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ShanghaiTech

Welcomes Incoming Students

ShanghaiTech held an opening ceremony for the entering class of 2018 on September 14. Attended by representatives from institutes affiliated to Chinese Academy of Sciences (CAS), ShanghaiTech faculty and students, this year's ceremony welcomed ShanghaiTech's fifth class of 422 undergraduates coming from 17 provinces and municipalities nationwide. The university also admitted its sixth class of 560 master's degree students and fourth class of 220 PhD students who chose to continue their research at ShanghaiTech. A video presentation showed ShanghaiTech's historical development and conveyed messages from ShanghaiTech's recently graduated class to the incoming students. According to university tradition, the deans of each school announced each incoming student's name. Vice Dean Liu Zhi and Adjunct Professor Zong Jianguang (representing the School of Physical Science and Technology); Executive Dean Wu Jiarui (representing the School of Life Science and Technology); and Associate Deans Yu Jingyi and Zhou Yu (representing the School of Information Science and Technology) welcomed the incoming undergraduate and graduate students for their schools. There were audible reactions as the crowd read the students' self-introductions on a large screen above the stage, including 'I could either watch it happen or be

part of it,' 'Write the code, hack the world,' and 'Never underestimate yourself or overestimate your computer.'

Undergraduate representative Chen Xiduo, spoke to the audience about the incoming students' experiences so far at ShanghaiTech and her aspirations for her university career. Shi Jiahe, a 2018 ShanghaiTech graduate who will continue on here for his master's degree, reflected on growing up with the university and encouraged new students to bravely pursue their research dreams.

SPST Assistant Professor Zuo Zhiwei, whose research was recently published in *Science*, shared with students his own research experience and advised students to concentrate and learn from their setbacks and failures. SIST Distinguished Adjunct Professor and CEO of United Imaging Dr. Chen Qun called for students to prepare for challenges and make contributions to society.

Chairman of the University Council Zhu Zhiyuan encouraged students to take full use of the resources available at ShanghaiTech and strike a balance between their major course load and general courses. He advised students to focus on their personal development as well as make contributions to the national strategy.

President Jiang Mianheng took to the stage and spoke about how much ShanghaiTech has achieved in the past five years in research and education and the milestone the school has reached in cultivating students of every year. Jiang discussed how interdisciplinary studies and collaboration are important for general education in natural and social sciences, major courses, professional skills and entrepreneurship. Jiang then discussed how arts and science can interact, and explained why ShanghaiTech decided to found the brand-new School of Creativity and Art. SCA will offer





faculty and students high-quality course offerings in humanities and arts, boost interdisciplinary exchange and original scientific research, and explore ways to incubate innovative business. He emphasized his hope that ShanghaiTech students would contribute to the restructuring and development of China. Then President Jiang officially announced the beginning of a new school year.

Outside the gymnasium, students gathered to find their photos on banners reading “Welcome Home.” Yang Jiajie and her classmate from the School of Life Science and Technology both said that attending a Campus Assessment Day was crucial to their decision to come to ShanghaiTech. “I came to visit here and as soon as I was on campus I knew I wanted to come here for university. The dorms were great and everything here is new and high quality,” she said. “I knew if I came here I’d benefit from the opportunities and teaching philosophy here.”

Wang Yujing, one of 11 students from Gansu Province who chose ShanghaiTech, said she was excited to start classes at SLST. “I came here because I wanted to come to a new university; it’s different from traditional universities. There’s a lot of new things here, and the resources are amazing. I think it’s really worth it to come here.”

SIST graduate student Deng Xin agreed. “I went to a more traditional university for undergraduate studies. I wanted to come to a newer school for my graduate studies, one in a great location. ShanghaiTech has a different philosophy, and many of the faculty did their studies abroad. The traditional university atmosphere didn’t suit me, and I’d like to try something new.”

Then they joined the crowds of new students streaming towards the dining halls for lunch. ShanghaiTech’s fall term had officially begun.

Nobel Prize Winner Joachim Frank Gives ShanghaiTech Lecture

On August 31, Columbia University Professor and 2017 Nobel Prize winner in Chemistry Joachim Frank delivered the first ShanghaiTech Lecture of the new academic year on “Single-particle cryo-EM -- A Journey to High Resolution without Crystals” to a packed auditorium.

Vice President Gong Jinkang introduced the host of the lecture, iHuman Institute Distinguished Adjunct Professor Kurt Wüthrich, recipient of the 2002 Nobel Prize in Chemistry for developing nuclear magnetic resonance spectroscopy to help ascertain the size and structure of biological macromolecules.

After Professor Wüthrich’s humorous introduction, Professor Frank explained the composition of cryo-electron microscopy (cryo-EM) and discussed how the advent of direct electron detection cameras has propelled a long-existing technique of visualization to the forefront of structural biology in his hour-long lecture. Molecules are imaged in their native, hydrated states without the need for crystallization. Density maps at resolutions in the 2-4 Å range allow atomic models to be built. Reconstructions showing a molecule in multiple conformations and binding states can be obtained simultaneously from the same sample. This development promises to expand the range of biological molecules in the cell that are possible targets for drug design. Professor Joachim Frank’s engaging speech and humorous metaphors won the audience’s rapt attention and they awarded him with sustained applause.



Professor Kurt Wüthrich hosts the lecture

"Great scientists always make great discoveries," said Vice President Gong as he thanked Professor Frank for his wonderful speech on behalf of the university, and gave him a commemorative ShanghaiTech Lecture plaque.

The ShanghaiTech Lecture attracted many freshmen students, who said afterwards they were very happy to have the opportunity to listen to a speech by a Nobel laureate.

Professor Frank is a German-American dual nationality biophysicist. He was born in Germany in 1940, received his PhD from the Technical University of Munich in 1970 and is currently a professor at Columbia University. He is a member of the National Academy of Science and a fellow of the American Academy of Arts and Sciences since 2006, and received the Benjamin Franklin Medal in Life Science of the Franklin Institute in 2014. He is regarded as the founder of single-particle cryo-EM, for which he shared the Nobel Prize in chemistry in 2017 with Jacques Dubochet and Richard Henderson. He has also made significant contributions to structure and function of the ribosome from bacteria and eukaryotes.



Wharton Professor Introduces Connected Strategy and Digital Disruption

On July 23, Professor Christian Terwiesch from the Wharton School at the University of Pennsylvania visited ShanghaiTech to deliver a lecture on "Connected Strategy and Digital Disruption." The lecture was hosted by Dean of School of Entrepreneurship and Management Fang Hanming.

In his talk, Dr. Terwiesch discussed three significant and highly-intertwined topics: the power of connectivity between firms and consumers, patterns of disruptive innovations, and lessons about digital disruption. For disruptive innovations, connectivity leads to new user experiences and thus new dimensions of merit from the customer perspective. At the same time, from the firm perspective, connectivity allows for new delivery models and thus makes existing capabilities obsolete. Connectivity is an especially potent ingredient in digital disruption. Scientists can use this framework proactively to come up with new ideas and defensively to spot disruptive threats.

His talk provided valuable insights for tech entrepreneurs and researchers on how to effectively discover new ideas and manage innovations. After the talk, SEM professors had further dialogue with Professor Terwiesch.

Christian Terwiesch is an award-winning teacher with extensive experience in MBA teaching and executive education. He is the Andrew M. Heller Professor in Wharton's Operations, Information and Decisions department. He co-directs Penn's Mack Institute for Innovation Management, and holds a faculty appointment in Penn's Perelman School of Medicine. His research on Operations Management and on Innovation Management appears in many leading academic journals ranging from *Management Science* to *The New England Journal of Medicine*.



Vice President Gong Jinkang (left) and
Professor Joachim Frank (right)



Father of Computer Graphics Introduces *Asynchronous Computing*

Ivan Sutherland, known as the "father of computer graphics" and winner of the 1988 ACM Turing Award, was invited to give the ShanghaiTech Lecture on August 10th, along with his research partner and wife Marly Roncken.

Sutherland chatted with the audience, including college students from different colleges, high school students and corporate employees, to better understand their professional backgrounds and interest. After an introduction by Vice President Li Ruxin, Sutherland and Roncken began their talk on Asynchronous Computing, the first ShanghaiTech Lecture given by two guests.

Using humorous and vivid metaphors, the two guests alternately explained asynchronous computing, and described how to replace the rigid clock of modern computers with more flexible self-timed regimes. Computers with the self-timed regimes will change the operating rhythm and transmission rhythm of the present computers, and will have an innovative impact on both computer architecture and software. Roncken and Sutherland revealed a marvelous model for such asynchronous systems whose actions are distributed in both space and time. The model gives equal status to the storage and communication done by its links and the flow control and computation done by its joints. Making links and joints equally important opens new vistas for research in both Computer Science and Electrical Engineering.

The Q & A session was lively, with audience members enthusiastically putting forward their opinions and questions on self-timed regimes. Roncken and Sutherland meticulously and patiently answered each question. Sutherland also expressed his hope that in this new and energetic university, more people will continue this meaningful work.

Li Ruxin thanked Marly Roncken and Ivan Sutherland for their wonderful speech and presented them with a commemorative ShanghaiTech Lecture plaque on behalf of the university. Many students and teachers took selfies with the speakers.

Ivan Sutherland, ACM fellow, and a member of both the US National Academy of Engineering and the US National Academy of Sciences, was the recipient of the 1988 ACM Turing Award, the 1998 IEEE John von Neumann Medal and the 2012 Kyoto Prize. Sutherland received his PhD from MIT in 1963, with a well-known thesis called "Sketchpad" for which he has become known as the "father of computer graphics." His career has included work in government, private industry, venture capital and academia, including professorships at Harvard, the University of Utah, and Caltech. With his research partner and wife, Marly Roncken, he joined Portland State University in 2009, and the two co-founded the Asynchronous Research Center (ARC). Ivan holds more than 70 US patents, and is author of numerous publications and lectures. Now 80 years old, Ivan devotes himself full-time to research, lectures, and writing.

As the highest lecture series of the university, The ShanghaiTech Lecture, aims to provide a platform for the world's top experts and scholars to promote science, and to sow seeds of hope in its young students.





Google VP Jay Yagnik Speaks on Artificial Intelligence

On September 18th, the School of Creativity and Art and the Office of Student Affairs invited Google Vice President and Engineering Fellow Jay Yagnik to speak on AI at Google and share his views on the application and development prospects of the artificial intelligence industry at ShanghaiTech's International Conference Center.

Yagnik began by introducing different ways to deal with spam e-mails, showing students how computer deep learning has changed our lives tremendously. Computer programs used to be designed to follow strict rules, but nowadays, computer programs are designed to learn from examples. Whether it is the increasing number of computer learning papers on Arxiv each year, or the growing number of people around the world who are paying attention to the Neuro Information Processing Systems conference, the impact of computer deep learning is felt worldwide.

