

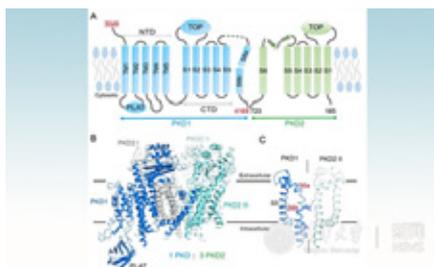
# Tsinghua Newsletter

ISSUE  
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Tsinghua University holds the First International Forum on Engineering Education



Yigong Shi's group reports on the structure of autosomal dominant polycystic kidney disease related to the PKD1/PKD2 complex



China Theory Week 2018 launched



# Tsinghua University holds the First International Forum on Engineering Education

On September 24th, the first International Forum on Engineering Education opened in the Main Building of Tsinghua University. Attending the forum were Li Xiaohong, President of the Chinese Academy of Engineering, Zhou Ji, Honorary Chairman of the Presidium of the

Chinese Academy of Engineering and Chairman of the Advisory Committee of UNESCO's International Engineering Education Center, Marielza Oliveira, Director of UNESCO's Beijing Office, Wu Qidi, Director of the International Center for Engineering Education under the auspices

of UNESCO, as well as Tsinghua President Qiu Yong, Vice President You Zheng, and the Vice Chairpersons of Tsinghua University Council Xie Weihe and Yuan Si. The opening ceremony of the forum was hosted by Chen Xu, Chairperson of Tsinghua University Council.

Themed "Innovation and Development of Engineering Education", this forum aims to bring together renowned scholars and outstanding leaders worldwide in the fields of engineering education, engineering technology, and engineering management to discuss the innovation and development of engineering education, promote the progress of world engineering technology and society, and meet major global challenges. Jointly sponsored by Tsinghua



University, the Chinese Academy of Engineering and UNESCO, the forum was attended by more than 150 experts, scholars and industry representatives from prestigious universities, international organizations, academic communities and enterprises in nearly 20 countries or regions.

At the opening ceremony, Li Xiaohong noted in his welcome address that the development of engineering technology is an important symbol of human social progress, and education is an important factor affecting the movement of the world science and technology center. With the acceleration of scientific and technological revolution and industrial transformation, engineering education has heralded a new stage of development. China is attaching great importance to engineering education in the new era, striving to contribute its wisdom to international engineering education. Oriented to the fourth industrial revolution, this forum would hold exchanges and discussions around future engineering education, which he believed would inspire new and different thinking.

Marielza Oliveira said she was very pleased to have the chance to discuss cutting-edge issues of engineering education with experts and scholars in academia and industries. At present, engineering education needs to be more inclusive and sustainable, to promote lifelong learning, enhance team spirit and social responsibility,



and help people to understand the development of new technologies.

At the opening ceremony, President Qiu delivered a plenary speech entitled "Engineering Education: For a Better Home of Mankind". On behalf of Tsinghua University, President Qiu extended a warm welcome to all the guests. He noted that engineering has created the world in which we live, and engineering education will determine our future world. Since

the founding of the People's Republic of China, especially since the reform and opening up, China's engineering education has developed rapidly, and China has worked out a path of engineering education development that suited to its national conditions, which plays an important role in promoting the country's modernization. Committed to outstanding engineering education, Tsinghua University has trained a large number of outstanding engineers and technicians, making important contributions to the country's industrialization.

President Qiu pointed out that in order to meet the challenges, the international engineering education community has been considering and taking active measures. This forum will discuss in depth the new concept of engineering education and plan for the future of engineering education. He believed that with the joint efforts of the world community, the voice of



engineering education will be heard more widely in the world, the goal of engineering education development will become clearer, and the action plan dedicated to training outstanding engineering talents will be more coordinated.

President Qiu also stressed that future-oriented engineering education should serve to build a better home for mankind. He put forward the following suggestions for future engineering education: strengthen the education of responsibility awareness, train engineers with a strong sense of social responsibility, engineers with noble ethics, engineers with a soul; strengthen the cultivation of innovative ability and strive to cultivate innovative talents in the field of engineering technology; strengthen communication and cooperation, and strengthen understanding and exchange, to timely and accurately convey the information and value

of engineering to society, and comprehensively enhance the influence of engineering and engineering education in society. Finally, President Qiu said that we should, with a lofty vision of the world, the future and all mankind, promote the innovation and development of engineering education and jointly train outstanding engineering and scientific talents to build a better home for mankind.

Richard Lester, Vice Provost of the Massachusetts Institute of Technology, delivered a plenary speech entitled “Innovations in Engineering Education”. Lester elaborated on MIT’s practice of coping with the new trend of international engineering education: encourage students to select courses and study across departments and schools; urge students to interact with diverse groups by setting up study groups and achieve a balance between classroom learning, digital learning and

experimental learning; select top talents and teachers worldwide, strengthen international exchanges and cooperation and jointly promote the development of engineering education.

