中国科学院
CHINESE ACADEMY OF SCIENCES

CASNewsletter

NO. 151 • May 2019

LEAD ARTICLE

Bai made the remarks at a press conference on science and technology cooperation between China and countries participating in the BRI.

Chinese Academy of Sciences throws weight behind BRI projects

The Chinese Academy of Sciences (CAS) has provided over 1.8 billion yuan (about $268 million) for construction of science and technology projects in association with the Belt and Road Initiative (BRI) since 2013, said CAS President Bai Chunli on April 19.

The Alliance of International Science Organizations (ANSO), consisting of scientific research organizations from BRI participating countries and international organizations, was launched in November under the framework of the BRI. According to Bai, ANSO members recently clarified its vision and mission, pledging to make it an international organization with great influence in promoting, organizing and carrying out sci-tech innovation.

The first 37 ANSO members have discussed and worked out the ANSO Action Plan for 2019-2020. It plans to set up awards, scholarships, industry associations and joint training projects in order to build a great mechanism and platform for sci-tech cooperation, meet common challenges and promote sustainable development.

Meanwhile, CAS has trained nearly 5,000 high-level sci-tech talents for countries and regions participating in the BRI, including more than 1,500 people with master's and doctoral degrees in science and engineering. Many of them have returned to their home countries and become a new force in building the BRI.

Bai said that CAS, based on the principle of achieving shared growth through discussion and collaboration, has built nine overseas science and education centers in BRI countries and regions and a tenth center is currently in the works.

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Radiation facility remains on cutting edge

The Shanghai Synchrotron Radiation Facility will see its research capability more than double within the next three years, the facility's director said on the occasion of the center's 10-year anniversary on May 6. >> PAGE 2

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Go random walking, 12-qubits — a step for many-body quantum random walks

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Uzbekistan, China agree to create a joint medical techno park

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Chinese researchers' excellent work in Kenya

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Edited by Bureau of International Co-operation, Chinese Academy of Sciences
CAS Newsletter – Monthly – Editorial Board: 52, Sanlihe Road, Beijing, 100864, China
http://www.conference.ac.cn/newsletter.html http://www.casbic.ac.cn

Radiation facility remains on cutting edge

The Shanghai Synchrotron Radiation Facility - which represents a major step in Shanghai's journey to become a world-leading science and technology innovation center - will see its research capability more than double within the next three years, the facility's director said on the occasion of the center's 10-year anniversary on May 6.

Zhao Zhentang said there will be 40 beam lines and 60 laboratories in operation at the facility by 2022, up from the current 15 beam lines and 19 laboratories. Over the past decade its area has doubled to 107,100 square meters, he said.

The facility, the first large science project jointly invested by the central government and the municipal government of Shanghai, is involved in frontier scientific research in various fields, including life sciences, new materials, physics, chemistry, environmental sciences and archaeology. It is by far the largest scientific project in China.

While there were only 300 users when the facility opened in 2009, the number has surged to more than 24,600. There are nearly 100 overseas users now, mainly from the Republic of Korea, Japan, Australia and Canada. The facility operates 7,000 hours a year.

Shi Erwei, a senior researcher at the Shanghai Zhangjiang Comprehensive National Science Center, said a large number of Nobel laureates in physics over the past few decades have made breakthroughs at large scientific installations.

In 2013, China Petroleum and Chemical Corp announced a 380 million yuan ($56 million) investment to build three beam lines at the facility.

Shi said this signals that China's scientific research has entered a new age in which the government teams up with companies to co-invest in large scientific projects, while in the past the government had to shoulder all the responsibility.

An aerial view of the Shanghai Synchrotron Radiation Facility [IMAGE FROM CHINA DAILY]

