中国科学院
CHINESE ACADEMY OF SCIENCES

CASNewsletter

NO. 157 • November 2019

LEAD ARTICLE

CAS President Bai Chunli (5th, R) attends the International Conference on Frontier Sciences of the Chinese Academy of Sciences on November 7 at the Yanqi Lake campus of UCAS in Beijing's Huairou district. [IMAGE: CAS]

CAS hosts seminar on frontier sciences in Beijing

The International Conference on Frontier Sciences of the Chinese Academy of Sciences (CAS) was held on November 7 at the Yanqi Lake campus of the University of the Chinese Academy of Sciences in Beijing's Huairou district.

It was one of the academy's celebrations for the 70th anniversary of the founding of the People's Republic of China and for its own 70th birthday.

Science and technology have been the key driving force for human progress, and fundamental research and innovation breakthroughs can greatly promote the development of a social economy, CAS President Bai Chunli said at the opening ceremony of the event.

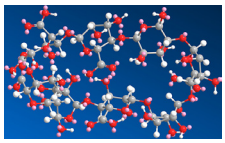
"The world is entering a new age in scientific and technological revolution characterized by the advent of artificial intelligence, virtual reality, quantum communication and computing, as well as other cutting-edge fields," he said.

"At the same time, humanity is facing climate change, pollution, resource shortages, uneven socio-economic development, diseases and other major challenges," Bai said. "This will require the international scientific communities to strengthen cooperation to jointly meet these challenges."

>> **PAGE 6**

HOT ISSUE

China conditionally approves new homegrown Alzheimer's drug



The National Medical Products Administration gave conditional approval on November 2 to the market launch of GV-971, a new drug treating Alzheimer's disease. >> **PAGE 2**

RESEARCH PROGRESS

Novel strategy of preventing chitin-triggered host immunity by soil-borne fungal pathogens revealed

The group of Dr. Guo Huishan identified a secretory polysaccharide deacetylase, VdPDA1, from a soil-borne pathogenic fungus, Verticillium dahliae, that facilitates infection through direct deacetylation of chitin oligomers. >> **PAGE 5**

INTERNATIONAL COOPERATION

CAS-RIKEN Young Scientists Seminar held in Shenzhen

The third CAS-RIKEN Young Scientists Seminar was held in Shenzhen Institutes of Advanced Technology (SIAT) on November 4. >> **PAGE 6**

SCIENCE STORY

CAS PIFI fellowship impressions from Guangzhou Institute of Geochemistry

During my time in Guangzhou and CAS I had the opportunity to take part in many research and personal activities at the Institute and around the city. >> **PAGE 8**

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

China conditionally approves new homegrown Alzheimer's drug

The National Medical Products Administration gave conditional approval on November 2 to the market launch of GV-971, a new drug treating Alzheimer's disease developed by several Chinese teams including Green Valley Pharmaceutical Co Ltd.

The medicine has been found to be capable of treating mild-to-moderate Alzheimer's disease and can improve cognition, according to the National Medical Products Administration.

The administration required continued research on the drug's pharmacological mechanism and long-term safety and effectiveness and improvement in the analysis method of oligosaccharide as well as timely submission of test data.

The market launch was approved after passing the prioritized review and approval procedure in the Chinese mainland, and filled a global blank in this area that has existed for the past 17 years.

