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LEAD ARTICLE

Wind from the East — Belt & Road cooperation in the eyes of global experts

In Aberdare of Kenya, Chinese and Kenyan researchers are monitoring water quality.
[IMAGE FROM PEOPLE'S DAILY]

I. BELT-AND-ROAD INITIATIVE PROMOTES ECONOMIC AND TECHNOLOGICAL DEVELOPMENT IN THAILAND

(Thailand) ***Dr. Weerapong Pairsuwan***

Joint efforts on the Belt-and-Road Initiative have opened new channels for transfer of Chinese technical outcomes to Thailand, and supported local economic development and technical talent cultivation.

"Thailand and China are close like family members," they are two nations enjoying a long-lasting friendship. Since China launched the Belt-and-Road Initiative, our cooperation has been enhanced in all fields. In terms of technical innovation, joint efforts on the Belt-and-Road Initiative have opened new channels for the transfer of Chinese technology to Thailand, and supported local economic development and tech talent cultivation.

As a frequent visitor to China, I am much impressed by how well China has been doing in the tech arena. I visited the "Eye of Heaven" in

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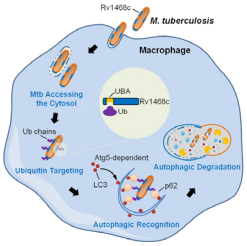
HOT ISSUE

China approves norovirus vaccine for clinical trial

Chinese authorities have greenlit a clinical trial for the world's first tetravalent vaccine against norovirus, the most common cause of viral gastroenteritis. >> PAGE 5

RESEARCH PROGRESS

New findings may lead to new strategy for TB therapy



Tuberculosis (TB) is a chronic infectious disease caused by *M. tuberculosis* (Mtb) and remains a ticklish problem for human health. >> PAGE 7

INTERNATIONAL COOPERATION

CAS enhances cooperation with Pakistan

Zhang Yaping, Vice-President of the Chinese Academy of Sciences, led a delegation to Pakistan in late May. >> PAGE 11

SCIENCE STORY

China, a favorable choice for Asian students

It has been three stressful weeks since Sadyrbek, a Kyrgyz PhD candidate studying in China, became fully consumed with the revision of his doctoral dissertation. >> PAGE 12

NEWS IN BRIEF

Scientists develop primate models for autism research

A joint China-U.S. research team has made new breakthroughs in developing non-human primate models for autism research, paving the way for possible drug discoveries and gene therapy for the disorder. >> PAGE 13

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Guizhou, the world's largest single-dish radio telescope. It is a symbol of the advanced technical strength of China. I have also been to many tech companies in Shenzhen, amazed by the vibrant high-tech community there. Very recently, I was at Shanghai Science and Technology Museum and saw how much China has been investing in technology and how technical outcomes have facilitated people's lives.

Positive achievements have been made in technical cooperation between Thailand and China in recent years. In 2017, Wuhan University, the Geo Informatics and Space Technology Development Agency of the Ministry of Science and Technology of Thailand, and Burapha University signed a memorandum of understanding on the Princess Sirindhorn Dual-Degree Post-graduate Program on Geo Informatics and Space Technology. Dedicated to cultivating high-level global-oriented research talents for Thailand and Southeast Asia, the program has been admitting students since 2018.

In December 2017, the CAS Innovation Cooperation Center in Bangkok was inaugurated. The Thai side views highly the cooperation with the Chinese government on high-tech innovation. Her Royal Highness Princess MahaChakri Sirindhorn has visited CAS many times to promote Thailand-China cooperation and exchanges on microbial technology, rail transportation, plasma technology, and geographic information technology. The CAS Bangkok Center has facilitated tech sharing between our two nations, as its foundation was considered as the beginning of a new chapter of cooperation under the Belt-and-Road Initiative.

In the second Belt and Road Forum on International Cooperation, the Ministry of Science and Technology of Thailand became a co-sponsor of the Belt and Road International Science Organization Alliance. Thailand's technical cooperation with China will be centered on joint labs, tech zones, and technology transfer. The forum will contribute to wider technical cooperation between our two nations and help Thailand and other nations secure a great future.

(Based on an interview with the permanent secretary of Ministry of Science and Technology of Thailand by Lin Rui from People's Daily)

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II. AFRICAN-CHINESE SCIENCE COOPERATION MEETS VISIONS AND GOALS OF BELT-AND-ROAD INITIATIVE

(Kenya) *Robert Gituru*

Through joint development of the Belt-and-Road Initiative, China has offered practical and feasible solutions to some of the most pressing issues faced by Africa and even the world. The African countries look forward to China's sharing of technical outcomes, and more development opportunities enabled by the technology transfer.

In 1999, awarded with a scholarship by the Chinese government, I was enrolled in a doctoral program with College of Life Sciences at Wuhan University. During the three-year program, I worked closely with the Chinese researchers, and we became very good friends. I was much impressed by the selflessness, punctuality, respect for dignity, and strong sense of responsibility of my Chinese colleagues. The research group I worked for in China has discovered new plant species both in Kenya and China.

A bird's eye view of the Sino-Africa Joint Research Center, Chinese Academy of Sciences

In 2013, the Sino-Africa Joint Research Centre was launched at the Jomo Kenyatta University of Agriculture and Technology. As one of the founding members, I have been a witness to the growth momentum brought by research cooperation. It is to our delight that close to 150 young researchers who have worked on our projects have been awarded with full CAS scholarships, just like I was two decades ago. This is how the African-Chinese friendship passes down to younger generations of researchers.

In November 2018, I was invited to the founding ceremony of the Belt and Road International Science Organization Alliance, which is a milestone in China's research collaboration with Africa and the rest of the world. Under the Belt-and-Road framework, remarkable achievements have been made in bio-diversity reservation and utilization, epidemic control, and disaster management and warning.