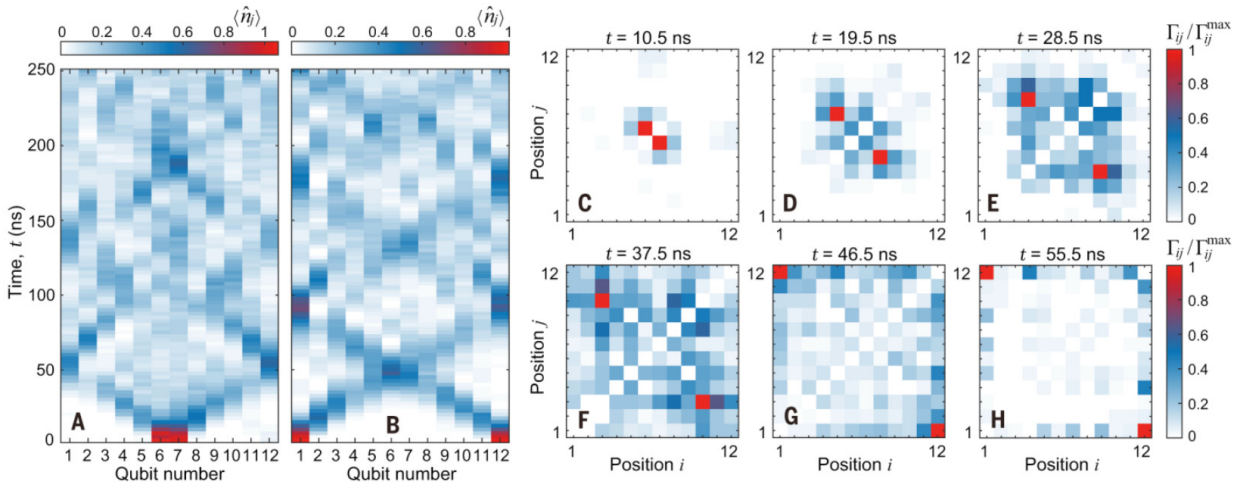
He added that such large scientific projects would not be able to stand without the support of the country's manufacturing industry.

"But the stable, ongoing operation of large scientific projects is much more important than simply building them. It is only when they can run in the manner of public utilities, such as subways, that they can be defined as complete, high-end scientific projects," he said.

Xu Hongjie, a senior researcher at the Shanghai Institute of Applied Physics, participated in writing the design report for the radiation facility a decade ago. He said it was a great delight to see it operating in line with industrial standards throughout the year, as some other similar facilities in China only operate for short periods.

The radiation facility is one major part of a cluster of large-scale radiation scientific projects in Zhangjiang, where one of the country's three comprehensive national science centers is based. Seven other major projects such as beam line stations, hard X-ray free-electron laser equipment and soft X-ray free-electron laser equipment, form a cluster with a total investment of around 13.8 billion yuan, 71.2 percent of which will come from the municipal government of Shanghai. All eight projects will be completed and operational by 2025.

Source: China Daily



Go random walking, 12-qubits — a step for many-body quantum random walks

PAN's Superconducting Quantum Experiment Team applied superconducting qubits in quantum walks and published the work in *Science* on May 2. It is expected to have a great influence on the research of simulation of many-body physical phenomena and universal quantum computation with quantum walks in the future.

While simulating complex quantum many-body systems, the computation complexity of classical computation grows exponentially with particle number — in other words, increases several times whenever one more particle is involved. Hence, it's urgent to promote the development of the quantum computation, which can fuel exploration in areas from the macroscopic to the microscopic, including the human genetic map and the celestial body evolution. Developing this technology, however, first requires sufficient entangled qubits and deducting the correlation between them.

Superconducting quantum computing is based on solid state systems and holds an inherent advantage in scalability, making it one of the most promising proposals for quantum computation. Currently, the biggest challenge is to ensure the quality of all qubits while continually integrating more qubits.

Quantum walks are essential to simulating large-scale many-body systems and realizing universal quantum computation in theory. Random walks refer to the irregular movements of objects in a region. Classical random walks are used to describe physical phenomena like Brownian motion and diffusion in classical physical mechanics, and quantum walks are the analogs of classical random walks in the quantum mechanics. Due to the quantum superposition, the behaviors of particles moving on the lattice need to be described by the statistical law of wave function of quantum mechanics.

Before this work, Pan Jianwei and his colleagues Zhu Xiaobo, Lu Chaoyang, Peng Chengzhi had successfully generated 12-qubit genuine entanglement in cluster states, which broke the world record of superconducting qubit entanglement. Especially, their proposal is easier to scale to more qubits than previous ones.

This time, the research team experimentally demonstrates the quantum walks of the strongly correlated entanglement system for the first time worldwide, based on the precedent high-quality solid-state quantum computation system with sufficient quantum entangled qubits. They investigated the behaviors of quantum walks under single-particle and two-particle excitation, observed the propagation and evolution of quantum entanglement during quantum walks, as well as the Fermization of two-photon in the strongly correlated photon system. This work lays the foundation for further studies on many-body physical phenomena and universal quantum computation using quantum random walks.

