

World Widest Information Highway

A 40G SDH fiber-optical transmission system, a project contracted to the Wuhan Institute of Posts and Telecommunications under the National Key Technology Program for the 10th Five-year period(2001-2005), passed a validation check on January 5, 2006. Through attacking technical difficulties involving high-speed and large-volume optical telecommunications, researchers have worked out the world's first 40Gb/s STM-256 SDH equipment up to the ITU-T standard. Having passed grid experiments and long term stability tests, the system is able to deliver a non-reproductive 560-km long distance transmission over G. 652 and G.655 optic-fiber cables.

As the world's first 40G fiber-optical transmission system up to the ITU

standards, the new equipment heralds the largest and fastest single-channel optical transmission system in the world, with a capacity four times that of the most advanced transmission system in the world. The system proves a breakthrough in exceeding the limit of electronic signal processing, which makes a half million people simultaneously talking over a hair-thin optical line possible. Combined with Wavelength Division Multiplexing techniques, a single optic-fiber may allow millions or even hundred millions of people to talk simultaneously, with only half of the costs asked by the existing equipment.

The new system has been granted with 29 patents, of which 18 are invention grants.

Enhanced Ethernet Passive Optical Network

An Ethernet Passive Optical Network (EPON) at the kilomega level, jointly developed by GW Technologies, part of Beijing University of Posts and Telecommunications, and others under an initiative of the National 863 Program, passed a validation check in Suzhou and Wuhan respectively on December 27 and 28, 2005. The broadband optical access technology with EPON as the core is one of the four components initiated under the O-TIME project of the National 863 Program for the 10th five-year period. It not only boosts the transmission capacity of diverse applications, but also saves huge optic-fiber resources, becoming a major FTTH solution with reduced investment and maintenance costs. Up to date, researchers have completed the development of EPON equipment for commercial applications. Network vendors in nearly 20 localities, including Suzhou, Wuhan, Xuzhou, Chengdu, and Qiqiha'er, have used the new EPON system. The project also produced one national standard and two international standards for the industry.

Super High-yield Crop Harvested

A special project for new super-yield crops, initiated by the Ministry of Science and Technology, has invested RMB 140 million in building a modern efficient breeding technical system, and in developing a new species breeding system and associated commercial applications. The efforts have covered major crops, including paddy rice, wheat, cotton, soybean, corn, rape, potato, peanut, and vegetables. Aiming at establishing a modern technical innovation system for breeding, the project has made meaningful contributions to raising the nation's overall level for breeding major crops, and to turning out new varieties of high quality and high yields. It also provides technology support for the nation's food security, and makes high quality and high yield species available to farmers, which would eventually increase their incomes. In addition, it improves farming efficiency, and promotes agricultural restructuring.

In the past 4 years of implementation, the project has produced 171 domestic or international patents grants and technology standards, in addition to 339 national protection rights for new plant species. It also mastered a range of key technologies involving hybrid and molecular breeding, and advanced the development of the nation's original innovation capacity for crop breeding technologies. The project nurtured out 650 species featured with high quality and high yields, of which 262 promise major application perspectives. The improved breeds have grown over an area of 1.75 billion mu (1 mu = 0.0667 hectare), with an increased yield of 60 billion kilograms, and a direct economic return worth RMB 73.5 billion. The findings derived from the project have been granted with 14 prizes under the National S&T Progress Award and Invention Awards. The project has incubated 15 high tech breeding enterprises, and a breeding technical system in line with market needs and commercial applications. The efforts also accelerated the integration of breeding, reproduction, and diffusion, and the integration of research, production, and trade. It also works well for upgrading the breeding industry, and developing the nation's S&T breeding businesses.

Water Efficient Farming and New Products

Modern water efficient farming system and associated new products, a project jointly initiated by the Ministry of Science and Technology, Ministry of Water Resources, and Ministry of Agriculture in 2002, has recently passed a validation review. The project is implemented in three phases: advanced water efficient farming and associated key technology innovations, R&D of major products and key equipment and associated commercial applications, and integration of technical systems and associated demonstration. The project, teemed with 55 research topics, has attracted the participation of 282 domestic research institutes, universities, and enterprises.

Derived from the 4-year efforts are a range of findings that led to the establishment of an advanced water efficient farming system tailored to China's situation, featured with raised water efficiency for crops, arable land, and ditches, and improved water recycling and enhanced returns. The project produces water efficient products and equipment that are environment friendly with high efficiency and low consumption. The combination of advanced water efficient technologies, products and key equipment with practical technologies has resulted in a line of water efficient farming models for different regional needs.

The project has generated 110 key technologies, 146 new technology products, and 27 demonstration production lines. It also screened out 129 drought resistant and water efficient materials, and 28 new species of similar advantages. Also came out from the efforts are a range of intellectual

properties, including 320 patent applications, 160 patent grants, 48 software, and 35 copyright registrations, in addition to 53 technology standards, of which 29 have been put into implementation. With 18 demonstration areas for water efficient farming over an area of 250,000 mu(1 mu= 0.0667 hectare), the project is registered with a diffusing area approaching 320 million mu, a saved water consumption of 8.5 billion cubic meters, an increased grain yield of 15 billion kg, and an additional output worth RMB 8.8 billion.

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