Vice-Chancellor Stephen J Toope of the University of Cambridge visits Tsinghua University

President Lawrence Bacow of Harvard University visits Tsinghua University

Chief Executive of the Hong Kong Special Administrative Region (HKSAR) Carrie Lam Cheng Yuet-ngor visits Tsinghua
Vice-Chancellor Stephen J Toope of the University of Cambridge visits Tsinghua University

On March 24th, Professor Stephen J Toope, Vice-Chancellor of the University of Cambridge, visited Tsinghua University. Tsinghua University President Qiu Yong and Vice President and Provost Yang Bin had a meeting with the guests at Gongziting.

President Qiu welcomed the visit of Professor Toope and his delegation to Tsinghua University. He also expressed his gratitude to Professor Toope for his active response towards the launch of the Global Alliance of Universities on Climate (GAUC) initiated by Tsinghua University during the World Economic Forum held in Davos, Switzerland. As a renowned university with a long tradition, there are many links between the University of Cambridge and Tsinghua University in terms of academic partnership and talent exchange. It is hoped that the two universities will further deepen their cooperation in addressing the challenges of climate change in the future.

President Qiu introduced to Professor Toope a series of measures recently undertaken by Tsinghua University in its reform of education and teaching, which includes the establishment of the Tsinghua University Art Museum, as the university places great emphasis on art education, which will further improve the innovative thinking of the students. Besides that, the Future Laboratory, Institute of Artificial Intelligence and Big Data Research Center have also been established to promote the integration of arts and science, as well as strengthening the engineering and science disciplines of the university.

President Qiu also stated that exchanges between universities will provide students with the opportunity to learn from people with different backgrounds and further improve their global vision. Under the global strategy implemented since 2016, Tsinghua University has established the Global Innovation eXchange (GIX) Institute in the US, the China-Italy Design Innovation Hub in Italy, the Tsinghua Southeast Asia Center in Indonesia, and the Tsinghua University Latin America Center in Chile. Qiu Yong stressed that in the future, universities should work closely together and put more effort into innovation and entrepreneurship education in order to cultivate outstanding talent among the future generation.

Professor Toope praised Tsinghua University for its remarkable achievements and strong influence in the fields of scientific research and teaching, as well as the measures taken to engage with climate issues and develop low carbon energy. He stated that the University of Cambridge has also
taken several initiatives to deal with the issues of climate change, including the establishment of a Centre for a Carbon Neutral Future as part of its Carbon Reduction Strategy. As the University of Cambridge works on assessing its global strategy to strengthen its relationship with universities around the world, he looked forward to a stronger partnership and more collaboration between the two universities in the future.

Following the talks, President Qiu and Professor Toope signed a memorandum of understanding between the two universities.

President Lawrence Bacow of Harvard University visits Tsinghua University

On March 21st, Professor Lawrence Bacow, President of Harvard University, visited Tsinghua University. Tsinghua University President Qiu Yong, Vice President and Provost Yang Bin, and the guests had a meeting at Gongziting.

President Qiu welcomed the visit of Professor Bacow and his delegation to Tsinghua University, stating that there are many special links between Tsinghua University and Harvard University in various areas of research and study. He pointed out that universities nowadays are facing challenges on innovation and globalization. In its second hundred years, Tsinghua University will continue to strive for talent cultivation and further improve the quality of education and teaching.

President Qiu introduced to Professor Bacow a series of measures recently introduced by Tsinghua University in its reform of education and teaching, which includes a compulsory course of writing and communication set up last year to train the logic and critical thinking of undergraduate students. Apart from that, the old school rule that students must pass a swimming test before graduation has also been restored in an effort to carry forward the excellent sports tradition of Tsinghua University. Furthermore, the Tsinghua University Art Museum has also been established to enhance the humanistic and artistic atmosphere of the campus in an all-round way.

President Qiu stated that Tsinghua University attaches great importance to frontier science and cross-disciplinary research, and has established research institutions in
frontier fields such as the Institute of Artificial Intelligence, Big Data Research Center and the Future Laboratory, Tsinghua University. Tsinghua University is also committed to strengthening innovation and entrepreneurship education, and has made progress in cultivating innovative talents. Under the global strategy implemented since 2016, Tsinghua University has been putting much effort into becoming a global university, including the establishment of research and education centers such as Tsinghua Southeast Asia Center in Indonesia, Tsinghua University Latin America Center in Chile, China-Italy Design Innovation Hub in Italy, and the Global Innovation eXchange (GIX) Institute in the US. In the future, he hoped that there would be more collaboration between the two institutions in scholar exchange and talent cultivation.