Natacha DePaola, Chair of the Global Engineering Deans Council (GEDC), delivered a plenary speech entitled “Maximizing Impact through Synergy: a Global Perspective”. DePaola noted that engineering is the core of the development of global industry 4.0, and innovation must be realized through collaboration. Specifically, we should accelerate the development of platforms and tools suitable for global collaboration; we should reform teaching methods and train high-quality talents to meet future challenges; we should, through in-depth dialogue with industries, realize the integration of production, teaching and research, and seek holistic solutions.

The opening ceremony was followed by a university presidents’ forum and a sub-group forum. The presidents will deliver plenary reports and discussions on the following themes: “The Challenge of Engineering Education and the Development of First-class Engineering University” and “Engineering Education for Sustainable Development”. At the same time, nearly 50 experts, scholars and enterprise representatives will speak and discuss in groups about the new mode of industrial-academic cooperation, the cultivation of practical competence in engineering, artificial intelligence and innovation in engineering education, international cooperation and innovation in engineering education, innovative practices in engineering education, innovation and entrepreneurship education, engineering ethics education and the diversity of engineering education, among others.





# Yigong Shi's group reports on the structure of autosomal dominant polycystic kidney disease related to the PKD1/PKD2 complex

The kidney is an important living organ of the human body. It has many physiological functions such as excreting metabolic products, regulating water and electrolyte balance and the endocrine system. Under a variety of pathological conditions,

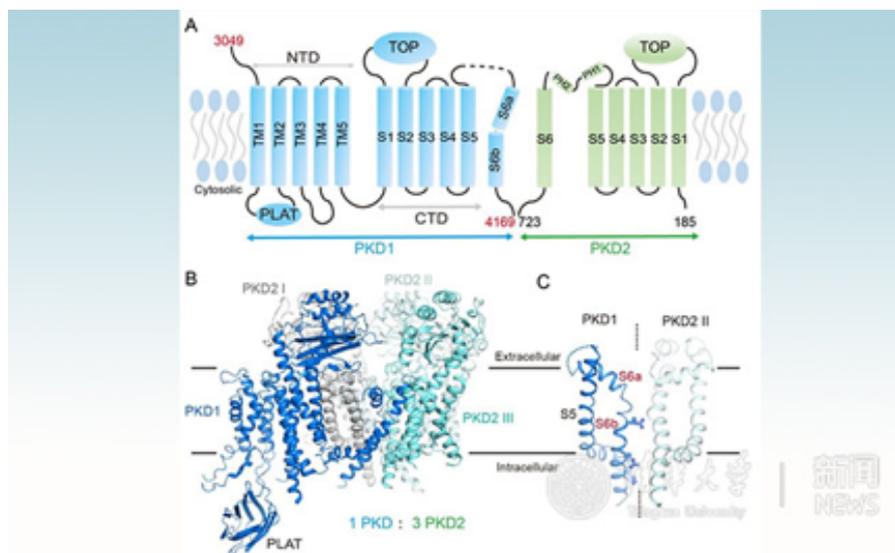
the kidneys need to excrete blood from the organs and supply it to more important organs (e.g. the heart and brain). While of such great importance, the kidneys, however, are among those most vulnerable organs. Genetic factors, hyperglycemia and

hyperlipidemia are important causes of chronic kidney disease. According to the National Institute of Health, the prevalence of chronic kidney disease in US adults (approximately 200 million in total) has reached 11.3%.

Autosomal dominant polycystic

kidney disease (ADPKD) is one of the most important causes of chronic kidney disease, with an incidence of 1/400-1/1000. About 12 million patients worldwide are affected by this disease. The bilateral kidneys of the patient gradually produce fluid-filled vesicles with increasing age, squeezing and destroying the surrounding normal tissues. About 50% of patients develop end-stage renal failure, requiring heterologous kidney transplantation or life-long hemodialysis. There are about 1.5 million patients with this disease in China. Every year, tens of thousands of patients are on the waiting list for donated kidney transplantation or sustaining life through continuous dialysis. ADPKD not only causes severe physical and mental suffering to the patient, but also imposes a heavy financial burden on the patient's family.

The genes associated with ADPKD pathogenesis are PKD1 and PKD2, and their gene products are the membrane proteins PKD1 and PKD2 respectively. Mutations in both accounted for approximately 85% and 10% of all patients respectively. The human *pkd1* gene is located on chromosome 16, encoding a protein of PKD1 with a length of 4302 amino acids containing 11 transmembrane helices. Because of the huge molecular weight of PKD1, researchers have been challenged with great technical difficulties in their research. Since the successful sequencing of the *pkd1* gene in 1993, many scientists have been investigating this protein for more than 20 years. Although these studies have broadened the perception of ADPKD, the function of the PKD1 protein and the pathogenesis of polycystic kidney disease remains controversial for lack of sufficient information. Another pathogenic protein, PKD2, is a chaperone molecule of PKD1, and plays an extremely important role in the folding of PKD1, transporting among organelles



**Figure 1: A. schematic diagram of the topology of human PKD1 and PKD2 proteins. B. The overall structure of human PKD1 and PKD2 protein complex; C. The unique channel domain of PKD1.**

and protein maturation. PKD1 and PKD2 proteins can interact to form hetero-tetrameric complexes and may perform important physiological functions on primary cilia.