The research team is led by Prof. Pan Jianwei, Zhu Xiaobo and Peng Chengzhi from the University of Science and Technology of China (USTC), in alliance with the theoretical research group headed by Fan Wei from the Institute of Physics of the Chinese Academy of Sciences.

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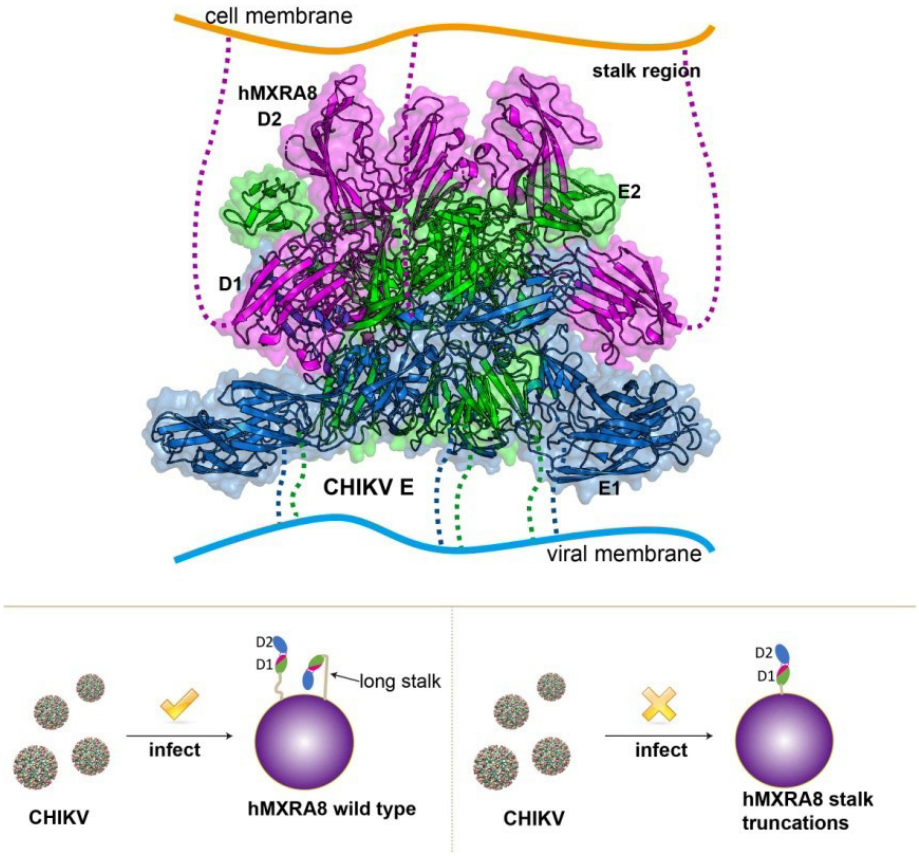
Source: University of Science and Technology of China, CAS

Chinese scientists uncover entry mechanism of Chikungunya virus

Recently, George F. Gao and Gao Feng from the Chinese Academy of Sciences (CAS) in Beijing and their colleagues, revealed how Chikungunya virus binds its receptor on human cells by structural biology and virology methods. The article entitled "Molecular Basis of ArthritogenicAlphavirus Receptor MXRA8 Binding to Chikungunya Virus Envelope Protein" was published in *Cell* on May 9, 2019(https://www.cell.com/cell/fulltext/S0092-8674(19)30394-0).

Arthritogenicalpha viruses, such as Chikungunya virus (CHIKV), Ross River virus (RRV), Mayaro virus (MAYV), and O'nyong-nyong virus (ONNV), cause severe and debilitating rheumatic diseases worldwide, resulting in severe morbidity and economic costs. One of them, CHIKV, is a serious disease in many tropical and subtropical countries throughout the world. The CHIKV infection is characterized by acute and chronic symmetrical peripheral polyarthralgia-polyarthritis, and severe cases, even fatalities, have been reported in recent outbreaks. However, no licensed vaccine or antiviral therapy is available.

Alphaviral invasions of susceptible cells are mediated by the envelope (E) glycoproteins, which form icosahedral shells at thevirion surfaces. Like other alphaviruses, CHIKV entry is mediated by two glycoproteins, E1 and E2, on the surface of the virion. It is believed that the glycoprotein E2 is responsible for receptor binding, while E1 is responsible for membrane fusion. A recent study showed that multiple emerging arthritogenicalphaviruses, including CHIKV, RRV, MAYV, and ONNV, use matrix remodeling-associated protein 8 (MXRA8) as a functional receptor. How this receptor binds the envelope protein is the key question addressed in this study, which will be helpful for the development of countermeasures against these viruses and the understanding of the viral entry into the cells.



