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— CAS HIGHLIGHTS IN 2020

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Learn more

FACILITATING SAMPLING OF SOIL FROM CHANG'E-5 LUNAR MISSION

The Chinese Academy of Sciences (CAS), as one of the initiators, participants and performers of China's lunar exploration project, continues to undertake key tasks in the Chang'e-5 lunar mission. The detector developed by the academy identifies the layered structure of lunar soil and effectively helps with soil drilling and sampling; the panoramic camera completes key operations such as photographing the surrounding area and imaging of the national flag.

The lunar mineral spectrum analyzer carries out full band acquisition at several key positions before and after sampling. The very long baseline interferometry (VLBI) orbit measurement subsystem achieves many key technical breakthroughs, such as simultaneous measurement of multiple detectors and rapid and accurate positioning of the lunar lander.

A total of 1,731 grams of lunar samples arrived safely at the "Lunar Sample Laboratory" of CAS on December 19, 2020. The academy will unseal, prepare, process and distribute the samples in anticipation of early scientific achievements.

MILESTONES OF LUNAR EXPLORATION

1609 — At the end of 1609, Italian astronomer Galileo Galilei drew the world's first sketch of the moon.

1647 — In 1647, German astronomer Johannes Hevelius compiled *Selenographia, or Pictures of the Moon.*

1959 — On January 4, 1959, the Soviet Union launched a lunar probe Luna-1, which went into solar orbit after a 5,995 kilometer fly-by. It was the first human spacecraft that got close to the moon.

On September 12, 1959, the Soviet Union launched Luna-2. This was the first lunar probe to land hard on the moon's surface.

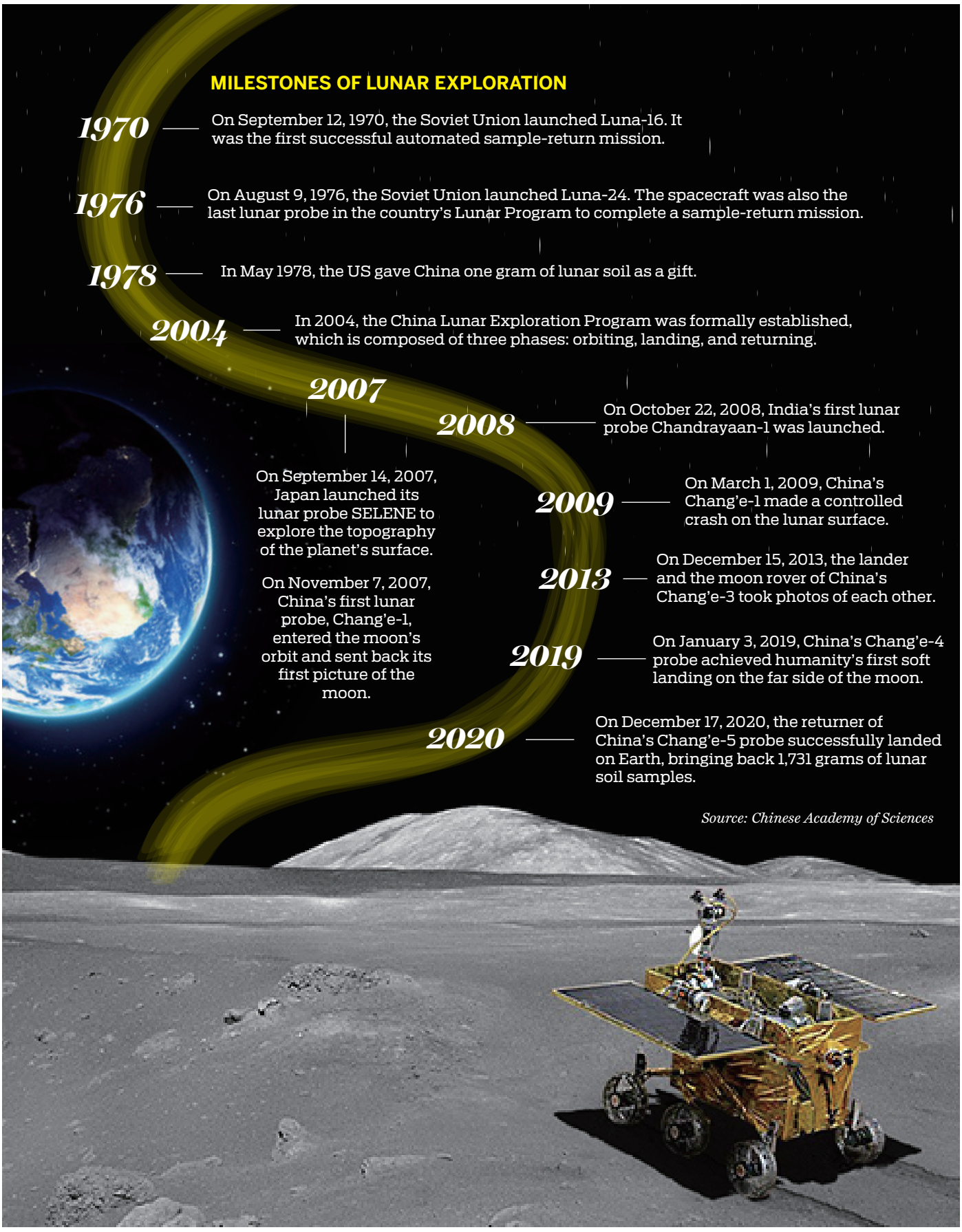
On October 4, 1959, the Soviet Union launched Luna-3. The Luna-3 probe was the world's first spacecraft to photograph the far side of the moon.

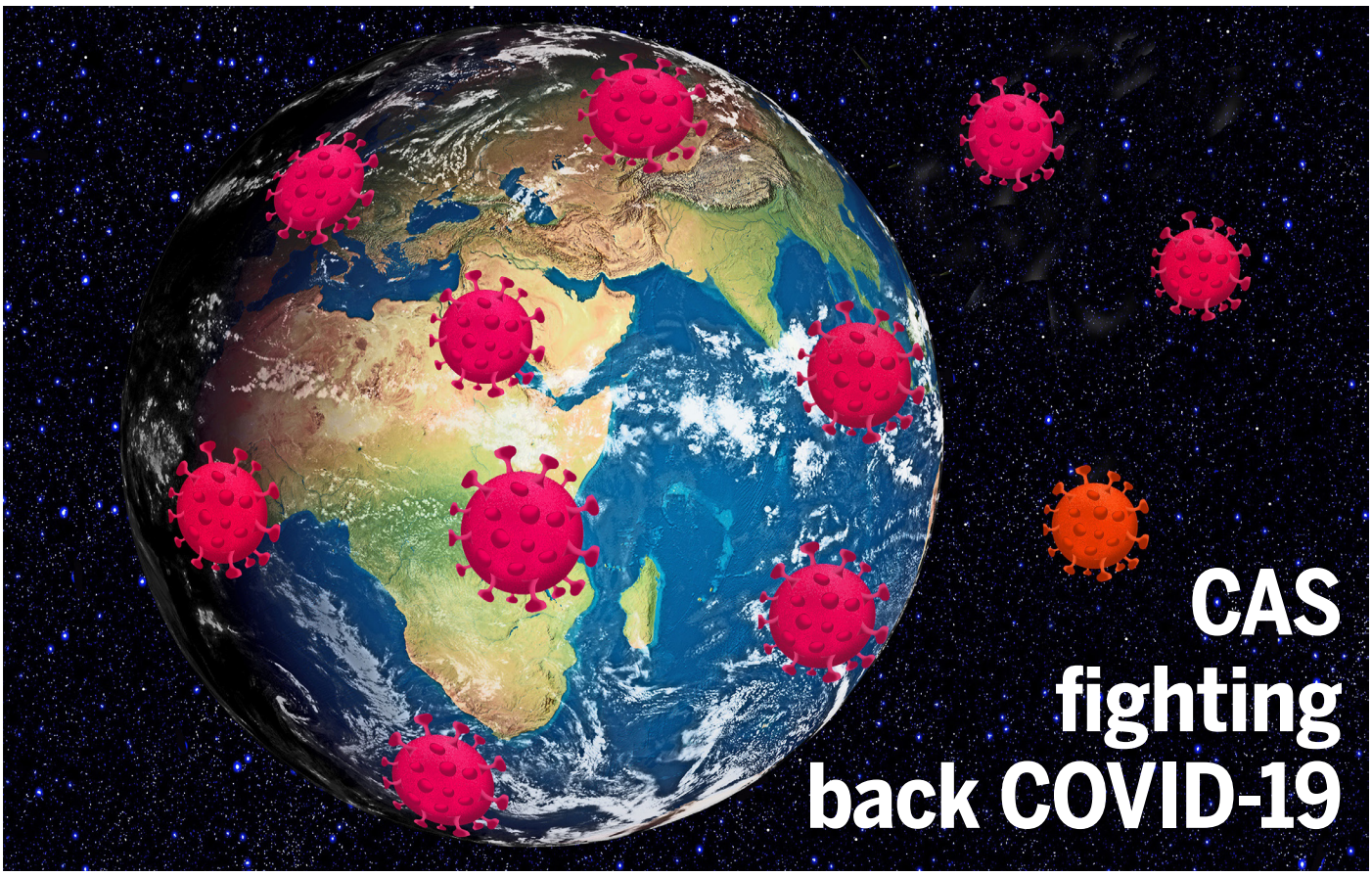
1964 — The Ranger-7 lunar lander launched by the United States delivered the first close-distance imagery of the lunar surface in July 1964.