On August 10th, 2018, UTC+8, Yigong Shi's group, published a research article entitled "Structure of the human PKD1 and PKD2 complex" online in the journal *Science*, reporting the first near-atomic resolution (3.6Å) of the polycystic kidney disease-associated protein PKD1/PKD2 complex.

Yigong Shi's group first resolved the near-atom resolution structure of human PKD1 and PKD2 complexes. This structure reveals that the PKD1 and PKD2 proteins form a distinctive one-to-three complex (1 PKD1: 3 PKD2). Based on this structural and biochemical data, the team found that PKD1 and PKD2 were able to form complexes without the protein C-terminal coiled-coil domain. This result is inconsistent with the mainstream doctrine which previously thought that "no protein complex can be formed when there is no coiled-coil domain". Therefore, many studies based on this conclusion need to be reconsidered. In addition, the researchers found that the pore domain structure of PKD1

is different from that of all currently known voltage-gated ion channels. The S6 transmembrane helix of PKD1 has a number of positively charged amino acids protruding into the central cavity of the channel, potentially blocking the central channel path which is for calcium permeation. There have been many debates about whether PKD1 and PKD2 form calcium channels in the field. The current conformation of this structure does not support the channel hypothesis, which brings new thinking to the investigation of the mechanism of polycystic kidney disease.

Yigong Shi's research team cooperated with Prof. Mei Changlin and Prof. Yu Shengqiang from Shanghai Changzheng Hospital. Since 2013, the structure of two human proteins, PKD1 and PKD2, has been conceived. During the past five years, unremitting efforts on the protein boundary, frozen sample preparation conditions and detergent optimization have been tried and screened. Finally, the structure of PKD1 and PKD2 protein complex was resolved with an overall resolution of 3.6Å, and the core region resolution was able to reach 3.2Å. This was the first time that the structure of a TRP channel family heterologous complex had been

obtained.

Professor Yigong Shi from the School of Life Sciences of Tsinghua University and the Center for Structural Biology and Innovation, is the corresponding author of this article; Qiang Su, a third-year doctoral student at the School of Life Sciences of Tsinghua University, and Dr. Feizhuo Hu from the School of Medicine, are the co-first authors of this article; Ge Xuefei, an undergraduate student in the six-character class of the School of Life, Tsinghua University, helped

complete some of the experiments. Dr. Lei Jianlin from Tsinghua University's cryo-electron microscopy facility provided assistance in the collection of cryo-electron microscopy data. Professor Zhou Qiang, School of Medicine, Tsinghua University, provided cryo-EM data processing guidance. Associate Professor Wang Tingliang, School of Medicine, Tsinghua University, was involved in the early operation of the subject. The electron microscope data was collected from the cryo-electron microscope

facility of Tsinghua University. The calculation work was supported by the Tsinghua University High Performance Computing Platform and National Protein Facility Experimental Technology Center (Beijing). This work has received funding support from the Beijing Center for Structural Biology and the National Natural Science Foundation.

**Link to the publication:**

<http://science.sciencemag.org/content/early/2018/08/08/science.aat9819>

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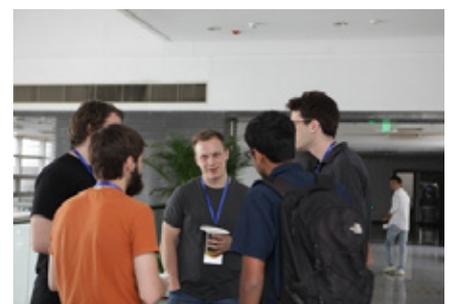
# China Theory Week 2018 launched

China Theory Week 2018 took place from September 17th to September 20th, 2018 at the Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University. An international group of young scholars from Harvard University, Princeton University, MIT, UC Berkeley, Tsinghua University and Shanghai Jiaotong University had the chance to discuss their current research on theoretical computer science at the workshop. The workshop was opened by IIIS Assistant Professor Ran Duan, co-chair of CTW 2018; Prof. Andrew Yao, IIIS Dean and CTW General Chair, also attended the workshop.

The four-day program included four keynote talks by the Director of the Baidu Quantum Computation Institute Runyao Duan, Michigan Professor Seth Pettie, Aarhus Associate Professor Kasper Green Larsen and UB Assistant Professor Shi Li, as well as twenty-four talks by graduate students from renowned universities,

covering a wide range of topics from algorithms, complexity theory, and cryptography to machine learning theory, quantum computation and mechanism design.

Now in its 12th year, the workshop is an annual event that brings together and connects pioneering academics across the world. Vatsal Sharan from Stanford University said he was advised to attend the workshop by his advisor Gregory Valiant, who came to CTW three times (CTW2009 student speaker, CTW2014 keynote speaker, and CTW2016 keynote speaker) and this was something that made this workshop special. Prof. Seth Pettie, one of the keynote speakers, commented on the workshop: "It is a great idea. It does a good job at advertising China to the world, and it's a big success." This year also sees two alumni of Yao's class attending the workshop as speakers: Shi Li, Yao class of 2008 graduate and now UB Assistant Professor, and Tianren Liu, Yao class



of 2014 graduate and now MIT PhD candidate.