The mechanism of CHIKV entry mediated by MXRA8 receptor

The team solved the crystal structures of the mouse MXRA8, human MXRA8 in complex with the CHIKV E protein, and the cryo-electron microscopy structure of human MXRA8 and CHIKV virus-like particles, and they found that MXRA8 has two Ig-like domains that display unique structural topologies, different from those of previously described two-domain Ig-like molecules. Domain 1 (D1) is formed by two discrete fragments, while the region

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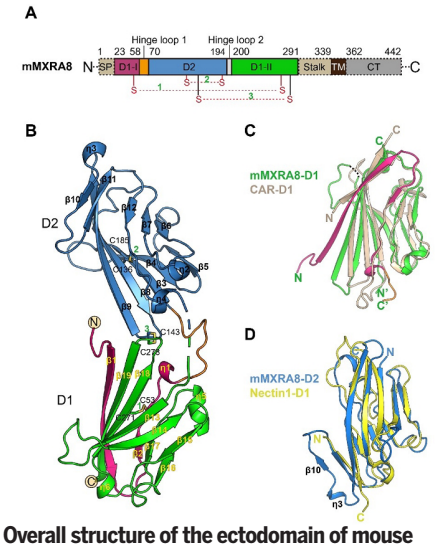
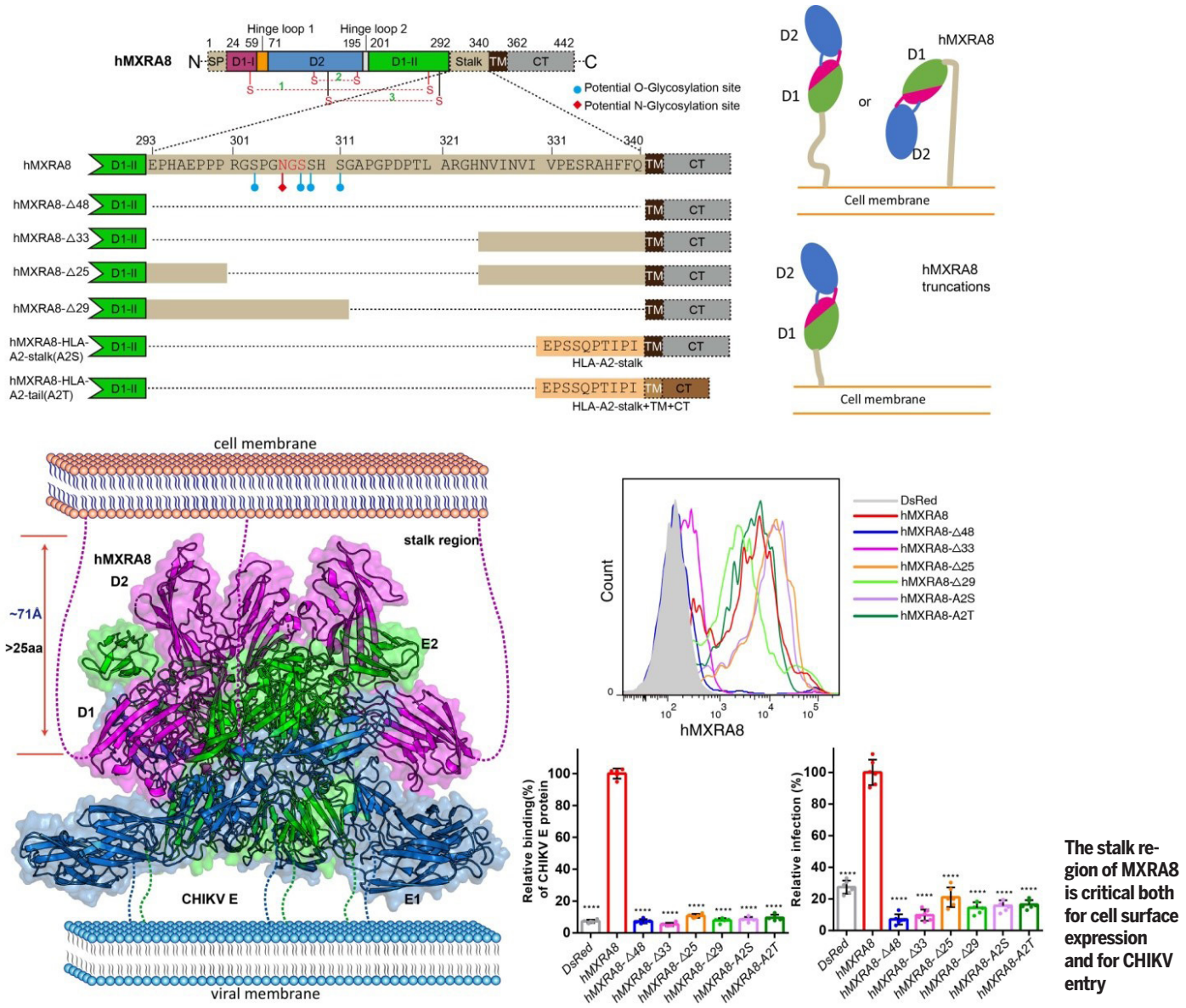