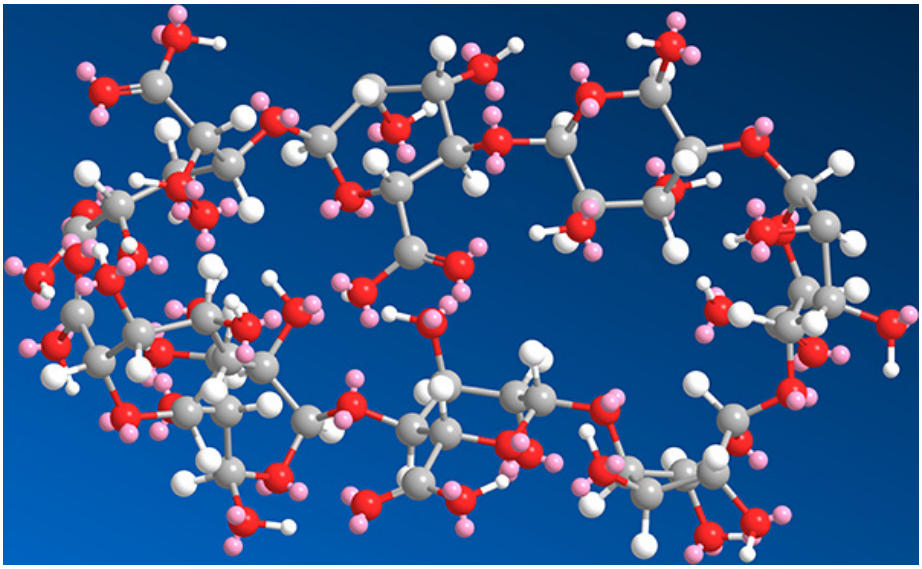
The innovative medicine was developed by a group of scientists led by Geng Meiyu, lead researcher from the Shanghai Institute of Materia Medica working with the Ocean University of China and Green Valley Pharmaceutical Co Ltd, after 22 years of research efforts.

As the world's first drug targeting the brain-gut axis for Alzheimer's disease patients, the Chinese-developed medicine will provide new treatment options.

According to Geng, GV-971 can improve cognitive dysfunction by remodeling the balance of intestinal flora, inhibiting the abnormal increase of specific metabolites of intestinal flora, reducing peripheral and central inflammation, and reducing β-amyloid protein deposition and Tau protein hyperphosphorylation.

This unique mechanism targeting the brain-gut axis provides an important scientific basis for better understanding of the drug's efficacy.

>> PAGE 7



The chemical formula of GV-971 [IMAGE: SIMM]

GV-971, the home-grown drug treating Alzheimer's disease [IMAGE: SIMM]

The unveiling ceremony of the Alliance of International Science Organization is held in Beijing's Huairou Science City on November 7.
[IMAGE: CAS, CHINA SCIENCE DAILY]

ANSO headquarters comes to Beijing's Huairou Science City

The headquarters of the Alliance of International Science Organizations (ANSO) in the Belt and Road Region was unveiled in Huairou Science City in Beijing on November 7.

Representatives from science and education institutions in Asia and Europe and international organizations attended the ceremony.

Bai Chunli, president of the Chinese Academy of Sciences and Liu Yinchun, deputy secretary general of the Beijing Municipal People's Government, addressed the event. Dai Binbin, leader of Huairou district, presided.

According to Bai, ANSO achieved great development last year.

It rooted its concept in people's hearts and scaled up its organization, making new progress in internationalization and expanding its presence, he said, adding that its growth demonstrated vigorous vitality and great development.

An additional 14 national academies of sciences, education institutions and international organizations have joined ANSO since its establishment last year, Bai noted.

It has launched a group of plans and projects to promote international scientific and technological cooperation and capacity-building; it has also made sound progress in construction of its Secretariat and the working mechanism linking its member units.

Settling its headquarters in Huairou Science City was a crucial decision made just as the alliance's first anniversary approaches.

The move aims to improve the alliance's organization and inject new impetus into Huairou Science City's internationalization. It is of great significance for Science City in increasing its global influence to house an international academic network organization.

The participants discussed new opportunities and developments in Huairou Science City and how to promote its internationalization, as well as international scientific and technological cooperation.

They reached consensus on the interaction between ANSO and Huairou Science City and on Belt and Road development.