1966 — The Luna-9 sent by the Soviet Union on February 3, 1966 realized the first successful soft landing on the moon.

1968 — On September 15, 1968, the Soviet Union launched Zond-5 on a circum-lunar flight. The probe was the world's first spacecraft to return to Earth after a circum-lunar flight.

1969 — On July 21, 1969, American astronaut Neil Armstrong became the first person to walk on the moon. That mission collected 21.5 kg of lunar soil samples. By the last lunar landing in 1972, a total of 382 kg of rock had been brought back to Earth.


MILESTONES OF LUNAR EXPLORATION
1970
On September 12, 1970, the Soviet Union launched Luna-16. It was the first successful automated sample-return mission.
1976
On August 9, 1976, the Soviet Union launched Luna-24. The spacecraft was also the last lunar probe in the country's Lunar Program to complete a sample-return mission.
1978
In May 1978, the US gave China one gram of lunar soil as a gift.
2004
In 2004, the China Lunar Exploration Program was formally established, which is composed of three phases: orbiting, landing, and returning.
2007
On September 14, 2007, Japan launched its lunar probe SELENE to explore the topography of the planet's surface.
On November 7, 2007, China's first lunar probe, Chang'e-1, entered the moon's orbit and sent back its first picture of the moon.
2008
On October 22, 2008, India's first lunar probe Chandrayaan-1 was launched.
2009
On March 1, 2009, China's Chang'e-1 made a controlled crash on the lunar surface.
2013
On December 15, 2013, the lander and the moon rover of China's Chang'e-3 took photos of each other.
2019
On January 3, 2019, China's Chang'e-4 probe achieved humanity's first soft landing on the far side of the moon.
2020
On December 17, 2020, the returner of China's Chang'e-5 probe successfully landed on Earth, bringing back 1,731 grams of lunar soil samples.
Source: Chinese Academy of Sciences



When the COVID-19 pandemic broke out in China, the Chinese Academy of Sciences (CAS), using its advantage of multidisciplinary innovation, immediately launched its pandemic emergency response and prevention research project.

It produced a number of important innovations that have been applied to frontline pandemic prevention and control.

CAS was among the first in the world to detect the gene of the virus and to isolate the novel coronavirus strain. It submitted the gene sequence of the virus to the World Health Organization. These efforts helped global scientific community to identify the pathogen that causes COVID-19 and trace the origin of SARS-CoV-2 virus.

The academy's researchers found the molecular mechanism by which the SARS-CoV-2 virus enters cells, which provided a theoretical guidance for developing new targeted therapy for the disease.

Six COVID-19 detection products co-developed by CAS and other parties have been approved by the National Medical Products Administration (NMPA), and 15 products have gained CE certification, a safety requirement for entering the European Union market.

CAS, together with other parties, has developed China's first recombinant protein vaccine approved for clinical trials and the world's first inactivated vaccine approved for phase-III clinical trials.

It has also developed a neutralizing antibody that has been undergoing synchronous phase-I clinical trials in China and the US and has been approved to begin clinical trials by the NMPA and the US Food and Drug Administration (FDA).

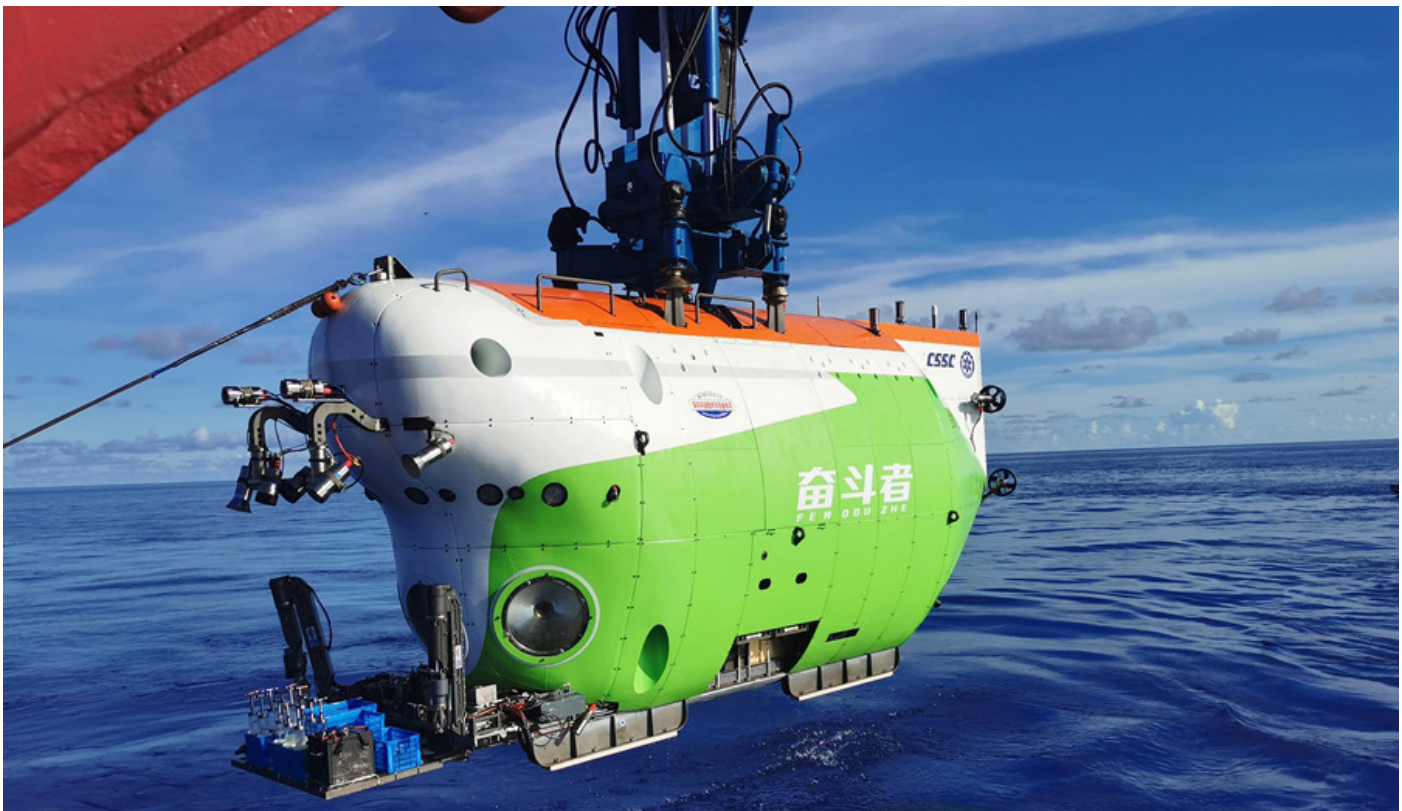
Meanwhile, the academy has made progress in developing new types of vaccines, such as the adenovirus vector vaccine, the mRNA vaccine, the fusion protein vaccine, the adeno-associated viral (AAV) vector vaccine, and the VSV-vectored vaccine.

