中国科学院
CHINESE ACADEMY OF SCIENCES

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LEAD ARTICLE

Bai Chunli is turning the tassel for graduates. [IMAGE: CAS]

Universities of CAS hold commencement ceremonries for graduates

The 2019 Graduation Ceremony of the University of Chinese Academy of Sciences (UCAS) was held simultaneously on its two campuses in Beijing's Shijingshan and Huairou districts on July 2.

Li Shushen, president of UCAS, sent out an invitation to the graduates to reunite as alumni 30 years from now.

The ceremony was attended by Bai Chunli, president of the Chinese Academy of Sciences (CAS).

He urged broad vision and inclusive minds in cooperation, learning from brilliant individuals whether academic giants or teachers and fellow students and cherishing friendly sentiments with teachers and mutual help between alumni.

Li Shushen said the ability to learn, to create and to concentrate are the keys to success in the future. He encouraged the graduates to keep their passion to explore the world, to maximize their potential, to dare to break down routine and never to lose heart because of failures.

Yang Shuyuan, one of the undergraduates, said in her speech at the ceremony that the sense of responsibility and mission she gained during her study at UCAS will help her develop and learn to shoulder responsibility for herself, her family and her alma mater.

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HOT ISSUE

CAS tops *Nature Index* for seven years in a row

CAS is the world's highest-ranked research institution, according to the *Nature Index Annual Tables* 2019 released on June 20. >> **PAGE 4**

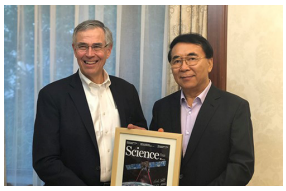
RESEARCH PROGRESS

A possible approach for personalized cancer therapy

A joint team from the Shanghai Institute of Materia Medica (SIMM), CAS and Xiamen University made progress in the identification of the metabolic vulnerabilities of receptor tyrosine kinases (RTK) aberrant cancer. >> **PAGE 7**

INTERNATIONAL COOPERATION

CAS President meets with AAAS CEO

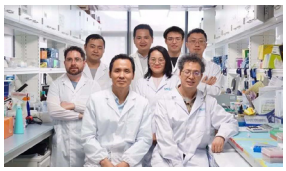


Bai Chunli, president of CAS, met with a delegation led by Rush Holt, the chief executive officer of the American Association for the Advancement of Science (AAAS), in Beijing on June 24.

SCIENCE STORY

From Europe to China: Learning a new scientific culture with CAS

This country and the working methods here have been very surprising to me. >> **PAGE 9**



NEWS IN BRIEF

Lotus blossoms from century-old seed

A lotus blossomed for the first time in the Old Summer Palace from a seed unearthed in 2017 that had been underground for a hundred years, the Beijing News reported. >> **PAGE 10**

Edited by Bureau of International Co-operation, Chinese Academy of Sciences
CAS Newsletter – Monthly – Editorial Board: 52, Sanlihe Road, Beijing, 100864, China

The graduation ceremony for USTC doctoral and postgraduate students was held recently in Hefei, Anhui province. [IMAGE: USTC]

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Cao Xing, a doctoral graduate thanked the university and vowed to integrate personal needs and growth into national demands and development so as to contribute to the country and society.

Mads Vesterager Nielsen, a foreign postgraduate student from Denmark said he would help build closer ties between the two countries via his work at the Danish Chamber of Commerce in China.

According to reports, 309 undergraduates and 5,605 doctoral students graduated from the university in 2019. There are 271 undergraduates choosing to continue their postgraduate studies, including 69 planning to study abroad.

Some of the undergraduates participated in writing academic papers for top international journals like *Nature*. A total of 67 papers were published by this year's doctoral graduates in *Science*, *Nature*, *Cell* and *Proceedings of the National Academy of Sciences of the United States of America*. They published 9,938 SCI papers and 2,028 in EI citations.

A chorus from the University of Science and Technology of China (USTC) performed at the university's graduation ceremony for its doctoral and postgraduate students.

Bao Xinhe, president of the university, suggested in his commencement speech that the students will pursue their dreams no matter how tough the journey is and hoped they will shoulder their responsibilities, reach high and cultivate their moral character.

Zeng Jie, a mentor representative, congratulated the graduates and said that the faith of integrating personal development into national rejuvenation can guide people to take the lead in their industry and position.