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In addition to educational efforts, the Chinese researchers have helped households in resource-poor rural areas to increase income. In Makueni, a drought area in eastern Kenya, they used extracts from salvadora persica, also called the "Toothbrush Tree", and developed a new tooth paste product. With the launch of the product, locals have been engaged in larger plantations and gained higher income.

Our cooperation has helped eliminate disease and poverty and promoted growth on the African continent. Through joint development of the Belt-and-Road Initiative, China has offered practical and feasible solutions to some of the most pressing issues faced by Africa and even the world. Successful closing of the second Belt and Road Forum on International Cooperation has contributed to formation of new models of win-win cooperation under the initiative. Chinese President Xi Jinping announced at the forum that China will continue to implement the Belt-and-Road action plan on technical innovation, and work with relevant parties on the four main measures of technical and cultural exchanges, joint labs, tech zone cooperation, and technology transfer. We have been much inspired by this statement. The African nations look forward to China's tech sharing and more growth opportunities that come with it.

Now, I am working with some Chinese researchers, who have travelled far to help us in Africa, for science and technology development in China and Africa. The African-Chinese research cooperation meets the visions and goals under the Belt-and-Road Initiative, which is to work collectively for a great future shared by mankind.

(Based on an interview with the director on the African side of the Sino-Africa Joint Research Center by Lv Qiang from People's Daily)

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III. CHILEAN-CHINESE COOPERATION IN ASTRONOMY EMBODIES SILK ROAD SPIRIT

(Chile) ***Guido Garay***

Cooperation between the Chilean and Chinese astronomers across the southern and northern hemispheres shows close partnership between the two nations in astronomy-related areas. The cooperation embodies the Silk Road spirit of peace and cooperation, openness and inclusiveness, mutual learning and mutual benefit at its core.

In early March, the Chilean-Chinese free-trade upgrade agreement came into effect, a highlight in China-Latin America cooperation under the Belt-and-Road Initiative.

The Chilean-Chinese cooperation under the initiative is represented by technical programs, in particular in astronomy-related areas, in addition to projects in politics, economy, and culture. In 2012, the two nations signed a technical cooperation agreement, which was proceeded by the establishment of the CAS South America Center for Astronomy ("CASSACA" or "the Center"). Situated in the Atacama Desert in northern Chile, a place with outstanding astronomical observation conditions, the CASSACA helps to realize un-interrupted observation, as well as exchanges, integration and complementation of observation results when working with the Chinese counterparts.

Relying on the CASSACA, positive research results have been achieved in astronomic cooperation. The Center has facilitated research exchanges and cooperation, facilitated team-building on specific research topics, and launched multiple projects in relevant areas. In 2016, the National Astronomical Observatories, CAS and the Pontifical Catholic University of Chile entered into an agreement to set up an observatory in northern Chile. Now, the observatory is under construction. Additionally, the Center, in collaboration with CONICYT, offers the "China-Chile Post-doctoral Fellowship Program in Astronomy", which is now recruiting world-wide. The program is a global representative brand that receives wide recognition in the academic world. I also have post-doctors from China working on my research projects, and quite enjoy our effective and delightful cooperation.

In 2016, as a representative project of the CAS National Astronomical Observatories in Chile, the CASSACA was recognized as a "global research organization" by the Chilean government. Along with this recognition, the Center has been eligible to enjoy preferential policies from the government.

At the second Belt and Road Forum on International Cooperation, China announced plans for multiple tech projects with Belt-and-Road nations. The University of Chile has been a co-sponsor of the Belt and Road International Science Organization Alliance. After the forum, we look forward to wider technical cooperation between China and Chile.

(Based on an interview with the deputy director of the School of Astronomy of University of Chile by Chen Xiaowei from People's Daily)

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IV. GREATER DEVELOPMENT OPPORTUNITIES AND CO-OPERATION PLATFORM FOR SOUTH ASIAN COUNTRIES

(Nepal) ***Binod Dawadi***

Under the cooperation framework of the joint Belt-and-Road Initiative, relying on the CAS Kathmandu Science and Education Center, research cooperation between China and South Asia has made multiple achievements. Our cooperation has been consistent with the cooperation and win-win concepts of the Belt-and-Road Initiative.

Located in the southern end of the Himalayas, Nepal is known for its complex geographical conditions, changing climates, and frequent earthquakes. As the Nepalese research in land resource management and ecological environment protection is relatively outdated, the Belt-and-Road Initiative has provided opportunities and platform for us to explore cooperation in sciences and education.

Thanks to the cooperation framework under the initiative, Nepalese-Chinese cooperation has been on a fast trajectory. In August 2015, the CAS and Tribhuvan University jointly established the CAS Kathmandu Science and Education Center, which aims to work with research institutes in the region on issues relevant to climate change, ecological environment, biological diversity, and geographical disasters. Over the years, China has helped Nepal train a number of researchers, which has significantly driven up research capacity of Nepal, and brought us closer to the world's research frontier in relevant fields.

I myself obtained a doctoral degree from the CAS, and learnt a lot from the Chinese scientists when I studied in China. In 2016, I joined the CAS Kathmandu Science and Education Center. As its deputy head, I saw for myself how fast our cooperation in technology and education has progressed.

Starting in 2016, the Center has sent Nepalese students to study with Chinese universities and research centers. It offers post-graduate scholarship at Tribhuvan University to incentivize research by students and provide training opportunities for young scientists. Tribhuvan University joined the Belt and Road International Science Organization Alliance as one of the first members, which is a milestone for Nepal to participate in global research cooperation.

Under the cooperation framework of the joint Belt-and-Road initiative, relying on the CAS Kathmandu Science and Education Center, research cooperation between China and South Asia has made multiple achievements. Working with Chinese scientists, scientists from Nepal, Pakistan and Bangladesh have conducted a dozen joint scientific projects and achieved high-end outcomes. In the aftermath of the 2015 Nepal Earthquake, China sent an earthquake investigation and assessment group to facilitate local authority's decision-making in earthquake relief and restructuring. In 2016, the center sent a scientist group to Annapurna to promote the sitting of the monsoon-vegetation-environment monitoring section.