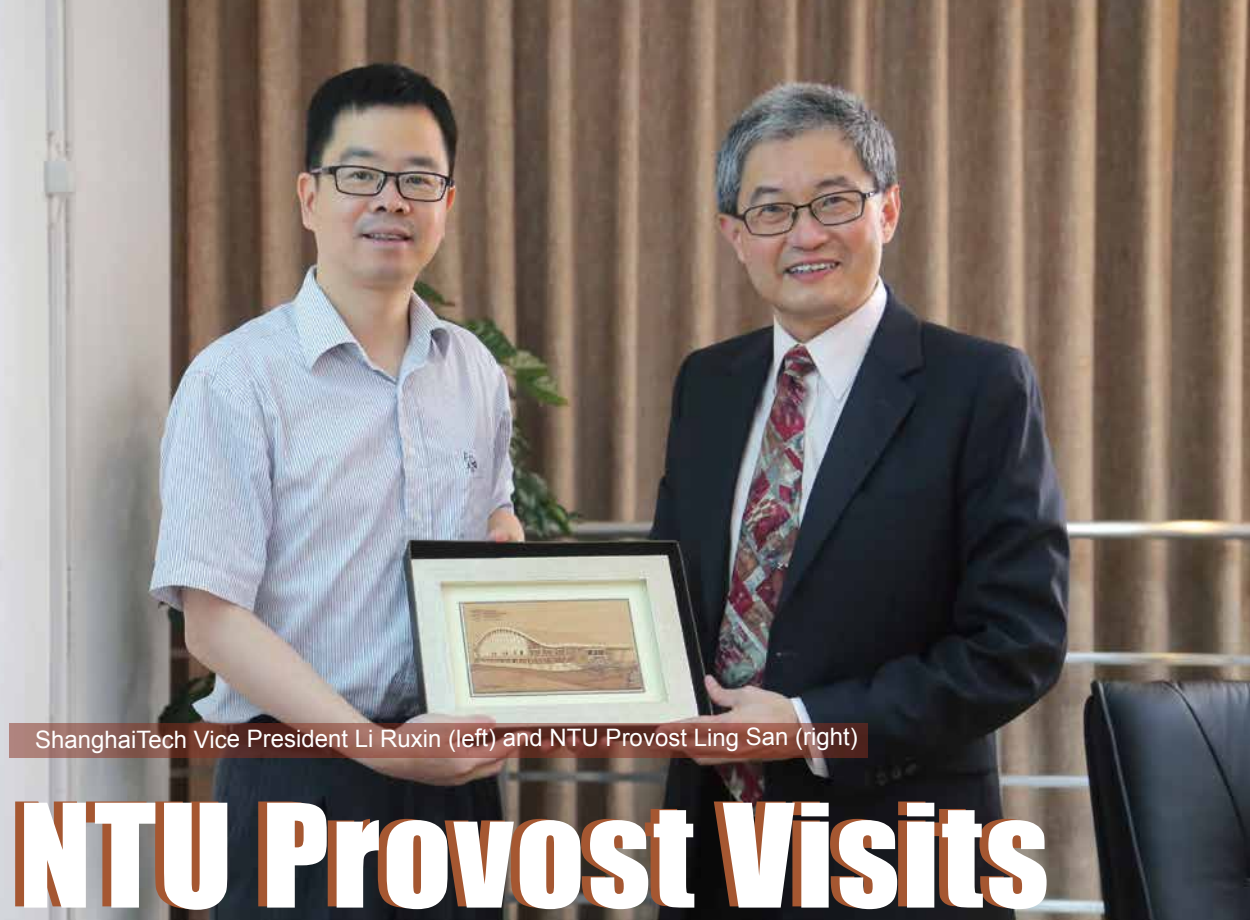
Yagnik also discussed in detail the history of photography as an analogy for today's machine learning to show its huge potential for future development. From the first blurry photo, made in 1826, to the first photography self-portrait in 1839, from the first aerial photograph in 1860 to the first color photo in 1861, from the first dynamic picture in 1878 to the first digital photo in 1957, the evolution of photography between 1826 and 1839 can serve as an analogy for the development of machine learning. It is still at the beginning of development and the future of machine learning is unpredictable.

He then introduced some of Google's current achievements in the field of artificial intelligence. For example, Google Translate, which can help users complete language translation through simple photo recognition. He argued that artificial intelligence has the potential to improve the quality of human life and help humans achieve breakthroughs in fields such as energy, environmental protection, and medical health. Whether it is using deep learning to provide better treatment for people with diabetes, or to solve the problem of world hunger, even to use AI to predict floods...everything is possible in the future, he said.

Finally, Yagnik emphasized the goal of AI is to serve humanity and contribute to global development. He said he believes this will never change no matter how AI technology evolves. The final Q&A session was quite successful and he affirmed that privacy should be valued and protected as AI develops. At the same time, he said he firmly believes that AI has very promising future prospects.

The School of Creativity and Art Presents is a SCA-initiated series of lectures, seminars and activities where artists and interdisciplinary creative talents are invited to share their work, experiences, and insights. After the lecture, many students said they were greatly inspired and motivated. AI is a core target for ShanghaiTech scientific research.





ShanghaiTech Vice President Li Ruxin (left) and NTU Provost Ling San (right)

NTU Provost Visits ShanghaiTech

On September 6th, Professor Ling San, provost and vice president of Nanyang Technological University (NTU) and alumna Ms. Ye Hairong, met with ShanghaiTech Vice President Li Ruxin, who introduced ShanghaiTech's establishment and latest developments. As quite a few ShanghaiTech faculty members have studied or researched at NTU, the two parties agreed to explore collaboration opportunities based on further communication and interaction.

Afterwards, Professor Ling visited SIST's VR Lab and was given a full demonstration of billion pixels immersive browsing and light field virtual object reproduction. He was impressed that ShanghaiTech undergraduates have opportunities to engage in such high-level research projects. Later he toured the university library, including the multi-media center.

Nanyang Technological University, a comprehensive university in Singapore with a focus on both engineering and business, is one of the world's leading universities. It enjoys a world-renowned reputation in many fields such as nanomaterials, biomaterials, functional ceramics and polymer materials.

Professor Ling San received BA and MA degrees from University of Cambridge and a PhD in Mathematics from UC Berkeley. He was appointed Provost and Vice President (Academic) of NTU in 2018. A professor of mathematical sciences, he joined NTU in April 2005 as the founding head of the Division of Mathematical Sciences in the School of Physical & Mathematical Sciences (SPMS). Before joining NTU, he spent 13 years at the National University of Singapore (NUS).

Earlier this year, Mr. Heng Swee Keat, Singapore's minister of finance, paid a visit to ShanghaiTech. He toured SIST's VR Lab and listened to a detailed introduction of the research and tech-transfer between School of Life Science and Technology and the two research institutes.



Professor Osamu Terasaki delivers an address at ChEM inauguration

SPST Professor Honored by Shanghai Government

In September, School of Physical Sciences and Technology (SPST) Professor Osamu Terasaki, director of Center for High-resolution Electron Microscopy (ChEM), was awarded the 2018 Magnolia Silver Award in recognition of his positive contributions to Shanghai's economic and social development, especially for fostering international exchange of advanced technology.

Bringing Art and Science Together

In less than one year since its founding, the School of Creativity and Art has established a significant presence at ShanghaiTech University. It has brought creative technology, design, art and films to campus, developed and opened a variety of creative courses, and has begun to form a base to empower local creative talents and projects.

As industries and fields of study merge together to develop new realms, it not only promotes innovation and the collaboration of creative arts with advanced science and technology, but also builds an open platform that is fully engaged internationally for research, experiment, exchange, growth and breakthroughs to challenge the next generation of creative professionals.

The School of Creativity and Art aims to provide students at ShanghaiTech with a humanities and arts curriculum that will cultivate their full potential, develop interdisciplinary studies that will encourage them to explore alongside with scientists working in multiple fields, forge innovative approaches to combine art and science, and incubate creative industries to promote ShanghaiTech University as a singular launchpad for creative technologies internationally.

Breathing Creativity into Academics and Life

Setting up an art school at a science and technology university like ShanghaiTech has been a challenging and ambitious endeavor. But the first step is as simple as awakening the university community to the creativity and inspiration underlying everyday life.

On December 13th, 2017, SCA held its inaugural event: *The Beauty of Science* lecture by its founder

Dr. Liang Yan and photographer Zhu Wenting. They presented a sumptuous banquet of scientific visual images, turning an artistic lens to the beauty of chemical reactions, molecular movements and cellular formations. The audience was fascinated to see how molecular patterns and structures were revealed to be a riot of colorful repetition and escalation under high-speed microscopes.



Dr. Liang Yan at The Beauty of Science lecture

Professor Terasaki is a world-renowned scientist in the field of electron microscopes. He has built a long history of friendship with Chinese academics since 1990s and was awarded the Friendship Award in 2003. In 2015, Professor Terasaki was invited to take the lead in building a brand-new electron microscopy center at ShanghaiTech University. He devoted himself to his work and has contributed much effort in the past three years. Under his guidance and coordination of the university's functional departments, an advanced electron microscopy research and a well-equipped teaching center have begun to take shape pushing the frontiers of scientific research at ShanghaiTech. The Center for High-Resolution Electron Microscopy (ChEM) was inaugurated in May this year in concurrence with an international electron microscopy forum at SPST.

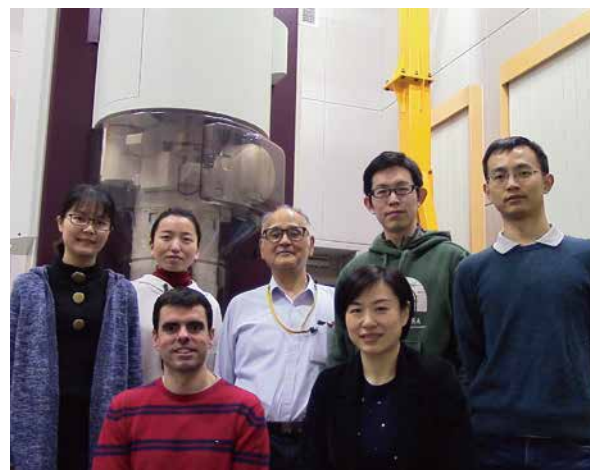
Through his work at ShanghaiTech, Professor Terasaki has not only built a solid foundation for the development and applications of new



Professor Osamu Terasaki awarded the 2018 Magnolia Silver Award

electron microscopy techniques, but he's also inspired the next generation of world-class researchers and enhanced international scientific exchange. "My aim at ShanghaiTech is two-fold," Terasaki said. "One is to provide a platform to develop a top international program on fine structures analysis at atomic scale for electron beam sensitive materials; second is to stimulate the next generation, not only by providing knowledge but also giving practical training in electron microscope."

Named after the city flower, the Magnolia Award was set up by the Foreign Affairs Office of the Shanghai Municipal Government in 1989. It has become one of the top honors given to foreign individuals who have made outstanding contributions to Shanghai's economic development, social progress and international exchange and cooperation. ShanghaiTech iHuman Institute Founding Director Dr. Raymond C. Stevens was awarded the Magnolia Silver Award last year.



Research Fellows in ChEM

After the success of the Beauty of Science lecture, a regular lecture series “SCA Presents” was inaugurated, inviting talents to share their insights and works. Just a few steps from their dormitories, ShanghaiTech students are able to meet noted influential speakers from around the world, including Google Greater China President Scott Beaumont, who spoke on AI for Everyone and Google VP and Engineering Fellow Jay Yagnik who spoke on AI at Google. Representing one of the leading companies in developing AI technologies, they asked the audience to reflect on the possibility of technology, design and application, and how it affects our everyday lives. Both events were packed by ShanghaiTech community members and outside visitors. The interest shown in the talks is evidence that SCA not only is providing a service to the university, but also to the broader creative and tech community in Shanghai.



Scott Beaumont, President of Google Greater China at AI for Everyone lecture

Other speakers, such as Katrin Eismann, a New York City-based photographer, author and educator, who led a “Better Photography through Photoshop” workshop and a popular “Look Again” photo-walk on ShanghaiTech’s campus, AI artist Gene Kogan, who taught a workshop on Machine Learning in Arts, and Wang Jie, an established modern Chinese painter who opened a show at the SCA gallery and shared his insights on the history of Chinese modern arts and paintings. SCA also led the students to embrace robust arts scenes in Shanghai. It has reached out to HOW

Museum, TANK Arts Center, Rockbund Art Museum, Shanghai Museum and Powerlong Museum for curator lectures and guided on-site tours.



Katrin Eismann and ShanghaiTech students at Better Photography through Photoshop workshop

Since the end of 2017, some of the most eagerly awaited events at ShanghaiTech have been film screenings in the 800-seat International Conference Center, curated by SCA. From Coco (2017) to Isle of Dogs (2018), from Avengers: Infinity War (2018) to Mission: Impossible-Fallout (2018), the ShanghaiTech community gets to sample all the latest hits and the best films in the theaters every month. In addition, SCA also supports arthouse and independent films in its own SCA Presents film series, screening the kind of films that are rarely released in theaters here - documentaries, short films, independent animations, to name just a few, and giving the audience a chance to meet the filmmakers themselves.

Tailoring a Brand-New Curriculum to the Students’ Interests

As SCA launched courses and events, the most frequently asked question was: what courses will SCA offer?

In Summer Term 2018, SCA offered a series of creative courses taught by an international faculty

body from China, USA, Denmark and Australia. The subjects spanned film, creative life drawing, game design and creative coding. All four classes were warmly received by the undergraduate and graduate students at ShanghaiTech, with enrollment reaching full capacity.

The passion of the instructors, TAs and students converged in these classes, and an art-loving atmosphere bloomed at SCA. Brooke Larsen, SCA’s first visiting artist, taught creative thinking and life drawing and showed an exhibition of his own works at the SCA gallery, along with student works created during the course. The creative coding students also presented their class projects – a variety of creative coding projects and interactive installations. All four courses received overwhelmingly positive student evaluations.

More is also in the works to empower ShanghaiTech’s scientists-to-be. The School of Creativity and Art is currently in the process of



Brook Larsen's Solo Exhibition at SCA Gallery

establishing a one-of-a-kind field of study: intelligence design. With the development of digital and intelligent technology, human social structure and behavioral patterns are undergoing new changes with differences emerging on a basis of traditional physical anthropology, cultural anthropology, archaeological anthropology and linguistic anthropology. A new branch of digital anthropology divides and studies humans from the

perspective of the behavior of the virtual world. Drawing on the evolution of this classic discipline, as we move into the era of artificial intelligence, shall art and design undergo a new evolution?