Lyu Song, one of the most outstanding USTC graduates, recalls his study in the university, expressing his sincere gratitude to the alma mater and faculty for providing such a good environment and a high-end academic research platform. He also promised to contribute to society in the new era in his speech.

On the evening of June 14th, the 2019 Eternal USTCer graduation ceremony and See You graduation party were held at the auditorium in the east campus of the University of Science and Technology of China (USTC). When a group of USTC students is about to graduate, such a grand party is held so the graduates can spend a good time together, make wishes, encourage each other, and say goodbye. The university leaders and alumni accompanied by nearly 2000 graduates crowded into the auditorium.

The graduation ceremony of ShanghaiTech University was held on June 29, with 270 undergraduates, 140 postgraduates and 69 doctoral graduates receiving their degree certificates.

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Yang Shuyuan gives a speech at the ceremony. [IMAGE: UCAS]

Cao Xing gives a speech at the ceremony. [IMAGE: UCAS]

Mads Vesterager Nielsen gives a speech at the ceremony. [IMAGE: UCAS]

BaoXinhe, president of USTC, addresses the commencement ceremony. [IMAGE: USTC]

Zeng Jie, a mentor representative, gives a speech at the ceremony. [IMAGE: USTC]

Lyu Song gives a speech as a representative of outstanding USTC graduates at the ceremony. [IMAGE: USTC]

Jiang Mianheng, president of ShanghaiTech University, addresses the graduation ceremony on June 29. [IMAGE: SHANGHAITECH UNIVERSITY]

Li Xiaoting, a postgraduate representative of ShanghaiTech University, makes a speech at the ceremony. [IMAGE: SHANGHAITECH UNIVERSITY]

Yu Jingyi, a professor and deputy dean of the School of Information Science and Technology, cites the example of Geoff Hinton to inspire the graduating students in his speech. [IMAGE: SHANGHAITECH UNIVERSITY]

CAS tops *Nature Index* for seven years in row

The Chinese Academy of Sciences (CAS) is the world's highest-ranked research institution, according to the *Nature Index Annual Tables 2019* released on June 20. It has been No. 1 on the list for seven straight years.

The latest *Nature Index* is based on the data in 2018 from Jan 1 to Dec 31. The tables showed that CAS stood out among science and technology research institutions throughout the world, while Harvard University, the German Max Planck Society, the French National Center for Scientific Research and Stanford University ranked from second to fifth in sequence.

Meanwhile, CAS topped the categories of physical sciences, chemistry and Earth studies and environmental sciences. Its life sciences ranked fifth this year, up from sixth last year.

Forty-three American research institutions and 17 from China are listed among the world's top 100 research institutions; the top Chinese research institutions on the list include CAS (1st), Peking University (10th), Tsinghua University (13th), Nanjing University (15th), the University of Science and Technology of China (17th), the University of CAS (24th), Zhejiang University (27th), Fudan University (34th), Shanghai Jiao Tong University (41st) and Nankai University (51st).

While the United States reigns over the countries' ranks, the *Nature Index's* data shows China and Germany ranking after it in second and third places. Among the top 10 countries, only China and Australia achieved positive growth in research output, according to the new fractional count (FC).

Forty-three of China's institutions have ranked in the top 50 in terms of FC growth rate in the past three years. The University of CAS, Shanghai Jiao Tong University, Tsinghua University, Nanjing University and Sichuan University are the top five highest-ranked Chinese candidates.

China remains number one in chemical scientific research. Five of the top 10 contributors to chemistry research output are from China: CAS, Nanjing University, Peking University, Tsinghua University and USTC.

The ranking of a college's research institutions after normalized computing debuted in this year's *Nature Index Tables*. This ranking considers the number of an institution's high-quality research papers as a proportion of its overall output in the natural sciences.

The *Natural Index* was first published in November 2014, and the number of journals included in its statistics is 82. It applies multiple methods to evaluate productivity and quality. An institution or a country is given an article count (AC) for each article that has at least one author from that institution or the country. FC is assigned based on the sum of contributions to articles of authors affiliated with each country's institutions.

Source: China Daily

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ShanghaiTech University President Jiang Mianheng addressed the ceremony, saying that the university looks forward to seeing more young and promising talents thrive and reach high in an environment full of innovation and vitality.

He encouraged students to continue the tradition of struggle and uphold the spirit of hard work in the future.