CAS researchers found that Tocilizumab and Tanreqing (TRQ) injections are effective in treating COVID-19 patients. These two drugs have been included in the Diagnosis and Treatment Protocol for COVID-19.

CAStem injection, which was independently developed by the academy, was also included among the several drugs and herbal formulas approved to treat COVID-19 patients.

In addition, CAS has made important progress in developing diagnostic equipment and a virus information database, and has offered psychological assistance and increased international cooperation in anti-pandemic science and technology.

Source: Chinese Academy of Sciences



Submersible *Fendouzhe* returns after setting new record

China's first full-depth deep-sea manned submersible, *Fendouzhe*, successfully descended into the Mariana Trench, the deepest point of the Earth, reaching a depth of 10,909 meters and setting a new record for Chinese manned deep-diving on November 10. Three *Fendouzhe* divers immediately used the groundbreaking underwater acoustic communication system to talk to audiences around the world.

The *Fendouzhe* is a major deep-sea scientific and technological vessel that has been specially supported by the National Key Research and Development Program of China since 2016. The Institute of Acoustics of the Chinese Academy of Sciences (IACAS) is responsible for its acoustic technology and equipment.

The underwater acoustic communication system is the only link between *Fendouzhe* and its mother ship Tansuo-1 (Exploration), and is able to transmit text, voice, and images in real time from the 10,000-meter seabed to the mother ship.

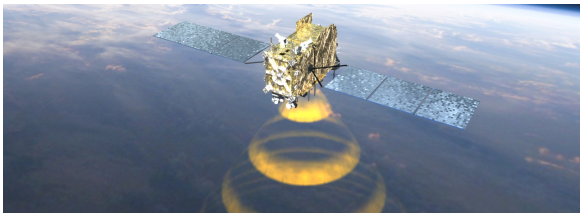
With the help of the integrated navigation system and sonar equipment, the divers in *Fendouzhe* successfully retrieved three underwater samples from the 10,000 meter seabed on November 16 in just half an hour. An image of the sample was transmitted back to the mother ship through the underwater acoustic communication modem.

Source: Global Times

BDS-3 improves timing service

China's BeiDou Navigation Satellite System (BDS-3) has improved its timing service, according to a new study.

Researchers from the National Time Service Center of the Chinese Academy of Sciences analyzed the time transfer performance of BDS-3 signals. Results showed that the time transfer performance of the BDS-3 is over 50 percent higher than that of the BDS-2.

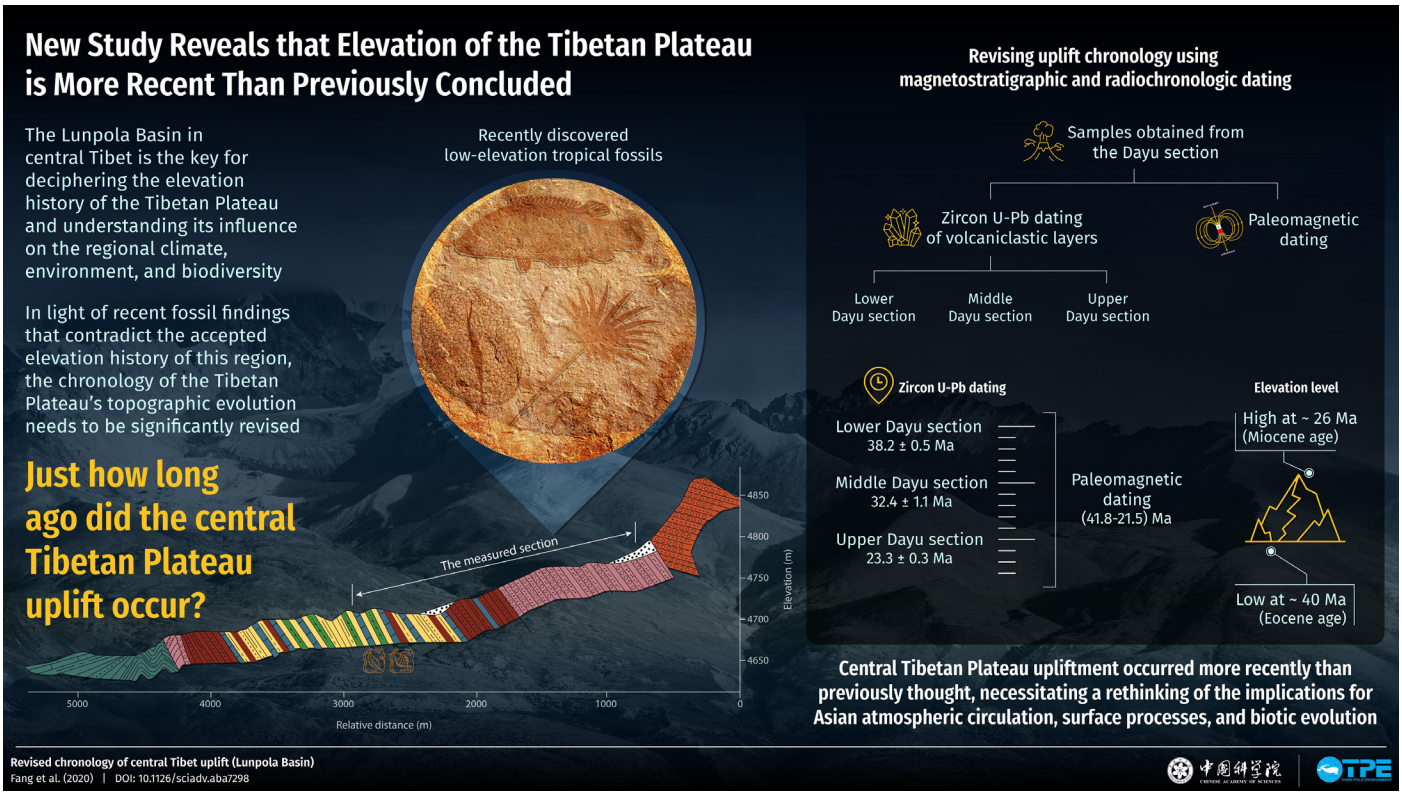


Scientific research equipment for high-altitude ice operations carried by helicopters, observation of glacier terrain by drones, and measurement of lake water by unmanned ships

[IMAGE: INSTITUTE OF TIBETAN PLATEAU RESEARCH, CHINESE ACADEMY OF SCIENCES]

After conducting a zero-baseline common clock time comparison and other analyses, the research found that the time transfer performance of BDS-3 signals is comparable to that of Galileo and GPS.

Source: Xinhua



'Birthday' of the roof of the world recalibrated

Third Pole rose to modern height much later than previously thought.

As the roof of the world, the Third Pole centered on the Tibetan Plateau can be easily considered a permanent presence. However, it is not. The place where Mount Qomolangma (known as Mount Everest in the West) stands today was once underwater. Exactly when the Third Pole grew to its current height has been a topic of debate for years. However, a recent study published in *Science Advances* proves through fossil analysis that much of the Third Pole only grew to its modern height over the past 10 to 20 million years, rather than 40 million years ago (Ma) as previously thought.