Instead of using AI’s computing power and learning ability to increase design efficiency, or to replace human designers with machines; intelligent design applies technological means, including artificial intelligence, material increase manufacturing and biosynthesis, along with coopeartion between humans and machines, to break the boundaries of traditional design concepts, and create more intelligent, organic and sustainable solutions. The structure of intelligent design will be integrated and based upon three aspects: 1. Intelligent Innovation (human brain and CPU); 2. Intelligent Tools (3D printing and robot, etc.); 3. Intelligent Materials (new synthetic materials and

biological materials, etc.)

The School of Creativity and Art is planning to recruit discipline leaders, 20 professors, 5 artists in residence and 10 visiting artists by 2020. Research areas for intelligence design includes artificial intelligence, modern design, additive manufacturing, 3D printing, creative thinking, psychology, education, sociology, ecology.

A Firm Foothold in the Film Industry

With its existing relationship with USC School of Creative Arts, ShanghaiTech is also establishing its own screenwriting minor program. Professor Irving Belateche from USC has taken the lead in developing a screenwriting curriculum that has both core courses in screenwriting, and electives in film history. Aided by visual media and storytelling skills, science becomes more animated, humane and accessible.

Now in its fourth year, The ShanghaiTech-USC SCA filmmaking program has successfully established a firm foothold in the film industry. With almost 300 producers, directors and screenwriters in its pool of alumni, the program is beginning to form a micro-ecology for aspiring filmmakers in China, for those who believe in the significance of highly professionalized and industrialized know-hows, hands-on learning, and effective cross-cultural communication.

The 2018 producing program is making strides into the center of Chinese film industry - Beijing. This year the Beijing class was attended by executives from major studios across China including Tencent, YouHug Media, Phenom Films, PMF Films, ZUIBook, as well as

agents representing A-list talents in China. As the film industry expands in China, and co-productions are advancing to a new level of creative engagement from both sides, there is an increasing awareness of how essential creative producers are to a well-developed commercial film industry. In reality, many working producers come from non-creative producing backgrounds, such as finance, marketing and distribution. The seminar not only provides a systematic education on producer how-to knowledge, from pre-production to production to co-production, but also gives participants first-hand experience in cinematic technologies and services in Hollywood. All participants get to take a close look at what a full-fledged film industry looks like, where regulation, professionalism and passion for the arts prevail on all levels.

In 2018, all three workshops achieved tremendous results. Cao Jingling, one of the screenwriters from 2015, was selected to join the producing exchange program with Cannes, hosted by Wu Tianming Film Foundation, and also the 2018 Shanghai International Film Festival Pitch Market with *Mordaga*, a feature project that she wrote in 2015 during the

workshop, and now is a writer-producer on. Zhao Wenjia's project *The Empress and Me* was not only selected to the pitch, but also was awarded development funds by two leading Chinese production companies. The short films produced in 2016 to 2017 as part of the directing program have continued to tour film festivals worldwide. These Shanghai-based stories vary in style and subject matter. *Crazy Hives* (directed by Shi Wei), a black comedy set in the near-future Shanghai, won Best Short Film at Long Island International Film Festival. *Money Saving Couple* (directed by Cao Jing) was nominated at the Vancouver Chinese Film Festival. *A Dangerous Journey* (directed by Ping Yinfang) starring famous Chinese art-house actress Huang Lu has been admitted to a host of European film festivals.

To further serve the industry, the ShanghaiTech-USC SCA program has proactively reached out to Shanghai International Film Festival's Pitch Market and offered to award two emerging producers with free admission to the producing workshop. As the only non-cash award at the Pitch Session, the program declares its goal to identify and educate the working producers who are fully-engaged as an important creative input in their projects, on the rising curve of their career paths, and aspiring to creating quality stories for the big screen.

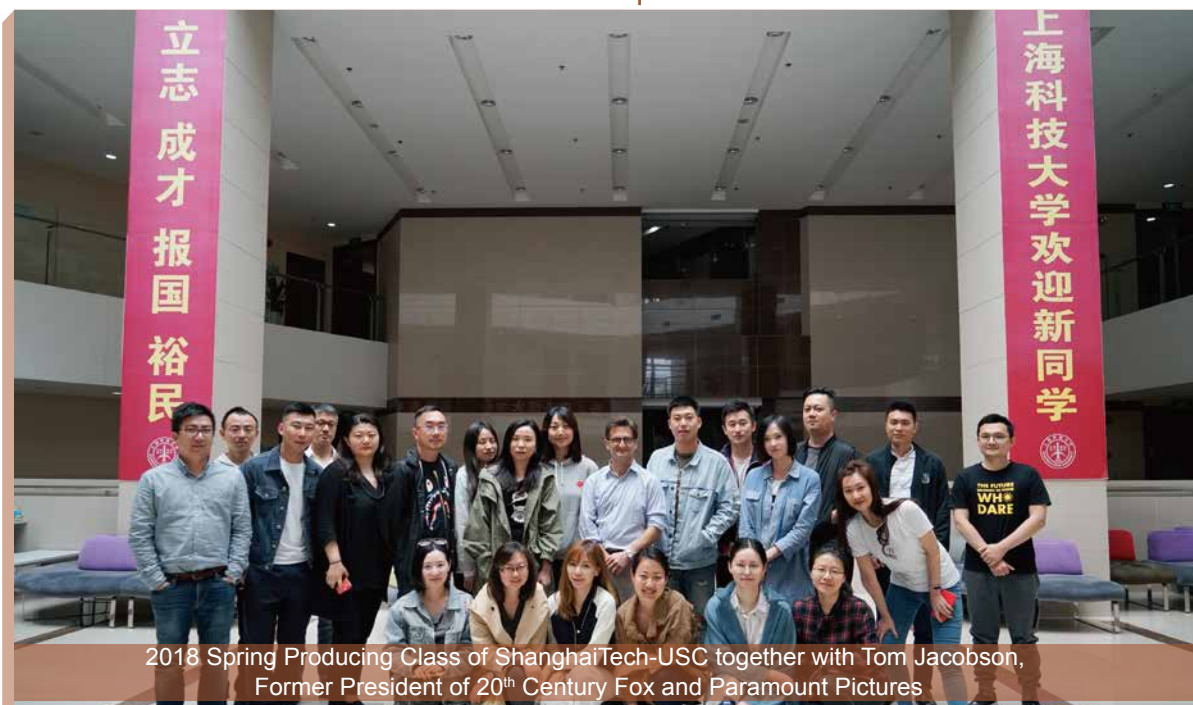
Future Prospects

Gustave Flaubert once commented: "Science and arts part ways at the foot of the mountain, and they converge on the top of it." At SCA, this process is accelerated. As SCA Dean Li Ruigang states on the school's website: the practice of arts and the practice of science not only just converge on the far horizon of human future, but also go hand in hand in all kinds of interdisciplinary efforts in the immediate reality.

In the future, SCA will forge its academic

endeavors into a nexus that connects with other scientific disciplines at ShanghaiTech. By collaborating with other ShanghaiTech schools and building external relationships with leading practitioners and scholars, the arts can join forces with information science, material science and ultimately life science on technical, material and conceptual levels. Information science has already become an essential tool or even material for artistic expression in new media and interactive arts. Renovation in material sciences has contributed to easier materialization and manufacturing of innovative designs. And as the aggressive development of life science is making a foray into both artificial intelligence and other fundamental discovery of life and nature, it will profoundly affect the way human beings understand and query the nature of life and environment, which in turn will be reflected in arts and design.

To that end, SCA will continue to build a cutting-edge curriculum that will fundamentally impact the way students think, and establish itself as a robust incubator for groundbreaking innovations, talents and projects. SCA's integrative courses will allow students to engage with a range of disciplines including compulsory Design Basics courses (design thinking, creative principles, psychology, aesthetics, etc.), compulsory Science and Technology courses (computational design, data mining, machine learning, neural networks, etc.), optional Application Direction (industrial design, urban architecture, data visualization, etc.) and complete their degree with graduation projects that challenge them to experiment, take creative risks, and tackle problems. Design is not only for the sake of design, but also for the purpose of improving or breaking the status quo. As it grows, SCA will energize students, researchers and creative industries, constantly challenging the next generation of creative professionals to inject new inspiration and momentum into China's future growth.



2018 Spring Producing Class of ShanghaiTech-USC together with Tom Jacobson, Former President of 20th Century Fox and Paramount Pictures



GeekPie_HSC members (from left to right):
Yuan Weijun, Liu Jianzhong, Shen Jiqi, Luo Haocong, Xie Zhiqiang

GeekPie Excels in International ISC Competition

When ISC-2018 Student Cluster Competition (ISC-SCC) announced final results on June 27th, ShanghaiTech University team GeekPie_HPC won Fan Favorite Team award and achieved the highest scores for HPCG Benchmark and AI application. Nearly three hundred teams from all over the world took part in the ISC-SCC this year, and 12 teams coming from nine different countries qualified for the ISC-SCC final. Made up of five students (Yuan Weijun, Liu Jianzhong, Shen Jiqi, Luo Haocong, Xie Zhiqiang), this was GeekPie_HPC's first time to participate in ISC. The team was invited to the ISC-SCC final directly as the ASC-2018 silver medal winners.

The Tsinghua University team won first place, Singapore Nanyang Technology University Team ranked second, and South Africa's Center of High-Performance Computing team took third.

ISC, SC, and ASC host the three largest high-performance computing challenges for students in the world. Teams have to build and test their HPC clusters under the 3KW budget and pursue high scores of six applications in three major categories -- HPC benchmarks, HPC applications, and AI applications.

The HPC benchmarks are comprised of three commonly used benchmarks: HPL (the High-Performance Linpack Benchmark), HPCC (the High-Performance Computing Challenge Suite), and HPCG (the High-Performance Conjugate Gradients Benchmark).

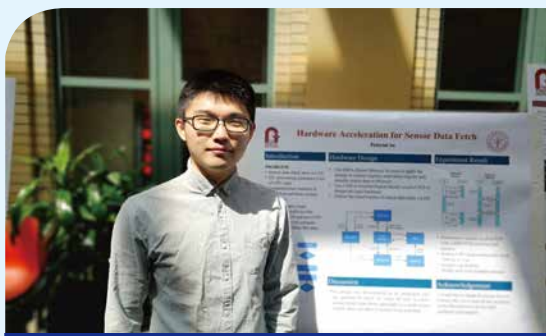
The HPC Applications are GRID, which is a HPC for Lattice Quantum Chromodynamics (Lattice QCD) calculations, Nektar++, a spectral/HP element framework designed to support the construction of efficient high-performance scalable solvers for a wide range of partial differential equations, and a mystery application that is released after the submission of HPC benchmarks results. This year, the mystery application was Nek5000, a popular simulation tool for computational fluid dynamics. The Deep Learning AI task was an image recognition model training, using TensorFlow.



Robotics Summer Scholar Program at CMU

Carnegie Mellon's Robotics Institute Summer Scholars (RISS) program is an eleven-week summer undergraduate research program that immerses a diverse cohort of scholars in cutting-edge robotics projects focusing on innovation and social impact. Launched in 2006, RISS is among the best and most comprehensive undergraduate robotics research programs in the world.

A highly competitive program, there are over 800 student applications from around the world each year. The program provides hands-on experience with cutting-edge robotics research and there are over 75 mentors, presenters and others engaged in the program. This year marked the first year ShanghaiTech students were accepted into the program.



Su Junyan at poster session

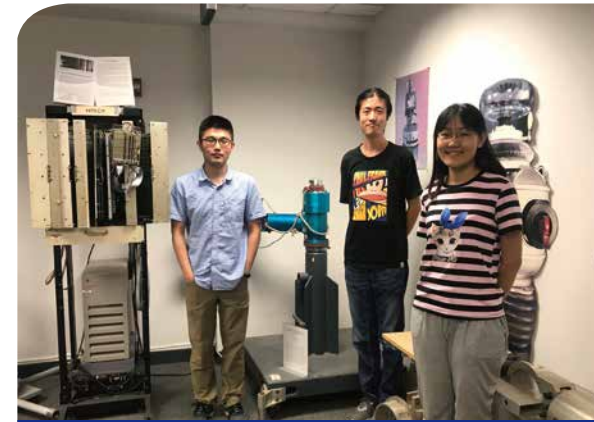
It was eight o'clock in the evening when I arrived in Pittsburgh but the sky was not yet dark. As I sat by the window of the bus I looked forward to the next two months' research life in CMU.

While I arrived two weeks later than the others, everyone in the group was very friendly and willing to talk to me about their wonderful life and culture. It was exciting to hear new perspectives from others and their ideas about China. I think this is what it means to go abroad -- to meet new people, to hear new opinions and realize there's a bigger world out there.