China Theory Week was initiated by Prof. Andrew Yao in 2007, and aims to promote academic exchange in the field of computer science worldwide. It now enjoys a high reputation among graduates and has witnessed the process of growth and transformation into researchers by the student participants. This annual event rotates locations chosen by the host organization (IIIS) from Beijing to Aarhus, Hong Kong, Shanghai; this year, it was held in Beijing.



# The Nobel Prize Winner Prof. Steven Chu joins TBSI's External Advisory Board

On September 26th, Professor Steven Chu from Stanford University, the winner of 1997 Nobel Prize in Physics, was invited to visit the Tsinghua-Berkeley Shenzhen Institute (TBSI) and to give a lecture to students and faculty, whose title was Progress in Molecular and Ultrasound Imaging in Biology and Bio-medicine. The Core-PI from TBSI and industry audience listened to the lecture with the students, and engaged in some active questions after the lecture with Professor Chu.

Professor Steven Chu's speech focused on recent progress in ultrasound super resolution imaging and the development and applications of rare-earth nanoparticle probes in biology and biomedicine. His group used the rare-earth nanoparticles Er<sup>3+</sup> and Yb<sup>3+</sup> imbedded in a crystalline host to achieve long-term live cell tracking



of dynein transport with millisecond time resolution. Rare-earth nanoparticle probes are nanometer-sized, bright, photostable, non-toxic and able to label single proteins in cells and tissues. Professor Chu's group are aiming to attain ~10 nanometer

spatial resolution for live cell imaging. In clinics, ultrasound imaging is extensively used worldwide.

In the second half of the lecture, Professor Chu shared new approaches to greatly improve the resolution of ultrasound imaging through reducing



speckle noise. Angular compounding with nine angles along with frequency compounding can lead to 6~8 times speckle noise reduction.

The bio-harmless detection methods produced by Professor Chu are able to obtain unprecedented high-resolution ultrasound images of living biological tissues and monitor molecular migration in living cells or tissues, which will make a significant contribution to the fields of biology and biomedicine.

After the lecture, as a representative of the TBSI, the core-director Professor Lin Zhang issued a certificate to Steven Chu officially appointing him a consultant of the External Advisory Board (EAB). Professor Chu's parents both came from Tsinghua University in the 1940s. They wrote two letters to the university when they graduated. Professor Zhang gave two photocopies to Professor Chu as a gift. Afterwards,

Professor Zhang showed the TBSI's labs and scientific achievements to Professor Chu.

The TBSI's External Advisory Board held its first meeting on 26th March, 2018, and elected Eric Grimson, the former president of MIT, as its chairman. Eight of the world's top scholars became founding members, including Emeritus Professor Chenming Hu from UC Berkeley, the former president of Tokyo Tech



Professor Kenichi Iga, the Deputy Provost of UC Berkeley Professor Tsu-Jae King Liu and Professor Fiona M. Doyle, the Provost of Nazarbayev University Professor Ilesanmi Adesida, the President of the University of Surrey Professor Max Lu, and Professor Leonidas Guibas from Stanford University.

It is an honor to invite Professor Steven Chu to join the EAB, which will further enhance the international influence and reputation of the TBSI and inject more theoretical foundations and practical experience into the interdisciplinary concept of the institute.



## Renowned Professor Donald B. Rubin launched a new course “The Design of Experiments” at Tsinghua

In the fall semester of 2018, Professor Donald B. Rubin, an internationally well-known statistician opened a graduate course entitled

“The Design of Experiments” at Tsinghua.

“The Design of Experiments” is a basic subject of statistics and has

a wide range of applications. The course is mainly taught by professor Rubin himself, and overseas scholars of related majors are also invited



to participate through seminars and special reports, so that students can experience the research frontier in the field of statistics while learning basic knowledge.

Professor Rubin joins Yau Mathematical Sciences Center, Tsinghua University, from Harvard University, where he was the John L. Loeb Professor of Statistics. He has served on Harvard's faculty as full professor of Statistics since 1983, chairing its Department of Statistics for 13 of those years. He is most well-known for the Rubin Causal Model, a set of methods designed for causal inference with observational data, and for his methods for dealing with missing data. As a statistician, his research focuses on the design of empirical studies, including surveys and experiments, and the analysis of data from such studies. As of 2017, he has authored/coauthored over 400 publications (including ten books), has four joint patents, and for many years has been one of the most highly cited authors in the world, with currently over 200,000 citations and nearly 20,000 in 2016 alone (Google Scholar).

Yau Mathematical Sciences Center (YMSC) of the Tsinghua University was established in December



2009. Professor Shing-Tung Yau, Director of YMSC, is one of the most famous mathematical scientists in the world, being honored by numerous prestigious prizes and awards, such as Fields Medal, Crafoord Prize, Wolf Prize, and Marcel Grossman Award. YMSC is devoted to studying

international frontier subjects, promoting academic communication of mathematical conceptions and achievements, and improving the level of mathematics research and teaching in China.