Thanks to the platform of the CAS Center, China has been working with researchers and educators in Nepal and other South Asian nations to support regional development. Our cooperation has been consistent with the cooperation and win-win concepts of the Belt-and-Road Initiative.

At the second Belt and Road Forum on International Cooperation, China announced plans for joint tech programs with Belt-and-Road nations, indicating China's intention to share with relevant nations its innovative outcomes. It is expected that Nepal and other South Asian nations will enjoy greater development opportunities and cooperation platforms from the initiative.

(Based on an interview with the deputy head of the CAS Kathmandu Science and Education Center by Yuan Jirong from People's Daily)

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V. COOPERATION WITH CHINA DRIVES RESEARCH CAPACITY IN SRI LANKA

(Sri Lanka) ***Prof. Tilak Priyadarshana***

At the second Belt and Road Forum on International Cooperation, participants reached consensus on promoting higher quality projects under the Belt-and-Road Initiative. It is expected to bring more growth opportunities to Sri Lanka and the South Asian region.

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China approves norovirus vaccine for clinical trial

Chinese authorities have greenlit a clinical trial for the world's first tetravalent vaccine against norovirus, the most common cause of viral gastroenteritis.

The vaccine received a clinical research permit from the National Medical Products Administration on May 30, its developer, the Institut Pasteur of Shanghai (IPS) under the Chinese Academy of Sciences, announced at a press conference Tuesday.

The highly contagious and sometimes deadly norovirus afflicts about 685 million people worldwide annually with gastroenteritis and has increasingly emerged as a public health issue in China.

The vaccine, after four years of development, can theoretically prevent 80 to 90 percent of norovirus infections, also known as "stomach flu", said Huang Zhong, who leads the project at IPS.

Development of a vaccine for the norovirus has proved elusive as traditional strategies of inactivation and attenuation fail because the virus cannot be cultured in vitro on a large scale. This was further complicated by the virus's many genotypes, regional variations and its propensity to mutate, according to Huang.

The clinical trial is expected to last for five years before the vaccine can apply for new drug registration, which once in place will benefit norovirus prevention in both China and abroad, said Tang Hong, a researcher with the IPS.

The vaccine was jointly developed by the IPS and Anhui Zhifei Longcom Biopharmaceutical Co. Ltd.

Source: Xinhua

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Situated at the crossroad of the east-west transport network of the Indian Ocean, Sri Lanka was once a key stop along the ancient on-shore Silk Road and maritime Silk Road. We enjoy a long friendship with China, as one of the first South Asian nations to support the development of the 21st century maritime Silk Road. As a nation, our support of the Belt-and-Road Initiative has helped us gain domestic economic growth.

In 2015, under the framework of the Belt-and-Road Initiative, the China-Sri Lanka Joint Science and Education Center was established in Colombo. I was lucky enough to be part of the whole process, and a witness to substantive outcomes of bilateral cooperation in science and education under the initiative.

Relying on the center, technical cooperation has been fruitful. Sir Lanka and China jointly established a real-time monitoring network on maritime environment in the southern Sri Lanka nearshore to facilitate root cause analysis of marine disasters, weather forecasting, and shipping guarantees in nearshore Sri Lanka. More than that, scientists from both nations have set up a marine weather forecast system in Sri Lanka. It has been used in the fishing industry as well as disaster prevention and relief, and is widely recognized by the fishery authorities. More projects are in the pipeline or under construction.

Since 2016, the Center has been admitting Sri Lankan students jointly with Chinese universities and research institutes. Over the years, China has trained a number of researchers for us. Many of them have returned home to work for the nation on important roles. In June 2018, the first Sri Lankan post-graduate student enrolled to the South China Sea Institute of Oceanology of CAS graduated from the institute with excellent performance. He now works as a senior technical expert jointly employed by the China-Sri Lanka Joint Science and Education Center and the University of Ruhuna.

Cooperation is driving the nation's research capacity forward to the world's frontier, thanks to the Belt-and-Road Initiative. At the second Belt and Road Forum on International Cooperation, participants reached consensus on promoting higher quality projects under the Belt-and-Road Initiative. It is expected to bring more growth opportunities to Sri Lanka and the South Asian region.

(Based on an interview with the head of the China-Sri Lanka Joint Science and Education Center by Yuan Jirong from People's Daily)

Source: People's Daily

Giant balloon to garner climate data

Jimu-1, a helium-filled tethered balloon, was launched on May 23 and will reach a record altitude of 7,003 meters. [IMAGE FROM CHINA DAILY]

Chinese scientists launched Jimu-1, a giant aerostat or helium-filled tethered balloon, on May 23 to observe atmospheric water vapor at a record altitude of 7,003 meters in the Nam Co region of the Qinghai-Tibet Plateau.

Unlike a blimp, which is powered and steerable in the air, Jimu-1 is essentially a super-sized balloon with a volume of 2,300 cubic meters. It is made of a composite fabric that can withstand temperatures as low as - 70°C. It is the first time an aerostat of its class and weight has operated at such an altitude.

Jimu-1 is the first of three Chinese made aerostats that will be tasked with collecting more accurate atmospheric data to be used in studying climate change and sustainable development in the region, according to the Aerospace Information Research Institute of the Chinese Academy of Sciences, the balloon's manufacturer and operator.

Jimu-2, which is expected to be completed next year, will operate at an altitude of around 7,000 to 7,500 meters, said Li Zhaojie, director of the academy's Center for Lighter than Air System Research and Development.

Jimu-3, scheduled to be finished in 2021, will be a "state-of-the-art model" that will reach an altitude of more than 8,848 meters, greater than that of Mount Qomolangma, he said, adding this will be a monumental feat that will push the limits of engineering given its technical difficulties and scientific value.

Gao Jing, a professor at the academy's Institute of Tibetan Plateau Research, said ground-based instruments are generally used to observe atmospheric data such as water vapor, methane and dust, but they are too far away to examine moisture transport and environmental changes at high-altitude, or to assess their impact on human activities.