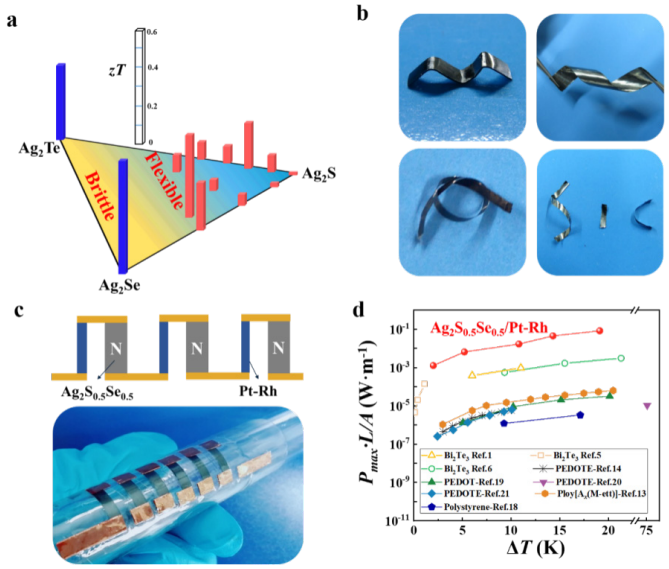
Source: Chinese Academy of Sciences, China Science Daily

Major breakthrough: world's first flexible full-inorganic thermoelectric materials created

The internet era is accompanied by an increasing demand for alternative power sources in the W-to-mW range to drive distributed, wearable, and implantable microelectronics. It is hard for traditional electrochemical batteries to keep up with the fast-paced progress of microelectronics in miniaturization, packing density, mechanical flexibility, bio-safety, and reliability. Nonetheless, a thermoelectric battery excels where an electrochemical battery falls short. Thermoelectrics is the simplest technique to directly convert heat, ubiquitous in the environment, into electricity, a versatile form of energy. Thermoelectric devices are all solid-state, free of greenhouse emissions or moving parts, friendly for miniaturization and low-maintenance in the long term. However, they generally lack mechanical flexibility, a key ingredient for wearable electronics.

Based upon the early discovery of the flexible inorganic semiconductor Ag_2S (Nat. Mater., 2018, 17, 421-426), the research team led by Prof. Shi Xun and Prof. Chen Lidong at the Shanghai Institute of Ceramics, in collaboration with Prof. He Jian from Clemson University, successfully fabricated the world's first flexible full-inorganic thermoelectric power generation module based on silver calcogenides. Since Ag_2S has poor thermoelectric performance despite its flexibility, and Ag_2Se and Ag_2Te exhibit the opposite, it took serious materials research efforts via doping Se and Te on the S-site and controlling native defects to attain a delicate balance between the material's thermoelectric performance (state-of-the-art figures of merit zTs up to 0.44 at 300 K and 0.63 at 450K) and flexibility.

The material's mechanical, electrical and thermal properties survived bending tests, meeting the requirements of wearable electronics. The team has also solved several of the device's architecture design problems. The as-fabricated 6-leg device exhibits a normalized maximum power density up to 0.08 W·m-1 near room temperature under a temperature difference of 20 K, orders of magnitude higher than organic devices and organic-inorganic hybrid devices. These results constitute a key initial step towards the new paradigm of flexible thermoelectrics, and will inspire more follow-up research efforts, e.g., developing p-type legs in place of Pt/Rh wires.



a) TE figure of merit *zT* and b) power factor *PF* for Ag_2(S, Se), Ag_2(S, Te), and Ag_2(S, Se, Te) at 300 K. c) Upper panel: a schematic of the $Ag_2S_{0.5}Se_{0.5}$/Pt-Rh in-plane device with $Ag_2S_{0.5}Se_{0.5}$ as n-type legs and Pt-Ru wire as p-type legs. Bottom panel: optical image of a six-couple flexible $Ag_2S_{0.5}Se_{0.5}$/Pt-Rh TE device. d) Comparison of normalized maximum power density (PmaxL/A) among the Ag_2(S, Se)-based inorganic TE device, inorganic-organic hybrid flexible TE devices, and organic flexible TE devices [IMAGE: PROF. SHI XUN'S GROUP]

The study was published in *Energy and Environmental Science* with the title "Flexible thermoelectrics: from silver chalcogenides to full-inorganic devices". This work is primarily supported by the National Key Research and Development Program, the National Science Foundation of China, the Youth Innovation Promotion Association of the Chinese Academy of Sciences, and the Shanghai Rising-star program.

