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# NEWSLETTER

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## INTERNATIONAL COOPERATION

### China-France Joint Astronomy Lab

Chinese and French research institutes and universities recently signed an accord at CAS National Astronomic Observatories to establish an International Associated Laboratory (LIA) named Origins. The new lab will mainly work on three major topics, including the sources of matters and energies in the cosmos, the formation and evolution of galaxies, and the origin of planets. 11 renowned Chinese research institutes and universities, including CAS National Astronomic Observatories, Peking University, Nanjing University, and the University of Science and Technology of China, are part of the new lab. 10 French research institutes and universities, including CNRS, INSU, the Paris Observatory, the Pierre & Marie Curie University, and Université Paris-Diderot are the French collaborators.

LIA Origins will be operated and managed by CAS National Astronomic Observatories and CNRS, with a major goal to facilitate extensive and in-depth collaborations between Chinese and French astronomers, in particular, in the area of the formation and evolution of galaxies, dark matter and dark energy, and the nature of sources of high energies including gamma-ray bursts. Scientists will also work on extrasolar planets and instrumentation, including space experiments (SVOM), radio astronomy (ALMA, SKA), and future giant telescopes with a diameter of 40 m (Extremely Large Telescope).

The new lab has been supported by a joint research team, with well defined research orientations and topics. It will sponsor a range of academic meetings on a regular basis. While many Chinese students and researchers have already been working in French laboratories, the International Associated Laboratory will also enable French researchers to work in China.

## RESEARCH AND DEVELOPMENT

### Best World Record for Superconducting Current Leads

China's nuclear fusion study has recorded an important progress on December 19, 2008. CAS Hefei Plasma Institute obtained a 90 kilo-ampere current from an experiment of high temperature superconducting large current leads, the best record so far achieved in the world. Before this, scientists in Japan and Germany had obtained 60 kiloampere and 80 kiloampere current from ITER.

The experiment made by Chinese researchers is to obtain the current leads in line with ITER needs. The event has made China the first in the seven participating countries of ITER that has successfully tested a component of original size, indicating that ITER is going smoothly in China. The successful development of the current leads allows China to deliver the feeder system needed by ITER on time, and to find a solution to addressing the energy efficiency issue of the huge super-conducting magnets.

### GPS/Compass Data Collection System

East China Normal University Lab of Geographic Information, in collaboration with Beijing Chaosheng Yueyu and Shanghai Pushi Navigation, has recently rolled out a GPS/Compass Real Scene Data Collection System in Shanghai. The new system, integrated with camera, laser scanner, computer, GPS/Compass receiver, and IMU, is installed in a van. The onboard camera and laser scanner would scan and record the details in all directions, when the van is moving, and store the collected data in the onboard computer. The navigation

equipment in the van can accurately position the latitudes and longitudes of the moving cars, producing accurate real scene data.

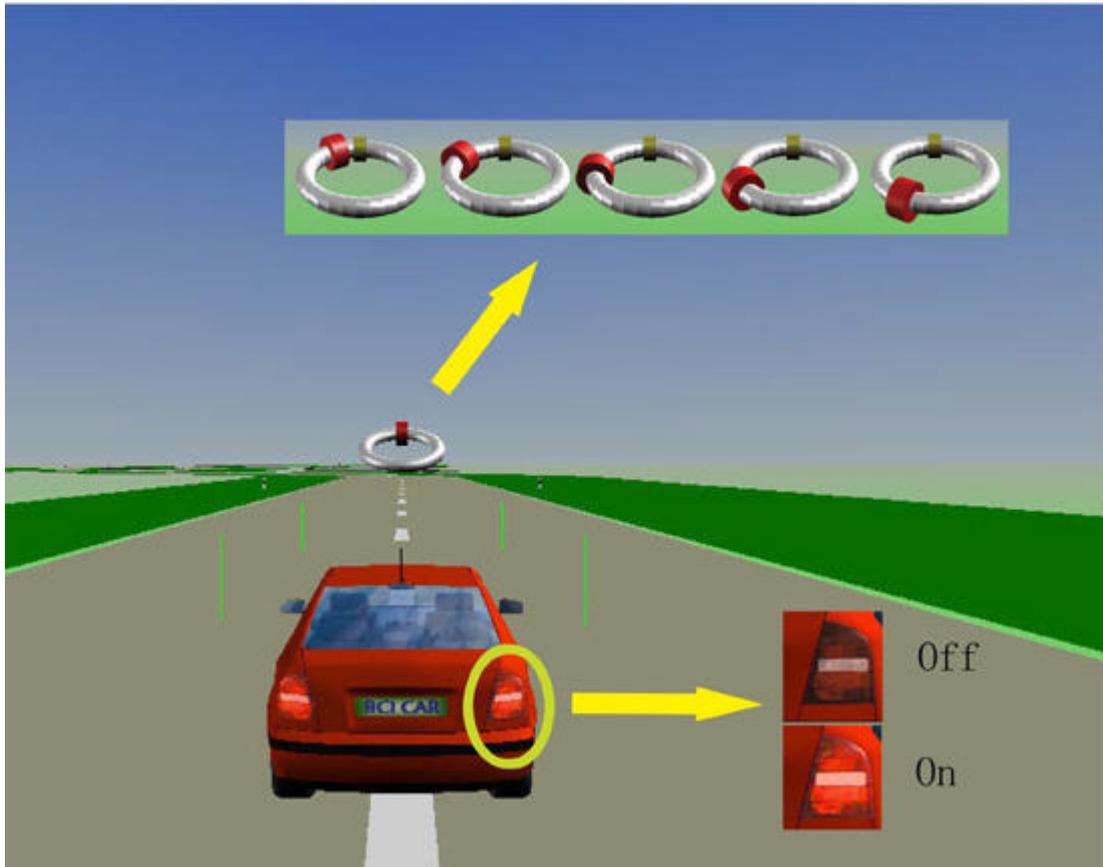
As a novel urban space data collection platform, the new system calculates the scene of the objects using photogrammetry. One can derive 3-D information of the ambient environment and objects from the system using laser data. The built-in program would handle and integrate the data for better pictures.