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Full view of China's Five-hundred-meter Aperture Spherical Radio Telescope (FAST) [IMAGE: CHINESE ACADEMY OF SCIENCES]

FAST, revealing secrets of universe

The Five-hundred-meter Aperture Spherical radio Telescope (FAST) is the largest single-dish radio telescope in the world. It is more sensitive than other single-dish radio telescopes, such as the Arecibo, Effelsberg, and Green Bank telescopes.

The design of FAST differs from that of a fully steerable telescope, and shares similar concepts with the 305-meter Arecibo telescope. It is built in a karst depression to achieve a larger aperture and avoid the risk of flooding. Together with the active reflector and the flexible feed support system, these three main features give FAST its current status.

Based on its characteristics, several scientific research projects have been designed for FAST, including searching for and timing of pulsars, searching for HI (neutral hydrogen) galaxies and HI mapping of the Milky Way, molecular line searches, the search for extraterrestrial intelligence (SETI), tasks taken on as part of the VLBI network, and several others.

Since the discovery of the first pulsar, more than 240 pulsars have been discovered by FAST. About 30 percent of them are millisecond pulsars. There are also pulsars of special kinds, such as pulsars with nulling. Another time domain study using FAST is of SETI in the radio band, i.e., radio SETI. Recently, the first SETI observation using FAST was reported, marking FAST as a powerful machine in SETI signal searching.

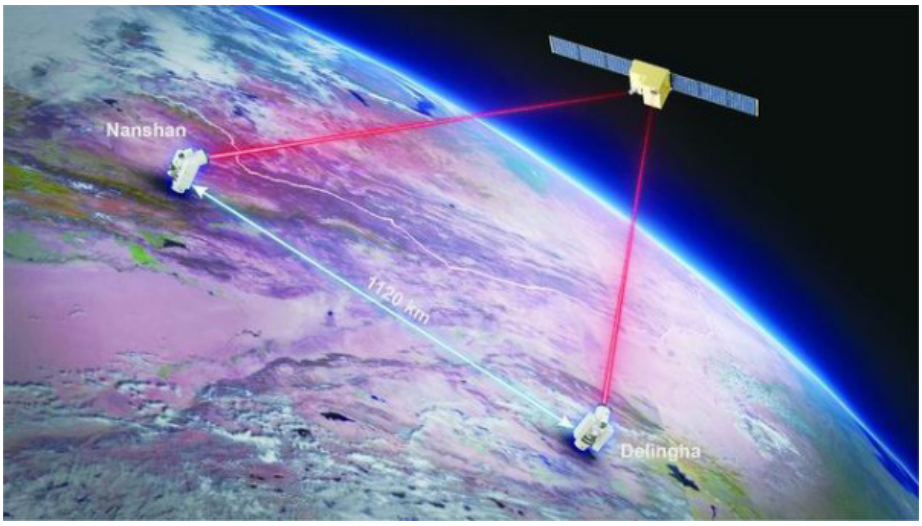
As a new dimension of the parameter space, the human bandwidth of FAST is notable. More users are encouraged to observe using FAST and to contribute ideas. The FAST team has called for proposals from astronomers working in China in 2020. The calling for worldwide proposals will come in 2021. With more proposals, the human bandwidth of FAST will increase even more.

Source: The Innovation

Breakthroughs in quantum communication and quantum computing

A group of scientists led by researchers of the University of Science and Technology of China (USTC) realized entanglement-based secure quantum cryptography over 1,120 kilometers through the Micius quantum science satellite, the most advanced quantum key distribution (QKD) demonstration so far in the world.

It is a breakthrough in the practical quantum communication to increase the secure distance on the ground by an order of magnitude without the need for trusted relays, even if the satellite is controlled by an adversary, ensuring the security based on the fundamental laws of nature.



Schematic diagram of entanglement-based quantum secure communication experiment over one thousand kilometers without relay [IMAGE: UNIVERSITY OF SCIENCE AND TECHNOLOGY OF CHINA]

Research teams from USTC revealed a prototype quantum computer which they named Jiuzhang, after the ancient Chinese mathematics text. The device is able to manipulate 76 quantum bits, or qubits, for calculations.

They also realized Gaussian boson sampling (GBS), which boasts good perspective for practical application.

Their achievement brought China to the first milestone for quantum computing research, called the quantum computational advantage, or quantum supremacy.

In addition, scientists from the Innovation Academy for Precision Measurement Science and Technology of the Chinese Academy of Sciences have achieved coherent synthesis of a single molecule for the first time in the world, marking the start of the research on comprehensive coherent manipulation of all degrees of freedom of atom-molecule systems.

Source: University of Science and Technology of China, Chinese Academy of Sciences

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Using magnetostratigraphic and radiochronologic dating, the study found that low-elevation tropical fossils retrieved from the central Third Pole were deposited about 40 million years ago. However, an analysis of paleosols (fossil soils) using oxygen paleoaltimetry showed that paleosols corresponding with the elevation of the present day can be dated from about 25.5 Ma to 21 Ma, rather than over 35 Ma — the figure often previously used to date the age of the Tibetan Plateau.

"This result means the Third Pole was still lower than 2300 m about 40 million years ago," said Professor Fang Xiaomin, lead author of the study from the Institute of Tibetan Plateau Research of the Chinese Academy of Sciences (CAS). "It only grew to 3500 m and above around 26 million to 21 million years ago."

Fang's study was part of the Second Tibetan Plateau Expedition and Research (STEP), a science project launched in 2018 by CAS to reassess the environment of the Third Pole given rapid climate changes over recent years. The much debated "birthday" of the roof of the world is not just an academic issue concerning how the Third Pole uplifted over history. It also helps shape our understanding of several processes highly relevant to regional and global climate. These include continental collision and uplift geodynamic mechanisms, Asian atmospheric circulation, surface processes and biotic evolution. With this recalibrated elevation history, there is still much rethinking to do.

Source: Institute of Tibetan Plateau Research, Chinese Academy of Sciences

Controlling plague locusts using their own scent

Aggregation pheromone is considered to be the most critical factor of locust aggregation and plagues. However, over the past 50 years, no compound could meet all the criteria of aggregation pheromone, especially lack of field verification.

A study by the Institute of Zoology of the Chinese Academy of Sciences (CAS) found that 4-vinylanisole (4VA), a compound with low release but high biological activity, is quite attractive to gregarious and solitary locusts in different developmental stages and sexes, and can respond to changes in their population density.

Through the olfactory receptor OR35 located in their basiconic sensilla, locusts quickly sense 4VA and then begin to aggregate. The experiments show that 4VA is very attractive to both laboratory and field populations. This study not only revealed the mystery of locust aggregation but also made sustainable locust control possible.

The CAS team's study reveals the reason for locust aggregation. [IMAGE: INSTITUTE OF ZOOLOGY, CHINESE ACADEMY OF SCIENCES]

Source: Institute of Zoology, Chinese Academy of Sciences

Ancient DNA unveils missing piece of human history

Left: Piece of petrous bone from a ~9,500-year-old individual from Bianbian Cave, Shandong, China. This individual was part of a northern ancestry group found along the Yellow River and up into the eastern steppes of Siberia. [IMAGE: GAO WEI]
Above: Skull of Qihe 2, a ~8,400-year-old individual from Qihe Cave, Fujian, China [IMAGE: FAN XUECHUN]

The origin and evolution of modern humans has always been a hot issue discussed by scientists around the world, and the emergence of ancient DNA capture techniques has brought new developments in this field. While the genetics of ancient humans in Europe, Southeast Asia, and Siberia have been well-studied, little is known to date about the genetics of ancient humans in East Asia, especially in China.

Using co-developed ancient DNA techniques, a team from the Institute of Vertebrate Paleontology and Paleoanthropology of the Chinese Academy of Sciences has published the first results of the study of the genetics of ancient humans in northern and southern China.