Professor Bacow expressed his enormous respect towards Tsinghua University for its outstanding achievements in various fields and disciplines. He stated that Tsinghua University has always been a strong academic partner of Harvard University, and the good relationship between the two universities is very crucial in promoting the advancement of global higher education. He looked forward to more visits and exchanges between the two universities to ensure that the future generation can have the same opportunity to enjoy high-quality education.

After the meeting, Professor Bacow and his delegation visited Schwarzman College and held discussions with 14 Schwarzman scholars from all over the world during a round table lunch session held in the Master Kong Pub at Schwarzman College.

Chief Executive of the Hong Kong Special Administrative Region (HKSAR) Carrie Lam Cheng Yuet-ngor visits Tsinghua

On March 6th, Carrie Lam Cheng Yuet-ngor, the Chief Executive of the Hong Kong Special Administrative Region (HKSAR), visited Tsinghua University and delivered a speech at Schwarzman College. Tsinghua University Council Chairperson Chen Xu attended and hosted the session.

In her opening remark, Chen Xu welcomed all the guests and students who joined the session on behalf of the university. She stated that Tsinghua University attaches great importance to the exchange and cooperation between Tsinghua University and the HKSAR government. On behalf of the university, she expressed her appreciation to the renowned entrepreneurs and scholars from the HKSAR for their generous
On March 24th, the 21st CUBA (Chinese University Basketball Association) finals for the Northeast Division was held in Tsinghua University Sports Center. It is the first regional tournament held by CUBA in this season and a total of 32 teams participated. Male and female basketball teams from Tsinghua University and Peking University gave outstanding performances in the group and elimination stages, and all four teams advanced to the finals for the Northeast Division with undefeated records.

During the finals, the female team of Tsinghua University won the women’s championship with a 92-66 win over the female team of Peking University. Tsinghua won the women’s championship and was placed second in the men’s championship of the 21st CUBA for the Northeast Division.

In her speech entitled “Hong Kong Special Administrative Region: Vision and Action”, Carrie Lam shared her thoughts after elected as the Chief Executive of HKSAR, as well as her views on the future development of the HKSAR. “Hong Kong will actively take part in the ‘Belt and Road’ initiative and play its role in promoting the development of the Guangdong-Hong Kong-Macao Greater Bay Area”, noted Carrie Lam.

In the context of globalization, Hong Kong will enhance its competitiveness and further develop its advantages in traditional industries including finance, tourism, trade and logistics. Under her administration, Carrie Lam emphasizes the importance of high-quality education and talent cultivation in promoting causes. The HKSAR government will also provide more resources to universities to promote the development of innovative technologies and industries in Hong Kong.

In her speech entitled “Hong Kong Special Administrative Region: Vision and Action”, Carrie Lam shared her thoughts after elected as the Chief Executive of HKSAR, as well as her views on the future development of the HKSAR. “Hong Kong will actively take part in the ‘Belt and Road’ initiative and play its role in promoting the development of the Guangdong-Hong Kong-Macao Greater Bay Area”, noted Carrie Lam.

In the context of globalization, Hong Kong will enhance its competitiveness and further develop its advantages in traditional industries including finance, tourism, trade and logistics. Under her administration, Carrie Lam emphasizes the importance of high-quality education and talent cultivation in promoting causes. The HKSAR government will also provide more resources to universities to promote the development of innovative technologies and industries in Hong Kong.

In her speech entitled “Hong Kong Special Administrative Region: Vision and Action”, Carrie Lam shared her thoughts after elected as the Chief Executive of HKSAR, as well as her views on the future development of the HKSAR. “Hong Kong will actively take part in the ‘Belt and Road’ initiative and play its role in promoting the development of the Guangdong-Hong Kong-Macao Greater Bay Area”, noted Carrie Lam.

In the context of globalization, Hong Kong will enhance its competitiveness and further develop its advantages in traditional industries including finance, tourism, trade and logistics. Under her administration, Carrie Lam emphasizes the importance of high-quality education and talent cultivation in promoting causes. The HKSAR government will also provide more resources to universities to promote the development of innovative technologies and industries in Hong Kong.

In her speech entitled “Hong Kong Special Administrative Region: Vision and Action”, Carrie Lam shared her thoughts after elected as the Chief Executive of HKSAR, as well as her views on the future development of the HKSAR. “Hong Kong will actively take part in the ‘Belt and Road’ initiative and play its role in promoting the development of the Guangdong-Hong Kong-Macao Greater Bay Area”, noted Carrie Lam.