The system is guided by both GPS and Compass systems for an enhanced performance. The Compass system allows the system to be of the navigation and telecommunication functions. In the field, one can send commands at the control board in the form of short messages, to monitor the objects on a real-time scene.

### Brain Drives Car



A volunteer is driving a car using his brain signals



Feedback signals



Turn left, gear up, and turn right

ZHAO Qibin, a doctoral student at Shanghai Jiaotong University, and his mentor Prof. ZHANG Liqing, have realized driving a car using one's brain signals in a 3-D visualized environment. One can control the car operation, such as turning directions and gearing up and down, along a designated route using his brain power, rather than using the steering wheel or control rod.

According to ZHAO, one's brain would produce numerous weak signals when thinking, and

different judgments of movement would produce different signals, allowing researchers to categorize the signals. In the study, volunteers were asked to wear a hat teemed with sensible sounders, sending brain signals to the computer. The computer would turn the brain signals into commands, and feed them to the car control equipment. The experiment has shown that a car can be driven smoothly by brain signals on a designated road in a visualized environment.

## Innovative Brick Laying System

Thanks to their 10-odd-year efforts, researchers at Harbin Engineering University School of Civil Engineering have developed a novel brick laying system that is both environment friendly and earthquake resistant. Up to date, the new system has been applied to an area exceeding 2 million square meters. The new system works in the following manner: the prefabricated concrete bricks are laid in a conventional manner, with holes left in the wall both horizontally and vertically. Steel bars will be inserted into the horizontal holes in the course of brick laying. The vertical holes will be filled in with steel bars when the brick laying is completed. The steel bars, both horizontal and vertical, will then be tied up, and cemented solid for an enhanced steel-concrete wall.

The building materials used by the system are the small hollow concrete bricks, special sand plaster, filling concrete, and steel bars. Producing concrete bricks using the new system is able to save energy by 54%, compared with the traditional approach. It also saves water by 10% ~ 15%, cement by 7% ~ 10%, stone materials by 30% ~ 35%, substitute materials by 70% ~ 80%, and reduces waste gas emissions by 30% ~ 50%, compared with the on-site cement application.

Earthquake resistance experiments show that the new system is able to produce a wall with better earthquake resistance performance, compared with the existing approaches. Meanwhile, it saves engineering costs by 10% ~ 18%, steel 30% ~ 40%, molding boards 40% ~ 50%, and wall plaster 30%. It increases floor area by 3% ~ 5%, and accelerate the construction speed by 20% ~ 25%.

NEWS BRIEFS

## Fruitful China Chip Decade

A meeting, co-sponsored by the Ministry of Industry and Information Technology, Ministry of Science and Technology, Ministry of Finance, and Beijing Municipal Government, was held on December 28, 2008 to review the accomplishments that China Chip Project has harvested in the past decade. DU Zhanyuan, Chinese Vice-Minister of Science and

Technology, thought highly of the accomplishments. He said that China Chip Project has terminated the history of digital multimedia technologies without China's proprietary chips, and opened up an age of Chinese chips. The project has sold its chips to the global markets, and realized the historical breakthrough from made in China to created in China.