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Source: Shanghai Institute of Ceramics, Chinese Academy of Sciences

Novel strategy of preventing chitin-triggered host immunity by soil-borne fungal pathogens revealed

The main component in the fungal cell wall, chitin, is required to maintain the structure of the fungal cell, but is also a strong elicitor of plant resistance which hinders the progression of pathogens. Chitin oligomers act as microbe-associated molecular patterns recognized by plant transmembrane LysM receptor kinases/proteins and initiate chitin-triggered host immunity. The capacity of the fungus to escape from recognition determines the success of the fungal pathogen to colonize the plant. Several leaf-infecting fungal pathogens deliver LysM effectors to bind chitin oligomers, perturbing host chitin perception. However, LysM effectors of soil-borne fungal pathogens do not perturb host chitin perception. It remains elusive how soil-borne fungal pathogens overcome chitin-triggered host immune response.

Recently, the group of Dr. Guo Huishan at the State Key Laboratory of Plant Genomics, Institute of Microbiology (IM), Chinese Academy of Sciences, published their research results in *Nature Plants* under the title "Deacetylation of chitin oligomers increases virulence in soil-borne fungal pathogens", in which they identified a secretory polysaccharide deacetylase, VdPDA1, from a soil-borne pathogenic fungus, Verticillium dahliae, the most notorious plant pathogen of the Verticillium genus, that facilitates infection through direct deacetylation of chitin oligomers, leading to suppression of plant LysM chitin receptor perception and dimerization. Moreover, a phylogenetics analysis of 5714 fungal proteins with conserved polysaccharide deacetylase domains showed that the VdPDA1-containing subtree includes a large number of proteins with conserved polysaccharide deacetylase domains from the Verticillium genus and the Fusarium genus, another group of characterized soil-borne fungal pathogens. Further analysis showed that a Fusarium PDA also possesses deacetylase activity and is required for virulence during plant infection, suggesting that soil-borne fungal pathogens have adopted chitin deacetylation as a major virulence strategy.

In summary, this study uncovers a novel mechanism by which the soil-borne fungal pathogens evolve an enzymatically active polysaccharide deacetylase, rather than analogous strategies of chitin oligomer-binding, effectively converting chitin oligomers into chitosan to prevent detection by host plants during root infection.

(Dr. Gao Feng and the Ph.D. student Zhang Bosen as co-first author and Dr. Guo Huishan as corresponding author, in collaboration with Dr. Zhou Jianmin from the Institute of Genetics and Development, CAS, and Dr. Zhang Jie from IMCAS.)

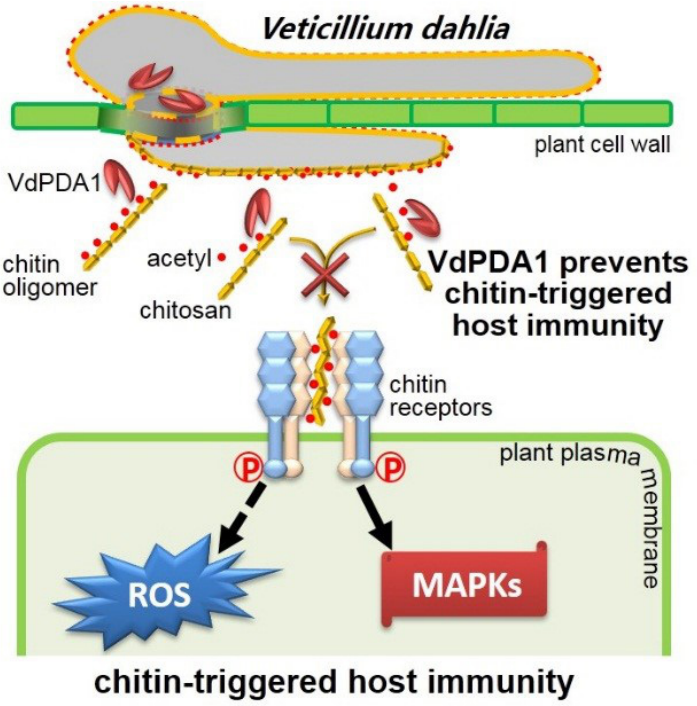

Figure: acetyl group plays a key role in chitin-perception by host LysM chitin receptors; VdPDA1-mediated deacetylation prevents chitin-triggered host immunity. [IMAGE: PROF. GUO HUISHAN'S GROUP]