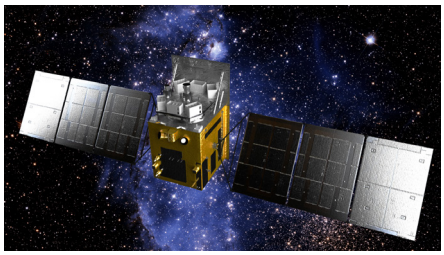
Regarding the population formation of China, the research results reveal north-south differentiation ~8,400-4,000 years ago, with more recent mixture leading to admixed present-day populations in China today, with no substantial influence from populations outside of this region over the past 8400 years. In addition, Austronesian speakers and ancient southern Chinese share high genetic similarity, which suggests that populations giving rise to Austronesians likely originated in southern China at least 8400 years ago. This research presents the genetic and evolutionary history of Chinese prehistoric populations, filling in important information about the genetics, evolution and adaptation of prehistoric humans in China and other eastern areas.

Source: Chinese Academy of Sciences

Insight-HXMT: Strongest magnetic field in the universe directly detected

Using China's Hard X-ray Modulation Telescope (HXMT) led by the Institute of High Energy Physics of the Chinese Academy of Sciences, scientists observed an X-ray accretion pulsar GRO J1008-57 and found its surface magnetic field was as high as 1 billion Tesla. This is the strongest magnetic field that has ever been directly and reliably measured. It is about 60 percent higher than the previous record of the strongest magnetic field held by NASA's Rossi X-ray Timing Explorer (RXTE) satellite.

Neutron stars have the strongest magnetic fields in the universe. Neutron star



China's Hard X-ray Modulation Telescope (HXMT) [IMAGE: INSTITUTE OF HIGH ENERGY PHYSICS, CHINESE ACADEMY OF SCIENCE]

X-ray binaries are systems consisting of a neutron star and a normal stellar companion. By detecting the cyclotron absorption line in the radiation energy spectrum when they interact, the magnetic field near the surface of the neutron star can be directly detected.

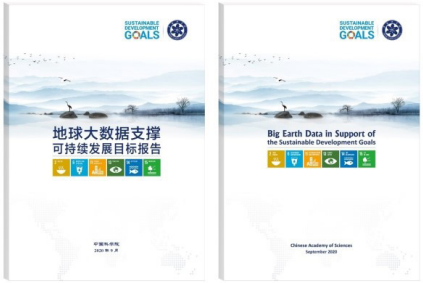
Dubbed Insight, HXMT, launched in June 2017, is China's first X-ray astronomy satellite. Compared with other X-ray satellites, it has the advantages of covering a broad energy band, a larger detection area in the high-energy X-ray band, high time resolution, small detection dead time, and no photon pileup effect when observing strong sources. It thus boasts the unique feature of detecting high-energy cyclotron absorption lines.

Source: Institute of High Energy Physics, Chinese Academy of Science

Big Earth Data in Support of the Sustainable Development Goals

The *Big Earth Data in Support of the Sustainable Development Goals* report, drafted by the Big Earth Data Science Engineering Project (CASEarth) of the Chinese Academy of Sciences (CAS), has been released as an official Chinese government document for two consecutive years (2019 and 2020) at the 74th and 75th United Nations General Assemblies.

The report focuses on six sustainable development goals (SDGs) including Zero Hunger, Clean Water and Sanitation, Sustainable Cities and Communities, Climate Action, Life below Water, and Life on Land. It showcases China's efforts to use innovation-driven technologies such as big data, cloud computing, and artificial intelligence to establish an

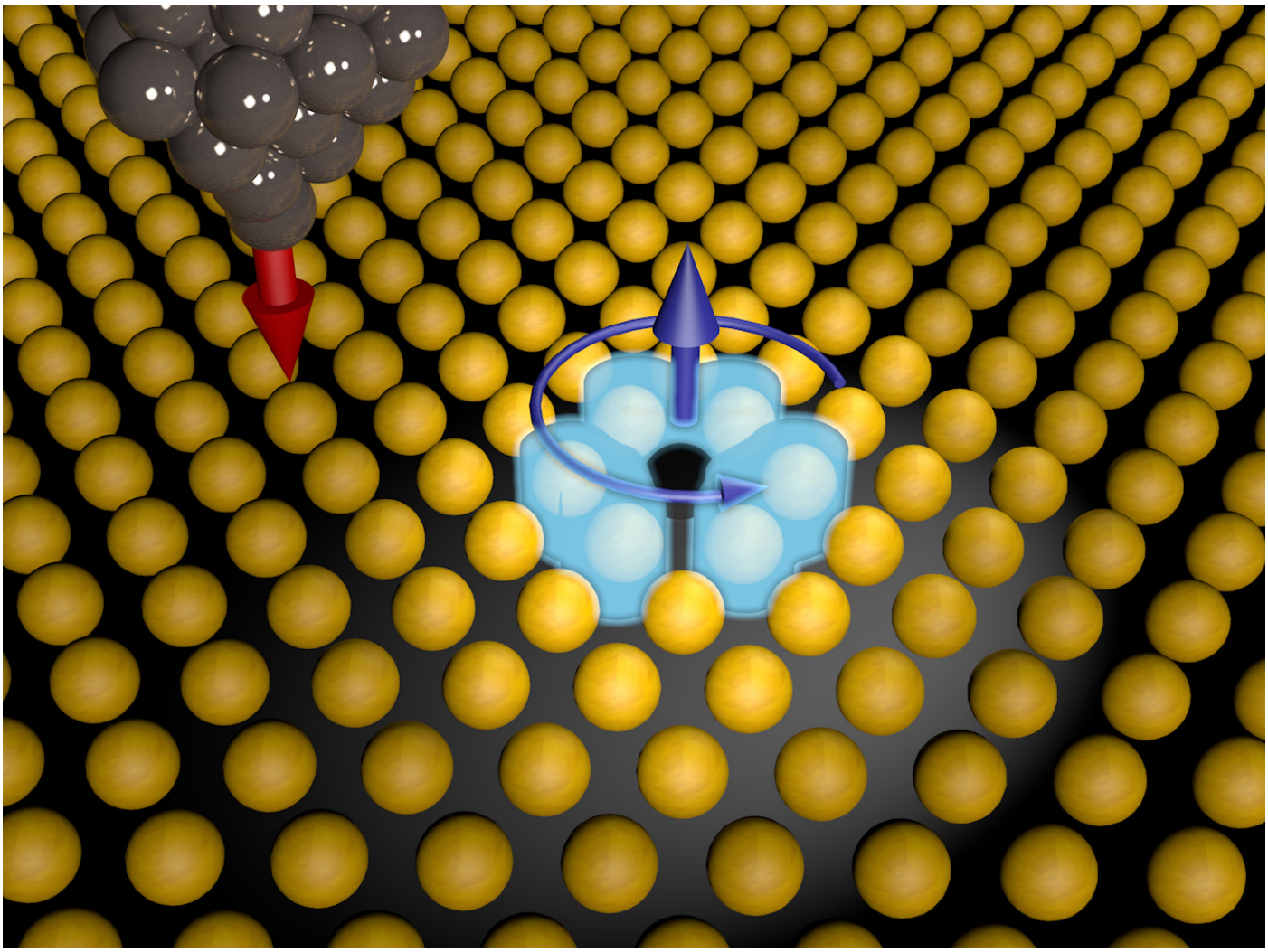


Big Earth Data in Support of the Sustainable Development Goals
[IMAGE: CHINESE ACADEMY OF SCIENCES]

evaluation system for the implementation of the UN 2030 Agenda. In particular, the report reveals the value as well as prospect of utilizing Big Earth Data for monitoring and evaluating the implementation of the SDGs. The project has filled the gaps of SDG implementation in terms of data and methodology, serving as a successful practice for the international communities to implement the UN 2030 Agenda.

