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**CHINA SCIENCE AND TECHNOLOGY**

# **NEWSLETTER**

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## **INTERNATIONAL COOPERATION**

### **Protecting Clean Energy IP**

A China-US Clean Energy Intellectual Property Seminar, the first of its kind held in the two countries, was convened from March 5 to 7 in Haikou. At the two-day meeting, more than 100 experts from China-US Clean Energy Alliance, government agencies, and the intellectual property circles discussed intellectual property rights protection issues and associated cooperation in the area of clean energy. Participants improved their knowledge

of the intellectual property laws in the opposite countries, and reached consensus on many important issues. The two sides agreed that the next seminar on the same topic will be held later this year in the United States.

## Fully Automated Telescope

BOOTES-4, a global GRB transient source observing system jointly built by CAS Yunnan Observatory and the Spanish National Research Council Institute of Astrophysics of Andalusia, was put into operation on March 20, 2012 at the Yunnan Observatory's observing site in Lijiang. The event marks China's first possession of a program-controlled observatory.

The fully automated telescope makes its optical observation of the GRB afterglow and other transient sources. Applied with an advanced program-control technology, the telescope is able to automatically open the dome and move the telescope to observe according to weathers and targets.

Started in last July, it took less than six months for the collaborative parties to complete the site selection, geological survey, infrastructure construction, and goods importation and transportation. The dome and telescope were installed last December, and the whole system was commissioned and put into an automated operation in February 2012.

## RESEARCH AND DEVELOPMENT

## China's First Chip Test-Tube Baby

A "chip test-tube baby" weighing 3 kilogram was recently born at a hospital affiliated to Zhengzhou University. The baby was conceived using the single cell SNP chip technique for the IVF embryo pre-implantation genetic diagnosis. The baby's parents have married 5 years without a child, as the father has a rare abnormal chromosome that would lead to lethal abnormal embryos at a probability of 16/18, suggesting that the probability having a normal embryo in only 1/18. The hospital researchers used the SNP chip to make the pre-implantation genetic diagnosis of egg retrieval, fertilization, and embryo culture, in a bid to produce an offspring genetically related to the parents, before implanting the healthy blastocysts into the mother's uterus.

A chip test-tube baby is differed from a test-tube baby in pre-implantation genetic diagnosis. The single nucleotide polymorphism (SNP) genetic chip is a high-throughput detection tool able to pick out structural abnormalities and some single-gene mutations in

46 chromosomes, with a very low (2%) misdiagnosis rate.

## Mechanism Regulating Glial Cells Found

A new study, led by ZHANG XIA of Shaanxi Normal University, produced the direct evidence showing for the first time through live animal experiments that cannabinoid is able to manipulate the CB1R in glial cells, sending them to regulate neuronal synaptic transmissions, which would in turn cause damages to the working memory, suggesting a lead role turned from a supporting role. Studying the impact of cannabinoids on brain functions, ZHANG and coworkers found that cannabinoid regulates the cannabinoid receptors (CB1R) in glial cells. The activated glial cells would make hippocampal CA3-CA1 excitatory synapses to have LTD, damaging the working memory.

ZHANG said human brain itself also produces cannabinoids, making an endogenous cannabinoid system. Increasing evidence suggests that endogenous cannabinoids plays an important role in regulating people' emotion, learning, and memory, implying that brain's endocannabinoid system can be manipulated to improve the needed functionalities, treat neuropsychiatric diseases such as Alzheimer, or develop new educational techniques for enhancing students' learning capability, growth and development.

## New DNA Mutation Mechanism Found

Prof. HE Xionglei and his team at Sun Yat-sen University School of Life Sciences reported an important progress achieved in understanding how the composition and structure of DNA within the cell affect spontaneous mutations in the March 9 issue of *Science* magazine.

HE and coworkers found that the nucleosome structure in eukaryotic cells can suppress cytosine hydrolytic deamination, reducing the C→T mutation rate in nucleosomal DNA. The finding reveals a role played by nucleosome structure in regulating DNA mutations and associated implications on understanding the origin of mutations in cancers, laid a ground for improving people's knowledge of DNA structure and composition, and associated biological evolution.

## China's First Direct Injection Natural Gas Engine

China's first natural gas engine featuring high pressure direct injection (HPDI) technology recently made its debut at Weifang Diesel Engine. The truck using the engine may save RMB 120 for a 100-kilometer journey.

An HPDI engine is designed with an oxidation catalytic converter for a cylinder ignition with 5% diesel, allowing 95% natural gas being injected into the flame as the main fuel. The process would reduce particulate matter emissions by 70%, and carbon dioxide emissions by 20%, up to the national V emission standard. An HPDI engine uses the parts and components that are used at a generic diesel engine, without changes to the piston and engine, under an operational mode similar to that of a diesel. With a low exhaust temperature, it achieves the reliability comparable to a diesel engine at the same power level. It is designed to avoid detonation and fire without air-fuel ratio control. Its heat load is also lower than a spark plug ignition gas engine. An HPDI engine delivers the same power, torque and performance as that of a conventional diesel engine. The engine's power and torque is 20% respectively higher, compared with a spark ignition natural gas engine, which solves the problem of large power loss in a plateau environment.

According to a briefing, a conventional diesel engine needs an expansive selective catalytic reduction system to achieve the national V emission standard. Comparatively, an HPDI engine is more economical, thanks to the high-pressure direct injection nozzle designed without throttle load control. Additionally, an HPDI engine has the potential for an enhanced performance and further reduced fuel consumption, emissions and noise.