## 2nd Anniversary of the Opening of Tsinghua University Art Museum

Tsinghua University Art Museum was officially opened to the public on September 11th, 2016, following the opening ceremony on September 10th, that same year. On September 10th, 2018, the museum celebrated its

second anniversary.

To celebrate it having been opened now for its second year, the museum opened nine exhibitions.



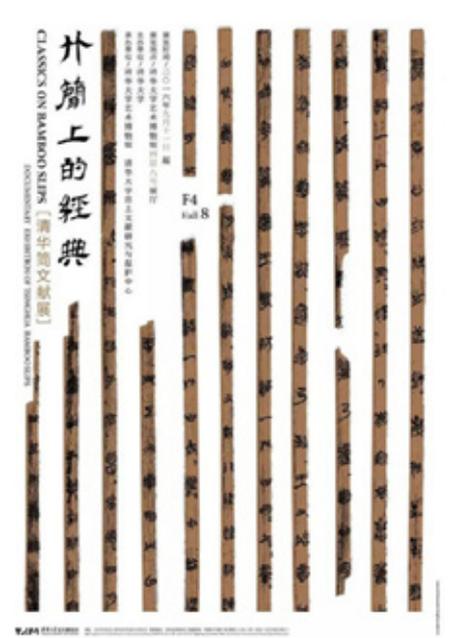
The first exhibition, open from August 16th, 2018 to October 7th, 2018, is called “Bright Glory—The Aesthetics of Yuan Yunfu.” It attempts to cherish the memory of Mr. Yuan Yunfu, and prize the artist’s life path and significance in art history through the organization, interpretation and description of his artistic thoughts and works, while delving into the historical traditions and ideological development track of the Academy of Arts and Design at Tsinghua University.



The second exhibition, the Koji Kinutani Exhibition, is open from September 1st, 2018 to September 23rd, 2018, and tries to explore the future of the relations between these two countries with the force of art in the long history through a selection of masterpieces of Koji Kinutani along with his other works themed on China introduces the artist in three units.

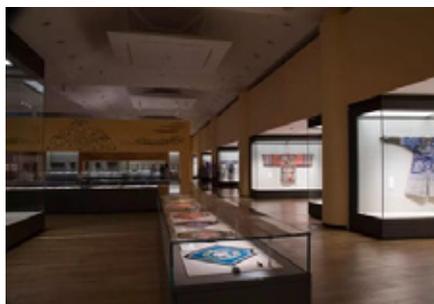
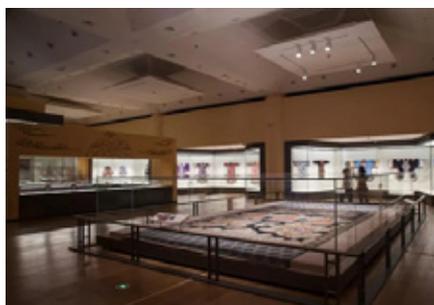
“Foster + Partners: Sustainable Communities | Shared Futures” is an exhibition that is open from July 24th, 2018 to October 7th, 2018, while investigating the work of the world-renowned architectural studio led by Norman Foster, through the lens of sustainability by focusing on the Foster + Partners’ integrated design approach that combines expertise from several disciplines from engineering and research to industrial design.

Another exhibition is “Classics on Bamboo Slips” - Documentary Exhibition of Tsinghua Bamboo Slips.” These “Tsinghua Bamboo slips” are the cultural relics unearthed from the tomb in Kingdom Chu in the middle Warring States Period in Chinese history, totaling approximately 2,500 pieces (including some broken ones).

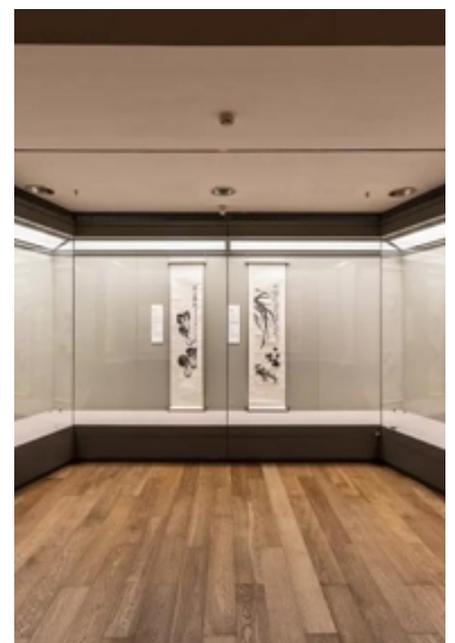




“Tsinghua Treasures – Selected Silk Embroidery Exhibition of Tsinghua University Art Museum Collection – Textile” is an exhibition that captures the Ming Dynasty’s Round Chinese silk Kesi with phoenix and peony patterns, Qing Dynasty’s Kesi Buddha with “Infinite Life Buddha” patterns, Red and Soft Silk Changyi Gown embroidered with “Jinyumantang” designs and Blue Kesi Imperial Robe.