Jiang also reminded the graduates planning to further their studies abroad that the motherland is their strong backing and urged a good tradition of learning and plain living.

Li Xiaoting, a postgraduate representative, said her personal academic achievements could not have been made without the schooling and scientific atmosphere in the university, which she witnessed from 2013 to 2019.

Yu Jingyi, a professor and deputy dean of School of Information Science and Technology inspired the graduating students with the story of Geoff Hinton, a winner of the Turing Award, the highest distinction in computer science and hailed the graduates as "natural creators and pioneers" with down-to-earth practice, bold thinking, and open attitudes about competition and cooperation.

Statistics showed that 39 percent of the undergraduates received 196 offers from 12 countries and regions to further their studies, including about half of them offered by the top 50 universities in the world.

The undergraduates choosing to continue their postgraduate studies in China and to get an employment account for 37 percent and 18 percent, respectively.

About 50 percent of the postgraduate students will continue their doctoral program at the university and 7 percent will further their study abroad while 3 percent will study in other domestic universities and 1 percent will start a business.

Among the 69 doctoral graduates, 32 percent will work abroad and 17 percent will conduct post-doctoral research in China.

Experiment yields unique find in space

Scientists from China and Japan have spotted the highest-energy light particle ever observed on Earth, and they believed it came from one of the most mesmerizing celestial objects that has captivated poets and physicists alike since the 11th century - the Crab Nebula.

Capturing and studying these speedy space photons can help shed light on their mysterious origin and acceleration mechanism, leading to new revelations about the extreme conditions of the universe, scientists said.

The Tibet AS-gamma experiment, a China-Japan joint research project located about 4.3 kilometers above sea level in the Tibet autonomous region, has discovered 24 photons with energies above 100 trillion electron volts (TeV), one of which even registered a staggering 450 TeV.

These findings represent the first detection of high energy photons over 100 TeV and the highest ever recorded. "It is a milestone for super-high-energy gamma-ray astronomy," said Huang Jing, a spokeswoman for the project and a researcher from the Institute of High Energy Physics of the Chinese Academy of Sciences.

The previous record energy level was 75 TeV, observed by the HEGRA Cherenkov telescope.

Huang said they believe these photons originated from the Crab Nebula, the remnant of a supernova that was observed in 1054 AD, around 6,500 light years away from Earth.

The research results will be published later this month in the journal *Physical Review Letters*.

The stellar event that led to the Crab Nebula was recorded in official histories of the Song Dynasty (960-1279) in ancient China, as well as in Meigetsuki, a literary diary by 12th century Japanese poet Fujiwara no Teika.

The AS-gamma experiment site in the Tibet autonomous region. [IMAGE: CHINA DAILY]

In 2005, NASA's Hubble Telescope released the most detailed optical view of the entire nebula, calling it "the most interesting and well-studied object in astronomy".

However, since the discovery of cosmic rays - energetic, subatomic particles from space - in 1912, scientists have been baffled by how the universe can accelerate particles to close to the speed of light and make them travel for hundreds, if not millions of light years through space.

Scientists hypothesized that the high-energy cosmic rays might have generated from massive stellar explosions or black holes. "But one thing is now certain, and that is the Crab Nebula is the most powerful natural electron accelerator currently known in our galaxy," Huang said.

"The recent discoveries open a new window for the exploration of the extreme universe and are key to understanding the fundamental physics in extreme conditions," she added.

In 1991, scientists from the United States discovered the highest energy particle to ever reach Earth, a proton with 300 million TeV. They dubbed it the "Oh-My-God" particle for its mind-boggling speed and energy.

Visible light, for comparison, has just a few electron volts of energy. The Large Hadron Collider, the world's most powerful particle smasher, only has a maximum designed collision energy of 14 TeV.

While the Earth is being constantly bombarded with cosmic rays, it is still very difficult to detect a high-energy particle given interferences from Earth's atmosphere and other disturbances.

As a result, the Tibet AS-gamma experiment, jointly operated by China and Japan since 1990, built an observatory across an area of more than 65,000 square meters in high altitudes to reduce noise and improve sensitivity.

In 2014, scientists from China and Japan added new underground detectors that can suppress 99.92 percent of the cosmic-ray background noises. That addition, along with other innovative upgrades, led scientists to finally discover the high-energy photon they were looking for, Huang said.