## Ultrafast Imaging Recorder

An SSF ultrafast process imaging recorder, jointly developed by Shenzhen University, Chinese Academy of Sciences Xi'an Institute of Optics and Fine Mechanics, and Chinese Academy of Engineering Physics Institute of Fluid Physics, recently passed an appraisal check. Experts involved in the appraisal commented that the ultrafast process imaging recorder makes a precision scientific instrument for studying high-speed transient processes, and it can be used to provide the spatial and temporal information of a transient phenomenon, study detonation physics and shock wave physics, and measure high-density energy transfer, high temperature plasma physics, high-voltage discharge, jet fuel chemistry, and hypersonic wind tunnel experiments.

The instrument's major technical performances, including the intrinsic spatial resolution of frame imaging, the temporal and spatial information rate of high-speed photography, principle error of adjacent framing, and the maximum scanning speed of scan imaging system, are superior to their internationally advanced counterparts. Meanwhile, the instrument overturned the conclusion that a frame scanning imaging recorder can not achieve the high spatial resolution that a single-functioned ultra-high-speed camera can.

## Tech Business Planning Contest

A Tech Business Planning Contest, jointly sponsored by the Ministry of Science and Technology and the Ningbo Municipal Government, was recently kicked off. Some 2,000 tech businesses attended the contest that started from the early March and will end in the late September. Some 50 domestic and foreign venture capital firms will be invited to provide technical support to contesters, helping them choose investment projects, improving the hatching tech businesses' fund raising skills at national tech incubation parks, and helping them secure investment opportunities. The contest will produce 93 winners for an amount of RMB 7.9 million. The Organizing Committee will recommend contesters to private investors, especially venture capitals, wining their investments to tech businesses. The winners that are qualified for the SME Technology Innovation Fund may also apply for the financial support of the Innovation Fund.

## Cancers Molecular Diagnosing Platform

An Asia-Pacific bio-signal research center was inaugurated on March 15 at Tianjin International Biopharmaceutical Institute. Equipped with a tumor tissue bank and a database housing major infectious diseases samples, the Center is designed to be the first molecular platform in the country for diagnosing major cancers (liver, lung, breast and colorectal cancer) and infectious diseases, and an individualized bio-signal R&D platform working on genomics, proteomics, and metabolomics. Meanwhile, the center makes a powerful support to the implementation of an anticancer program initiated by the Tianjin Municipal Government. As a Headquarter of Global Biological Signal Research Cooperation Organization in China, the Center will work on the research and development of biological signals for the Asia-Pacific region and associated commercial applications in Tianjin.

## Earth Observing System into Full-Fledged Construction

China's high-resolution earth observing system has entered the full-fledged construction. The system development and testing are proceeding smoothly. A range of new satellites will be launched and put into use starting from 2013, and the whole system will be completed around 2020.

Starting to build in May 2010, the system is one of the 16 major projects initiated under the national medium and long term scientific and technological development plan (2006-2020). The project is created to build a high-resolution earth observing system made up of satellites, stratospheric airships, and aircraft, in an attempt to develop an

all-weather and all-day earth observing capability with a global coverage, taking advantage of the ground resources and other observing means.

The system, once completed, will provide information service and decision making support to a range of areas, including modern agriculture, disaster prevention and mitigation, resources management, environment control, public safety among others, meeting the needs of the nation's economic and social development, and supporting the development of China's space infrastructures and satellite application businesses and associated industrial chains, and promoting satellite applications and strategic emerging industries.

## China's Internet of Things Standards Become International

According to the 5<sup>th</sup> International Sensor Networks Standardization Working Group meeting, Chinese researchers have landed a range of breakthroughs in the theoretical study of sensor network (internet of things) standardization. The three tiered internet of things architecture and the model of common platform plus application subsets, proposed by LIU Haitao and his team at Wuxi Institute of Internet of Things, have been adopted as international standards.

LIU and coworkers embarked on the study of the internet of things in 1999, under an innovative technical line with sensors as the core. They completed the theoretical study of the internet of things standardization from network-aware interaction to network transmission, and further to application and service, and proposed a three tiered internet of things architecture that fully agrees with the upload sensor network architecture (ISO/IEC), and a model featuring a common platform plus application subsets. The results and findings stemmed from the study have been adopted as international standards. Among them, the common platform plus application/subsets model becomes a solution to addressing the bottleneck of scale industrialization.

## Crustal Movement Observing Network

China Tectonic Environment Monitoring Network that took more than four years to build and consumed an investment worth more than RMB 500 million has recently passed an acceptance check organized by the National Development and Reform Commission. According to the acceptance document released, the network becomes the third most advanced crustal movement observing network in the world, along with the PBO in the United States and the GEONET in Japan, in terms of both scale and precision.

The network mainly works on GNSS observation, supported by other technologies, including the very long baseline interferometry (VLBI), satellite laser ranging (SLR), and

precision gravity and leveling measurement. Equipped with a proprietary data processing system, the high precision and high spatial and temporal resolution network is made up of 260 continuous observing stations and 2,000 occasional observing sites, covering mainland China.

The network is designed to monitor the continental crust movement, gravity field pattern variations, tropospheric water vapor variations in the atmosphere, and ionospheric ion concentration in China, providing basic data and products for studying a range of scientific issues, including the spatial and temporal variation of crustal movement, three-dimensional tectonic deformation patterns, the short term and imminent spatial and temporal variation of crustal deformation under earthquakes, the establishment and maintenance of a modern geodetic reference system, large-scale water vapor transport model for flood season heavy rains, and dynamic ionosphere variation patterns over China.

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Comments or inquiries on editorial matters or Newsletter content should be directed to:

[Department of International Cooperation, MOST 15B, Fuxing Road, Beijing 100862, PR China](#) Tel: (8610)58881360 Fax: (8610) 58881364

<http://www.most.gov.cn>