In the context of globalization, Hong Kong will enhance its competitiveness and further develop its advantages in traditional industries including finance, tourism, trade and logistics. Under her administration, Carrie Lam emphasizes the importance of high-quality education and talent cultivation in promoting causes. The HKSAR government will also provide more resources to universities to promote the development of innovative technologies and industries in Hong Kong.

In her speech entitled “Hong Kong Special Administrative Region: Vision and Action”, Carrie Lam shared her thoughts after elected as the Chief Executive of HKSAR, as well as her views on the future development of the HKSAR. “Hong Kong will actively take part in the ‘Belt and Road’ initiative and play its role in promoting the development of the Guangdong-Hong Kong-Macao Greater Bay Area”, noted Carrie Lam.

In the context of globalization, Hong Kong will enhance its competitiveness and further develop its advantages in traditional industries including finance, tourism, trade and logistics. Under her administration, Carrie Lam emphasizes the importance of high-quality education and talent cultivation in promoting causes. The HKSAR government will also provide more resources to universities to promote the development of innovative technologies and industries in Hong Kong.

In her speech entitled “Hong Kong Special Administrative Region: Vision and Action”, Carrie Lam shared her thoughts after elected as the Chief Executive of HKSAR, as well as her views on the future development of the HKSAR. “Hong Kong will actively take part in the ‘Belt and Road’ initiative and play its role in promoting the development of the Guangdong-Hong Kong-Macao Greater Bay Area”, noted Carrie Lam.

In the context of globalization, Hong Kong will enhance its competitiveness and further develop its advantages in traditional industries including finance, tourism, trade and logistics. Under her administration, Carrie Lam emphasizes the importance of high-quality education and talent cultivation in promoting causes. The HKSAR government will also provide more resources to universities to promote the development of innovative technologies and industries in Hong Kong.

In her speech entitled “Hong Kong Special Administrative Region: Vision and Action”, Carrie Lam shared her thoughts after elected as the Chief Executive of HKSAR, as well as her views on the future development of the HKSAR. “Hong Kong will actively take part in the ‘Belt and Road’ initiative and play its role in promoting the development of the Guangdong-Hong Kong-Macao Greater Bay Area”, noted Carrie Lam.

In the context of globalization, Hong Kong will enhance its competitiveness and further develop its advantages in traditional industries including finance, tourism, trade and logistics. Under her administration, Carrie Lam emphasizes the importance of high-quality education and talent cultivation in promoting causes. The HKSAR government will also provide more resources to universities to promote the development of innovative technologies and industries in Hong Kong.

In her speech entitled “Hong Kong Special Administrative Region: Vision and Action”, Carrie Lam shared her thoughts after elected as the Chief Executive of HKSAR, as well as her views on the future development of the HKSAR. “Hong Kong will actively take part in the ‘Belt and Road’ initiative and play its role in promoting the development of the Guangdong-Hong Kong-Macao Greater Bay Area”, noted Carrie Lam.

In the context of globalization, Hong Kong will enhance its competitiveness and further develop its advantages in traditional industries including finance, tourism, trade and logistics. Under her administration, Carrie Lam emphasizes the importance of high-quality education and talent cultivation in promoting causes. The HKSAR government will also provide more resources to universities to promote the development of innovative technologies and industries in Hong Kong.
University, while the male team of Tsinghua University lost by 5 points to the male team of Peking University. With this, the female team and male team of Tsinghua University advanced to the national top 32 as the champion and runner-up of the Northeast Division respectively.

The first 10-m resolution global land cover map

The first 10-m resolution global land cover product (FROM-GLC10) was successfully realized by the research team led by Prof. Gong Peng from the Department of Earth System Science, Tsinghua University, cooperating with domestic and international institutions. This work titled “Stable classification with limited sample: transferring a 30-m resolution sample set collected in 2015 to mapping 10-m resolution global land cover in 2017” has been published in Science Bulletin that presents the methodologies and results of the first 10-m resolution global land cover map.

The development of the world often faces many challenges, such as population growth, urbanization, agricultural development and impact of climate change on food security, energy and water shortages, overexploitation of resources, biodiversity loss and environmental pollution. In order to ensure the peoples’ well-being and achieve the United Nations’ sustainable development goals, the timely and high-resolution land cover information is needed that permit to provide a better environmental monitoring. However, the first 30-m resolution global land cover map (FROM-GLC30) did not come out until 2012 and was realized by Tsinghua University.