"But with Jimu, we can carry all sorts of instruments to various heights and collect data directly," she said. "This gives scientists a brand-new view of atmospheric moisture transportation processes and regional climate change."

The aerostat's size and design allows it to carry a heavier payload and have a greater resistance to the elements than a typical weather balloon, Li said. "This resistance is critical for the balloon's application since the weather conditions and the electromagnetic environment on the plateau can be very harsh and complex."

The Qinghai-Tibet Plateau is dubbed the "third pole". It is the source of many Asian rivers, including the Yangtze, Yellow, Indus and Mekong, as well as the natural habitat of rare animals, including Tibetan antelopes, wild yaks and black-necked cranes.

However, the effects of climate change are threatening the plateau's fragile ecosystem, which can have a profound impact on the region and the world. "This monitoring will allow us to have a better understanding of the water cycle and its influence on the ecosystem," Gao said.

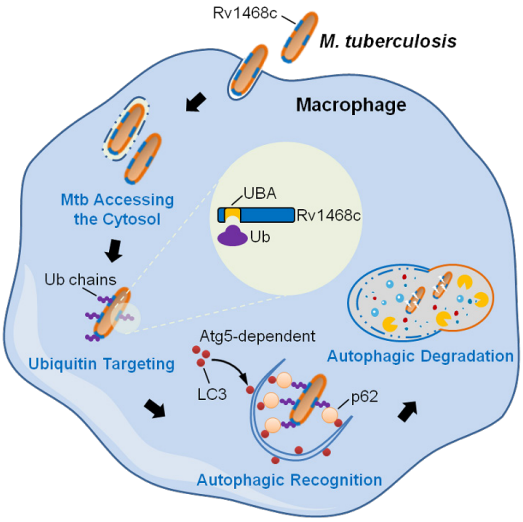
Source: China Daily

New findings may lead to new strategy for TB therapy

Tuberculosis (TB) is a chronic infectious disease caused by *M. tuberculosis* (Mtb) and remains a ticklish problem for human health. According to report from the World Health Organization (WHO), about 10.0 million people were estimated to have fallen ill with TB and 1.3 million people to have died from it in 2017 (WHO, 2018). Mtb is a successful intracellular pathogen that employs multiple strategies to subvert host cellular functions for immune evasion, thus ultimately promoting their prolonged intracellular survival. On the other side, there is also a range of immune mechanisms adopted by the host to defend against invading mycobacteria. Such interaction and antagonism between the pathogen and the host continues throughout the whole period of Mtb infection, and has a profound impact on the course and outcome of TB disease.

Dr. Liu Cuihua's group has been investigating the molecular mechanisms underlying Mtb-host interactions. Previous studies from her group revealed that a variety of effector proteins (such as PtpA and a number of Mce family proteins) delivered by Mtb could modulate host innate immunity to promote the intracellular survival of mycobacteria (*Nature Immunology, 2015; Nature Communication, 2017; Cellular & Molecular Immunology, 2018; The Journal of Immunology, 2015; Cellular Microbiology, 2017*). They also discovered a host restriction factor, TRIM27, which restricts intracellular survival of mycobacteria but is antagonized by MtbPtpA (*Scientific Reports, 2016*). Those studies revealed the mutual antagonism between Mtb and host innate immune defense, and provided potential targets for the development of anti-TB treatments based on pathogen-host interacting interfaces.

Recently, it has emerged that ubiquitin-mediated xenophagy plays an important role in host immune defense against intracellular pathogens including Mtb. However, the exact mechanism by which host ubiquitin targets invaded microbes to trigger xenophagy remains vague. Previous studies from Liu's group found that the mycobacterial effector protein PtpA contains an ubiquitin-interacting motif-like (UIML) region for host ubiquitin binding and innate immune suppression, which discovery prompted them to wonder whether there are certain Mtb surface proteins that could directly bind to host ubiquitin for triggering xenophagy-mediated bacterial clearance. In their efforts to search for novel potential ubiquitin-binding proteins from Mtb, they identified a eukaryotic-like ubiquitin-associated (UBA) domain-containing Mtb surface protein Rv1468c. Interestingly, rather than being ubiquitinated by E3 ubiquitin ligases, Mtb Rv1468c could directly bind to host ubiquitin through UBA-dependent interaction, which is followed by recruitment of autophagy receptor p62, leading to the engulfment of mycobacteria into LC3-associated autophagosomes for Atg5-dependent autophagic clearance. Mutation of Rv1468c UBA domain to subvert its interaction with ubiquitin impairs host xenophagic clearance of Mtb in macrophages, and elevates bacterial loads in mice with enhanced inflammatory responses. This study uncovers a previously unrecognized role of ubiquitin as an innate immune trigger that binds to the pathogen surface protein to evoke host antimicrobial autophagy, and indicates a novel "diplomatic" strategy adopted by Mtb to benefit its prolonged intracellular survival via maintaining optimized intracellular bacterial loads to avoid excessive host inflammatory responses.



Schematic model showing mechanisms by which host ubiquitin directly binds to Mtb Rv1468c for triggering antibacterial xenophagy.

The paper entitled "A Mycobacterium tuberculosis surface protein recruits ubiquitin to trigger host xenophagy" has been published online in *Nature Communications* with Chai Qiyao as the first author and Dr. Liu Cuihua as the corresponding author.