Overall structure of the ectodomain of mouse MXRA8



The stalk region of MXRA8 is critical both for cell surface expression and for CHIKV entry

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between these two fragments consists of the hinge region and domain 2 (D2); that is, the linear protein sequence crosses the two domains. Therefore, the two Ig-like domains are connected by two hinge loops. The binding mode of MXRA8 to CHIKV E is also unique. MXRA8 binds in the "canyon" between two protomers of the E spike on the virion surface, with the involvement of both the E1 and the E2 proteins. The atomic details of the interface between the two binding entities reveal that the two domains and the MXRA8 hinge region all interact with the CHIKV E1-E2 residues from two protomers. The critical interactions observed in the complex structure were further demonstrated by site-directed alanine-scanning mutagenesis and surface plasmon resonance (SPR) experiments. In addition, they showed that the stalk region of MXRA8 was necessary for efficient binding and entry.

The identification of multiple binding interfaces for receptor-envelope interaction might inform the development of novel vaccines and broadly neutralizing antibodies. Their findings will help to drive the development of powerful antiviral reagents against arthritogenicalphaviruses.

Song Hao, an assistant professor from the Beijing Institutes of Life Science, CAS, Ms Zhao Zhennan and Dr. Chai Yan from the Institute of Microbiology CAS, are co-first authors of this paper. Prof. George F. Gao and Associate Professor Gao Feng from the Tianjin Institute of Industrial Biotechnology, CAS are co-corresponding authors of this paper.

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Source: Institute of Microbiology of the Chinese Academy of Sciences

Uzbekistan, China agree to create a joint medical techno park

During the course of President Shavkat Mirziyoyev's recent visit to the People's Republic of China, Uzbekistan and the PRC discussed the creation of a joint medical technology park for the synthesis of medicinal substances.

The Minister of Innovation Development of Uzbekistan, academician Ibrokhim Abdurakhmonov, and the project head of the Shanghai Institute of Materia Medica (SIMM) at the Chinese Academy of Sciences, Professor Shen Jingshan, signed a letter of intent.

By the terms of the document the parties agree to create a large technological platform in Uzbekistan for the synthesis of substances of various drugs in cooperation with the Chinese consortium Topharman & Vigonvita & CADDDC-CAS, the Ministry's press service said.

Left: Prof. Shen Jingshan; Right: The Minister of Innovation Development of Uzbekistan, academician Ibrokhim Abdurakhmonov

"Until today, the main medicinal substances have been imported to Uzbekistan from abroad. That is why it is so important to establish production of the synthesis of substances in our country. Currently, the Institute of Bioorganic Chemistry and the Institute of Plant Chemistry at the Academy of Sciences have established a platform for the production of medicinal substances," Abdurakhmonov noted.

As creation of the infrastructure necessary for the production of medicinal substances is one of the urgent tasks for development of the pharmaceutical industry, opening of this platform will serve to develop the sphere as a whole, create conditions to produce affordable import-substituting drugs and lead to an increase in exports, the Ministry reports.

The document envisages the creation of an Uzbek-Chinese medical technology park in the free industrial economic zone "Navoi"focused on the synthesis of medicinal substances. The amount of direct initial investment is currently being discussed.

As a result of the agreement, a phased implementation of work on the synthesis of a number of medicinal substances is expected. The latest technologies in the field of chemistry and pharmaceuticals will be applied.

Source: KUN.UZ

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He noted that the overseas centers have become significant platforms to carry out projects of scientific collaboration, and are helping to resolve livelihood issues in those countries and regions.