Chen Yang, a professor of astronomy from Nanjing University, said with a deeper understanding of cosmic rays, scientists can increase the efficiency for space breeding, the process of improving crop species via mutations caused by exposure to extreme conditions in space.

Source: China Daily

First observation of three-dimensional quantum Hall effect achieved

A research team led by Professor Qiao Zhenhua from the University of Science and Technology of China, and Associate Professor Zhang Liyuan from the Southern University of Science and Technology, has for the first time experimentally observed the three-dimensional quantum Hall effect in bulk ZrTe5 crystal. The work, entitled *Three-dimensional quantum Hall effect and metal–insulator transition in ZrTe5*, was published in *Nature* on May 9th.

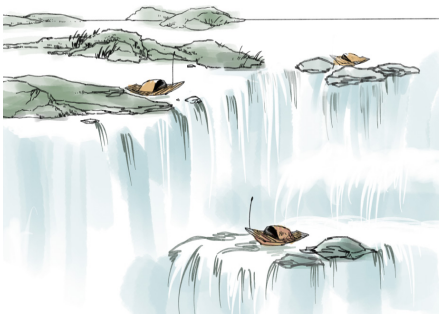
Normally, electrons travel in a straight line – meaning that the current usually flows following the direction of voltage drop. However, when a magnetic field is applied in a direction perpendicular to the current, a transverse force will be exerted on the charge carriers, leading to the production of a transverse potential difference. This phenomenon is the famous Hall effect, which has a far-reaching impact on the semiconductor industry.

In 1980 a quantum-mechanical version of the Hall effect was discovered by German physicist Klaus von Klitzing. Take a bunch of electrons, restrict them in a low temperature two-dimensional plane and exert a strong magnetic field. Following this simple set-up is the wonderful quantum Hall effect. Meanwhile, a natural question is raised: can the quantum Hall effect be observed in a three-dimensional system?

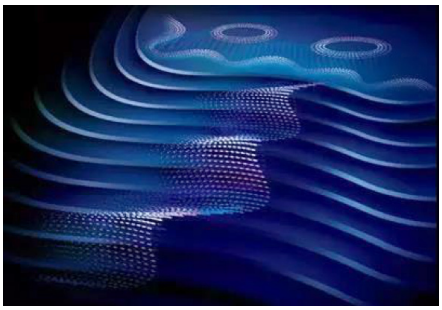
In 1987, Bertrand Halperin from Harvard University proposed signatures for such a three-dimensional quantum Hall effect. However, to observe this phenomenon, the system must enter an extreme quantum limit, which is a demanding task for physicists. For decades, it had not been demonstrated experimentally, until now.

A straightforward strategy for the realization of quantum Hall effect in a 3D system is to stack 2D topological materials layer by layer. At the boundary of each layer, electrons can move forward like an unimpeded boat in water. Nonetheless, the existence of an energy gap between every boundary hinders the movement of electrons from one layer to another, just as rocks on the riverbank isolate rivers from each other and restrict the steering of boats. In this case, such systems are still of a 2D nature.

An electron can only move freely on the boundary of one 2D layer, just like a restricted boat can only travel in a single river. [IMAGE: CUI JIE]



In systems manifesting 3D quantum Hall effect, electrons can travel freely between different energy bands, like boats traveling in a vast ocean. [IMAGE: CUI JIE]



Three-dimensional quantum Hall effect observed in ZrTe5system.
[IMAGE: WANG GUOYAN AND HE CONG]

Zirconium telluride (ZrTe5) is a new type of three-dimensional layered material with unique thermoelectric properties and anomalous resistance dependence on temperature. In recent years, researchers from around the world have been trying to explore its physical properties using various techniques. Since 2014, Zhang's team has been studying the topological properties of ZrTe5. To their surprise, they found that ZrTe5 is also an ideal platform for studying 3D quantum Hall effect. In 2017, Qiao's team from the University of Science and Technology of China, which have been studying related theoretical research for years, began to work closely with Zhang's team. They carried out numerous tests and analyzed countless samples from research institutes around the world, and eventually made observation of 3D quantum Hall effect on bulk materials a reality.

In this study, researchers discovered that the carrier density wave induced by electron-electron interaction is the key factor for the appearance of 3D quantum Hall effect. Electrons in such a system can travel freely between different energy bands, like boats traveling in a vast ocean.

Wen Xiaogang, a member of the National Academy of Sciences, spoke highly of this achievement: "This discovery just gave us a new material system with an underlying topological order."