Full text links: https://rdcu.be/bzs8B

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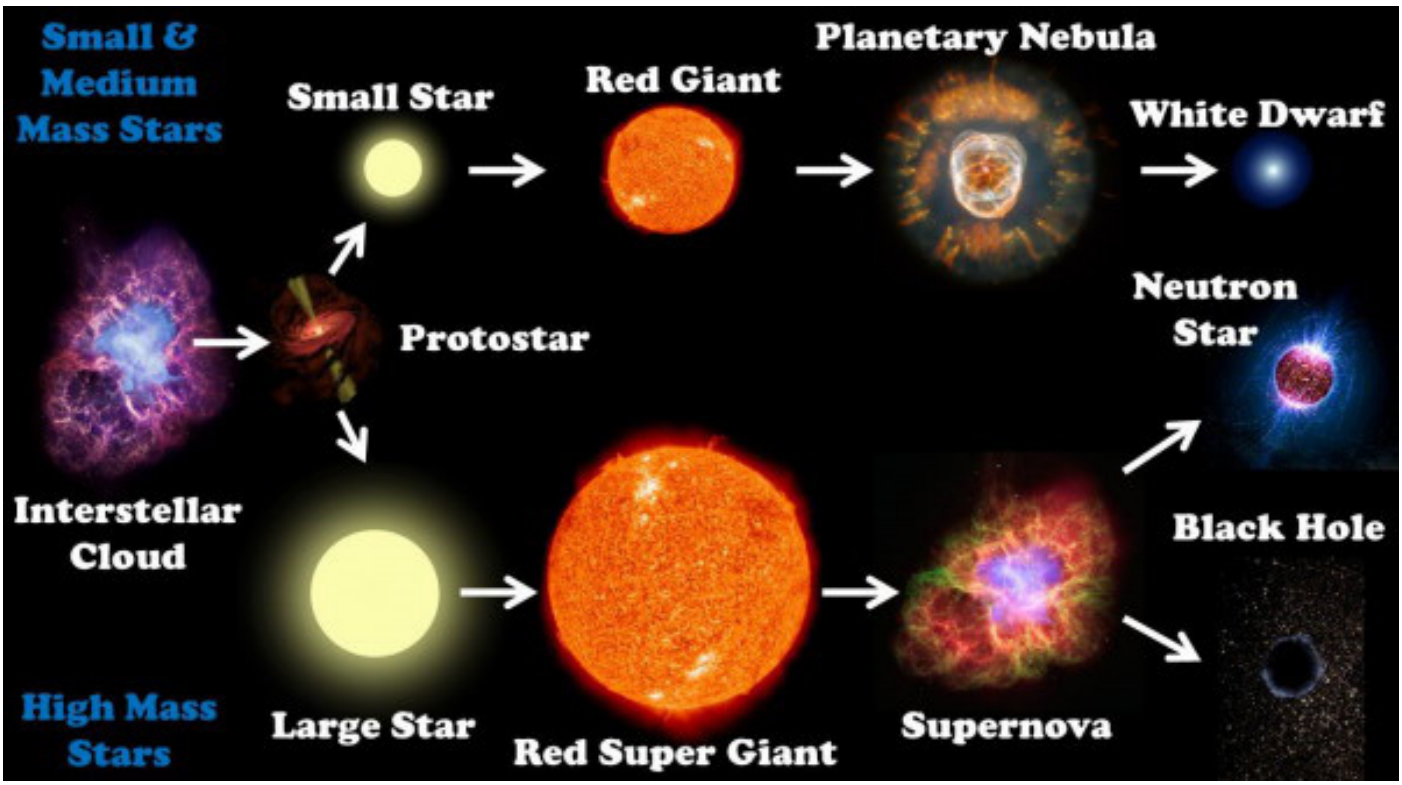
Source: Institute of Microbiology, CAS



Life cycle of stars [IMAGE FROM THE INTERNET]

6.6 Billion light years away: neutron stars merger radiance observed

On April 11, 2019, an international team led by Professor Xue Yongquan from the University of Science and Technology of China (USTC) announced their observation of a unique X-ray signal from 6.6 billion light years away, which is highly likely powered by a magnetar, the aftermath of a binary neutron star merger. This discovery was published in *Nature*.

Neutron stars are some of the most miraculous objects in the universe, yet our grasp of their physics is still fuzzy. For years, astronomers wondered about what is the ending of a binary neutron star merger system. Many advocated for its becoming a black hole, while some believed that a magnetar would be formed.

The answer was finally revealed by the universe itself. The X-ray transient captured by the group, lasting for 7 hours, gave researchers evidence about the formation of magnetar. Duration is the key -- if the transient were powered by a resulting black hole, it could shine for only seconds.

A portrait of Xue Yongquan. The background panels show his research interests: mysterious magnetars, the active galactic nucleus and the 7Ms Chandra Deep Field-South survey. [IMAGE BY SHENG ZHENFENG]

The group also observed that the X-ray transient lies in the outskirts of its host galaxy, like binary neutron star systems usually do, since they are usually kicked away from the center after supernova explosions. This can be taken as supporting evidence that the X-ray transient is indeed powered by a binary neutron star merger.

Meanwhile, researchers calculated the event rate density of similar X-ray transients. The result is consistent with the neutron star merger event rate density robustly inferred from the gravitational wave detection of a binary neutron star merger in 2017.

"The discovery of this new X-ray transient is highly intriguing. Particularly exciting, due to the discovery being

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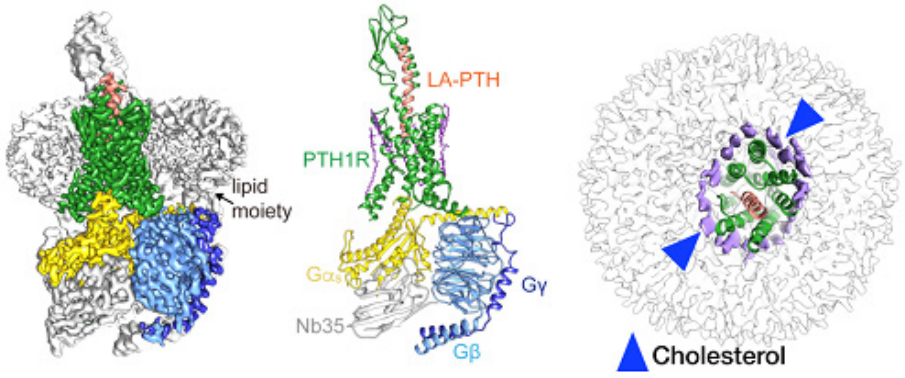
A Major breakthrough in structural and functional studies of human parathyroid hormone type 1 receptor

Scientists at the Shanghai Institute of Materia Medica, Chinese Academy of Sciences, led by Xu Huaqiang (also known as Huaqiang Eric Xu) and Wang Mingwei, in collaboration with their counterparts at Zhejiang University School of Basic Medical Sciences led by Zhang Yan and the University of Pittsburgh School of Medicine (USA) led by Jean-Pierre Vilardaga, revealed a near-atomic resolution cryo-electron microscopy (cryo-EM) structure (3.0A) of the human parathyroid hormone type 1 receptor (PTH1R) bound to a long-acting parathyroid hormone (PTH) analog and the stimulatory G protein.