Bai also said that CAS has initiated more than 100 scientific and technological cooperation projects to support green development in BRI countries and regions. It has also set up a special fund for transferring scientific and technological achievements in those regions.

It has also cooperated with more than 100 high-tech enterprises and research institutions to establish the Belt and Road Industry Alliance to serve regional economic and social development.

Also on April 19, a research report on the Pan-Third Pole Environment Study for a Green Silk Road was published. The program was launched by CAS in 2018 with a focus on natural resources, ecosystems, climate change, and biodiversity in the region, and it now provides important scientific insights for green and sustainable development.

Yao Tandong, a CAS member and director of the program, said at the press conference that China has gained experience in ecological and environmental protection by tackling such matters as desertification and ecology conservation in the Qinghai-Tibet Plateau.

"We hope these successful experiences can be used in countries participating in the BRI. A group of Chinese scientists has joined the building of an eco-environmental protection park in Kazakhstan as well as a global allium garden in Uzbekistan," Yao said.

Cao Jinghua, director of international cooperation with the academy, said science and technology cooperation has contributed to the improvement of people's lives in countries and regions participating in the BRI.

He cited research on disaster prevention and mitigation of railway construction in Pakistan, more precise weather forecasts for fishermen in Sri Lanka and the joint efforts to develop new medicine in Uzbekistan.

"Our overseas joint laboratories and projects have also greatly improved the research capabilities of those countries," Cao said.

State Councilor and Foreign Minister Wang Yi announced on April 19 that the second Belt and Road Forum for International Cooperation will be held from April 25 to 27 in Beijing.

Leaders including heads of state and government from 37 countries will attend the forum's roundtable summit.

Source: Xinhua

Prof. Yan Xue (C), researcher and executive director of the Sino-Africa Joint Research Centre (SAJOREC), together with Kenyan students, analyses drinking water quality along the Tana River, the longest river in Kenya, in August, 2018.

Chinese researchers' excellent work in Kenya

When botanist Wang Qingfeng first visited Kenya 18 years ago, he was fascinated by the fact that many locals had snow-white teeth, but they did not use fancy dental products. The secret was found in twigs, known as miswak, from the Salvadora persica tree. When chewed, the miswak splits into soft, bristly fibers and releases natural, antimicrobial compounds that can protect the mouth from oral disease, according to the World Health Organization. Intrigued, Wang and his team worked with African scientists to extract the active ingredients and add them to toothpastes, which are now being manufactured by local companies, said Wang, director of the Sino-Africa Joint Research Center, Chinese Academy of Sciences, in Kenya.

As he surveyed the Kenyan grassland, zoologist Jiang Xuelong was bitten by ticks at least 24 times. Some even burrowed under his skin and had to be removed with a knife. Yan Xue, executive director of the joint research center in Kenya, said poor transportation, cultural barriers and dangerous wildlife are common challenges for scientists working in the field. However, that did not stop Chinese and African scientists from surveying water sources in East African countries such as Ethiopia, Kenya and Tanzania. They have completed investigations on the quality of drinking water in Tanzania's major cities, and are now working on cities in Kenya, Yan said.

By 2024, Chinese and African scientists hope to build a database on East Africa's major rivers and lakes to help local officials make decisions on water safety, irrigation, hydroelectric power, environmental protection and other water-management issues, based on countries' specific needs, Yan added.

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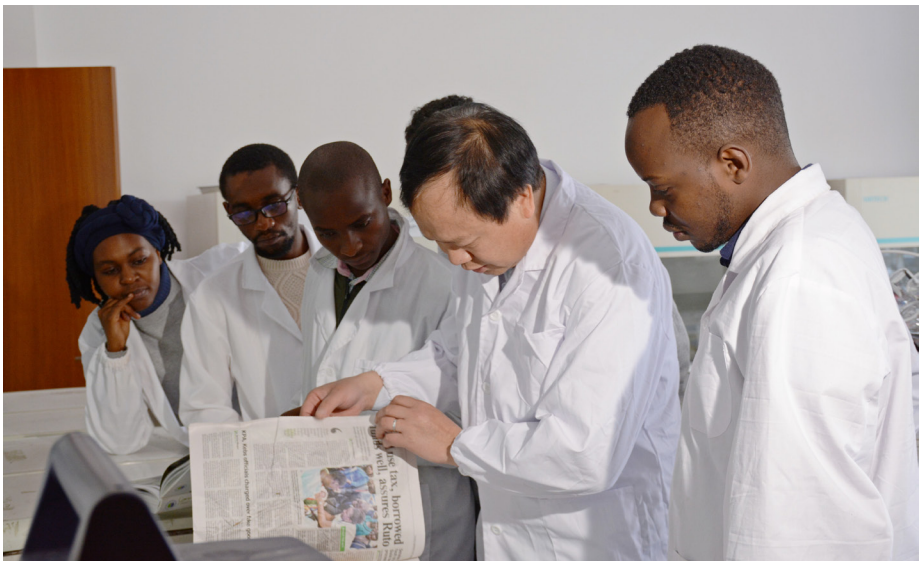
According to the nonprofit Water Project, water security is one of the biggest environmental challenges for African development. About 319 million people in Africa south of the Sahara have poor access to potable water. Yan said: "The continent is not as dry as people think; there are lakes, rivers and oases throughout East Africa. The problem is lack of infrastructure, expertise and data to effectively use those resources."