Since the discovery of quantum Hall effect in 1980, related research has put great focus on two-dimensional materials, leading to a growing Hall effect family. The

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A possible approach for personalized cancer therapy

Deregulated metabolism is a hallmark of cancer. It is believed to present new therapeutic opportunities and to attract increasing efforts in anticancer drug discovery. However, the metabolic vulnerabilities for most human cancers remain unclear.

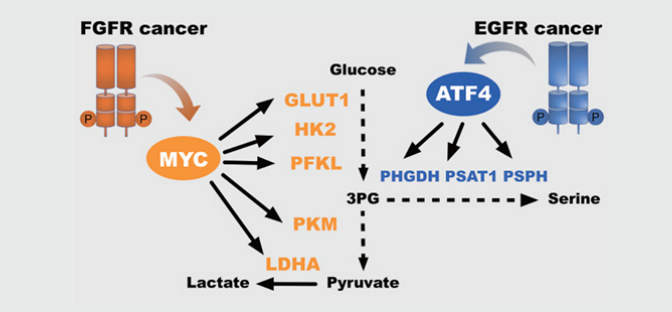
In an article published in *Nature Communications*, a joint team from the Shanghai Institute of Materia Medica (SIMM), CAS and Xiamen University made progress in the identification of the metabolic vulnerabilities of receptor tyrosine kinases (RTK) aberrant cancer, the well-defined molecular subtypes in clinical cancer treatment.

The finding provides the possibility of tailoring metabolic inhibitors using known oncogenic alterations for cancer therapy. So far, very limited benefits have been obtained in the clinical modalities of metabolic targets, in which metabolic inhibitors were often delivered to broad cancer patients without indication of metabolic dependency.

With the advancement of metabolic inhibitors discovery, it is imperative to understand the patient stratification strategy for the treatment.

To stratify the responsive tumors to metabolism inhibitors, Huang Min, Geng Meiyu at the SMM and Lin Shuhai from Xiamen University took an approach to establish the linkage between metabolic dependency and the oncogenic alterations of receptor tyrosine kinases (RTK), the well-defined cancer genotypes occurred in a broad spectrum of cancer tissue types.

By integrating metabolomics and transcriptomics, they discovered that oncogenic RTK activation causes distinct metabolic preference. Specifically, epidermal growth factor receptor (EGFR) activation branches glucose metabolism to the serine synthesis for nucleotide biosynthesis and redox homeostasis,



Metabolic vulnerabilities driven by FGFR and EGFR gene alterations in cancer. [IMAGE: JIN NAN]

whereas fibroblast growth factor receptor (FGFR) activation recycles lactate to fuel mitochondrial phosphorylation for energy generation. Genetic alterations of EGFR and FGFR stratify the responsive tumors to pharmacological inhibitors that shut down the serine synthesis and lactate fluxes, respectively.

These findings provide a basis for stratifying EGFR and FGFR aberrant patients for metabolism-targeted therapies, suggesting a potential for precise and direct metabolic intervention to a broad patient population.

Linkage: https://www.nature.com/articles/s41467-019-10427-2

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Source: Shanghai Institute of Materia Medica, Chinese Academy of Sciences

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successful observation of three-dimensional quantum Hall effect is like finding a piece of a jigsaw puzzle. Qiao believes: "More scholars will be attracted to join the exploration of novel 3D quantum states and phase change, thus bringing about new insights in the development of the Hall effect family."

140 years ago, Edwin Hall, who discovered the effect, could not answer what the classic Hall effect can do. But take a look at today -- the classic Hall effect has been integrated into our daily lives. It has been widely used in automobiles, home appliances, mobile phones and other industries. So what can the 3D quantum Hall effect do in the future? Let us wait and see. *(Written by Wu Qiran, edited by Ye Zhenzhen, USTC News Center)*.