CASEarth has been designated as a partner and one of 24 technical support institutions for the online platform of the Technology Facilitation Mechanism (TFM) to help achieve SDGs. The research results of CASEarth have also laid a solid foundation for China's move to launch an International Research Center of Big Data for SDGs to facilitate the implementation of the UN 2030 Agenda, which was announced by Chinese President Xi Jinping during his UN General Assembly address in September 2020.

Source: Chinese Academy of Sciences



Schematic of spin-polarized STM measurements on the spin-orbital polarons [IMAGE: INSTITUTE OF PHYSICS CHINESE ACADEMY OF SCIENCES]

Localized spin-orbit polaron first proposed in magnetic Weyl semimetal

The Institute of Physics of the Chinese Academy of Sciences and their collaborators reported the discovery of localized spin-orbit polaron in Weyl semimetal with intrinsic magnetism.

The kagome lattice $Co_3Sn_2S_2$ exhibits topological phenomena of a magnetic Weyl semimetal. By using the independently designed and assembled world's top-level ultra-low temperature, strong-magnetic field scanning tunneling microscopy (STM) and spin-polarized STM systems, the research team discovered the localized spin-orbit polarons (SOPs) with three-fold rotation symmetry nucleated around a single S-vacancy at the S-terminated surface of $Co_3Sn_2S_2$.

Further research shows dominant orbital magnetization contribution to the local magnetic moment. The discovery of the localized spin-orbit polaron indicates that defect engineering could be realized in new quantum topological materials, which opens a novel route for manipulating the magnetic order and topological phenomena in Weyl semimetal, and paves the way toward practical applications in functional quantum devices.

Source: Chinese Academy of Sciences

Novel species-dependent HCV host factor discovered

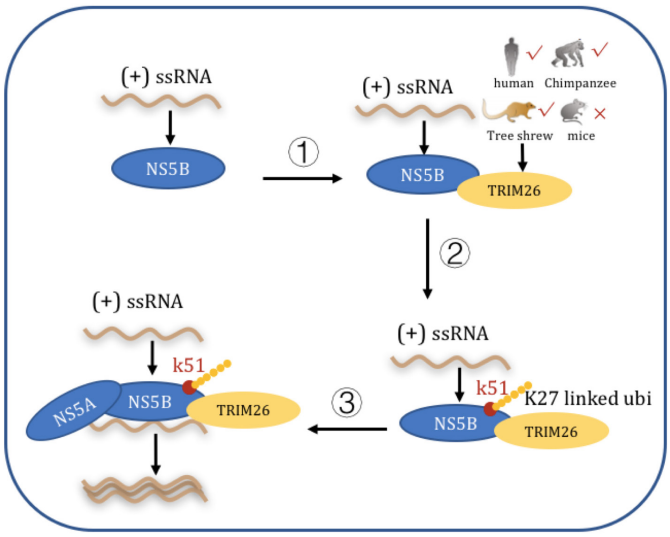
The researchers from Professor Zhong Jin's group at the Institut Pasteur of Shanghai (IPS) of the Chinese Academy of Sciences and Professor Wei Wensheng's group at Peking University as well as Doctor Zhang Guigen's group at Sun Yat-sen University report that TRIM26 is a critical host factor for HCV replication and contributes to host tropism. The study was published online in *Science Advances* on January 8, 2021.

Hepatitis C virus (HCV) is an RNA virus belonging to the *Hepacivirus* genus of the *Flaviviridae* family and is an important pathogen that causes hepatitis C. HCV has evolved a variety of strategies to escape host immune systems and to establish chronic infection. Long-term chronic infection can lead to severe liver diseases such as cirrhosis and cancer. Direct-acting antiviral agents (DAA) have greatly improved the efficiency of hepatitis C treatment, but due to the lack of vaccines, the eradication of HCV is still very challenging. Animal models of HCV infection are crucial tools for the development of a hepatitis C vaccine.

HCV only infects humans and chimpanzees, but due to ethical issues, the use of chimpanzees as model animals is now prohibited. Transgenic mice expressing HCV receptors can support HCV infection to a limited extent. However, due to the lack of other human host factors, especially the ones essential for the steps after the virus enters the cell, the application of this transgenic mouse model in evaluating the protection efficacy of HCV vaccines remains limited. Therefore, the identification of new species-specific HCV host factors is of great significance for the establishment of HCV small animal infection models.

To identify essential host factors in HCV infection, the researchers used the previously established HCV live cell real-time reporting system to perform genome-wide CRISPR/Cas9 screening and found for the first time that TRIM26, an E3 ubiquitination ligase, is an important host factor of HCV. The results show that TRIM26 specifically promotes the replication of the HCV genome, but has no effect on the replication of other viruses belonging to the same *Flaviviridae* family (such as Dengue virus and Zika virus).

To study how TRIM26 promotes HCV genome replication, the researchers examined the interaction between TRIM26 and HCV proteins. The results demonstrate that TRIM26 interacts with virus-encoded NS5B protein, an RNA-dependent RNA polymerase, to catalyze the K27-linked ubiquitination modification of lysine 51 in NS5B, thereby enhancing the interaction between NS5B and NS5A, another key component of the virus replication complex, and ultimately promoting the replication of the HCV genome.



Working model of TRIM26 (from human and tree tupaia) enhancing HCV genome replication [IMAGE: INSTITUT PASTEUR OF SHANGHAI, CHINESE ACADEMY OF SCIENCES]

Furthermore, the researchers also compared the effects of TRIM26 from different host species on HCV replication, and found that TRIM26 from humans and tree shrews can support virus replication, whereas TRIM26 from mice cannot do so. Amino acids analysis revealed that compared with other species, mouse TRIM26 has a unique 6-amino acid insertion. The mouse TRIM26 with a deletion of this insertion can partially restore its interaction with the HCV NS5B and its ability to enhance virus genome replication. Finally, the researchers found that the ectopic expression of human TRIM26 in mouse hepatic cells can significantly enhance HCV infection.

Overall, this study not only discovers a novel HCV host factor and further deciphers the molecular mechanism of HCV replication, but also provides a new strategy to develop a small animal model for HCV infection.

For more information, please contact:
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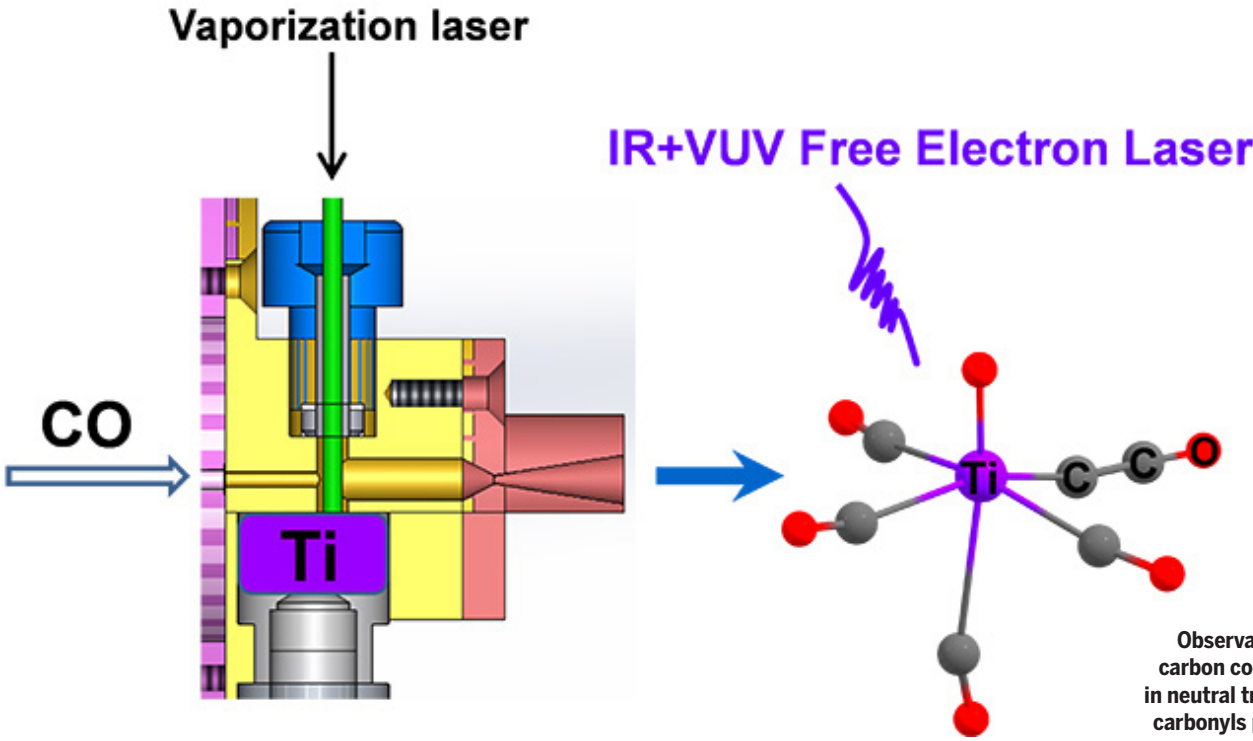
E-mail: jzhong@sibs.ac.cn
Institut Pasteur of Shanghai, Chinese Academy of Sciences