Kenya and Tanzania are famed for ecotourism, including the Great Migration, which sees millions of animals move during the dry season in search of sources of water and new habitats."If we can help officials better understand, track and protect those water sources, it would make industry more sustainable," Yan said.

Hu Chunsheng, director of the Center for Agricultural Resources Research at CAS, said effective water use would also lead to improved food production, a key factor in sustaining African societies amid population booms. Agriculture is the backbone of many African economies. However, productivity has been stagnating due to a lack of advanced equipment, crop varieties and farming methods, he said. In response, since 2014, Hu and his colleagues have brought several dozen high-quality crops from China and planted them at a cultivation demonstration area at the Sino-Africa Joint Research Center. They include Chinese-developed hybrid rice, maize, grains, sorghum and high-value commercial fruits such as grapes.

In 2017, the hybrid rice demonstrated great advantages in both growth and yields, compared with local varieties. WS13, the most successful variety, yields about 11.4 metric tons per hectare, compared with 4.87 tons per hectare for Kenya's native Basmati rice. Chinese scientists have also selected sweet sorghum varieties from Africa and created quality hybrids with improved resistance to disease and drought, in addition to prompting higher yields, Hu said."All these crops have been carefully selected to succeed in the local environment and climate, and to satisfy people's dietary and economic needs," he added.



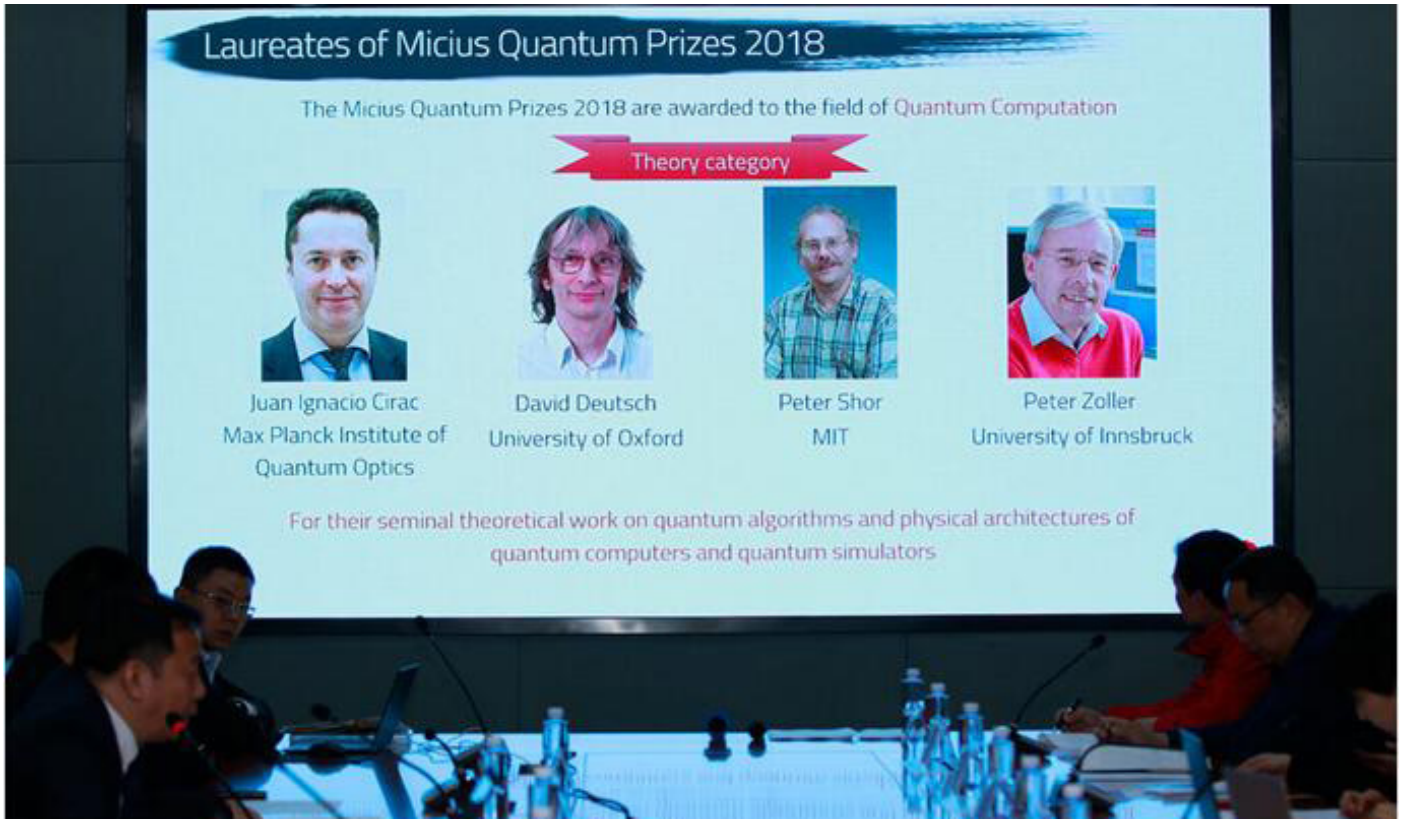
Prof. Wang Qingfeng (R2), gives a lecture to African students studying at Wuhan Botanical Garden, CAS.