In recent years, more and more demands of global land cover maps with higher spatial resolution are emerging. Based on the research work in producing 30-m resolution global land cover map and accumulation of sample library construction, complete storage and free access of 10-m resolution Sentinel-2 global image, as well
as powerful cloud computing capabilities of Google Earth Engine, Gong et al. developed the first 10-m resolution global land cover map.

This work proposed the theory “Stable land cover classification with limited global sample”, pointing out the requirements for minimum sample size and error limits for remote sensing data obtained by global training samples moving to other years or different sensors. The accuracy of the 2017 FROM-GLC10 map was compared with the 2017 FROM-GLC30 map. The results show that the overall accuracy of FROM-GLC10 product is 72.76%, which is comparable to the one of FROM-GLC30 product.

The FROM-GLC10 product is now officially available worldwide and can be downloaded free of charge at http://data.ess.tsinghua.edu.cn.

---

Yigong Shi’s Group elucidated the cryo-EM structures of the catalytically activated yeast spliceosome in Cell

On March 15th 2019, Professor Yigong Shi’s group in the School of Life Sciences, Tsinghua University, published an article entitled “Structures of the Catalytically Activated Yeast Spliceosome Reveal the Mechanism of Branching” in the prestigious international magazine Cell. In this paper, Shi and colleagues assembled the catalytically activated spliceosomes (B* complex) on two different pre-mRNAs and determined the cryo-EM structures of four distinct B* complexes from Saccharomyces cerevisiae at the overall resolutions of 2.9-3.8 Å. Comparison of these structures reveals mechanistic insights into the branching reaction.

In 1977, scientists observed that the adenovirus mRNA could not form a continuous double-stranded RNA-DNA hybrid duplex with its corresponding DNA transcription template. Instead, single-stranded DNA bulges were extended at different positions in the hybridized double-stranded RNA-DNA duplex. This discovery suggested that the transfer of genetic information from DNA to mRNA involved not only transcription but also pre-mRNA splicing, which is to further remove the non-coding regions (introns) and joined the coding sequences (exons). RNA splicing is ubiquitous in eukaryotes. The average numbers of introns per gene increase from simple single-cell eukaryotes, such as yeast, to higher organisms such as worms and flies, and all the way up to humans. Some pre-mRNAs can be spliced in more than one way. Therefore, mRNAs containing different combinations of exons can be generated from a given pre-mRNA.

Pre-messenger RNA (pre-mRNA) splicing is a crucial and the most complicated step in the central dogma in eukaryotic cells. This process is executed by a dynamic mega-complex known as the spliceosome. From the discovery of RNA splicing in 1977 to the beginning of this century, scientists have recapitulated assembly and disassembly of the spliceosome by immunoprecipitation, gene knockout, cross-linked mass spectrometry, and in vitro splicing reaction and so on. The essence of RNA splicing is the removal of intron and ligation of exons through two successive transesterification reactions in which phosphodiester linkages within the
pre-mRNA are broken and a new one is formed. To catalyze splicing of the pre-mRNA, spliceosome has to undergo extremely precise stepwise assembly by forming a series of spliceosomal complexes. Based on the assembly and catalytic states and the biochemical composition of the spliceosome, these spliceosomal complexes have been defined as the A, pre-B, B, B* C, C*, P, and ILS complexes (Figure 1).

The catalytically activated spliceosome (B* complex) is a highly transient complex that is difficult to be captured under normal physical conditions. In their recent Cell paper, Shi and colleagues reconstituted the B* complex using the in vitro assembly approach, in which the assembled Bact complex was remodeled into the B* complex upon incubation with recombinant Prp2 and Spp2 in the presence of ATP. Then they acquired the good B* complexes by applying affinity purification strategy and determined the three-dimensional structures by single particle cryo-EM, and built the atomic model (Figure 2). Structure of the S. cerevisiae B*

![Figure 1. The precursor messenger RNA (pre-mRNA) splicing cycle. (Yan, C., Wan, R., & Shi, Y. (2019). Cold Spring Harbor perspectives in biology, 11(1), a032409.)](image1)

![Figure 2. Cryo-EM structures of the catalytically activated spliceosomes (B* complexes) from Saccharomyces cerevisiae.](image2)
complex contains 35 discrete proteins, three snRNA molecules, and the pre-mRNA. Structural elucidation of the B* complex fills an important void in the mechanistic understanding of pre-mRNA splicing by the spliceosome. The duplex between U2 snRNA and the branch point sequence (BPS) is discretely away from the 5'-splice site (5'SS) in the three B* complexes that are devoid of the step I splicing factors Yju2 and Cwc25. Recruitment of Yju2 into the active site brings the U2/BPS duplex into the vicinity of 5'SS, with the BPS nucleophile positioned 4 Å away from the catalytic metal M2. This analysis reveals the functional mechanism of Yju2 and Cwc25 in branching. These structures on different pre-mRNAs reveal substrate-specific conformations of the spliceosome in a major functional state (Figure 3).