For more information, please contact:
Prof. Guo Huishan
E-mail: guohs@im.ac.cn
Plant Immunity against Insect-Borne Viral Diseases

Source: State Key Laboratory of Plant Genomics, Institute of Microbiology, Chinese Academy of Sciences

CAS-RIKEN Young Scientists Seminar held in Shenzhen

Scientists from the Chinese Academy of Sciences and Japan's Institute of Physical and Chemical Research attended the third CAS-RIKEN Young Scientists Seminar held in Shenzhen Institutes of Advanced Technology (SIAT) on November 4.

"The science and technology cooperation between China and Japan has not only witnessed tremendous achievements, but also played a positive role in the cultivation of young people and the improvement of academic levels," said Li Yin, Director of the Bureau of International Cooperation of the Chinese Academy of Sciences.

Experts giving their talks [IMAGE: SIAT]

The seminar was divided into academic presentations and panel discussion. Eighteen experts from the two countries exchanged in-depth views on how to jointly promote international cooperation on various aspects of information technology and biotechnology including AI, Big Data, Smart Health, and the Internet of Things.

"RIKEN, like the Chinese Academy of Sciences in China, is committed to promoting basic scientific research and technological development," said Dr. Motoko Kotani, the executive director of RIKEN. "I sincerely hope we can maintain such a friendly cooperative relationship and expand the areas of cooperation in the future."

It was decided that the seminar will be turned into a regular dialogue mechanism between the two institutions to promote exchanges and cooperation between young scientists from both countries. Efforts will also be made to establish bilateral funding programs to support the cooperation.

Source: Shenzhen Institutes of Advanced Technology (SIAT), Chinese Academy of Sciences

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>> **PAGE 1**

Over the past 70 years, CAS has made numerous great achievements, and "we could not have done this without collaboration with fellow top scientists and institutions around the world," he said.

To promote global cooperation in science, technology, innovation and capacity-building, CAS established the Alliance of International Science Organization (ANSO) last year, which includes 36 institutes, organizations, and universities from countries and regions involved in the Belt and Road Initiative, Bai said.

Themed "cutting edge science and a better life", the event clearly shows the impact of scientific development on lifestyle.

More than 50 top scientists in the world, including Samuel Chao Chung Ting, 1976 Nobel Prize laureate for physics, and Alexander Sergeev, president of the Russian Academy of Sciences, as well as nine representatives from the ANSO attended the event.

About 1,000 frontier science researchers, engineers, managerial personnel from research institutes, and students from UCAS took part in the six subforums on mathematics, chemistry, life, geoscience, information, and technology.

They listened to four keynote speeches and discussed strategic scientific issues centering on the construction of a community with a shared future for mankind and hot issues like "how to help people live a more peaceful and prosperous life, and help children grow better, work better and live better".

Their idea exchanges combined with the development trends of disciplines and the actual needs of science and technology will build a bridge for future cooperation between all parties.

Source: Chinese Academy of Sciences

CAS signs cooperation agreement with CEA

Bai Chunli, president of the Chinese Academy of Sciences (CAS), signed an agreement on behalf of the academy with a French energy organization to cooperate on fundamental research and applications at the Great Hall of the People in Beijing on November 6.

The deal, between CAS and the French Alternative Energies and Atomic Energy Commission (CEA) was witnessed by Chinese President Xi Jinping and French President Emmanuel Macron.