The most important part of RISS is research. The lab I entered was a biorobotics lab with

more than thirty people. At the weekly meeting lots of impressive results were demonstrated. I was surprised to find such a wide range of research interests. From low-level hardware to high-level control algorithms, the lab engaged in almost every area of robotics. Other labs at CMU's Robotics Institute built their own robots. During these two months, I saw snake robots and hexapod robots, a micro-robot, a jump robot and robots that can balance on a ball. Seeing all these advanced robots, I was inspired by the cutting edge of the robotics world and confirmed my desire to be a great robotics scientist.

After a week of exploration, I started my own project – using hardware design to accelerate an algorithm. To be honest, at first I thought it would be easy since I had some experience but when I started to put theory into practice, I realized how difficult it was. If we want to realize a stable and robust system, many practical details must be considered. I had to dive into many datasheets to know the bottom mechanism of certain devices so that I could find the cause of problems. This experience taught me how to locate a bug in a short time.



Group Photo of CMU biorobotics lab

In CMU, there are many opportunities to communicate with other talented students. In the biorobotics lab, I met many intelligent students from various fields like physics, biology, mechanics, electronics and computer science. I learned a lot from them and their wide range of experiences. There were also many wonderful poster sessions held during my stay at CMU. It was great to see others demonstrate their impressive results and ask them questions. Everyone could talk to them and every presenter was willing to explain their research findings.

In addition to the research, we had a fantastic experience there. Every Wednesday there was a lunch workshop where RISS students gathered together to communicate with each other and share ideas. There were also interesting activities like parties and baseball games.

I'd like to thank Dr. John Dolan, Rachel Burcin, and Guo Ziqi for organizing such a great program. I also would like to thank Professor Howie Choset and Mr. Li Lu for their support in the robotics lab. Mr. Li Lu gave me helpful advice when I came to the biorobotics lab. He encouraged me to actively participate in the lab and talk to others. From him, I learned a lot about how to be a good researcher and balance work and life.

Su Junyan, SIST Undergraduate Class of 2019

It was my honor to have a summer research internship at my dream school Carnegie Mellon University. I learned of Robotics Institute Summer Scholar program (RISS) when Dr. John Dolan visited ShanghaiTech's robotics lab. He discussed autonomous driving and other robotics technology with us and shared a lot about the Robotics Institute. That conversation enlightened me and showed me the broad field of Robotics. Several months later, Dr. Guo Ziqi came to ShanghaiTech to introduce the Robotics Institute Summer Scholar program to us. He talked about the competitive application process and how this amazing opportunity to work with top scientists in CMU could be a valuable undergrad experience. From then, I was determined to step into robotics and try to explore this amazing field. I took several graduate-level courses related to robotics and founded Team Magician to compete in the international robotics competition – RoboMaster. These experiences helped me understand robotics and influenced me to choose this field for my research career. I was very fortunate to be accepted into RISS 2018.



Zhou Yang serves as a volunteer at RSS



Field Robotics Center

The purpose of the program is to shape our understanding of robotics and to participate in state-of-the-art research projects. Each scholar is mentored by leading faculty and technical staff from CMU's robotics institute. During the two-and-a-half month program, each scholar needs to complete a research project under supervision of their mentors and submit a paper to RISS's working paper journal which is publicly accessible. These projects are challenging and require deep understanding of a particular field. However, the research projects may not always be the topic that you are most experienced on so you have to learn fast in order to complete them in a short time.

Robotics is a multidisciplinary topic and the projects we were working on are part of an integrated project. My research project was about calibration of 3D LiDAR and stereo camera, part of a long-term project involving perception, planning and mechanical design. You can learn a lot in lab group meetings from research updates. It trained me to think of my projects from an integrated system perspective. It is essential to master system thinking, not only for robotics research but also for other fields. Each component needs to coordinate with other components like gears to optimize the

whole system performance. Locating the bottlenecks and improving them can save time to optimize the whole system performance rather than wasting a lot of time on improving some parts that are already close to the limit.

The other scholars participating in this program were brilliant and amazing people. We were selected from around the world with different backgrounds which are related to robotics with integrated knowledge of mechanics, electronics, computer science, and other fields. One of my cohorts was a bio-engineering major who developed a tactile sensor this summer. Another two cohorts from the field of mechanics developed a pretty cool mechanical manipulator design. The different backgrounds of the students in the program exposed us to different disciplines, and the peer-learning experience not only helped us understand different cultures but also opened our minds to disparate subjects that are connected by robotics. At our weekly meetings we shared wonderful food from different countries while exchanging our thoughts on research and culture. Their deep understanding of the domain they are working on impressed me a lot and I valued each opportunity to discuss with them.

Apart from working in the lab, the RISS program also provided many opportunities for us to explore the world of robotics. We had the chance to visit NREC (US National

Robotics Engineering Center). Due to the confidentiality agreement, I cannot share the details of our visit but I was shocked by the robots they showed us and felt a gap in the level of robotics between the United States and China. The technicians there told us the stories behind these advanced machines and their mission to build a better world using the technology of robotics that inspired me to be more responsible for my research which could become an important component in projects that can propel society forward.

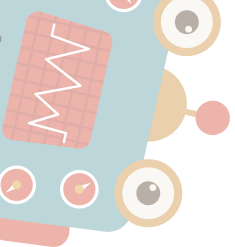
There were several great activities provided by this program. DJI organized a drone challenge, and UBtech organized a robot boxing challenge. In the DJI drone challenge, we formed several teams and programmed a DJI spark drone to track visual tags placed on the ground and fly following the order of tags. An additional challenge is to show an AR object on these flags which required computer vision knowledge. After hours of coding and debugging, our team of four people finished the task the fastest, but because we used one more tire, we ended up ranking second. The challenge taught us a lot and strengthened our teamwork skills.

Another opportunity we participated in was volunteering at RSS (Robotics: Science and Systems), a top robotics conference held by CMU over the summer. I was in charge of helping sponsors set up booths and handing microphones to researchers in the audience who had questions for the speakers on stage. I had a lot of opportunities to talk with people

from industry and the academic community. Robotics is not only about theory; this research field also has a very strong relationship with industry. I learned a lot from conversation with people working in the companies. In the sponsor exhibition sessions, a number of open positions for internship and job were shared and companies were busy attracting researchers to apply for scientist openings. At a banquet sponsored by Amazon Robotics, their chief scientist shared his ideas about the relationship between industry and academics in the robotics field. He argued that industry and academic community should cooperate with each other to put cutting-edge research into practice, which can have a big impact on society. Talking with HR (Human Resources) was also helpful for me to understand the needs of the company. They mentioned that having experience of real-world application will make an applicant very competitive in the job market. From the academic side, I was inspired by the poster session and had the



UBTech robot boxing challenge



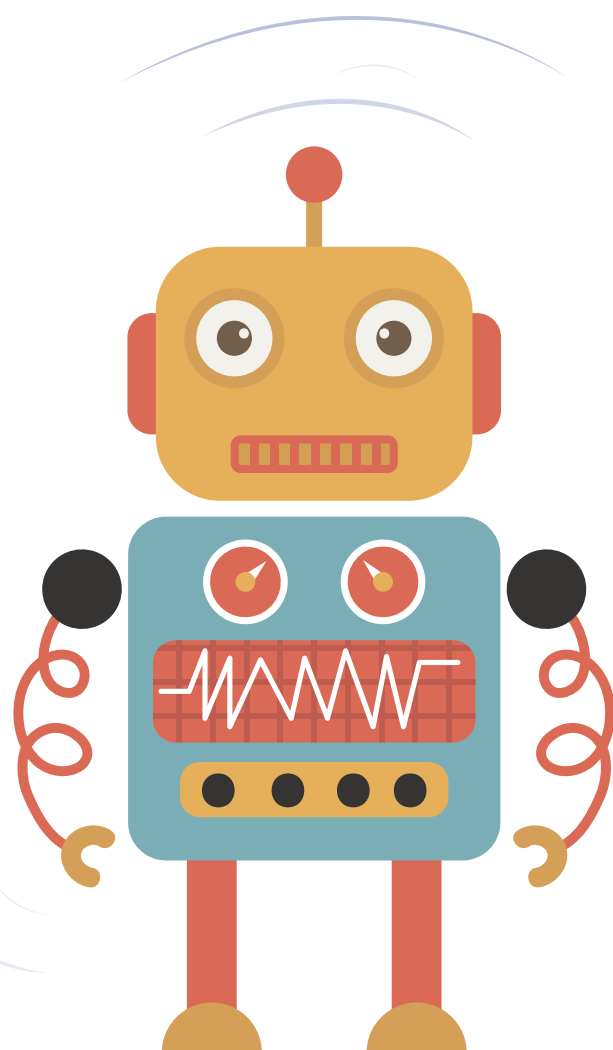
Zhou Yang's team ranks second at DJI drone challenge

chance to ask questions to specific researchers who are working on topics that I am interested in and authors who wrote the papers that I have read. The most amazing advantage of RSS is that authors of every paper have the chance to introduce their work on stage, unlike some large conferences where so many interesting papers can only be shown in a poster session. I found several papers which were pretty amazing and was able to catch the authors to ask questions in the poster session. The collision of ideas exposed me to more topics in robotics and helped me realize the research process with more empirical thoughts beyond papers. The conference enabled me to talk with researchers from different institutes. Since I had little knowledge of the robotics community, it was surprising for me to see some not so well-known institutes actually

have wonderful research groups in robotics. Many students shared their experience about the advantages and disadvantages of being a PhD, which helped me decide on the degree I'd like to pursue.

After the RISS program, I applied for an extension of my internship at the Robotics Institute of CMU. I would recommend more students who have an interest in robotics to participate in this splendid program. My summer in Pittsburgh was unforgettable. We participated in the program, explored advanced technologies, made new friends, were exposed to more opportunities, and found our own interests.

Zhou Yang, SIST Undergraduate Class of 2019



Being a Visiting Student at Harvard



Thanks to ShanghaiTech's '3+1' study abroad program, I was able to apply as a visiting student at Harvard University. I selected three of the most difficult undergraduate physics courses at Harvard, namely Statistical Mechanics, Quantum Mechanics and Vector Space Methods for Differential Equation. At the same time, I spent plenty time doing research in biophysics and soft matter.

Generally speaking, Harvard shares many similarities with ShanghaiTech in class size and teaching methodology. However, the challenge came when I found out there are many physics terms that I was unfamiliar with. Despite taking some math and physics classes in English when I was back at ShanghaiTech, the language barrier was still a big concern. During the first few weeks, it was a bit hard for me to fully follow what the professor was talking about, but things started to become better after the midterms.

The second challenge for me was that I found the problem sets, or what we call PSets, are different at Harvard. At ShanghaiTech, the homework is always related to what is taught during class, and mostly just the direct application of the theorem. However, PSets at Harvard aren't closely related to class content and requires lots of extra self-study and discussion. With absolutely no other Chinese undergraduates in class, I was forced to discuss every physics problem in English with my classmates and in this way, my listening and speaking gradually improved during the first half-semester, which became a basis for my further study and research.

During my stay, I was fortunate to be selected by Professor David Weitz to join his lab as an undergraduate research assistant. Professor Weitz is a member of US National Academy of Sciences and member of American Academy of Arts and Sciences and part of his team's work is dedicated to investigating the mechanical properties of biopolymer networks with a goal of understanding mechanical behavior at the single cell and tissue level. I used passive microrheology to study the mechanical property of the reconstituted composite biopolymer networks of actin, microtubules and intermediate filament. I got involved in the entire experiment and was in charge of the particle tracking for the microrheology. I found my interdisciplinary background in physics, computer science and biology helped me solve problems in a different way. For example, I enabled automation of data processing in our project by Matlab, Python and Shell Script and realized algorithm optimization on Harvard Linux cluster.

My experience at Harvard was fantastic and I am grateful to ShanghaiTech for giving me this chance to participate in international exchange, which broadened my experience and deepened my roots. In the future, I hope to pursue further study abroad and explore cutting-edge technologies in physical world.

Wang Dianshuo, SPST Undergraduate Class of 2020

Thoughts on My Life at Oxford

This summer, I was fortunate to have a summer study at Sir William Dunn School of Pathology at Oxford University with the support of ShanghaiTech. The building of Dunn School was built in 1926 and was the first place in the world to purify penicillin (1938-1941). The laboratory I worked in mainly studies the function of the rhomboid protein family. The specific research involves biochemistry, cell biology, and a little fly biology. The new things I saw in the lab were electronic microscope and the dissection of drosophila's retina, which were both complicated and kind of tedious.

Regardless of its youth, ShanghaiTech's infrastructure is absolutely compatible to that of Oxford University, and even exceeds it. The microscopes of various specifications and brands in Shanghaitech gave me a chance to "show off" in front of my colleagues in the Oxford laboratory. The resources that a student/PI can access in ShanghaiTech are very rich, so during the two or three months stay in Oxford, there was very little except the EM that I hadn't encountered before.