Source: Institut Pasteur of Shanghai, Chinese Academy of Sciences



Observation of carbon-carbon coupling reaction in neutral transition-metal carbonyls [IMAGE: WANG CHONG]

Carbon-carbon coupling reaction in neutral metal carbonyls revealed

Metal carbonyls play an important role in heterogeneous and homogeneous catalysis such as Fischer–Tropsch chemistry, hydroformylation, alcohol synthesis, and acetic acid synthesis.

A laser vaporization technique has been employed in generating and studying homoleptic metal carbonyl cations and anions in the gas phase, which serve as archetypical examples for demonstrating metal–ligand bonding and the electron counting rules.

However, the spectroscopic characterization of neutral metal carbonyls in the gas phase is more challenging due to the difficulty of size selection.

A research team led by Professor Jiang Ling from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences, in collaboration with Professor Zhou Mingfei from Fudan University, identified a carbon-carbon coupling reaction in neutral transition metal carbonyls.

Their findings, published in *The Journal of Physical Chemistry Letters*, revealed that C-O bond breaking and C-C bond formation proceeded efficiently in the reactions between laser vaporized titanium atoms and carbon monoxide. The study also highlighted a viable strategy for CO insertion for carbon-chain growth and higher alcohol synthesis.

Based on recently-developed infrared plus vacuum ultraviolet (IR+VUV) two-color ionization spectroscopy using a tunable vacuum ultraviolet free electron laser (VUV-FEL), the researchers synthesized and characterized a series of neutral titanium carbonyl complexes.

Bonding analysis indicated that the OTiCCO core structure could be described by the bonding interactions between a TiO^+ cation in the doublet ground state and a doublet ground state of CCO^-.

Theoretical calculations predicted that the $Ti + nCO \rightarrow OTiCCO(CO)_{n-2}$ reactions were both thermodynamically exothermic and kinetically facile in the gas phase.

The observed C-O bond cleavage and C-C bond formation is a viable strategy for CO insertion for carbon-chain growth and higher alcohol synthesis.

For more information, please contact:
Dr. & Prof. Jiang Ling
E-mail: ljiang@dicp.ac.cn
Dalian Institute of Chemical Physics (DICP), Chinese Academy of Sciences

Source: Dalian Institute of Chemical Physics, Chinese Academy of Sciences

Dr. Dambaru Ballab Kattel's decade in China

Where did you work before coming to China?

I worked at the Nepal Academy of Science and Technology (NAST) as a scientific officer. I joined this institution in 2006. I also worked as a visiting faculty for teaching at the College of Applied Sciences in Nepal, which is one of the Tribhuvan University affiliated colleges in Nepal. I have a strong background in public communication, especially in science and technology. I've been involved in various electronic (radio and television) and print media since 1990, when I was an undergraduate student. I also received the "National Talent Award on Science and Technology" in 2005.

How many years have you been in China?

About nine years, which combines the periods from 2009 to 2012, and 2016 to present.

Use three words to describe your stay in China?

Knowledge, career, and food

What's your favorite Chinese food?

There are numerous varieties of food in China. Among them, I like Kung Pao Chicken, Malatang, Hot Pot, and the Beijing special "Peking Duck" the most.

You were the first overseas graduate student at the Institute of Tibetan Plateau Research (ITP) of the Chinese Academy of Sciences (CAS), is that right? When did you start your PhD and how?

Yes, you are right. I was the first international graduate student of ITP. I started my PhD research at ITP in March 2009. It is an interesting story. I met Professor Yao Tandong for the first time in Kathmandu in November 2008. He was an invited keynote speaker at the "5th National Conference on Science and Technology", which was organized

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by the institution where I worked. His presentation was on the "Third Pole" research and findings, and he also discussed future opportunities for international students during the plenary session. Among the research objectives of ITP, as presented by Professor Yao, some were relevant to my background and goals. Three months later, in March, I came in Beijing for 45 days as a visiting scholar; it was my first international journey. After a discussion with Professor Yao, and the education and international office of ITP, I gathered all the documents, prepared a PhD research concept note, and submitted my application to the University of Chinese Academy of Sciences (UCAS). Promptly, the university's international office allowed me to join the language class at the same time, as a new PhD student. I guess I was the first Nepalese student of UCAS in Beijing.

You once told me that working here as Yao's PhD has rekindled the connection between Professor Yao and Professor Lochan P. Devkota. Can you tell me more about that? Especially if it is relevant to the establishment of KCRE.

Yes, when I joined ITP as a PhD student, the TPE program was in progress, and had not formally started researching collaborative activities in South Asia. I discussed research collaborations in Nepal with Professor Yao. I also suggested to him that it would be better to sign a memorandum of understanding (MoU) with the Central Department of Hydrology and Meteorology (CDHM), Thribhuvan University. He asked me to invite the department head of CDHM to visit Beijing. At that time, Professor Lochan was the head of the department; he was also my teacher from bachelor's to master's level. I did not have his e-mail address, but tried to connect with him; it took me about three or four months to connect with him, with the help of my colleague (Binod, who was the second international graduate student of ITP). In August 2009, two international programs (5th International Symposium on the Tibetan Plateau and 24th Himalaya-Karakorum-Tibet Workshop) were held in Beijing. We (me and Professor Lochan) both attended both programs. The TPE program was initiated formally after these two big events. Then, an MoU was signed between ITP, CAS and CDHM, Tribhuvan University. It would be the first MoU with an international institute under TPE, along with the Tajikistan Academia. Later, I also found that both were friends from 25 years back when they were in the US. Since then, there had been an MoU between CAS and the Nepal Academy of Science and Technology, but research activities were either very rare or nonexistent at the academic level. There is a long history of Nepalese students coming to China in order to pursue their higher studies, but a formal and effective research cooperation between Nepal and China began after the MoU between ITP, CAS and CDHM, Tribhuvan University. The MoU is the foundation for the establishment of the TPE Kathmandu Center and the KCRE in Nepal.

How do you think KCRE is running? What are your expectations for KCRE and how do your colleagues at TU feel about KCRE?

KCRE is an institution of the whole Nepalese scientific community, which directly/indirectly supports Nepalese academia, research institutions, teachers, and students. In addition, it delivers conferences, workshops, and training programs. There are considerable outputs that we have produced since our establishment. For example, there are 41 Nepalese students from different backgrounds who have pursued their graduate studies at ITP. Attendance at ITP for short-term research activities from Nepal is also increasing. There is also the number of interested students, which has been increasing year-by-year. It is notable here that a special course on palioclimate, via remote learning, has also been started by KCRE with the cooperation of Ohio State University, to enhance the academic quality of Nepalese students. We now have hundreds

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of significant research publications on our hands. However, these are still not sufficient; we can do a lot of work in the future from this platform to support scientific and technological development in Nepal. It's time to go into action by discovering the priority areas, as well as developing a long-term strategic plan to cover relevant universities, institutions and academia in all provinces, via different approaches, in order to support the government's national development goals on science and technology in Nepal. Further, the relationship of KCRE with the Nepal Academy of Science and Technology will also be highly fruitful. My colleagues also have the same expectations.