“Tsinghua Treasures - The Art of Chinese Ink and Brush Exhibition of Tsinghua University Art Museum Collection - Painting and Calligraphy II” has a rich collection of Chinese ancient and modern paintings and calligraphy. The vast majority of these paintings and calligraphy collections originate from the old possession of the former Central Academy of Arts and Design. With representative works of various genres and famous artists from various periods since Ming dynasty, they can clearly and systematically reflect the development of Chinese painting and calligraphy.





Another exhibition, titled as “Tsinghua Treasures – Built to Suit Exhibition of Tsinghua University Art Museum Collection—Furniture,” holds some of the 50 plus pieces of famous Ming-style furniture mainly made of yellow pears, red sandalwood and other materials.



The eighth exhibition is titled as the “Autumn Charm of Miu Pusun – The paintings of Chrysanthemums,” and is opened from August 25, 2018 to March 17, 2019. The album displays Miu Pusun’s One Hundred Chrysanthemum Pictures, counting one hundred leaves, displayed 187 kinds of chrysanthemum flowers.





Last but not least, the “Tsinghua Treasures – The Sunset Glow Exhibition of Tsinghua University Art Museum Collection – Porcelain” exhibition displays pottery made in Jingdezhen kiln factory in Kangxi, Yongzheng and Qianlong Period from the Ming and Qing Dynasties. Clearly, all of these exhibitions show the artistic history of China and some artwork created by some renowned artists.

Tsinghua University Art Museum owns more than 13,000 pieces of collections, covering six major categories, namely, painting and calligraphy,



embroidery, porcelain, furniture, bronze ware and comprehensive artwork. Most of the collections are from Academy of Arts & Design since 1956, and donations from Tsinghua alumni or some social elites.

(Photos from Tsinghua University Art Museum)

## Tsinghua Graduate claims high jump gold at Asian Game

Wang Yu, a graduate of Tsinghua University, won a gold medal in the men’s high jump athletics final at the 2018 Asian Games in Jakarta, Indonesia on August 27th 2018.

Wang, who obtained a Master’s degree from the Tsinghua School

of Social Sciences earlier this year, clinched the title with a jump of 2.30 metres, thus becoming the third Chinese athlete to claim a men’s high jump gold in the Asian Games. Wang stated that although he is very happy to have won the gold medal, he was

hoping to better his own personal best of 2.33 metres.

Talking about his alma mater, Wang Yu noted that Tsinghua has a profound cultural heritage and a tradition of attaching importance to sports. Speaking about his experience

at university, Wang said, “The Tsinghua spirit has helped me develop personally and my character has grown so I feel more fulfilled than before.”

Born in Zhuhai, Guangdong province, in 1991, Wang Yu showed a superior talent for sports early in his childhood. In March 2010, due to his excellent performance in Tsinghua University High School, Wang Yu qualified for a recommendation for admission to Tsinghua University. However, he did not accept the recommendation. He then took part in the national college entrance examination and was admitted to the School of Economic Management, Tsinghua University, with an excellent performance.

Wang Yu liked sports from an early age, enjoying playing badminton, golf, basketball, and swimming. He is also fond of music and reading, and watching animé. Wang started to learn high jump in his first year of high school and then became increasingly fond of the sport. “High jump enables one to continually challenge oneself,” said Wang.



(Photo from Chinanews.com)

Wang Yu, now aged 27, says there are two keywords which define his past ten years: Tsinghua and high jump. High jump represents his passion and Tsinghua is the place where he spent his youth, has his best memories, and was the place where he realized his dreams.

Currently, Wang Yu has joined the staff of the General Administration of Sport of China. He is now focusing on the 2020 Tokyo Olympics,

and looks to improve whilst enjoying the sport of high jump.

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## Yang Bin visits Russia and Kazakhstan to promote regional university cooperation

Tsinghua University Provost and Vice President Yang Bin has contributed to a Times Higher Education Summit in Kazan, Republic of Tatarstan, during a visit to Russia and Kazakhstan. The summit, entitled Research Excellence: Eurasia was

designed to understand the development of Eurasia as an emerging area for world research and innovation, and identify where new opportunities for the region exist.

Addressing the Summit on 31st August, Yang Bin highlighted the

role that the Belt and Road Initiative was having on academic partnerships, and how Tsinghua University is well placed to deepen cooperation with the region. “I would like to see greater education cooperation projects that are inter-disciplinary in nature,



promote people to people links and improve cross cultural fluency of our respective students and faculty. This approach will best serve the development of regional excellence in our institutions.”

Following the summit, Yang Bin visited university partners in Kazakhstan on 1st September, including Nazarbayev University (NU). Yang Bin and NU Provost Ilesanmi Adesida looked into the all-round cooperation between the two universities and explored future development and greater levels of engagement, including student and faculty exchange.