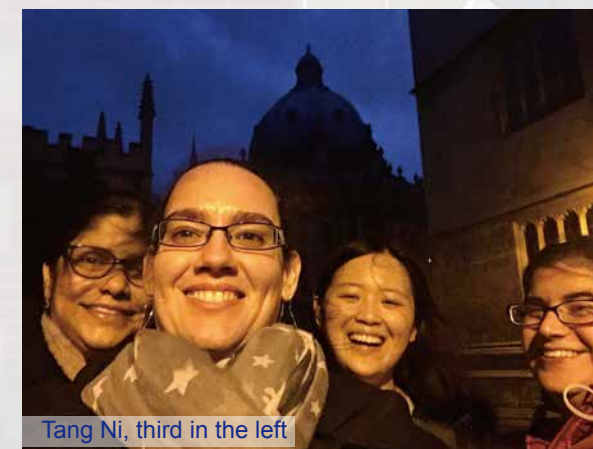
One thing I think we could learn from Oxford is to provide more practical resources for students' future career planning. For example, there is often a forum where students are taught how to apply their knowledge to the consulting industry, which is not only enlightening, but also exposes students to the options open to them.

While the quality of infrastructure is similar between the two universities, the research patterns varies between the two cultures. Thesedays, I often see a question on the internet about "why more and more doctors are escaping scientific research." One particular answer stood out: "People are not escaping scientific research, but are being knocked out from scientific research." I quite agree with this point of view. Research is really difficult and competitive. Thanks to the nice people in the lab, what I feel more here in Oxford is a kind of research based on pleasure and interest. I feel more and more that life has many choices, and there is not necessarily one way to do things. For example, there was a PI in another group who was a flight attendant before going into research. Some other PIs found jobs in totally different industries.

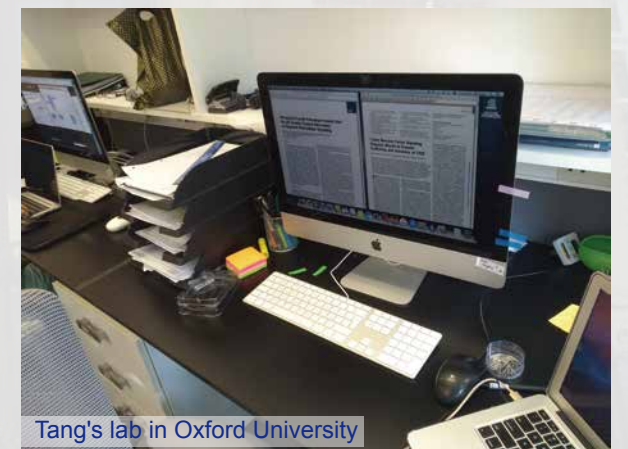
Oxford is very small, and the weather was very good when I first arrived. Now the summer is over and it is always cloudy and rainy and very cold. It is really beautiful here and the accommodation is good. I traveled by train to some places around Oxford and reunited with a high school roommate who I haven't seen for many years. I also visited Stonehenge and the small town of Salisbury.

In the future, I want to continue to study degeneration (on a biochemistry/cell biology level), protein degradation and homeostasis/proteostasis. I have been to four or five laboratories since I was a freshman, and I have participated in iGEM Contest. My research has been in microbiology, structural biology, stem cells, RNA, biochemistry, molecular biology, synthetic biology, bioinformatics. As for some professional classes, I am very interested in learning a lot about life omics and computational biology because I think that I have to experience a lot to know where my interests are.

Tang Ni, SLST Undergraduate Class of 2019



Tang Ni, third in the left



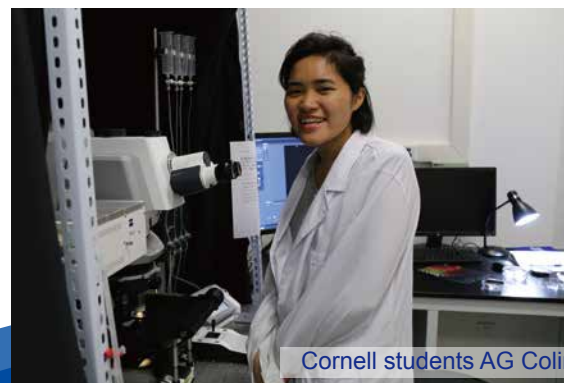
Tang's lab in Oxford University

In early July, just as many ShanghaiTech students were getting ready to leave campus for their Social Engagement Programs or Industry Engagement Programs, a small group of students arrived on campus, ready for a new experience. These were students from US universities who came to ShanghaiTech to gain lab training and jump into Chinese culture for the summer. Spending the summer at ShanghaiTech is ideal, explained UChicago student Elijah Harter, because it is not always easy for STEM students to find suitable study abroad experience that fit their schedules.

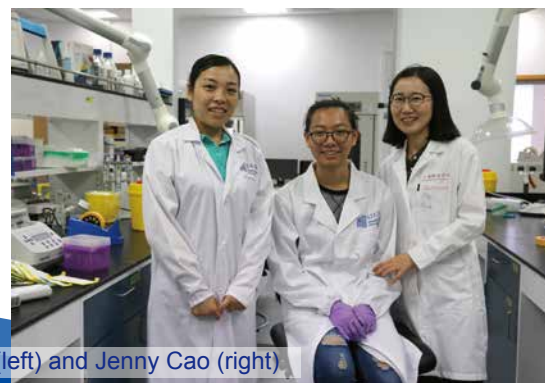
When the six rising juniors from Cornell, University of Chicago, and University of Illinois at Urbana-Champaign, arrived at ShanghaiTech, they had no idea what to expect. For UIUC student Yin Xiran, the experience was a way to get closer to home for the summer (she is a Hangzhou native), but the rest of the students didn't speak much Chinese and were dropped into a totally new experience. Cornell student Jenny Cao's past summer internships had been much closer to her New Jersey home. "I felt like I never really left home. This feels like an opportunity to go around the world and be as far away as possible."

For several of the students, the opportunity to research at ShanghaiTech was a strategic one. "At UChicago, undergraduate work in synthetic biology is a bit harder to get into and I actually came here to work with the lab director [SLST's Professor Liu Hongjun] just because I really love what he's doing," said Harter. He said he was impressed with the speed of research results that could be achieved at ShanghaiTech. "Every day we make a new primer, something we need to test, and you get it the next day. It's really crazy to get your materials in 24 hours. At UChicago you can usually get something sequenced in a few days, but primers can take upwards of a week. Here, I'm getting it in 24 hours."

Jenny Cao, who spent her summer at SIAIS working on micro-engineering human in vitro models, has been impressed with the level of research funding available here. "There's just so much more access to equipment here," she said. "There was a microscope that I got a half hour training [on] and a full day to figure out how to use. I've been working with all these expensive versions of things, and I can just use them and touch them, whereas in our school, most students wouldn't have access to things like that," she added.



Cornell students AG Colingo (left) and Jenny Cao (right)



culture trip to Nan Xun, an ancient river town nearby Shanghai

American Students Study Abroad at ShanghaiTech

That funding makes it possible to see some exciting developments, said the students. Zola Yi, who spent her summer with SLST Professor Yang Yang working on Neural Basis of Learning and Memory said, "It's interesting to see real progress being made and real groundbreaking things [happening]." Harter said he was impressed that even in such a short time, he could observe progress. "It sounds like we have a really major new direction to go in and it will be interesting to see how this plays out."

Between the lab work and the culture shock, the students found themselves exhausted by the end of each day. Harter explained, "With lab work, even though you not working constantly, you have to be focused, and it's draining." But determined to make the most of their summer in China, they still managed to find some time to have fun. Yin said she took advantage of her downtime to go to Disneyland and visit her family in Hangzhou. But for the other students, just a trip to downtown Shanghai was an adventure. Cornell student AG Colingo said that outside of the lab, she was surprised to be such an object of interest when she spoke English while riding the subway with the other visiting students. Yi and Phung, who is Chinese-American and speaks some Chinese, remembered similar experiences where they were surprised to be the center of attention. "People were staring and talking about us, saying how sing-songy our voices were," Phung recalled.



UChicago students from left to right: Linda Phung, Elijah Harter and Zola Yi

Of course, no study abroad experience is complete without a good near-death scary story. On a weekend trip to Anhui Province, the group had a harrowing experience getting lost on Huangshan Mountain during stormy weather. Avoiding falling rocks and battling altitude sickness and exhaustion, they happened to run into a group of Chinese university students in a similar predicament. They shared their snacks and water with the Chinese students, who in turn carried their bags and helped them get to a hotel, which unfortunately was full. As the students contemplated sleeping outside or continuing to climb down the mountain in the dark, they took a gamble and the adventure ended with a mad dash to make it onto the last cable car of the day. Of course, they documented the entire experience on WeChat and Instagram to share with everyone at home! In this age of social media, they maintained contact with the Chinese students and since become friends. So what could have been a complete disaster turned out to be a great memory.

As the students prepared to leave ShanghaiTech and return to school in the US, they took with them an appreciation for how hardworking and determined the faculty and students at ShanghaiTech are. “Whether it’s running three experiments in one day and working from 9 a.m. to 9 p.m., they get it done if needed,” recalled Phung. “I definitely have a cultural appreciation of how research labs are conducted in other countries,” she added. “China was such an interesting place to have a research internship, as it combined both my culture and my interests and it was very interesting to see how they came together.”

The students said that their summer at ShanghaiTech has had an influence on them. Yi said she took away a “renewed passion for research. When you’re surrounded by so many people who want to give you best experience possible and are so invested in it themselves you can grow to love it.” She added, “ShanghaiTech is a place I’d want to stay connected with in the future. They’re really open to collaboration.”

As many visitors to ShanghaiTech and Shanghai can attest, the energy of this community is unique and invigorating. “I am taking away the beauty and upbeat vibe of Shanghai, something that I think is a part of this whole experience,” Phung said. “Every day, I woke up excited to take on the day!”



SEM Hosts ISIC 2018

In July, the School of Entrepreneurship and Management successfully held the International Students Innovation Competition (ISIC 2018), co-sponsored by Hong Kong University of Science and Technology (HKUST), University of Applied Sciences and Arts Western Switzerland (HES-SO) and ShanghaiTech University. SEM Vice Dean Professor Lu Ding hosted the final session on Investor Pitching where the student competitors presented their ideas, while SEM Dean Professor Fang Hanming and experts from academic and industrial fields served as judges and made comments on the students' work.

The theme of ISIC 2018's theme, “Healthy Living in China,” is of great significance because as Professor Lu pointed out in his opening remarks, China is in a transitional era where the economy is moving from quantitative expansion to quality growth, and people are pursuing healthy living as a way to improve their quality of life. Fifty-five students from three universities were divided into nine competing teams and tasked with identifying a typical problem related to the issue of healthy living in Chinese society, then creating a new product or service to solve the problem with a detailed business plan.

During the week-long competition, students engaged in intensive activities including expert talks, faculty mentoring, team brainstorming, company visits, and investor pitching. SEM offered various professional talks on topics such as food safety, medical imaging and equipment, chemical materials, high-end medical treatment and public health care in China. The students visited Shanghai Engineering Research Center for Cell Therapy Group Ltd. and Swiss Center Shanghai, and they also went to different institutions and commercial districts to meet experts and consumers and do field research as part of the competition.

The winning team (Yang Xiangyu from ShanghaiTech, Zhi Yun Yap from HKUST, and Begoña Lopez, Ahmed Abid, Andrea Cogua and Tanay Rohatgi from HES-SO) created a mobile medical vehicle to provide rural elderly people with free health check services. The product included an automated system, an interactive app, a video demonstration, an integrated health check system and an analysis system of machine learning. The judges were impressed because it was the only public service project presented at ISIC 2018. This project could help elderly people in rural areas access early diagnosis and preventative treatment. It offers a solution for the government to address the challenges of an aging population and to improve quality of health care service in rural areas. The first and second runner up team awards were given to the fashionable BREEZ Mask and the smart Cocoon baby stroller, both designed for protection against air pollution. Tanay Rohatgi (HKUST) won the Best Presenter Award while Tan Kutluoglu (HES-SO) received First Runner-Up and Xu Hao and Xia Yincen (ShanghaiTech) received Second Runner-Up.

The competing teams were judged by the social relevance of the problem tackled, innovation and use of technology, business model effectiveness, teamwork professionalism and presentation. One ShanghaiTech student noted that the competition gave him a chance to learn about different cultures and make friends, while acquiring innovative and teamwork skills.



Aging Conference Held on Campus

In June, the School of Entrepreneurship and Management (SEM) held an international conference on "Addressing Population Aging: Institutional and Public Policy Innovation." The conference was co-organized by SEM, Center for Employment and Social Security (Fudan University) and ARC Centre of Excellence in Population Ageing Research (University of New South Wales). The one-and-a-half day conference program included academic presentations on Financial Innovation and Financial Behavior, Multi-Pillar Pension System, Intergenerational Interactions, and Impact of Population Aging, as well as two policy panel discussions on "Long-Term Care and Long-Term Care Insurance" and "Social Security Reform."