ITP has a lot of Nepalese students now. And I know you have helped many of them with their study here. Can you tell us something about that? And what's their view of ITP in general?

There are good indications that the Nepalese students are grabbing opportunities and benefitting from the recent progress on science and technology in China. They're becoming skilled workers, which ultimately helps our nations in terms of future development. As I previously mentioned, students came to China mostly for medical science and some other fields. Now things are different, and many students from different backgrounds are changing their destination to China from other places for their advanced studies. When I was in Beijing in 2009, there were very few Nepalese communities, including few students, in Beijing. Now, there are almost 500 Nepalese, among whom the majority are students. The students that are studying at ITP have positive responses to the institute. The majority of students are interested in supporting KCRE-TU Nepal and TPE-Kathmandu Center. Recently, I helped one student in his PhD graduation as a co-supervisor, and helped one master's student in her thesis. In addition to the students from Nepal, I have also been providing professional and academic help for many other international students who have been working at this institution.

How would you characterize the China-Nepal relationship? What role do you think scientists, especially TPE scientists, have played in this relationship?

The bilateral relation between Nepal and China has long been friendly. The first Sino-Nepal Treaty of Peace and Friendship was signed on April 28, 1960 by the two countries. However, the relationship between Nepal and Tibet (China) are centuries old. Around 600-650 CE, Nepalese Princes Bhrikuti got married to Songtsan Gampo, the earliest known Emperor of Tibet. The famous ancient Nepalese architect Araniko was invited to China in 1260 CE to design and built Stupa in Beijing. He may be the first foreign Nepalese expert coming to China to work. This shows that there is a long, expert, cooperative and friendly relationship between China and Nepal. Now here we are in the modern era, and science and technology obviously comes in to play. We did not have a strong scientific cooperative relationship before 2009. The TPE program is an international program that addresses common issues in various aspects, as well as sharing recent progress and support for regional scienctific and technological research. I believe that this program has been sketching a way to develop a scientific and research cooperative relationship between China and Nepal. The establishment of the TPE Kathmandu Center, KCRE and Nepalese students studying in Beijing all clearly reflect the role played by TPE scientists.

Source: Institute of Tibetan Plateau Research, Chinese Academy of Sciences

Oxygen content in deep sea surged 600 million years ago

A study has revealed that the oxygen content of the deep sea surged 600 million years ago, laying the foundations for the emergence of multicellular organisms.

Paleontologists at the Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences, worked with researchers from the United States and France. Their findings were published in the journal *Geology*.

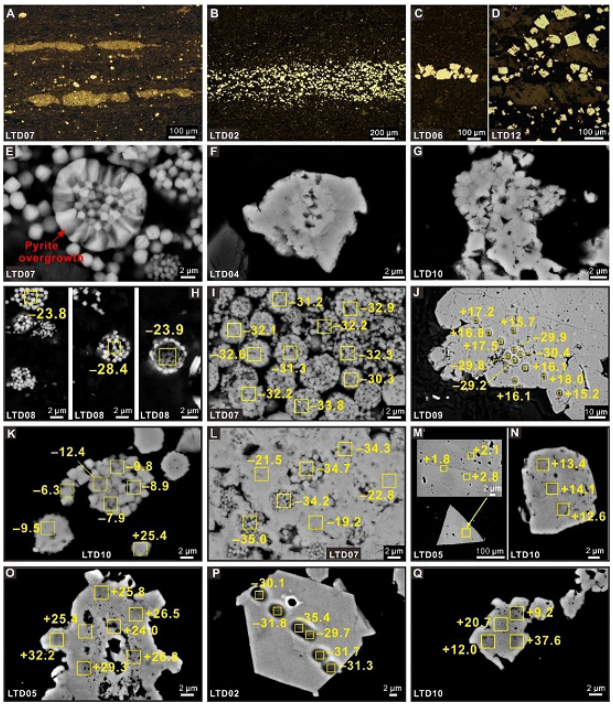
Oxygen is essential for the survival of life. There is enough oxygen in today's oceans to meet the needs of plants and animals, but this was not always the case, according to Wang Wei, a researcher with the institute.

It is generally believed that modern oceans began to form 450 million years ago. Before that, the deep-sea environment cycled between oxidation and hypoxia, said Wang, who was also the leader of the research project.

The research team studied deep-sea core samples dating back 600 million years and found the oxygen content increased significantly during this period due to large-scale oxidation, making the period a key chapter in the evolution of life on Earth.

The conclusion was also proved by the discovery of fossils containing multicellular organisms, Wang added.

Source: Xinhua



Dominant pyrite morphologies and in situ nanoSIMS sedimentary pyrite $\delta^{34}S$ [IMAGE: NANJING INSTITUTE OF GEOLOGY AND PALAEONTOLOGY, THE CHINESE ACADEMY OF SCIENCES]

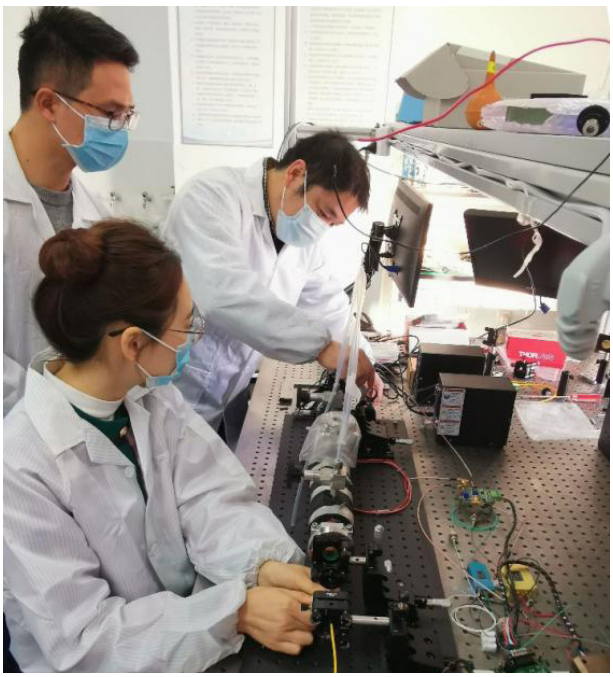
Researchers develop a novel method for gas tracing

A research team led by the Anhui Institute of Optics and Fine Mechanics (AIOFM) of the Hefei Institutes of Physical Science (HFIPS), Chinese Academy of Sciences, together with their collaborators from National Yunlin University of Science and Technology (YunTech), developed an approach to measure atmospheric gas isotopes using off-axis cavity-enhanced absorption spectroscopy (OA-CEAS), a procedure they created.

Combining the wavelength modulation principle with the multi-beam coupling and interference principle, they optimized a small volume long path optical resonator and solved the key problems like temperature and pressure control, spectral line correction and on-line locking frequency.

Up to now, the team has realized the simultaneous, in-situ and on-line monitoring of the key greenhouse gases CO_2, CH_4 concentrations, and $\delta^{12}C$ and $\delta^{13}C$ isotopic abundances in the atmosphere. Based on the measured data, the mass conservation equation and Keeling Plot equation have been established enabling study of air pollution source tracing and spatiotemporal distribution characteristics.

Source: Hefei Institutes of Physical Science, Chinese Academy of Sciences



Researchers adjust the optical-path mode. [IMAGE: HEFEI INSTITUTES OF PHYSICAL SCIENCE, CHINESE ACADEMY OF SCIENCES]