During a meeting with senior representatives of the Kazakh Department of Education and Science, Yang Bin introduced the cooperation history between Tsinghua and Kazakhstan. The two sides discussed pathways for greater cooperation including the promotion of talent training and other related matters. Representatives from Tsinghua’s Office of International Cooperation and Exchange and Wud-aokou Tsinghua School of Finance



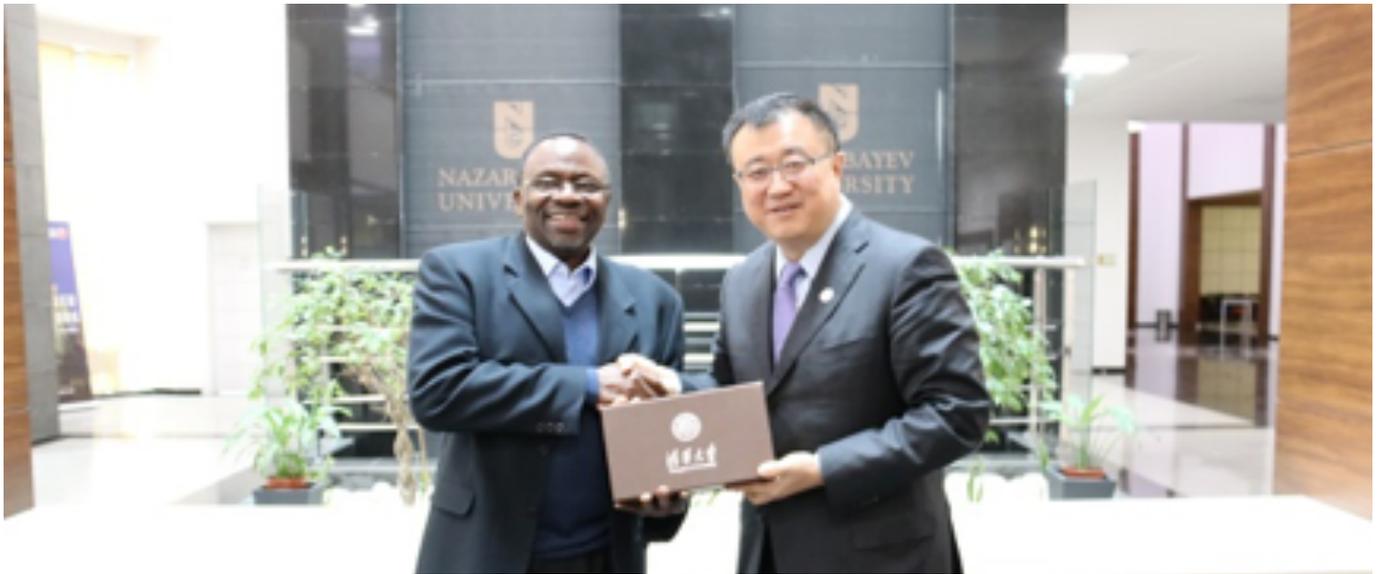
**Panelists included representatives from SOAS University of London, Nazarbayev University, Turan University and Atılım University**

attended the meetings.

Kazan Federal University was founded in 1804, making it the second-oldest Russian university. Famous mathematician Nikolai Ivanovich Lobachevsky served there as the rector from 1827 until 1846. The university is known as the birthplace

of organic chemistry due to works by Aleksandr Butlerov, Vladimir Markovnikov, Aleksandr Arbuzov, and the birthplace of electron spin

**For more information on Kazan Federal University, visit:**  
<https://kpfu.ru/eng>



**Meeting with Nazarbayev University Provost Ilesanmi Adesida**



**During his visit to Kazan Federal University, Yang Bin held talks with university representatives including the Vice Rector Dr Linar Latypov**

resonance discovered by Evgeny Zavoisky.

Nazarbayev University is an autonomous research university in Astana, the capital of Kazakhstan. Founded in 2010, it is an English-medium institution, with a high level of international faculty and staff.

**For more information on NU, visit:**  
<https://nu.edu.kz/>



**Meeting with representatives from the Kazakh Department of Education and Science**

# Yi Zhong's group published a Cell Reports article revealing the role of the Drosophila fan-shaped body neurons in nociceptive avoidance

Recently, a research team led by Professor Yi Zhong from the School of Life Sciences at Tsinghua University published a research article entitled Fan-Shaped Body Neurons in the Drosophila Brain Regulate both Innate and Conditioned Nociceptive Avoidance in Cell Reports, reporting an important role of Drosophila Fan-shaped Body (FB) neurons in nociceptive avoidance.

The living environment for animals is complicated and dangerous. If there is no effective escape mechanism to avoid noxious stimuli, it is hard for animals to survive. The avoidance of noxious stimuli consists of two parts; one is innate avoidance, such as escaping after being stabbed by a sharp object, or burning; the other is conditioned avoidance. For example, once a mouse receives electric shocks in room A which is not initially a dangerous room, it will couple room A with electric shock damage. Even if there is no electric shock in room A later, it will still avoid the room as it has the electric shock.

Two kinds of nociceptive avoidance behaviors also exist in fruit flies. Previous studies in fruit flies mainly focused on the peripheral nervous system, and little is known about how the central nervous system processes

nociceptive information and guides avoidance behavior. The authors set up automatic stimulation equipment and a living calcium imaging recording device based on two-photon microscopy. The living brain of the transgenic fly with the calcium ion indicator protein GCaMP3 was dissected and the response to noxious electric shock stimulation was recorded. The results showed that the fan-shaped body (FB) located in the middle of the brain responded strongly to such noxious stimuli. Since the FB is a complex multi-layer structure, the authors further investigated

electric shock-induced responses in different FB layers using multiple Gal4 lines. The data showed that different FB layers responded differently to an electric shock, and the responses of the ventral layers were higher than of the dorsal layers.