The conference program featured twenty-four international experts, economists, and government officials, focusing on the topics of pension system reform and its impact, flexible retirement systems and policies to improve the labor force participation of elder workers, technological revolution, income inequality and income distribution, elderly healthcare reform, long-term care needs, service delivery, long-term care insurance, and the impact of the wealth management system on pension burden. The conference was hosted by Fang Haming, dean of the School of Entrepreneurship and Management and professor of economics at the University of Pennsylvania. ShanghaiTech University President Jiang Mianheng, Yuan Zhigang (Fudan University's dean of School of Economics) and John Piggott (director of The ARC Centre of Excellence in Population Ageing Research, University of New South Wales) kicked off the conference with opening remarks.

Olivia S. Mitchell, a distinguished professor at the Wharton School of the University of Pennsylvania, spoke on the topic of financial innovation and financial behavior, based on her studies on the effect of a lump sum incentive for delaying social security claim age, which could also extend people's working lives, raise social security tax revenue and potentially enhance the system solvency. Professor Hazel Bateman of University of New South Wales described the survey results which showed huge potential for reverse mortgage products in China, if the product was properly designed. Professor Zhao Yaohui from Peking University gave a detailed overview of China's pension system. She described that the social pension system in China suffers from fragmentation, deficit and unequal distributions and she argued that the chance for China to adopt a fully funded individual accounts system might have been lost, but we still could use the Notional Defined Contribution (NDC) system as a transitional method, putting all pension contributions into individual accounts and letting a central agency take over individual accounts.

On the topic of long-term care and long-term care insurance, the expansion of long-term care insurance could stabilize the expectations of the long-term care market, and increase capital infusion into the long-time care service delivery, and the increased supply could lead to a decrease in expenditures for elderly care, said Xu Hong, director of Designated Medical Supervision Department at Shanghai Municipal Bureau of Human Resource and Social Security (Shanghai Medical Insurance Office). He introduced Shanghai's pilot long-term care insurance program, launched in three districts of Shanghai in January 2017, and extended to the whole city in January 2018, covering three million elderly people. The program has stabilized market expectations, and attracted a lot of private enterprises entering elder health care sector, he said.

Lu Bei, a research fellow at ARC Centre for Excellence in Population Ageing Research, University of New South Wales, summarized the case study of Qingdao, which launched China's first long-term care insurance policy in 2012. The policy was to address the increase of disabled elderly caused by

the aging population. She recommended the integration of long-term care insurance into basic medical insurance, and the integration of long-term care with medical care, as practiced in Qingdao. There is still about ten to fifteen years of strong demand for long-term care services in China. Currently, it is urgent to pay attention to long-term care needs in rural areas, said Lu.

On the topic of aging population impact, James Poterba, a prominent economist from Massachusetts Institute of Technology (MIT) and president of the National Bureau of Economic Research (NBER), argued that the aging population shifts the nature of financial product demand and would tend to lower the returns of financial assets. Fang Hanming pointed out that the "growing pains" in China's social security system, such as low retirement age and fiscal imbalance, could result from the high intergenerational human capital growth, coupled with the older generation's demand for wages that are tied to the average social wages. These forces also suggest that reforms to delay retirement age might hurt the elderly's welfare because of lack of labor demand for these elderly workers.

As for the issue of intergenerational interaction, Professor Chen Xi from Yale University discussed how the National Rural Pension Scheme (NRPS) had positive effects on the short-term health status of grandchildren within the household, especially boys. Professor Chen Yi from Jinan University examined the long-term consequences of having fewer children in old age. He explained that having fewer children, on one hand, led to more consumption and better physical health through the quantity-quality tradeoff or more self-insurance via savings, and on the other hand, led to more depression and mental health issues because of the decrease in time accompanied by their children. Fudan University Professor Feng Jin showed that retirement induced by the mandatory retirement rules caused a 25.3 percentage point increase in the probability of male obesity, while retirement had no significant effect on women's BMI and weight.

On the topic of multi-pillar pension system, Dr. Joelle H. Fong from National University of Singapore found that economic crisis and globalization were the two determinants of the launch of the second pillar pension reforms. Yuan Zhigang, former dean of the School of Economics at Fudan University, emphasized that in order to better deal with the challenges of an aging population, it was important to improve the level of globalization, to develop global enterprises, to further open up to the outside world, and to develop an international financial management system. Shanghai University of Finance and Economics Professor Liu Tian provided evidence that social security tax evasion was impacted both by the social security contribution rate and corporate income tax rate. Higher social security contribution rates led to more social security evasion, while a higher corporate income tax rate led to less social security evasion.

The conference resulted in exchange and dialogue on the current situation of population aging, and the success and challenges of policies addressing aging population in China and abroad. The conference highlighted the significance of China's burgeoning long-term care industry and long-term care insurance system, and the need for social security reform.





ACS and ShanghaiTech Host Innovation Symposium

ACS (American Chemical Society) Publications, in partnership with ShanghaiTech University, hosted Symposium: Innovation in Materials Science in late July. The three-day event at ShanghaiTech University featured world-renowned scientists from China and around the world.

ShanghaiTech University President Professor Jiang Mianheng, ACS Executive Director and CEO Thomas Connelly welcomed more than 200 students, postdocs, and senior researchers from around the world who came to learn about cutting-edge research at ACS Publications' fourth innovation symposium.

The three-day event featured five plenary sessions including Cutting-edge Nanomaterials; Materials for the Environment; Materials for Energy; Materials for Photon Sciences; Materials for Biology. Keynote lectures were given by W. E. Moerner, professor of chemistry at Stanford University and 2014 Nobel laureate, and Jiang Lei, dean of the School of Chemistry at Beihang University and a 2017 Humboldt Research Award recipient. Scientists including Professor Frank Caruso (The University of Melbourne), Professor Prashant Kamat (University of Notre Dame), Professor Catherine J. Murphy (UIUC), Professor Teri Odom (Northwest University), Professor

Robin D. Rogers (University of Alabama), Professor Ted Sargent (University of Toronto), Professor Paul S. Weiss (University of California), Professor Hao Yan (Arizona State University), Professor Jiang Lei (Beihang University), Professor Zhao Dongyuan (Fudan University), Professor Yang Xueming (Dalian Institute of Chemical Physics, CAS), Professor Liu Zhongfan (Beijing University), Professor Zhao Yuliang (CAS), Professor Liu Zhi (ShanghaiTech University), Professor Chia-Kuang Frank Tsung (Boston College) delivered speeches. ShanghaiTech Professors Lin Bolin, Mi Qixi, Ning Zhijun, Zhang Yuebiao, Zhong Chao also presented their research advances.

On the second day, a ribbon-cutting ceremony presided over by ACS Executive Director, CEO Thomas Connelly and ShanghaiTech University Vice President Li Ruxin was held for the opening of the "Science Meets Art: C&EN's Chemistry in Pictures" exhibition.

Exchange of world-class scientific discovery continued with a poster session complementing the broad topical areas of the symposium. The poster winners included Liu Jianxi (Northwestern University), Li Yingfeng (ShanghaiTech University), Gao Xuejiao (Shanghai Jiao Tong University), Ren Kefeng (Zhejiang University), and Cui Mengkui (ShanghaiTech University).

ACS Publications will host its next symposium in Beijing. The event, ACS Publications Symposium: Innovation at the Frontier of Chemistry & Life Science, will be held in partnership with Tsinghua University and Peking University from December 2nd to 4th, 2018.



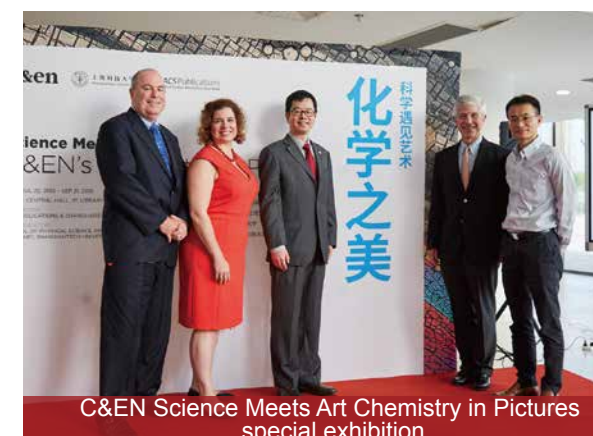
ACS Executive Director and CEO Thomas M. Connelly



President of ACS Publications Brian Crawford



Stanford University Professor W. E. Moerner



C&EN Science Meets Art Chemistry in Pictures special exhibition



ShanghaiTech University Hosts ICESS-14

The 14th International Conference on Electronic Spectroscopy and Structure (ICESS-14) was held from October 8th to 12th at ShanghaiTech University. Begun in 1971 and held every three years, this was first time the conference was held in China.

ShanghaiTech University Vice President and Provost Yin Jie, Chair of International Advisory Board (IAB) for ICESS Professor Wolfgang Eberhardt, and Co-chair of ICESS-14 and SPST Vice Dean Professor Liu Zhi welcomed more than 330 scientists coming from 22 countries and regions around the world to ShanghaiTech.

Professor Liu Zhi, Professor Feng Donglai (Fudan University) and Professor Chen Yulin (University of Oxford) served as the co-chairs of ICESS-14, which covered various research areas, including surface and interface science, condensed matter physics, synchrotron radiation, and free electron lasers. The speakers reported important progress from the past three years or that will be published soon. There were eight plenary talks, 40 invited talks, 41 contributed talks, a poster session and a tour around Shanghai Synchrotron Radiation Facility (SSRF).

In the plenary speech sessions, Professor Xue Qikun (Tsinghua University), Professor Tom Devereaux (Stanford University), Professor Atsushi Fujimori (University of Tokyo), Professor Maria Novella Piancastelli (Uppsala University), Professor Uwe Bovensiepen (University of Duisburg-Essen), Professor Giacomo Claudio Ghiringhelli (Politecnico di Milano), Professor Aaron Bostwick (Lawrence Berkeley National Laboratory) and Dr. Yang Wanli (LBNL) introduced recent breakthroughs and directions in the fields of topological quantum materials, high-temperature

superconductivity, atomic and molecular optics and advanced detection. Other invited speakers included Professor Shen Zhixun (Stanford University), Professor Zhou Xingjiang (Institute of Physics, CAS), Professor Hans-Peter Steinrück (Friedrich-Alexander-Universität Erlangen-Nürnberg), and Professor Wolfgang Eberhardt (CFEL).

120 posters were displayed at the poster session and the attendees fully exchanged their opinions while the expert panel voted. Finally, the Best Poster Awards were awarded to Feng Jiatai (NIMTE, CAS), Koichiro Yaji (Kyoto University), Jiang Chenggong (SIMIT, CAS), Stephen Urquhart (University of Saskatchewan) and Debora Pierucci (ALBA Synchrotron Facility). Best Student Awards were given to Chiara Bigi (Università degli Studi di Milano) and Philipp Eickholt (Univeristy of Moenster).

Professor Liu Zhi closed the conference with an introduction to Shanghai High repetition rate XFEL aNd Extreme light facility (SHINE) and then the attendees visited Shanghai Synchrotron Radiation Facility (SSRF).

During the conference, the IAB of ICESS decided that Professor Nobuhiro Kosugi would be the next chair and elected Professor Liu Zhi to become a new member of IAB. In three years, ICESS-15 will be held in Oulu, Finland.

ICESS-14 was sponsored by more than 14 companies and 26 volunteers from ShanghaiTech and SIMIT helped organize the conference.