The Shi Group has been focusing on the structural and mechanistic elucidation of pre-mRNA splicing in the past decades. After the success of crystal structural elucidation of subcomplexes within spliceosome, they undertook a direct assault on the intact spliceosome and made the breakthrough in the summer of 2015. Since then, the Shi lab has reported nine high resolution structures of the crucial spliceosomal complexes, including the S.pombe intron lariat spliceosome ILS complex at 3.6 Å, the pre-assembled U4/U6.U5 tri-snRNP at 3.8 Å, the precursor pre-catalytic spliceosome pre-B complex at 3.3-4.6 Å, the pre-catalytic spliceosome B complex at 3.9 Å, the activated spliceosome Bact complex at 3.5 Å, the catalytic step I spliceosome C complex at 3.4 Å, the step II catalytically activated spliceosome C* complex at 4.0 Å, the post-catalytic spliceosomal P complex at 3.6 Å, the ILS complex at 3.5 Å from S.cerevisiae and the newest published B* complexes at overall resolutions of 2.9-3.8 Å. These ten high resolution structures give
rise to a complete structural view for spliceosome activation, catalysis and disassembly, which provide unprecedented insight into the chemical basis for RNA splicing (Figure 4). (the video link)

Prof. Yigong Shi is the corresponding author. Dr. Ruixue Wan (post-doc fellow from the School of Medicine), and Rui Bai (4th year PhD student from the School of Life Sciences) are the co-first authors of this paper. Dr. Chuangye Yan (post-doc fellow from the School of Life Sciences and Center for Life Sciences) and Dr. Jianlin Lei provided technical support on the model building and EM data collection. EM images were acquired at the Tsinghua University Branch of the China National Center for Protein Sciences (Beijing).

Data processing was performed on the “Explorer 100” cluster system of Tsinghua National Laboratory for Information Science and Technology, the Computing Platform of China National Center for Protein Sciences (Beijing). This research was funded by the Beijing Innovation Center for Structural Biology and the National Natural Science Foundation of China.

The original link: https://www.cell.com/cell/fulltext/S0092-8674(19)30155-2
The video link: https://v.youku.com/v_show/id_XMzc3ODAwNzMxNg==.html
Related publications:
http://science.sciencemag.org/content/early/2016/01/06/science.aad6466
http://science.sciencemag.org/content/early/2015/08/19/science.aac8159
http://science.sciencemag.org/content/early/2015/08/19/science.aac7629
http://science.sciencemag.org/content/early/2016/07/20/science.aag0291
http://science.sciencemag.org/content/early/2016/07/20/science.aag2235
http://science.sciencemag.org/content/early/2016/12/14/science.aak9979.full
http://www.cell.com/cell/fulltext/S0092-8674(17)30954-6
http://www.cell.com/cell/fulltext/S0092-8674(17)31264-3
http://science.sciencemag.org/content/early/2018/05/23/science.aau0325

Dr. Peng Jiang’s group published research in Nature on ammonia metabolic remodeling in tumour cells

On March 6th, 2019, a research team led by Dr. Peng Jiang from School of Life Sciences at Tsinghua University published their findings on the discovery of the mechanisms for ammonia metabolic remodeling in tumour cells in Nature, entitled ‘p53 regulation of ammonia metabolism through urea cycle controls polyamine biosynthesis’.

In tumour cells and proliferating cells, elevated nutrient uptake and metabolic activity are greatly preferred to supporting biosynthesis and rapid cell proliferation. During the increased metabolic processes, ammonia, like reactive oxygen species (ROS), is concomitantly generated. However, it remains unknown how tumour cells dispose of excess ammonia and what outcomes might be caused by ammonia accumulation.

The tumour suppressor p53, which is the most frequently mutated gene (>50%) in human tumours, plays a pre-eminent role in protecting against cancer, through its ability to sense various stresses and in turn invoke anti-proliferative and repair responses. Recently, emerging evidence suggests that metabolic regulation appears to be central for its tumour suppression function. Previous studies extensively focused on the role of p53 in central carbon hydrate metabolism. However, the mechanisms of p53-mediated metabolic regulation and tumour suppression are not completely understood.