Cryo-EM structure of the human parathyroid hormone receptor-1 signaling complex. (Left, cryo-EM map; middle, structure of the complex represented by ribbon model; right, high resolution cryo-EM map revealed an ordered annular lipid belt wrapping the periphery of the receptor TMD. Green, human parathyroid hormone receptor-1 (PTH1R); orange, long-acting parathyroid hormone (LA-PTH); yellow, Ga; cyan, Gβ blue, Gy; grey, Nb35)

The finding was published on April 12, 2019 in *Science* titled "Structure and dynamics of the active human parathyroid hormone receptor-1". It provides valuable insights into the structural basis and dynamics of PTH binding and long-term activation of the receptor, thereby laying a solid foundation for discovering novel therapeutics against osteoporosis, hypoparathyroidism, cachexia and other diseases.

PTH is a classic endocrine hormone identified over 80 years ago which plays critical and distinct roles in skeletal development, calcium homeostasis, and bone turnover. The functions of PTH are mediated primarily through binding and activation of PTH1R, a member of the class B G protein-coupled receptor (GPCR) subfamily. As a well-recognized drug target for osteoporosis, PTH1R is highly expressed in bone and kidney cells where it exerts regulatory action in calcium and phosphorus metabolism. Analogs of PTH (such as Teriparatide acetate) are presently used in the clinic to treat osteoporosis.

Previous studies have speculated that endogenous ligand binds and activates class B GPCR through a "two-step" model: the carboxyl terminal of the ligand first binds the extracellular domain (ECD) of the receptor, and then, its amino terminus inserts into the hydrophobic pocket of the transmembrane domain (TMD).

However, how the ligand dissociates from the receptor remains unknown. Parathyroid hormone not only activates its cognate receptor quickly but also dissociates rapidly. Scientists prolonged its residence time on the receptor using a long-acting agonist and subsequently captured the process of ligand dissociation by means of delicate and meticulous three-dimensional classification during imaging analysis.

The flexible ECD of the receptor remains its inherent dynamic characteristic upon ligand binding and exerts two effects on the helical ligand during the continuous movement: (1) it approaches the ligand to produce stress that prompts the ligand unwinding; and (2) it moves away from the ligand to weaken their interaction. The combination of the two leads to initial dissociation of the carboxyl end of the ligand.

This study enhances our understanding of the molecular recognition mechanism of class B GPCRs.

Coordinated by Drs. Xu and Wang, each with different but defined tasks, scientists and graduate students of the above-mentioned four research teams worked diligently and cooperated closely with each other. They overcame major technical hurdles such as low PTH1R expression levels, protein instability and difficulties in receptor-Gs complex formation, and eventually determined

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the three-dimensional structure of a long-acting ligand (LA-PTH) bound to PTH1R-Gs complex.

This structure demonstrates detailed interaction between LA-PTH-bound PTH1R ECD TMD and offers a comprehensive understanding of how PTH1R interacts with a peptide agonist and couples to Gs. It is the first full-length PTH1R structure in an active state and the first three-dimensional GPCR structure under long-term activation.

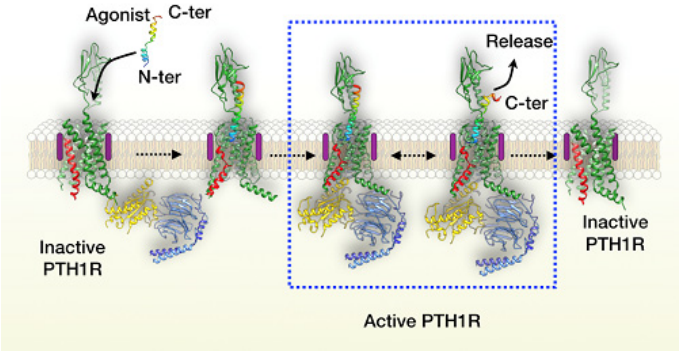
It also reveals the intracellular cyclic adenosine monophosphate (cAMP) signaling mechanism of PTH1R in a prolonged active state. Due to the high resolution (3.0A) of this complex, the scientists unexpectedly discovered the extensively ordered lipid distribution around the TMD which may increase conformational stability of the receptor.

This joint research "campaign" was organized by four team leaders with complementary expertise, and all of them have long been involved in structural and functional studies of class B GPCRs. Dr. Xu resolved the structure of the peptide-bound PTH1R ECD; Dr. Wang co-led the determination of crystal structures of TMD and full-length glucagon and glucagon-like peptide-1 receptors; Dr. Zhang specializes in macromolecule structural analysis using cryo-EM techniques; and Dr. Vilardaga is a renowned expert in PTH. With the spirit of collaboration and resource-sharing, Chinese and American scientists maximized each other's strengths and took only a little over a year to conquer this global-scale scientific challenge, providing the best structural resolution among all class B GPCRs.

Dr. Zhao Lihua and Ma Shanshan (PhD candidate) from the Shanghai Institute of Materia Medica, Dr. Shen Dandan from Zhejiang University and Dr. Ieva Sutkeviciute from the University of Pittsburgh are the four co-first authors of this paper. Contributing institutions also include the Van Andel Research Institute (U.S.A.), Fudan University and Harvard Medical School (U.S.A.).

