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Chinese Scientist Tu Youyou Wins 2015 Nobel Prize in Physiology or Medicine

It was reported that eight scientists were awarded the 2015 Nobel Prizes in Physiology or Medicine, Physics and Chemistry. Chinese pharmacologist Tu Youyou won the Nobel Laureate in Physiology or Medicine, becoming the first female Chinese scientist to win a Nobel Prize in science.

In the evening of October 5, Karolinska Institute announced that the 2015 Nobel Prize in Physiology or Medicine was awarded to Irish scientist William C. Campbell and Japanese researcher Satoshi Omura for their discoveries concerning a novel therapy against infections caused by roundworm parasites and to Chinese pharmacologist Tu Youyou for her discoveries concerning a novel therapy against Malaria.

Tu Youyou will share half of the prize money for her discovery of the effective drug against Malaria –

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Artemisinin. She became the first Chinese Nobel Laureate for carrying out much of the scientific research in home country. The accolade is the highest honor for Chinese medical community and traditional Chinese medicine (TCM). Tu Youyou was the 46th female to win Nobel Prize. The other half of the prize money will be equally shared by William C. Campbell and Satoshi Omura. They discovered a new drug, Avermectin, the derivatives of which have radically lowered the incidence of River Blindness and Lymphatic Filariasis and shown efficacy against an increasing number of other parasitic diseases. These two discoveries have provided mankind with powerful new means to combat these deadly diseases that deprives of lives of hundreds of millions annually.

(Source: Science and Technology Daily, October 8, 2015)

China's Science Papers Steadily Improved

The Institute of Scientific and Technical Information of China (ISTIC) released the latest statistics of China's science papers on October 21. China released the second most SCI (Science Citation Index) papers in 2014, and China's citations in the past decade were the fourth highest in the world. China's positions on both rankings were unchanged from the prior year, but an analysis of the statistics suggests the quality of Chinese research articles has been improving.

In recent years, ISTIC has been closely following indicators gauging the quality of science papers, such as how many times a paper is cited, and has made detailed analysis and evaluations of SCI papers published by Chinese researchers. In the recent decade, China's SCI papers were cited for 12.876 million times, a year-on-year increase of 24.2%, putting China at the fourth place for two consecutive years. China's growth in paper citations was much faster than other countries, but the country still lags behind the top three producers of science papers - the United States, Germany and the UK. On average, a Chinese SCI paper is cited 8.14 times, up 7.5% from the previous year, versus 11.29 times for the world average. China's SCI papers still draw fewer citations than the average level of the world, but we are making progress at a faster pace than most countries.

The number of "Highly Cited Papers" is another quality indicator. Highly Cited Papers are papers ranking among the top 1% most cited for their subject field. For the past decade, Chinese scientists published 15,011 highly cited papers, accounting for 11.9% of the world total and up 22.2% from last year's statistics, putting China at the fourth place for three years in a row.

The statistical result shows China's SCI papers in 19 subjects are among the top 10 most cited in the world, compared to 16 from last year's statistics. Papers in seven subjects, including agricultural sciences, chemistry, computer sciences, engineering technology, material science, mathematics, pharmacology and toxicology, received the second most citations. Papers in environment & ecology and physics drew the third most citations.

A growing share of "excellent papers" also reflects improving quality of China's SCI papers. For a specific subject, when you draw a line according to the average citations of a country's papers, those above the line are defined as excellent papers. In 2014, there were 235,100 SCI papers published with Chinese researchers as the first author, and 38.9%, or 91,389 papers, were considered excellent papers, up 5 percentage points from the previous year.

(Source: Science and Technology Daily, October 22, 2015)

USTC Realizes Controlled-Not Quantum Logic Gate in Two Strongly Coupled Semiconductor Charge Qubits

A research group led by Academician Guo Guangcan from Key Laboratory of Quantum Information and Synergetic Innovation Center of Quantum Information & Quantum Physics of University of Science and Technology of China, Chinese Academy of Sciences made progress in quantum computing based on solid quantum chip. Prof. Guo, Prof. Xiao Ming and co-researchers realized the controlled-Not quantum logic gate in two-charge-qubit system of semiconductor quantum dot. Their study was recently published on Nature Communications.

Logic gate is a basic unit to facilitate semiconductor quantum computing and a basic component of integrated circuit. The core component of modern computers is the semiconductor chip (CPU) with full electronic control. Semiconductor quantum chip compatible with modern semiconductor technology is an important research direction of quantum computers. The researchers have been dedicated to developing semiconductor quantum chip, and they realized ultrafast universal quantum control of a quantum-dot charge qubit in 2013. Recently they made important progress in experiments on multiple qubits.

The researchers prepared a variety of strong coupling electric semiconductor quantum dot structure using standard semiconductor micro- and nano-fabrication processes. The coupling strength between the two qubits exceeds 100 microelectronics-volts. Applying precise control of high frequency pulses with picosecond level to quantum logic gate, they accomplished the goal of two-charge-qubit controlled-Not logic gate with the shortest manipulation time less than 200 picoseconds. The highest current level of the semiconductor two-qubit was realized with electron spins.

According to Prof. Guo, in the standard circuit model, arbitrary single-qubit rotations together with two-qubit controlled-NOT gate provide a universal set of quantum logic gates. Although the coherence time of charge qubit is two orders of magnitude shorter than spin quantum qubit, the operation speed of charge qubit logic gate is more than two orders of magnitude faster. Charge qubit has advantages in all-electronic-manipulation method and compatibility to conventional semiconductor technology, and is a solid foundation for the development of semiconductor quantum computing.