In this work, the authors provided evidence that p53 regulates ammonia metabolism to dedicate polyamine biosynthesis and tumour growth through repressing urea cycle, a major ammonia metabolic pathway that operates to eliminate excess nitrogen/ammonia. They found that, by transcriptionally downregulating the expression of Urea Cycle genes, p53 represses urea cycle flux and ureagenesis, impedes ammonia elimination (increases cellular ammonia levels) and reduces tumour growth both in vivo and in vitro. Noticeably, tumour-associated p53 mutant lacks the urea cycle-inhibitory activity. Interestingly, urea cycle defect reciprocally activates p53 through reducing MDM2 expression, suggesting a positive regulatory loop between p53 and this metabolic pathway.

Furthermore, ammonia accumulation abrogates the translation of ODC mRNA, and suppresses the synthesis of ODC proteins, which is the initial and rate-limiting enzyme in polyamine synthesis and critical for tumour growth. Thus, ammonia accumulation induced by p53 is involved in p53-mediated tumour suppression.

Collectively, these findings
Article link: https://www.nature.com/articles/s41586-019-0996-7

connect p53 to ureagenesis, ammonia metabolism and polyamine biosynthesis, and further reveal a role for ammonia in controlling polyamine biosynthesis and cell proliferation. Clinically, enhanced Urea Cycle activity and ODC-mediated polyamine biosynthesis due to p53 inactivation may uncover a possible target for therapeutic intervention.

Ph.D student Le Li from the School of Life Sciences is the first author and Dr. Peng Jiang is the corresponding author of the article. Professor Li Yu from the School of Life Sciences provided invaluable help with this study. The study was funded by the National Science Foundation of China, and the 1000Plan Program for Young Talents and Tsinghua-Peking Joint Center for Life Sciences.

Recently, Professor Qiang Zhang’s group in Department of Chemical Engineering, Tsinghua University, published a paper entitled “Lithiophilicity Chemistry of Heteroatom-Doped Carbon to Guide Uniform Lithium Nucleation in Lithium Metal Anodes” in the journal of Science Advances and a paper entitled “Favorable Lithium Nucleation on Lithiophilic Framework Porphyrin for Dendrite-Free Lithium Metal Anodes” in the journal of Research. This work unveiled the lithiophilicity chemistry of carbon materials as lithium metal anode frameworks and proposed emerging lithiophilic materials to render a dendritic-free lithium metal anodes.

High-energy-density rechargeable batteries have been in increasing demand in modern society for the fast development and wide application of electric vehicles, portable devices, and large-scale smart grids. Lithium (Li) metal anodes, with an ultra-high specific capacity (3860 mAh g⁻¹) and a very low electrode potential (~3.040 V vs. standard hydrogen electrode) are considered as one of the most

Figure legend: p53 regulates the expression of urea cycle enzymes (a). By controlling urea cycle gene expression, p53 manipulates ureagenesis (b), ammonia accumulation (c), urea cycle metabolism in tumours (d), ODC activity (e), ODC mRNA translation (f) and polyamine biosynthesis (g).
promising negative electrode choices. However, Li metal anodes are facing challenging issues, such as the uncontrollable growth of Li dendrites and an infinite volumetric change during cycling. The growth of Li dendrites can result in “dead Li”, the loss of active electrode substance, and an irreversible reduce of capacity. Li dendrites can also promote the violent reaction between electrolytes and Li metal anodes, reducing the Coulombic efficiency and battery lifespan. More seriously, Li dendrites can even pierce through the separator, causing a short circuit and severe safety hazards. Recently, designing highly lithiophilic frameworks has been considered as a promising solution to retard the formation of Li dendrites and infinite volumetric change simultaneously. A deep insight into lithiophilicity chemistry and constructing lithiophilic materials have been the key issues to achieve a dendrite-free Li metal anode. Recently, Prof. Qiang Zhang from Tsinghua University achieved a breakthrough in this area.

With the advantages of excellent electrical conductivity, low density, and facile synthesis, heteroatom-doped carbon materials were proposed as a lithium metal framework. The lithiophilicity of doping sites were proved through first-principles calculation combined with experimental characterizations. There principles were proposed to judge the lithiophilicity: the electronegativity of heteroatom, the “local dipole” of the doping site, and the charge transfer during the Li nucleation process.