In the past decade, China Chip Project has landed eight major technology breakthroughs, along with some 1,500 domestic and international patent applications and the sale of several hundred million chips. It enjoys an array of R&D findings and industrial accomplishments, including a more than 50% global market share, without any intellectual property disputes.

## New Weather Satellite

At 08:54, December 23, 2008, China blasted off a FY-II-06 satellite aboard a CZIIIA launch vehicle, from the Xi'chang Satellite Launch Center. 24 minutes after lifting off, the Xi'an ground control received the data showing that the satellite has entered a transit geosynchronous orbit. The Xi'an ground control performed an orbital realignment at 22:57, December 26, 2008, allowing the new satellite to sit in the geosynchronous orbit above the equator at 123.5 degree east longitude.

The new weather satellite is designed to make global weather watch in an all-weather manner, collecting a range of needed meteorological information, including visible cloud images, day-night infrared cloud images, and water vapor distribution maps. It is also able to collect or relay meteorological, marine, hydrological, solar X-ray, and space particle radiation data.

## World Largest Radio Telescope

FAST, a project to build the world largest unit caliber radio telescope, was kicked off on December 26, 2008 in Pingtang County, Guizhou Province. The telescope, looks like a satellite dish, is designed with a receiving area as large as 30 football fields combined. It has an enhanced sensitivity that is 10 times the 100-m telescope in Bonn, and a comprehensive performance 10 times better compared with the Arecibo telescope (300m) in the United States. As a multidisciplinary basic research platform, FAST is built to extend the neutral hydrogen observation to the edges of the cosmos, observe dark matter and dark energy, and look for the first generation celestial bodies. In addition, the new telescope will be used to study the matter structures and physical laws under extreme conditions, in an attempt to discover strange, quark, and neutron stars, and accurately measure the mass of black holes.

According to a briefing, the project has produced three proprietary innovations: the site is built in a natural Karst pit in Guizhou; researchers have installed a 500-m crown shaped

active reflector made up of 4600 components in the pit; and the telescope is precisely positioned using a light tractor and a parallel robot. With a budget worth RMB 700 million, FAST will be completed in 5.5 years.

## Large Freight Locomotive

A 9600KW AC freight locomotive, developed by Dalian Locomotive LLC., rolled off the assembly line on December 29, 2008. The new locomotives with an enhanced acceleration and traction power will be capable of hauling a 5000-6000-tonne train at a speed up to 120km/h. The proprietary locomotive enjoys numerous merits, including 1) an enhanced power with better traction performance; 2) better energy efficiency and environment friendly quality, and an improved regenerative brake performance for more energy feedback; 3) full automatic control with added functions, better reliability and safety, and easier operation; and 4) installing all the high voltage equipment but pantograph and insulator in the vehicle, rather than on the top of the locomotive in the traditional design.

## Synthetic Oil Project Produces Oil

China's proprietary coal based synthetic oil pilot project produced oil on December 22, 2008 at Shanxi Luan Group. As a phase result and a major breakthrough of China's coal-for-oil industry, the cobalt based solid state bed synthesizing unit in the project has completed the full gas purification system from boiler, to separation, and further to gasification, laid a solid ground for the future trial operation of iron based liquid state unit. The pilot project has so far produced a number of products, including diesel oil, paraffin, and naphtha. The oil products can either be directly used by a diesel auto, or be an additive to diesel oil for a high grade product. Paraffin can find wide applications in food and pharmaceutical industries.

## High-end Fault Tolerant Computer

Not long ago, the Chinese Ministry of Science and Technology kicked off a project to develop and diffuse the application of high-end fault tolerant computers. The project, with a budget worth RMB 747.5 million, will work on 32-line and 64-line high-end fault tolerant computer series. The so-called high-end fault tolerant computer means a server system equipped with 8-64 processors. Such computer has an enhanced performance for handling demanding missions, with an extremely high reliability of an annual down time less than 5 minutes, desirable for high-end commercial core applications in the sectors of banking, telecommunication, taxation, and finance.

## Collect Alumina from Coal Dust

Experts have recently approved a new technique to produce alumina and active calcium silicate from coal dust. The new technique, derived from the joint R&D efforts of Datang International and Tsinghua University, is able to co-generate active calcium silicate for cement production, in the process of extracting alumina from coal dust in the chimney of a coal burning power plant owned by Datang. Comparing with the traditional alumina producing techniques, the new technique treats calcium silicate using acetylene sludge, which greatly reduces the emission of red mud, created a new approach to produce alumina using coal dust, in addition to its contribution to reducing the landfill and environmental pollution. The technique also helps to ease the shortage of alumina resources in the country.

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