The agreement between the two sides is expected to further promote exchanges and cooperation between China and France in substance science, material science, life science, nanotechnology, and information technology.

CEA is a key organization in research, development and innovation in France. Its main areas include defense and security, nuclear and renewable energy, technological research for industry, and physical and life sciences.

Zhang Yaping, vice-president of CAS, and CEA Chairman François Jacq had a talk on the implementation of the agreement on November 5.

They agreed to hold seminars to discuss cooperation in key research fields and carry out the agreement through joint research and personnel exchanges.

Source: Chinese Academy of Sciences

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A total of 1,199 patients received the phase I, II, and III clinical trials of the drug, which was managed by IQVIA, the world's largest provider of new drug developments and research outsourcing services.

Phase III was organized by the Shanghai Mental Health Center Affiliated to the Medical School of Shanghai Jiaotong University as well as Peking Union Medical College Hospital and 34 3A-grade hospital nationwide, and involved 818 patients.

The 36-week-long clinical trial was proven to effectively improve cognition among mild-to-moderate Alzheimer's disease sufferers.

Compared with the group given a placebo, subjects' main efficacy index and cognitive function improved significantly, and their score on the Alzheimer's Disease Assessment Scale-Cognitive section, or ADAS COG, improved by 2.54 points ($P < 0.0001$).

The drug shows instant effect, continuous and stable improvement, and good safety. The incidence of adverse events was similar to that of the group given a placebo.

Green Valley Pharmaceutical Co Ltd is ready for the production and sales of the drug. It is expected to be released in China by the end of this year.

The total number of patients suffering from Alzheimer's disease worldwide might be as high as 50 million, of whom 10 million are Chinese. China has the highest incidence rate in the world.

By 2050 the global population with the disease might exceed 150 million, with 40 million sufferers in China.

Data show that in 2018, the cost of treatment and care reached trillions of dollars, which put a heavy burden on their families and society.

Alzheimer's disease patients usually have cognitive problems, behavioral and mental disorders. It is the third major cause of disability and death in the elderly after cardiovascular and cerebrovascular diseases and malignant tumors.

Since the discovery of Alzheimer's disease more than 100 years ago, there have been only five drugs for clinical treatment in the world, and their clinical benefits are not obvious.

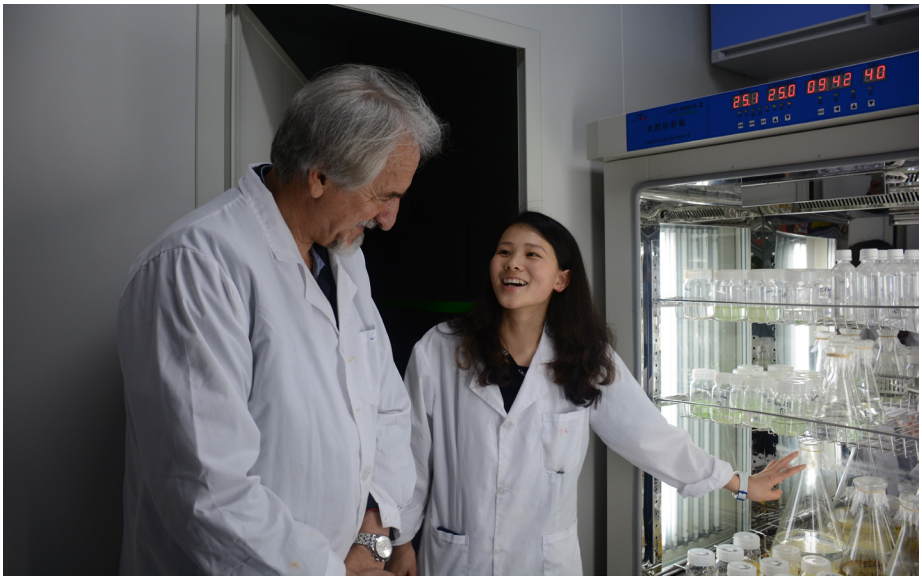
In the past 20 years, the world's major pharmaceutical companies have invested hundreds of billions of dollars in Alzheimer's disease treatment research, and more than 320 of the drugs that entered clinical research failed.