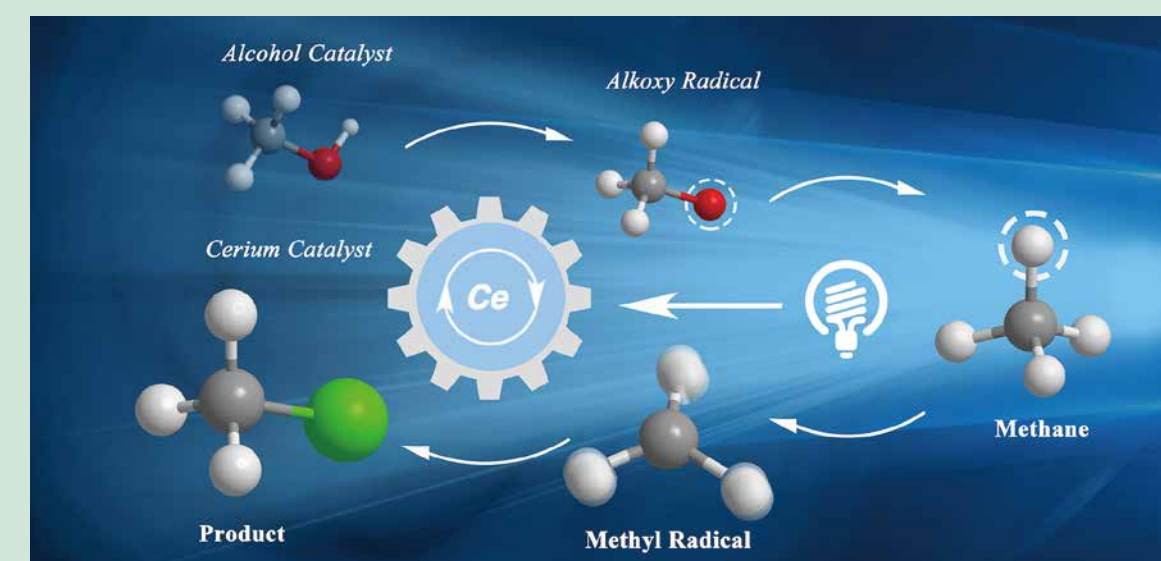
Science Publishes Influential Research by Zuo Group

The Zuo Group at the School of Physical Science and Technology recently developed a photocatalytic methane conversion methodology which can directly transform methane, ethane and other gaseous alkanes into value-added liquid product. This breakthrough in organic chemistry provides a novel, green and mild catalytic platform for natural gas utilization, and could lead to broad applications in the energy/chemical industry. Their results were published as “Selective functionalization of methane, ethane, and higher alkanes by cerium photocatalysis” in *Science* on July 27th. Postdoctoral researchers Hu Anhua and Guo Jingjing are co-first authors, graduate student Pan Hui is the second author, and Zuo Zhiwei is the corresponding author.

Methane and other gaseous alkanes have been traditionally viewed more as clean energy fuels than economical chemical feedstocks by the chemical community. With dwindling oil supplies and the growing importance of reducing worldwide dependence on petroleum-based chemical products, the recent discovery of huge volumes of unconventional reservoirs and soaring production of natural gas has made these gaseous hydrocarbons economically attractive and strategically important basic raw materials. The intrinsic inertness of C–H bond in methane and other gaseous alkanes has, however, brought extreme challenges for catalytic systems. These challenges are not only in the activation step, but also in controlling chemoselectivity to avoid solvent functionalization and overfunctionalization under frequently utilized harsh conditions (high temperature, superacids or strong oxidants). Moreover, the gaseous substrates’ low solubility in most solvents has raised substantial practical difficulties. Elegant catalytic systems utilizing transition metals such as Pd, Ir, Rh, Ru have been reported; however, the “grand challenge” remains the development of efficient catalytic systems with inexpensive catalysts and ambient conditions.

The Zuo Group has focused on the development of sustainable catalyst for highly efficient transformations. The unique electron structure of high valence cerium complexes, as well as their unique photophysical properties, attracted their research attention to explore valuable synthetic methodologies utilizing the ligand-to-metal charge transfer (LMCT) excitation process, a common photoexcitation manifold among coordination complexes of transition metal with an empty valence shell which has been under-investigated in synthetic organic transformations via modern photoredox catalysis. In 2016, they first found that CeCl₃ could act as photocatalyst in the C–C bond cleavage and amination of cycloalkanols. Then, in 2017, they demonstrated that the LMCT process could be utilized with 1,5-HAT event for the selective distal C–H functionalization of primary alcohols. On the basis of this work, after 2202 trials and optimizations, they have developed a general and highly efficient platform for the catalytic functionalization of methane and other gaseous alkanes under LED irradiation at ambient temperature with abundant and inexpensive cerium salts as photocatalysts. Critically, the use of LMCT catalysis to generate highly reactive alkoxy radicals enables the challenging HAT event from the strong C–H bonds of the light alkanes employed. This photocatalytic platform has enabled a number of direct transformations of methane and other gaseous hydrocarbons, including amination, alkylation, and arylation, and offers intriguing opportunities for further functionalization of feedstock alkanes.

Chinese Academy of Sciences (CAS) academician and Dean of Shanghai Institute of Organic Chemistry at CAS Professor Ding Kuiling said, “The direct functionalization of C–H bond in methane is one of the basic chemical transformations in energy and chemical processes. The high stability and low polarity of the C–H bond has brought extreme challenges for methane functionalization, therefore harsh conditions such as high temperature and high pressure are often required.” He added, “The C–H functionalization of methane under mild conditions is considered a ‘holy grail’ in the chemistry community. Through the exquisite design of the photocatalytic system, this work by the Zuo Group showcases a new breakthrough in methane conversion at room temperature, and provides a new pathway for the extensive utilization of methane feedstock.”



Selective methane functionalization enabled by cerium photocatalysis

SPST Scientists' Research Published in Nanomaterials



SPST Assistant Professor Zuo Zhiwei

One of the pioneers of modern photoredox catalysis, Professor David MacMillan, a member of the National Academy of Sciences (USA) and distinguished professor at Princeton University said, “The results of this study by the Zuo Group are simply astonishing. Over the last decade, there have been many new directions arising from photoredox with significant societal impact. This study introduces a new direction (LMCT) wherein alkanes such as methane and ethane can undergo direct amination. The potential for use in sectors such as pharmaceuticals, agrochemical, and fine chemical, among others, are clearly evident. This is a remarkable paper from a young Chinese chemist that will be widely influential on a global scale. I cannot wait to see what he will do next.”

Two experts from Shell, senior principal scientist Alexander van der Made and program lead methane to product Sander Van Bavel both spoke highly of the paper. They said, “This paper on photocatalytic functionalization of alkanes showcases excellent and intriguing chemistry on the very relevant topic of alkane activation. Moreover, the paper presents a key first step towards a green route to activate alkanes under mild conditions. Ultimately, this route could lead to more extensive use of abundantly available natural gas as feedstock by the chemical industry.”

“ShanghaiTech University has been striving to construct an independent and innovative academic atmosphere with full academic freedom, allowing our PIs to release their energy and creativity to the greatest extent, said Yang Peidong, founding dean of School of Physical Science and Technology, member of the National Academy of Sciences (USA) and professor at University of California, Berkeley. He added, “The breakthrough of the Zuo Group is a positive demonstration. The research group creatively used the unique rare-earth resources of China to solve the key scientific problem of methane activation, which has great importance for China and the world, in a very short period of time.”

This work was funded by the National Natural Science Foundation of China (21772121) and the “Thousand Plan” Youth Program.

Research teams led by Dr. Yu Ping and Dr. Li Gang of the School of Physical Science and Technology have found a new way to engineer the zigzag edge state of graphene nanoribbons with atomic precision. Their work, entitled “Edge State Engineering of Graphene Nanoribbons,” was published online in *Nano Letters* on August 15, 2018.

Graphene nanoribbon, a novel one-dimensional graphene nanomaterial, holds great promise for future electronic and spintronic device applications. In 2010, the Fasel research group successfully prepared graphene nanoribbons with atomically precise width by using a bottom-up on-surface synthesis method. Since then, much effort has been devoted to investigating the electronic structure of graphene nanoribbon through tuning the ribbon width or chemical doping. However, how to engineer the edge state of graphene nanoribbons with atomic precision remains unexplored.

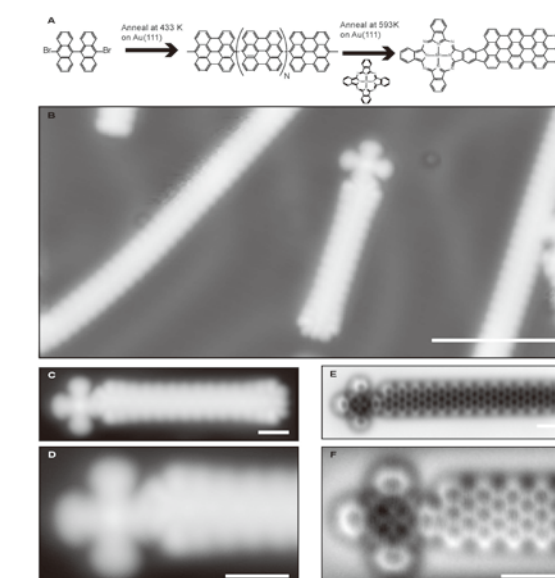


Fig 1. Bottom-up synthesis of MnPc fusing to the zigzag edge of AGNRs

In the study, the MnPc molecule was fused with the zigzag edge of 7-armchair Graphene Nanoribbons using an on-surface synthesis method. Using high resolution scanning tunneling microscope (STM) and atomic force microscopy (AFM), researchers observed the covalent bonding in MnPc and graphene nanoribbon junction, and the zigzag edge state of the graphene nanoribbons have energy splitting with MnPc fusing (shown in Figure 1). Moreover, the edge states of graphene nanoribbons can be successfully engineered through hydrogen atom adsorption and desorption (shown in Figure 2). In order to illustrate the physical mechanism of this phenomenon, Kelvin force spectrum (KPFS) measurements and DFT calculations were performed. The results suggest that the electronic structure of the zigzag edge state is engineered through tuning the local doping of graphene nanoribbon edges upon the charge transfer process. The results have paved a new way for the preparation of functional graphene devices.

The paper's first author is Su Xuelei, a master's student from Dr. Yu Ping's research group. Assistant Professors Yu Ping and Li Gang are both corresponding authors. Their work was supported from the startup funding of ShanghaiTech University as well as grants from the National Natural Science Foundation of China and Shanghai Natural Science Foundation.

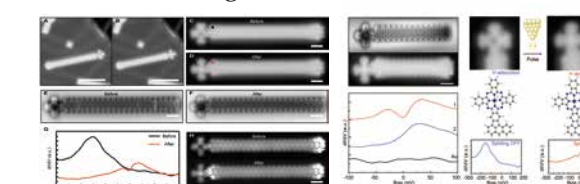


Fig 2. Engineering the electronic structure of the zigzag edge state

Chemical Science Publishes SPST Research

Research groups led by Assistant Professors Li Tao and Zhong Chao from the School of Physical Science and Technology (SPST) have co-developed a method that can grow metal-organic frameworks (MOFs) on nearly any polymeric surfaces using bacterial adhesive curli nanofibers (CNFs) as a mediator. Their work, “Adhesive Bacterial Amyloid Nanofibers-Mediated Growth of Metal-Organic Frameworks on Diverse Polymeric Substrates,” was recently published in *Chemical Science*, a top chemical journal. The first author, Zhang Cuizheng, is a junior undergraduate student from Li Tao’s group. Li Yingfeng, the co-first author, is a 5th year graduate student from Zhong Chao’s group. Li Tao and Zhong Chao are both corresponding authors of this paper.

As a class of extremely diverse porous materials, metal-organic frameworks (MOFs) have shown great promises in numerous applications such as gas storage, sorption-based separation and catalysis. Yet the development of other high value-added products like separation membranes and wearable devices demands the growth of MOFs on various flexible polymer substrates. This is an extremely challenging task because many polymer surfaces are chemically inert, thus not suitable for MOF growth. So far, we lack a general method to surmount this challenge.

In nature, the biofilm of *Escherichia coli* (*E. coli*) can tightly anchor on many biotic and abiotic substrate surfaces to protect the bacteria from environmental changes. This superior adhesive capability can be attributed to

numerous CNFs self-assembled from CsgA protein secreted by *E. coli*. Inspired by this phenomenon, two research groups used purified CsgA protein as a universal coating for a variety of polymeric substrates. Meanwhile, the remaining carboxylate, amino and imidazolate groups presented on the protein surfaces served as nucleation centers for crystalline MOFs to grow.

The research teams first investigated the crystallization mechanism of a model MOF, ZIF-8 on CNFs using transmission electron microscopy (TEM) and atomic force microscopy (AFM). The results reveal that ZIF-8 nuclei do indeed nucleate on CNFs, suggesting that CNFs can be used as the nucleation center for MOF growth. Next, utilizing the universal adhesion capability of CNFs, ZIF-8 thin films were densely grown on 12 common polymeric substrates with drastically different functionality and surface properties. These substrates include some of the notoriously non-stick or chemically inert polymers such as polytetrafluoroethylene (PTFE or Teflon), polyvinylidene fluoride (PVDF) and polystyrene (PS), etc. Compared to non-modified surfaces, the MOF coverages were dramatically improved. In the case of PVDF, nearly 100-fold MOF coverage enhancement was achieved. This powerful method was further extended to grow MOFs on plastic tubes, fabrics and even plastic objects with very complex geometric shapes. Combining protein patterning technique, Zhang and his team members successfully fabricated a pattern forming the word ‘ShanghaiTech’ using MOF particles on a non-stick Teflon surface.