(Source: Science and Technology Daily,
August 4, 2015)

China's Research Infrastructure

Heavy Ions Research Facility in Lanzhou

In 1988, the Institute of Modern Physics, Chinese Academy of Sciences built the Heavy Ions Research Facility in Lanzhou (HIRFL), which was the first of its kind in China with major technical parameters reaching or exceeding the design standards. It was among the most advanced facilities in the world in the 1980s and was awarded the First National Prize for Progress in Science and Technology in 1992.

In light of the need for scientific research, the facility was later expanded to become China's largest and most powerful cooler storage ring (CSR) with a circumference of more than 160 meters. The CSR and a similar facility in Germany are world-class research facility in the field of nuclear physics.

It's among a limited number of accelerators in the world that can accelerate a full spectrum of 92 elements in the Periodic Table, from hydrogen ions, the lightest element, to uranium ions, the heaviest element, as well as synthesized ions that do not exist in the natural environment of the planet.

If heavy ions are accelerated to 400 MeV/u, they can penetrate 30 centimeters into the surface. With this facility, heavy ions can be accelerated to up to 1,000 MeV/u and penetrate more than 100 centimeters beyond the surface.

It's worth mentioning that the HIRFL-CSR made a significant breakthrough in precise measurement of the mass of short-lived nuclides. It was the first in the world that can improve the relative accuracy of the mass measurement to 10^{-7}, suggesting China has become a world leader in developing heavy ion accelerator and conducting related physical research.

In July 2015 the HIRFL completed an experiment of synthesizing and studying a new nuclide. The facility is now able to synthesize and identify more than 20 new nuclides, roughly 1% of the total synthesized nuclides over the past century.

Thanks to the remarkable progress the facility has made in synthesizing new nuclides, the International Atomic Energy Agency decided to release the result of nuclide mass evaluations at the HIRFL. Such results were previously released at the CSNSM-Orsay in France. Since 2013 the Institute of Modern Physics, Chinese Academy of Sciences has been commissioned to evaluate the international mass measurement of nuclides.

(Source: Science and Technology Daily, April 20, 2015)

China's KTX Installed and Put Under Trial Operation

Fusion energy is believed to be one of the most promising and fundamental solutions to the world's energy challenges. ITER (International Thermonuclear Experimental Reactor) is an international nuclear fusion research and engineering mega-science project, which aims to explore and prove the feasibility of magnetic confinement fusion technology.

Keda Torus eXperiment (KTX), China's first large-sized reversed field pinch (RFP) device, has been installed in Hefei and been undergoing trials since April 2015. The device is independently designed and manufactured by China, and major technical parameters have reached internationally advanced levels compared to similar devices under operation in other countries.

The KTX is supported by the Ministry of Science and Technology under the special research project of magnetic confinement nuclear fusion. The device is undertaken by the Laboratory of Plasma Physics, the University of Science and Technology of China, and jointly constructed by the Institute of Plasma Physics, Chinese Academy of

Sciences and Hefei KEYE Electric Physics Equipment Company.

Complementary to the Tokamak and stellarator, the RFP is an alternative toroidal magnetic confinement configuration with a low externally-applied magnetic field. RFP provides scientists with an important platform to study magnetic fusion energy. The most important feature of a RFP is that its magnetic field is generated by the current in the plasma, while other advantages include that a RFP could achieve ignition solely with Ohmic power and its high mass power density, making it a possible alternative solution to build magnetic confinement reactor.

The KTX is six meters high and the diameter of the main body is eight meters, with a total weight of more than 70 tons and magnetic field intensity of 7,000 Gs. It has an Ohmic discharge current up to 1 MA, electron temperature as high as 6 million℃ and discharge time as long as 100 ms. The device, designed with a symmetric round-shaped vacuum vessel, addresses such shortcomings as its poor movability, inconvenience and high cost for maintenance and upgrade of the vacuum vessel. The optimized design of Ohmic helical equilibrium formed in the core of the RFP has effectively enhanced the efficiency of Ohmic heating, which is a prominent advantage for an RFP.

(Source: Science and Technology Daily, April 11, 2015)

National Center for Protein Science Shanghai Approved

In the morning of July 28, 2015, the National Center for Protein Science Shanghai (NCPSS), the world's first large comprehensive facility in the field of life sciences, was approved by national authorities.

It is introduced that NCPSS, one of China's major research infrastructure facilities, will house state-of-the-art instruments to facilitate cutting-edge protein research and highly accurate and large-scale protein production, purification, structure analysis and functional research in response to demand from the bio-medical and agricultural sectors. The NCPSS has built 9 technology systems dedicated to research into protein structure.

The approval committee noted that the NCPSS has set up a world-class protein research system and become the world's first comprehensive facility in the field of life sciences with state-of-the-art instruments and technologies. Generally speaking, as an advanced facility in the world, the NCPSS is leading the world in certain individual instruments.

Prof. Bai Chunli, President of the Chinese Academy of Sciences, said that our ultimate goal is not to complete the building the facility, it is, instead, to attract excellent scientists from China and the rest of the world to conduct high-level research and produce significant scientific achievements. The NCPSS should set up a science & technology committee and a user committee, establish an open and democratic system for the selection of research projects and expand the access and sharing of the facility to more researchers and institutes.

The NCPSS was put into trial operation in May 2014. As of July 2015, all systems in the facility had run for more than 50,000 hours in total, and carried out 500 research missions for 60 institutions, mostly from the Chinese Academy of Sciences, universities and research institutes from Beijing, Shanghai and Hong Kong. Some international pharmaceutical companies as well as Chinese and foreign scientists were also attracted to carry out frontier researches at the facility. By getting access to the facility and its services, some users made significant scientific achievements and some of them were published at prestigious international academic journals like Nature and PNAS.

(Source: Science and Technology Daily, July 29, 2015)