The research and development of GV-971 received funding from the National 863 Program, the National Natural Science Foundation of China, the National 973 Program, the Major Project of National Science and Technology on New Drug Creation and Development, the strategic leading science and technology special project of CAS (Category A), and the science and technology support plan of Shanghai.

Source: Shanghai Institute of Materia Medica (SIMM), Chinese Academy of Sciences

CAS PIFI fellowship impressions from Guangzhou Institute of Geochemistry

I'm Dusan Losic, Professor of the University of Adelaide, School of Chemical Engineering Australia, and I received the prestigious CAS PIFI fellowship award (2017VEA0009) submitted by Prof. Peng Yuan to come to Guangzhou Institute of Geochemistry, CAS for cooperative research on the functional modification technologies of natural porous minerals. During my time in Guangzhou and CAS I had the opportunity to take part in many research and personal activities at the Institute and around the city that made my visit and CAS Fellowship enormously memorable and valuable.



From scientific perspectives I met many excellent researchers and had very useful discussions about collaboration opportunities on using natural nanomaterials and minerals (e.g., halloysite and diatomite) to make new composites for useful industrial products. In working in collaboration with Prof. Yuan we discussed several new potential projects to combine graphene and other 2d materials with clays for environmental applications, which were closely related to our existing research activities with halloysites. I was pleased that my lectures at the Institute were well received and initiated many new ideas for future collaborative explorations. I also visited the CAS Institute's research facilities for materials characterization and learned about their use, applications and related challenges.

Most of my time was spent with Prof. Peng Yuan's research group and allowed very strong interaction with PhD students and postdocs, a very enjoyable and also valuable experience for me in many ways. I worked with PhD students to help their understanding of doing science, experiments, and writing journal papers which is a particularly difficult task for them because of language barriers. To compare them with students in my research group I found the students here are much more dedicated to doing research and projects and work much harder. I also had an opportunity to spend time with students outside of the Institute at lunches and dinners and really enjoyed our very open and relaxed talks as I got to know their life stories,

>> **PAGE 10**

ANSO Young Scientists Forum opens in Hangzhou

The 2019 ANSO Young Scientists Forum and Zhejiang International Science & Technology Cooperation Conference opened in Qiantang New Area of Hangzhou, capital of East China's Zhejiang province on November 9.

Sponsored by the Chinese Academy of Sciences and the Zhejiang Provincial People's Government, it was organized by the provincial science and technology department, and the provincial foreign affairs office, the Alliance of International Science Organizations (ANSO) in the Belt and Road Region, the CAS Innovation Cooperation Center (Bangkok) and the Administrative Committee of Qiantang New Area.

More than 500 people from 30-plus countries and regions attended. CAS President Bai Chunli, Zhejiang Governor Yuan Jiajun and Nobel Laureate Barry Sharpless as well as Zabta Shinwari, former secretary general of the Pakistan Academy of Sciences, gave speeches at the forum.

After expressing his welcome, Yuan Jiajun pointed out that in recent years, Zhejiang has been unswervingly implementing the innovation driven strategy and carrying out new policies to support scientific development and attract talents. It will deepen cooperation with global partners in an all-round way and build a community with shared scientific innovations in the Belt and Road region though planning of large-scale international science research.

In Bai's opening speech, he expressed sincere thanks to the CPC Zhejiang Provincial Committee and the provincial government for their long-term support for CAS, fully affirmed the cooperation achievements between the two sides, including the Institute of Oncology and Basic Medicine, and an institute of higher learning under the University of the Chinese Academy of Sciences in Hangzhou.

CAS President Bai Chuli addresses the opening ceremony of the forum. [IMAGE: CAS]

He also introduced the achievements of ANSO over the years and talked about plans for the organization. He stressed the important role played by young scientists in promoting scientific and technological progress, and welcomed them to actively participate in Belt and Road development.