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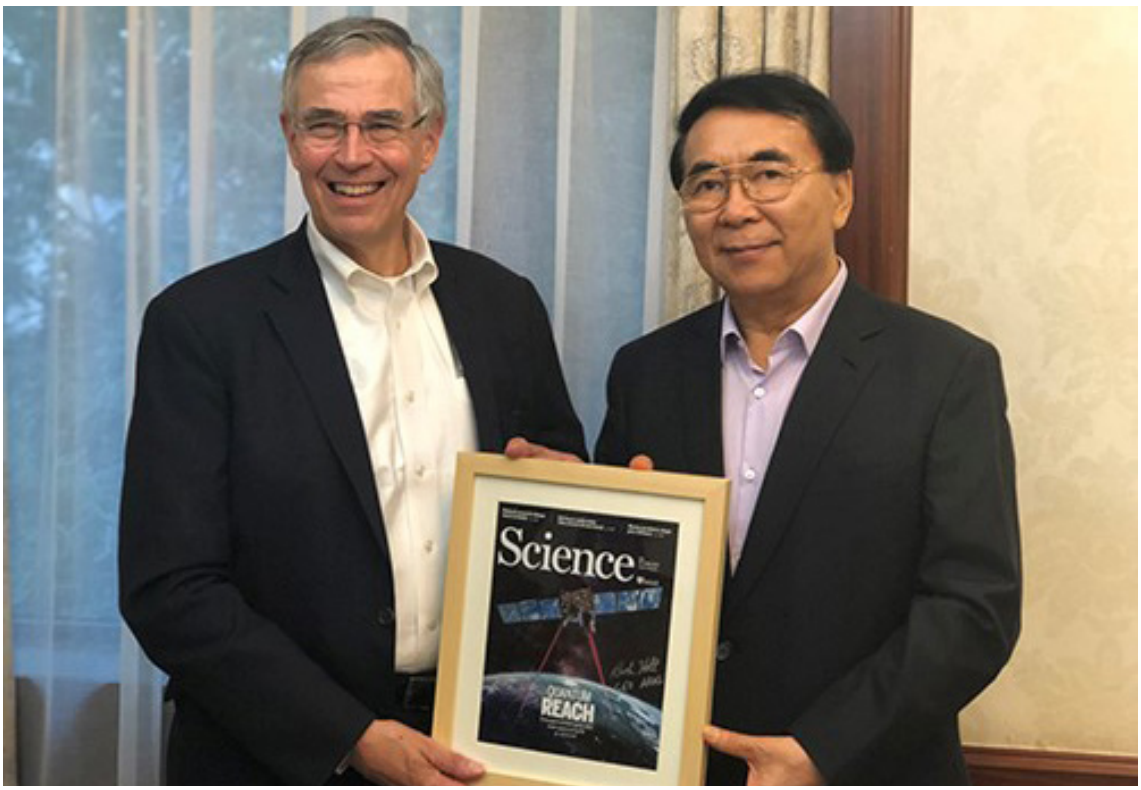
Source: University of Science and Technology of China



CAS President Bai Chunli receives a gift from AAAS CEO Rush Holt during their meeting in Beijing on June 24. [IMAGE: CAS]

CAS President meets with AAAS CEO

Bai Chunli, president of the Chinese Academy of Sciences (CAS), met with a delegation led by Rush Holt, the chief executive officer of the American Association for the Advancement of Science (AAAS), in Beijing on June 24.

Bai recalled the progress in cooperation between CAS and the US and appreciated the support from the US in that regard.

He said he looked forward to further enhancing cooperation and publicizing the key role of scientific and technological cooperation between the two countries in scientific and technological development via *Science* magazine, an AAAS publication.

He stressed that he hoped the meeting can help enhance understanding and mutual trust and add positive energy to the scientific and technological cooperation between China and the US.

CAS will continue to uphold an open attitude and innovation-oriented concept to promote exchanges and cooperation between Chinese and American scientists.

Holt appreciated CAS's achievements in scientific research and talent cultivation, saying that Chinese scientists play an increasingly important role in scientific and technological innovation.

More and more American scientists realize that in the long run, continuous exchanges and cooperation with China will be conducive to sharing of progress in science and technology by the two countries, he said.

The AAAS is willing to listen to more voices from the scientific community and work with Chinese partners to boost scientific and technological exchanges and cooperation, he added.

The two sides also exchanged ideas on other issues, such as Open Access, common global challenges, cooperation with the World Academy of Sciences and holding bilateral symposiums.

Founded in 1848, the AAAS is the largest American scientific community and an international non-profit organization. It has a strong influence in the global scientific community.

The annual meeting of AAAS is one of the largest scientific meetings and attracts thousands of attendees across the globe. It plays a big role in publicizing science in the world.