Prof. Wang Qingfeng (C), director of the Sino-Africa Joint Research Centre (SAJOREC), instructs local villagers in Kenya on the application of economic plants, on June 19, 2018.

"By sharing agricultural knowhow, we hope to help African countries foster the talent and ability needed to modernize their agricultural sectors," Hu said. "In turn, this will improve the livelihoods of African farmers and open new areas for Sino-African agricultural cooperation."

The center, established in 2013, has helped transform many local plants into medicinal teas, essential oils and other products, thus improving their potency and market value. Growing the plants for industrial use has raised local farmers' living standards. The center, in Juja, Kiambu county, is one of 10 joint overseas research and education facilities CAS has launched with foreign partners. They aim to extend scientific cooperation, talent training and innovation capability for China and countries participating in the Belt and Road Initiative.

Source: China Daily



The Micius Quantum Prize's 2018 and 2019 laureates were announced in Hefei, capital of East China's Anhui province, on April 26, 2019.
[IMAGE FROM CHINA DAILY]

Chinese prize for quantum research announced

A total of 12 million yuan ($1.78 million) of cash will be granted to 12 international scientists for their groundbreaking academic contributions to the fields of quantum computation and quantum communications, according to a press release by the newly founded Micius Quantum Foundation on April 26.

With a combined donation of 100 million yuan from Chinese entrepreneurs, the foundation based in Hefei, East China's Anhui province, will give each of the six annual laureates one million yuan. The foundation, a nonprofit organization, aims to promote development of quantum information science and technology.

The Micius Quantum Prize's 2018 and 2019 laureates were announced at the same time, as selection of first-year nominees took longer than expected, said Luo Yi, president of the foundation and a scientist from the University of Science and Technology of China, based in Hefei.

The prize includes two categories, theory and experimentation.

The 2018 laureates for theory are Juan Ignacio Cirac, David Deutsch, Peter Shor and Peter Zoller, for their seminal theoretical work on quantum algorithms and physical architectures of quantum computers and simulators, while the experimental category prizes went to Rainer Blatt and David Wineland for pioneering experiments that demonstrated fundamental elements of quantum computing with trapped ions.

The 2019 prizes were awarded to Charles Bennett, Gilles Brassard, Artur Ekert and Stephen Wiesner in the theory category for their work on quantum cryptography, and experimental prizes went to Pan Jianwei and Anton Zeilinger for their groundbreaking experiments that enabled practically secure and large-scale quantum communications.

The awards ceremony will be held on Sept 20, Luo said.

USTC has been leading the world's quantum information science and technology development in recent years, with Pan's team attracting enormous attention from home and abroad.

Detailed information on the foundation and the laureates is available on the foundation's official website, miciusprize.org.

Source: China Daily