The work was funded by the Chinese Academy of Sciences, the National Natural Science Foundation of China, the Ministry of Science and Technology of China, the National Health Commission of China, the National Institutes of Health (NIH, U.S.A.), the Shanghai Municipal Commission of Science and Technology, the Fudan-SIMM Joint Research Fund, the Novo Nordisk-CAS Research Fund and several career development grants from China and the United States (such as the Youth Innovation Promotion Association of the Chinese Academy of Sciences).

The paper link: https://science.sciencemag.org/content/364/6436/148



Proposed model of the human parathyroid hormone receptor-1 activation. Human parathyroid hormone receptor-1 (PTH1R) in green with transmembrane domain 6 (TM6) in red. Agonist is colored by rainbow, N- to C-terminal (N-ter and C-ter, respectively), blue to red. Peptide agonist binds to PTH1R and induces the outwards movement of TM6. GDP-bound Giheterotrimer engages the receptor. Compared with the transmembrane domain (TMD) of the receptor, extracellular domain (ECD) is wobbling around the agonist helix, leading to the separation of the peptide C-terminus from ECD and the unwinding of the helix in the C-terminal half of peptide. Subsequently, the agonist fully dissociates from the receptor.

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(Credit: Wang Mingwei; Editor:Pan Peihua)

Source: Institute of Materia Medica,CAS

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made by Chandra with its excellent spatial resolution, is the ability to identify the host galaxy," one reviewer of this paper said.

This discovery has profound implications for understanding the state of extremely dense nuclear matter. It helps rule out a series of theoretical nuclear matter models which are inconsistent with the observations, thus providing new insights into the physics of neutron stars.

(Written by Wu Qiran, edited by Shi Xiao, Hu Dongyin, USTC News Center)

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Source: News Center, University of Science and Technology of China

CAS enhances cooperation with Pakistan

Zhang Yaping, Vice-President of the Chinese Academy of Sciences, led a delegation to Pakistan in late May.

During his visit he met with the President of the Pakistan Academy of Sciences, Mohammad Qasim Jan, Pakistan's science and technology minister Chaudhry Fawad Hussain, and Tariq Banuri, chairperson of the country's Higher Education Commission (HEC).

Zhang introduced basic facts about CAS and the progress of cooperation on research and education between CAS and science and technology circles in Pakistan and called for further cooperation under the framework of the Alliance of International Science Organization (ANSO).

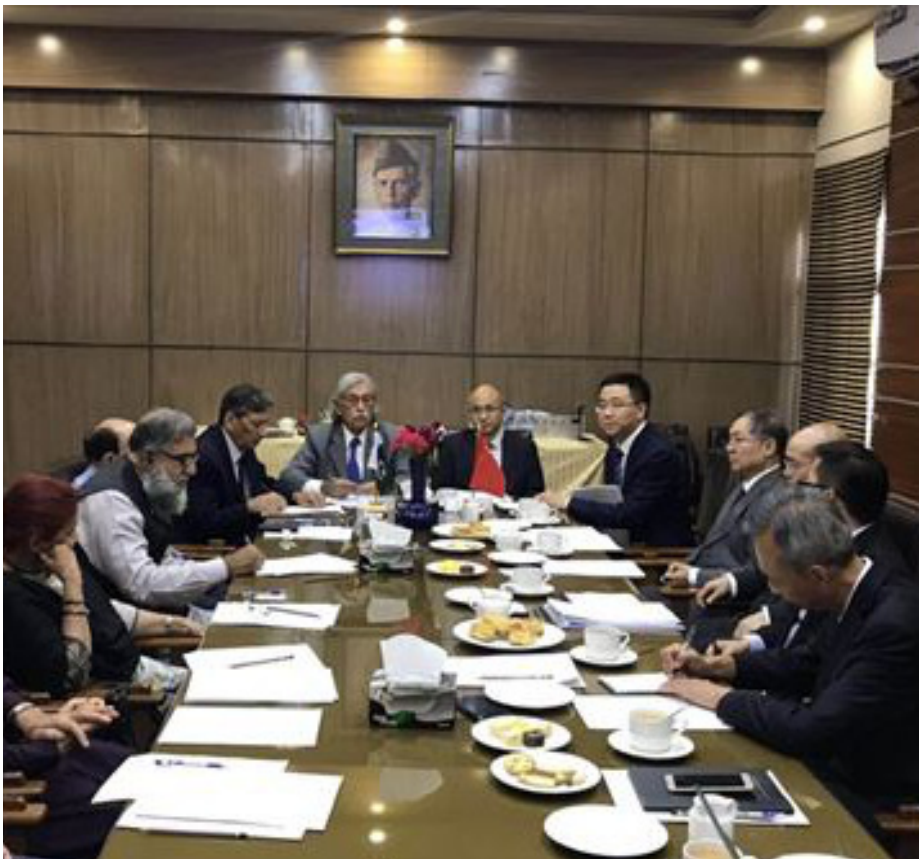
He stressed that efforts should be made to build the China-Pakistan Geoscience Research Center and support the Belt and Road Initiative and the construction of the China-Pakistan Economic Corridor.

The participating Pakistani research institutions appreciated CAS's long-term attention to cooperation on research and education with Pakistan and supported the cooperation proposal put forward by China.

Mohammad Qasim Jan, said that his academy felt honored to be a member of the ANSO Management Committee, adding that the ANSO is unlike other international scientific and technological organizations.

He also suggested that ANSO members hold more seminars to discuss and implement cooperative research projects.

Chaudhry Fawad Hussain advised that the two sides should further strengthen cooperation in information and water technology. He also suggested that the Pakistan Science Foundation sign a cooperation agreement with CAS to fund bilateral scientific research projects.



The delegation meets with the President of the Pakistan Academy of Sciences, Mohammad Qasim Jan.