Source: Chinese Academy of Sciences (CAS)

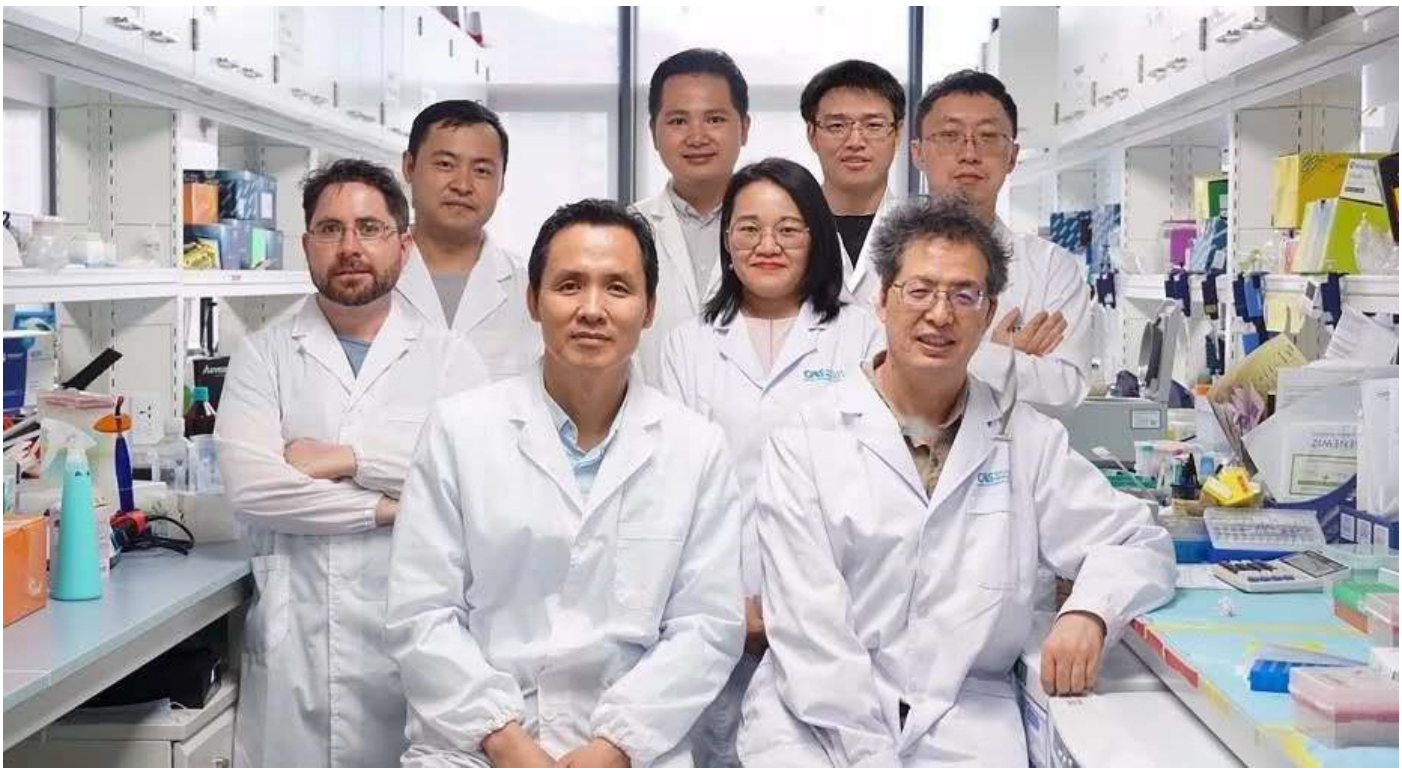


Photo of Quentin Montardy (first from left) and his Chinese colleagues from the Brain Cognition and Brain Disease Institute.
[IMAGE: SHENZHEN INSTITUTES OF ADVANCED TECHNOLOGY, CAS]

From Europe to China: Learning a new scientific culture with CAS

Name: Quentin Montardy
Project Number: 2017PB0090
Duration of stay in China: 2017-01-01 to 2018-12-31

A few years ago, I arrived in China from Europe (France) as a young post-doc, without really knowing how the research work was in China. This country and the working methods here have been very surprising to me. The methodological differences have been a real re-initiation to science, an opening towards another way of proceeding and improving science that has deeply enriched me. Several years later, and with this dual scientific culture, I finally had the opportunity to apply for the PIFI scholarship.