Do such shock-induced responses play a role in the nociceptive avoidance behavior of Drosophila? The authors conducted behavioral experiments to explore this question. The FB neurons were found to be necessary in avoiding noxious electrical stimulation or noxious thermal stimulation. In addition, if the stimulus

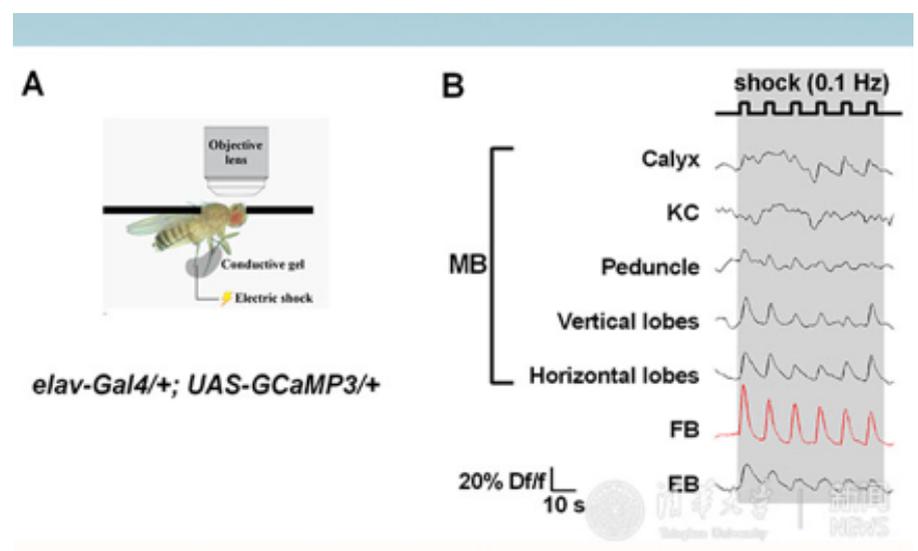
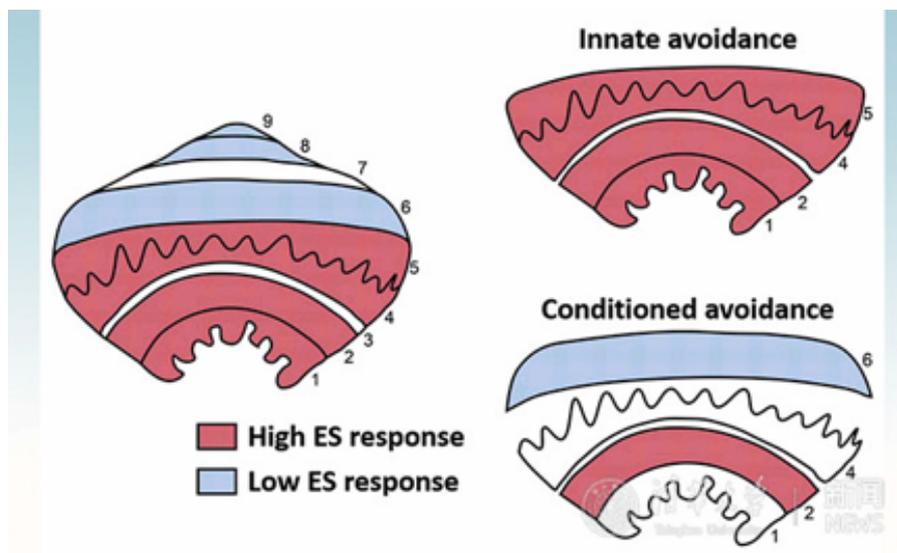


Fig 1 In vivo Calcium recording

was not noxious (for example, if the fly encountered a disgusting smell), its avoidance behavior was not affected by the activity of FB neurons. Flies also avoided the area where the FB neurons were artificially activated, and this “avoidance” could be conditionally learned. Moreover, the author found that the FB not only participates in innate avoidance, but also participates in conditioned avoidance. In such behavioral experiments, the flies learnt to avoid an odor coupled with noxious electrical stimulation. The activity of FB neurons was found to be required in such avoidance behavior. Interestingly, different FB layers had different roles in both innate and conditioned avoidance behavior.

Dr. Wantong Hu, Yiqing Peng, and Jiameng Sun at the School of Life Sciences at Tsinghua University are the co-first authors of this article. Dr. Qian Li and Dr. Yi Zhong are the



**Fig 2 Different FB layers take part in different avoidance behaviors**

corresponding authors of this article. Fang Zhang, Dr. Xuchen Zhang, Lianzhang Wang, and Bohan Zhao also contributed to this study. This work was supported by grants from the National Natural Science Foundation of China, the National Basic Research Project (973 program) of the Ministry

of Science and Technology of China, and the Tsinghua-Peking Joint Center for Life Sciences.

**Paper link:**

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