In addition, at the opening a round-table session centering on innovation and sharing in the era of scientific and technological globalization was held, where Qiu Min, vice-president of Westlake University in Hangzhou, China's first private school aimed at cultivating high-level talents in advanced technology, and scientists from the Austrian Academy of Sciences and Nepal's Tribhuvan University shared ideas.

About 40 agreements were reached to promote international cooperation at the event.

In addition to the opening and the round-table session, the forum also included parallel forums on life science, the role of fundamental research in supporting sustainable development, and the digital economy (Internet Plus). Road shows and business negotiations, as well as project matchmaking and an ANSO young scientists forum were also on the agenda.

Furthermore, Jinhua and Wenzhou, two cities in Zhejiang, held promotional events for their projects during the forum.

Source: Chinese Academy of Sciences

CAS celebrates 70th anniversary of PRC founding, its own 70th birthday

The labor union of the Chinese Academy of Sciences (CAS) held a party to celebrate the 70th anniversary of the founding of the People's Republic of China and CAS' 70th birthday at Beijing Theater on November 1.

CAS President Bai Chunli, vice-presidents Ding Zhongli, Hou Jianguo, Zhao Tao, and Li Shushen; Sun Yegang, head of the Discipline Inspection Team of the CPC Central Commission for Discipline Inspection in CAS; CAS Secretary-General Deng Maicun, and deputy secretary-generals Wang Keqiang and Li Hefeng attended the event.

Ma Yongming, head of the mass work department (United Front Work Department) of the Working Committee of the Central and State Organs, and Zhang Guoxian, chairman of the Chinese Education, Culture, Sports and Health Union and about 900 CAS employees attended the meeting.

Bai read out President Xi Jinping's congratulatory letter and Premier Li Keqiang's instruction on the academy's 70th founding anniversary, and conveyed the spirit of Vice Premier Liu He's speech, which greatly inspired the employees.

Bai pointed out that in the past 70 years, CAS has been devoted to "innovating science and technology, serving the country and benefiting the people", and the staff have contributed their wisdom and sweat to overcoming difficulties and have made a group of inspiring scientific achievements over the past seven decades.

CAS President Bai Chunli reads out President Xi Jinping's congratulatory letter at the event.
[IMAGE: CAS]

He urged all cadres and employees to closely unite around the CPC Central Committee with Xi Jinping as its core, work together to shoulder the mission of the times, be pioneers of innovation, and strive for the construction of a scientific and technological power and the realization of the Chinese dream of great national rejuvenation.

The theme of the show was "devotion to science and dream of developing a powerful country". It was divided into three parts and began with a warm-up video paying tribute to the elder generations of scientists for their spirit and achievements.

Source: Chinese Academy of Sciences

>> **PAGE 8**

dreams, expectations and hobbies. Having the hospitality, care and friendliness of these students around me all the time gave me all the help I needed in terms of accommodation, meals, phone problems, banks, and computers; it was just amazing and I had never had such an experience before.

I also had an opportunity to go with Prof. Yuan, other academics and students to visit Guangzhou city and many restaurants to enjoy delicious food I never experienced before. I found Guangzhou city to be very impressive and I was surprised to see such modern architecture, designs, lights shows, beautiful parks and large shops I couldn't see in other places around the globe. I visited Shamian, an old city and traditional Chinese market, and enjoyed very much seeing the old and traditional China. I didn't have much opportunity for shopping, but I will do that next time for sure.

From a personal perspective I met my daughter-in-law's family here for the first time. They live in Guangzhou and we spent a memorable time together and had several dinners. This family union, which we shared with photographs, was very exciting for my son and my family in Australia.

To conclude, this was a terrific trip and life experience for me in many ways and I am so grateful to CAS for giving me this award and opportunity. Most importantly collaboration with Prof. Peng Yuan and his team will continue in future and we expect more joint collaborative projects, student exchanges and grant applications.

Once again I would like to thank the CAS panel for giving me this Presidential Fellowship.

Source: Guangzhou Institute of Geochemistry