I was extremely happy and honored to be able to obtain it, and thus to participate even more formally in the work of CAS. Indeed, CAS has been an exceptional host for me, bringing me not only knowledge and a working framework, but also responsibilities and resources that I could never have had elsewhere. I am very grateful to the organization for this. This work that I have just completed under the PIFI umbrella was obviously not done alone: I had the help and support of precious Chinese collaborators, now friends; and the kind guidance of Dr. Wang Liping who taught me a lot.

During all these years I have also had the freedom and responsibility to help our institution build strong international scientific bridges with European laboratories and institutes, which I believe will lead to prolific collaborations. Indeed, CAS includes many very high-quality institutes, and it is important for me to share it and make this known by professors, young doctors, and European students. It is therefore certain that for me, my future scientific future will be with CAS, first of all to pursue most of my research within its institutions, but also to promote high-level scientific collaborations between CAS and European institutions. My identity as a foreign researcher at CAS, my now dual scientific culture, is a specific and strong quality that I wish to share with CAS institutions in the future.

Source: Quentin Montardy

Chinese researchers develop remedy for jellyfish stings

Chinese researchers have found a remedy for jellyfish stings and have transferred the technology to a company in Shanghai to develop products, according to the developer.

Jellyfish stings are relatively common problems for people swimming or snorkeling in the sea. People stung may suffer from severe pain, itching and skin necrosis. Currently, there is no special remedy or treatment.

Researchers from the Institute of Oceanology under the Chinese Academy of Sciences have spent more than ten years researching jellyfish stings. They analyzed the composition, biological activity and mechanism of jellyfish toxins and found a new target for detoxification. They then developed a compound from the co-existing microorganisms of jellyfish that can be used to treat their stings.

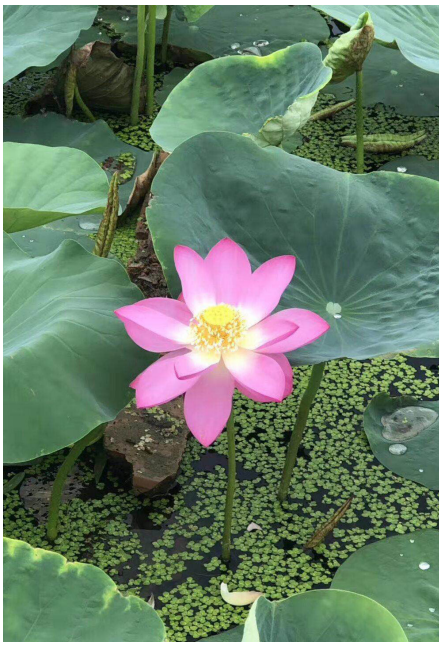
The technology will help enhance responses to jellyfish stings and improve coastal tourism services, according to the institute.

Source: Chinese Academy of Sciences (CAS)

Above:

Before treatment	**3 days after treatment**
• Erythema	• No ache
• Swelling	• No itching
• Ache	• Only marks of sting
• Intolerable itching	

Left: A lotion for jellyfish stings.
[IMAGES: YU HUAHUA]



A hundred-year-old lotus seed wakes up and blooms in the Old Summer Palace.
[IMAGE: THE INSTITUTE OF BOTANY, CAS]

Lotus blossoms from century-old seed

A lotus blossomed on July 7 for the first time in Yuanmingyuan, or the Old Summer Palace, from a seed unearthed in 2017 that had been underground for a hundred years, the Beijing News reported.

In 2017, 11 such seeds were discovered at Jingxiangchi inside the Old Summer Palace during archaeological work. It was the first time that ancient lotus seeds had been found since archaeological excavations were carried out in the Old Summer Palace.

In 2018, the Institute of Botany at the Chinese Academy of Sciences conducted a cultivation experiment on eight of the lotus seeds. Six sprouted, grew leaves, took root and spent the winter in a greenhouse. One flower blossomed on Sunday after it was transplanted at the lotus base in the Old Summer Palace in April.

Researchers used a carbon-14 test to determine the age of the ancient lotus seeds.

A staff member from the Old Summer Palace explained why lotus seeds can sprout, take root and grow leaves after a hundred years underground. One is that the seeds were buried in peat soil, where the temperature is low, humidity is low and microorganisms are few, which are not conditions for sprouting. The other is that as the hard shell of a lotus seed is not permeable by water or air, the lotus seeds were hibernating and their metabolism nearly stopped.

Source: Chinese Academy of Sciences