Specifically, the electronegativity difference between the heteroatom and carbon atoms is beneficial in forming a negative charge site to strongly absorb a Li ion with positive charge. A strong “local dipole” can induce a strong ion–dipole force to further enhance the interaction between a Li ion and host materials, while an efficient charge transfer is necessary to reduce the nucleation barrier. Based on the calculation results, O-doping was predicted to have the best lithiophilicity among single doping, which was further validated by experimental Li nucleation tests. Comparing with single doping, an O–B/P co-doping strategy was predicted to achieve even better performance. This work entitled “Lithiophilicity Chemistry of Heteroatom-Doped Carbon to Guide Uniform Lithium Nucleation in Lithium Metal Anodes” was published in the journal of Science Advances.

In order to achieve a uniform Li deposition and resist the formation of Li dendrites, a framework porphyrin (POF) material was designed. POF, which is constructed with porphyrin...
units through covalent bonds, can achieve precisely constructed lithiophilic sites in regard to chemical structure and geometric position. As the nature polarization and conjugate structure, the extraordinary lithiophilicity of POF even beyond Li nuclei affords the novel mechanism of favorable Li nucleation to render uniform Li deposition from dendrite growth. This work entitled “Favorable Lithium Nucleation on Lithiophilic Framework Porphyrin for Dendrite-Free Lithium Metal Anodes” was published in the journal of Research.

The journal Research, launching in 2018 as the first journal in the Science Partner Journal program, is the official journal of the China Association for Science and Technology. Research provides an international platform for academic exchange, collaboration and technological advancements. The journal aims to publish high-quality research from any research domain, from any author in the world. Topics of particular interest include, but are not limited to: Biology and life sciences, Micro- and nano-science, Artificial intelligence and information science, New energy studies, Mechanical science and engineering, Environmental science, Emerging materials research, Robotics and advanced manufacturing, and Technological applications of all research.

Qiang’s group was also invited to contribute a review entitled “Combining Theory and Experiment in Lithium–Sulfur Batteries: Current Progress and Future Perspectives” in the journal of Materials Today, cooperating with Prof. Kristin A. Persson from Department of Materials Science and Engineering, the University of California Berkeley. The review summarized the difficulty and how to combine theory and experiments in Li–S batteries, affording a fancy paradigm for energy and material science research.

Their work was supported from the National Key Research and Development Program, the National Natural Scientific Foundation of China, Beijing Key Research and Development Plan from the Beijing Municipal Science & Technology Commission, the Tsinghua University Initiative Scientific Research Program, and the Tsinghua National Laboratory for Information Science and Technology.

Prof. Qiang Zhang is the corresponding author of the papers. Xiang Chen, a Ph.D. student, is the first author of the papers entitled "Lithiophilicity Chemistry of Heteroatom-Doped Carbon to Guide Uniform Lithium Nucleation in Lithium Metal Anodes" and “Combining Theory and Experiment in Lithium–Sulfur Batteries: Current Progress and Future Perspectives”.

Boquan Li, Xiaoru Chen, and Xiang Chen, three Ph.D. students, are the co-first authors of the paper entitled “Favorable Lithium Nucleation on Lithiophilic Framework Porphyrin for Dendrite-Free Lithium Metal Anodes”.

Prof. Qiang Zhang’s group aims to research the energy materials, energy chemistry, and related chemical engineering science. Highly efficient energy storage system is the core pillar of modern transportation, energy industry, and consumer electronics industry. Seeking high-capacity electrode materials, unveiling the working mechanism, and building high-energy-density systems have been the key issues in this area. In exploring Li–S batteries, which works on multi-electron chemistry, the group proposed the concepts of Li bond chemistry and ion–solvent complexes. Li–S pouch cells were further constructed based on SEI (solid electrolyte interphase)-protected Li metal anodes and carbon–sulfur hybrid cathodes. Nano frameworks were also introduced to stabilize the Li metal anodes though lithiophilicity chemistry. This work was published in the journal of Advanced Materials, Journal of the American Chemical Society, Angewandte Chemie-International Edition, Energy Storage Materials, Chem, Joule, Nature Communications, Science Advances, Proceedings of the National Academy of Sciences of the United States of America, and
similar journals. Recently, the group published a paper entitled “Toward Safe Lithium Metal Anode in Rechargeable Batteries: A Review” in the journal of Chemical Review. The group also applied a series of Chinese patents and PCT patents.