Banuri said that Pakistan attaches great importance to cooperation with China in the construction of the Geoscience Research Center, which he believes will "significantly" expand the global presence of Pakistan's science and education institutions and improve the country's ability to cope with climate change.

Pakistan has already decided on the land for construction and plans to set up a task force with China to accelerate building of the center, Tariq Banuri noted.

The CAS delegation visited the land for the China-Pakistan Geoscience Research Center at Quaid-i-Azam University.

The delegation also met with Chinese Ambassador to Pakistan Yao Jing and executives of Chinese enterprises in Pakistan, briefing them on the progress and plans of cooperation between CAS and Pakistan.

Zhang was invited by the Chinese Embassy in Pakistan to make a report on CAS's scientific and technological cooperation with the countries and regions involved in the Belt and Road Initiative.

Source: The Bureau of International Cooperation, CAS

China, a favorable choice for Asian students

It has been three stressful weeks since Sadyrbek, a Kyrgyz PhD candidate studying in China, became fully consumed with the revision of his doctoral dissertation.

Born in the northern Kyrgyz town of Talas, Sadyrbek has spent five years studying in Urumqi, capital of northwest China's Xinjiang Uygur autonomous region.

"At the moment, every minute counts," he said.

Sadyrbek lost his father when he was 12. The hard-working young man did not fail his father's last wish and was enrolled in Kyrgyz National University to study geography.

Fond of Bruce Lee's kung-fu movies, he took an optional course in the Chinese language.

"There is a Chinese saying that goes 'Good company on the road is the shortest cut,'" he said. "And one more language brings one more opportunity for me."

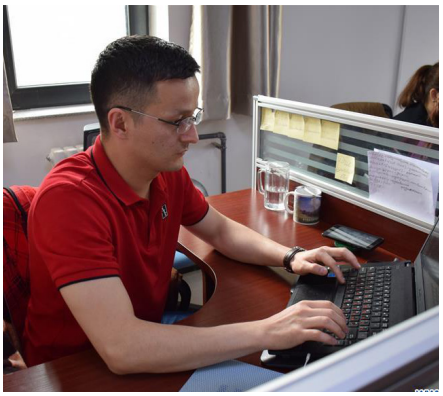
Sadyrbek learned Chinese history, calligraphy, traditional culture and martial arts as he studied in Xinjiang Normal University for his master's degree. The days he has spent in Xinjiang have deepened his understanding of China, which first impressed him with its products sold in his home country.

"The rich history and culture are what's behind China's rapid growth," he said.

Geographical proximity has brought a growing number of students from Central Asia to Xinjiang. A total of 55 Central Asian students -- 32 doctors and 23 in master's programs -- have graduated from the Xinjiang Institute of Ecology and Geography of the Chinese Academy of Sciences, where Sadyrbek currently studies.

Furkat, who comes from Tajikistan and also studied in the institute, prefers to learn more about China by traveling and has already visited many cities across the country.

Sadyrbek, a Kyrgyz PhD candidate studying in China, goes by bike to the Xinjiang Institute of Ecology and Geography of Chinese Academy of Sciences in Urumqi, northwest China's Xinjiang Uygur autonomous region, on June 11, 2019. [PHOTO FROM XINHUA]



Sadyrbek, a Kyrgyz PhD candidate studying in China, revises his doctoral dissertation at the office of the Xinjiang Institute of Ecology and Geography of the Chinese Academy of Sciences in Urumqi, northwest China's Xinjiang Uygur autonomous region, on June 11, 2019. [PHOTO FROM XINHUA]

He chooses a Chinese gift for his girlfriend in Tajikistan every year to give her when he returns, and she has fallen in love with traditional Chinese paintings and tea.

"She also wants to study in China," Furkat said.

Statistics from China's Ministry of Education show that the country has become a popular destination for students from other Asian countries to pursue their studies, and has swept a growing number of graduates off their feet.

Last year, the country received 492,200 students from 196 countries and regions, 260,600 of whom came from 64 Belt and Road countries, accounting for 52.95 percent of the total.

There are much more diversified choices for international students, with natural science becoming more appealing to them in recent years, the ministry said.

Sadyrbek is interested in the development of tourism in Kyrgyzstan and China and is doing research on social and economic influences.

"I hope to stay here after graduation," he said.

Source: Xinhua

China completes first offshore rocket launch

China successfully launched a rocket from a mobile launch platform in the Yellow Sea off Shandong province on June 5, 2019, sending two technology experiment satellites and five commercial satellites into space.

A Long March-11 solid propellant carrier rocket blasted off at 12:06 p.m. from the mobile platform. It is China's first space launch from a sea-based platform and the 306th mission of the Long March carrier rocket series.

The rocket is also named "CZ-11 WEY" under an agreement between the China Academy of Launch Vehicle Technology, China Space Foundation and a Chinese automobile producer.

Source: Xinhua

A Long March-11 solid propellant carrier rocket is launched from a mobile launch platform in the Yellow Sea off east China's Shandong province, on June 5, 2019. [IMAGE FROM XINHUA]

Scientists develop primate models for autism research

A joint China-U.S. research team has made new breakthroughs in developing non-human primate models for autism research, paving the way for possible drug discoveries and gene therapy for the disorder.

The research was conducted by scientists from the Shenzhen Institutes of Advanced Technology (SIAT) under the Chinese Academy of Sciences, the Massachusetts Institute of Technology (MIT), Sun Yat-Sen University and South China Agricultural University.

Autism is a neuro-developmental disorder with a strong genetic basis. Scientists have identified hundreds of genetic variants associated with autism. Researchers in the study focused on one gene with a strong association called SHANK3.

Through the genome-editing system CRISPR, they engineered macaque monkeys with SHANK3 mutations which showed some behavioral traits and brain connectivity patterns similar to those in humans with these conditions.

The primate model will provide a basis for a deeper understanding of the neurobiological mechanisms of autism and the development of more transformative therapies, according to the research team.

The research was published in the journal *Nature*.

Source: Xinhua