**Publication links:**


On the afternoon of February 26th, Vice-Chancellor and President Rocky S. Tuan and Pro-Vice-Chancellor Poon Wai-Yin of the Chinese University of Hong Kong (CUHK) visited Tsinghua University. President Qiu Yong and Vice President and Provost of Tsinghua University Yang Bin met with the guests and had in-depth exchanges on further strengthening the cooperation between the two universities. The two sides signed a MOU between Tsinghua University and the Chinese University of Hong Kong for dual-degree programs. The first batch of programs will include computer science and economics. Upon the approval of the Ministry of Education, students completing relevant program courses will receive bachelor’s degree certificates issued by Tsinghua University and the Chinese University of Hong Kong. It is expected that the first cohort of students will be enrolled for the academic year 2020-2021.

President Qiu Yong noted that the two universities have established a deep brotherly friendship in their long-term cooperation. Tsinghua University attaches great importance to the cooperation with the Chinese University of Hong Kong, and the two universities share a lot in common on the philosophy of university management. President Qiu highlighted Tsinghua University’s latest progress in global strategy, scientific and technological innovation, and humanities and arts education. President Qiu expressed his appreciation for the efficiency and strong dynamics of the two universities in the process of cooperation, and looked forward to
Rocky S. Tuan said that the two universities have close cooperation in education and teaching, scientific research, personnel training, administration and other aspects. He was very pleased to launch dual-degree undergraduate programs with Tsinghua University, which has far-reaching significance for the cooperative development of the two universities. In the future, it is hoped that the two universities will strengthen their ties in biomedical disciplines and social services. At the same time, they will seize the development opportunities in Guangdong-Hong Kong-Macao Greater Bay Area, expand substantive cooperation in more fields, and contribute new wisdom and strength to the construction of the Guangdong-Hong Kong-Macao Greater Bay Area and the development of higher education in China.

Yang Bin noted that the two universities’ joint undergraduate dual-degree programs are conducive to pooling the strengths of Tsinghua University and the Chinese University of Hong Kong in running universities, attracting top international students, promoting the diversification of talent cultivation, and improving the level of international education and the quality of talent cultivation.

Chen Yixian from Tsinghua University Department of Physics won the championship in the college group of the 24th China Daily “21st Century Coca-Cola Cup” National English-Speaking Competition

The 24th China Daily “21st Century Coca-Cola Cup” National English-Speaking Competition was held at the Hangzhou International Expo Center from March 22nd to 24th. Chen Yixian, undergraduate student of year 2017 from the Tsinghua University Department of Physics, won the championship in the college group (with Professor Wu Xia from the Department of Foreign Languages and Literatures as his tutor) and will represent China in the International Public Speaking Competition hosted by the English-Speaking Union in London in May.

Launched in 1996, the 24th China Daily “21st Century Coca-Cola Cup” National English-Speaking Competition is the regional selection competition held in China for the
International English-Speaking Competition held in London, UK, during May every year. Since September 2018, the competition has attracted keen attention from students at home and abroad, with more than one million students of all ages participating in the competition. After the regional preliminaries, semi-finals, and finals, as well as the selection competitions held in campuses and over the internet, 75 contestants advanced to the national competition of the college group. Chen Yixian, who won the championship in the previous Beijing district selection competition, was promoted to the national competition, which consists of two-day semi-finals and one-day finals.

The finalists gave speeches on the theme “A glimpse into the future” and answered the judges’ questions on the spot. Taking the development of photography technology as an example, Chen Yixian narrated the process of how photography turned from a frightening creation in the past to causing an obsession with taking selfies among today’s young people. He also elaborated the law of social development in which the development of science and technology must complement a human spirit, and described to audiences and judges a bright future of highly developed science and technology, as well as a prosperous human spirit. His speech was filled with both scientific features and a human background, and his answers to the questions asked were tactful and appropriate.

From a different perspective, Chen Qiyu from the Tsinghua University Department of Foreign Languages and Literatures became the first runner-up in the Belt and Road Youth English-Speaking Competition.

The judges of the competition were composed of senior experts from the English-Speaking Union, the Ministry of Foreign Affairs, the Cultural and Education Section of the British Embassy, renowned universities at home and abroad, and the China Daily News Agency.

The Tsinghua University Department of Foreign Languages and Literatures has offered courses on public speaking, established a second classroom for practical teaching, and held public speaking competitions. They have also selected and tutored students from different departments to participate in the national public speaking competition, in which the students have achieved outstanding results. In recent years, teachers and students of Tsinghua University have won four qualifications to represent China in global public speaking competitions, as well as winning several national championships and Beijing championships. They have formed a team with the highest level of public speaking skills and hold the highest number of championships won in the whole country.