To tackle one of the most challenging industrial separation processes, propylene/propane (C_3H_6/C_3H_8) separation, Zhang successfully fabricated a sub-micron defect-free ZIF-8 thin film composite (TFC) membrane on a microporous PVDF support using this method. Due to the ultrathin nature of the selective ZIF-8 layer, this membrane exhibited very high C_3H_6 permeation and high C_3H_6/C_3H_8 separation selectivity which are two most important attributes for membrane gas separation. Compared to the traditional cryogenic distillation process, this new technology may significantly reduce the overall energy consumption, making it a “greener” process.

The work is the result of interdisciplinary collaboration among experts in the fields of biomaterials, porous materials and chemical engineering, fully reflecting the importance of multidisciplinary cross-communication

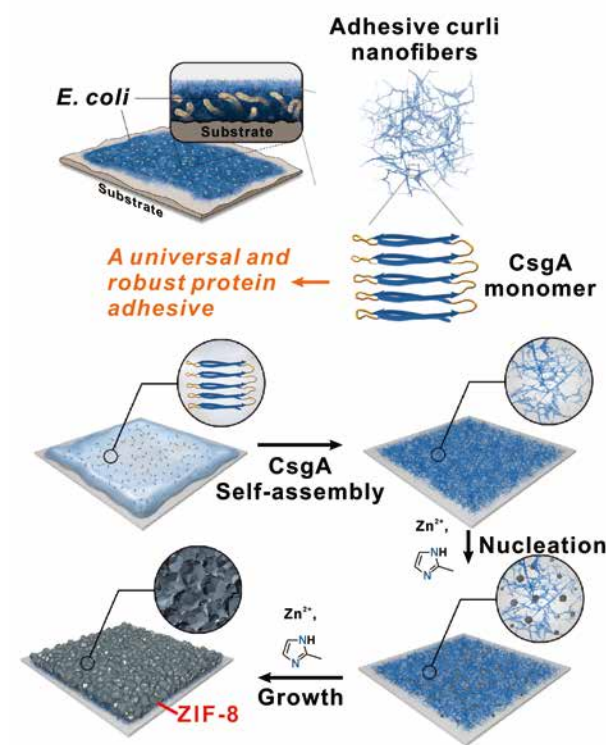


Figure 1. A schematic illustration of curli nanofibers-mediated growth of MOFs

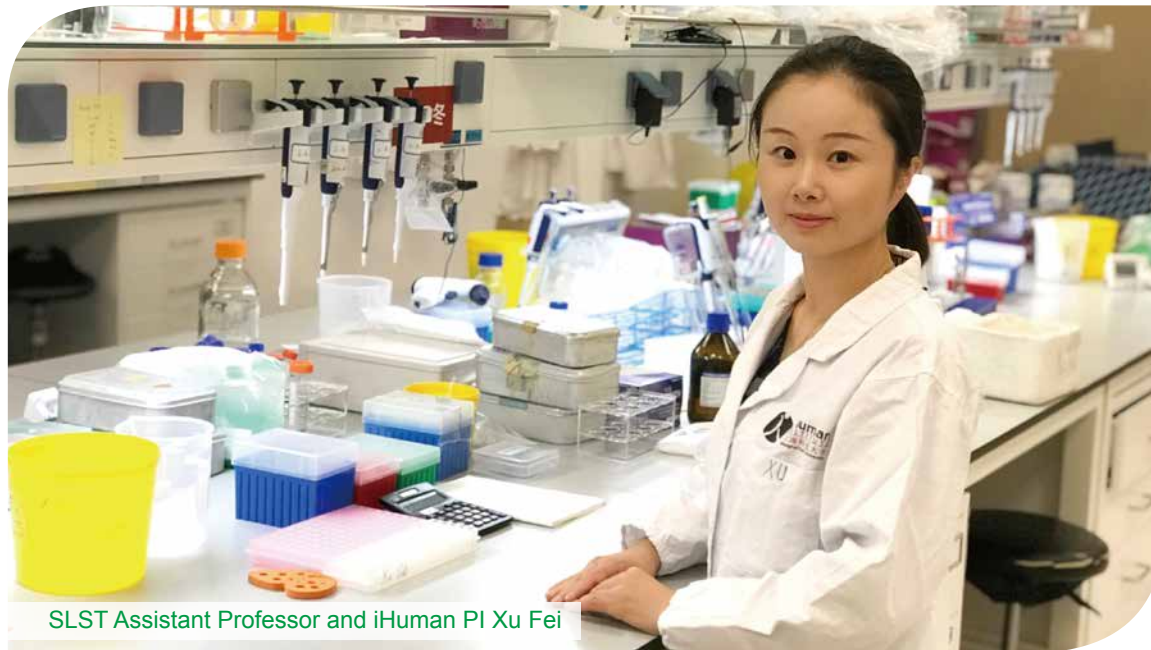
encouraged by ShanghaiTech University. It is worth noting that the first author, Zhang Cuizheng, is currently a junior undergraduate student in SPST. Influenced by the strong academic atmosphere of the university, he joined the Li Group when he was just a freshman and immediately picked up an independent research project on his own. During two years of research, he proactively communicated and cooperated with senior graduate student Li Yingfeng. His motivation and courage to break the traditional boundaries between undergraduate and graduate research led to this achievement. This also reflects ShanghaiTech’s determination to be an innovative university aiming to provide the strongest support for all of their students.

This work was supported by start-up funding from ShanghaiTech University, Young Overseas High-Level Talents Introduction Plan, the “Dawn” Program of Shanghai Municipal Education Commission, Shanghai Pujiang Program of Shanghai Science and Technology Committee (STCSM), National Natural Science Foundation of China and the Joint Funds of the National Natural Science Foundation.



Figure 2. MOF crystals (red) grown on various polymeric substrates with different morphologies

Nature Publishes iHuman Research Deciphering First Human Frizzled Receptor Structure



SLST Assistant Professor and iHuman PI Xu Fei

The Xu Laboratory at ShanghaiTech's iHuman Institute has deciphered the high-resolution crystal structure of the first human Frizzled receptor. As a gatekeeping protein in regulating the fundamental Wnt signaling in embryonic development and tumorigenesis, the Frizzled receptors (FZDs) have been cancer drug targets for decades without success. However, these results, which illustrate the unique architecture of Frizzled-4 in ligand-free state and explain the long-standing hurdle of identifying potent ligand for this family of receptors, will benefit basic and therapeutic research that could lead to important new drug discoveries. These new findings were published in the advanced online edition of the journal *Nature*, titled "Crystal structure of Frizzled 4 receptor in ligand-free state."

"In order to understand why no one has been able to develop good tool ligands or drug molecules for FZDs and to tackle the mystery of FZD signaling, we solved the intact transmembrane domain structure of Frizzled4 receptor (FZD4) at 2.4 angstrom resolution," said Xu Fei, corresponding author of the study.

What surprised the authors was the observation that the traditional orthosteric ligand binding site is very narrow, making it hard for small molecules to enter or bind. "These findings improve our understanding of the FZD ligand and signaling, and show that ligand design for this pocket may require special considerations that could be inspired by this crystal structure," said Xu.

"To generate a more stable human FZD4 protein amenable for structure determination in the absence of a ligand (apo state), the team spent four years and screened hundreds of constructs, optimized purification procedures, and tried thousands of possible crystallization methods," said Yang Shifan, postdoctoral fellow at iHuman Institute and first author of the paper. "It turns out to be extremely challenging to obtain diffraction-quality crystals, likely due to the lack of a tool ligand to lock the flexible region in the protein."

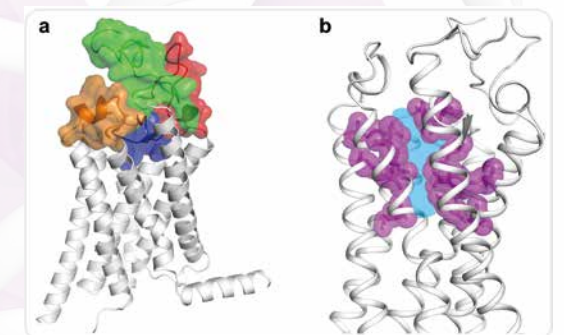
With further optimization of protein engineering, purification, and crystallization conditions, the team finally solved the structure of FZD4 in the apo state, which is the first structure of the Frizzled family GPCRs and the first apo structure of a ligand-regulated GPCR.

"For close personal reasons, I chose FZD4 four years ago when I started my postdoctoral career. It is an amazing protein, as it is not only a target for eye blindness given its critical role in retinal angiogenesis, but also a unique representative for us to understand other FZDs which are emerging cancer drug targets," said Yang.

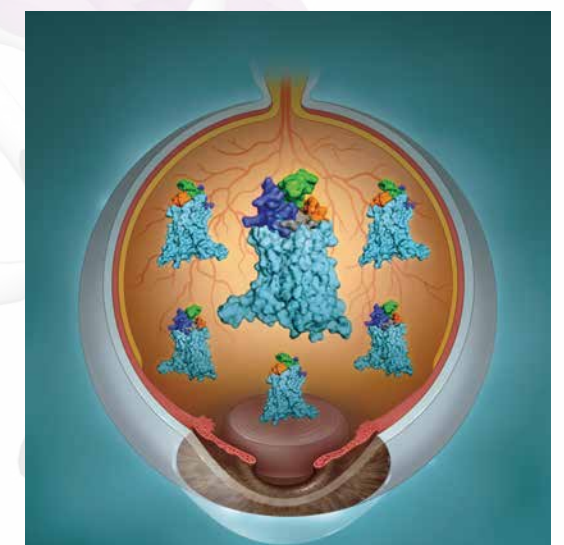
"The orthosteric ligand binding pocket is very unique in FZD4 and other FZDs," said Wu Yiran, iHuman Research Assistant Professor and second author of the paper. "It is not only narrow, but also highly hydrophilic, making traditional GPCR ligands difficult to bind tightly."

In addition to the discovery of a vacant pocket, this work also reveals an unusual packing in transmembrane helix VII and the short helix8, providing new insight into a potential activation mechanism of this family of receptors. "Such a remarkable structure provides a more accurate template to redirect the efforts on Frizzled drug discovery," said iHuman Institute Director Raymond Stevens.

Other key co-authors of this paper are: Dong Shaowei, Chen Yuxiang, Guo Yu, Zhao Suwen, Zhang Bingjie, Shui Wenqing, and Pu Mengchen from ShanghaiTech University; Ting-Hai Xu, Parker W. de Waal, He Yuanzheng, Zachary J DeBruine, Eric Xu, and Karsten Melcher from the Van Andel Research Institute; and Gye Won Han, Petr Popov, and Vsevolod Katritch from the University of Southern California. Financial support for this work comes, in part, from the Shanghai Municipal Government, ShanghaiTech University, and an NSF of China grant.



Overall structure of Frizzled4 and highlight of the narrow pocket



Artistic illustration of the Frizzled4 protein structure surfacing on the retina of an eyeball, demonstrating the functional role of Frizzled4 in retinal angiogenesis and relation to eye diseases (Image created by Julie Liu)

SIAIS Research Published in PNAS

A research collaboration between the laboratories of Yang Guang and Richard Lerner of SIAIS at ShanghaiTech University and the laboratory of Xu Tianle at Shanghai Jiao Tong University School of Medicine has led to an article published in the *Proceedings of the National Academy of Sciences of the United States of America* on July 25th. The article, “Selection of an ASIC1a-blocking combinatorial antibody that protects cells from ischemic death,” lists Dr. Qiang Min and graduate student Dong Xue as co-first authors and Richard Lerner, Yang Guang and Qu Zhihu as co-corresponding authors.

Acid-sensing ion channels (ASICs) are voltage-insensitive cation channels widely distributed in central and peripheral nervous systems throughout the body. In the nervous system, ASIC1a is involved in the synaptic plasticity, learning and memory, pain sensation and ischemic stroke conditions, and it represents a novel therapeutic target in stroke and pain. Despite their high potency, small molecules and animal venom peptides inhibiting ASIC1a are not selective or biologically unstable in humans. Monoclonal antibodies could represent novel ASIC1a modulators with greater potency, subtype selectivity, and biological stability. By panning from a combinatorial human antibody library, researchers from Yang and Lerner’s lab obtained a highly specific antibody targeting the human ASIC1a (hASIC1a) which could become a new drug for stroke and other neurological diseases.

To identify functional anti-hASIC1a antibodies, the hASIC1a was purified and assembled in the nanodiscs such that the target channel has a configuration as close as possible to its natural state in the plasma membrane. “Differential selection” was applied in the iterative selection process and a highly potent and selective antibody ASCo6 (KD = 7.9 nM) targeting only the ASIC1a subtype was identified. The specificity of ASCo6 was further demonstrated in the primary neurons from the ASIC1a knockout mice. Images from the transmission electron microscope clearly shows that in each of the ASIC1a channels consisting of three subunits, up to three ASCo6 antibodies can bind to the interfaces between two subunits and form a stable complex. Molecular dynamics (MD) was used to reconstitute the 3D structure of the complex (Figure 1).

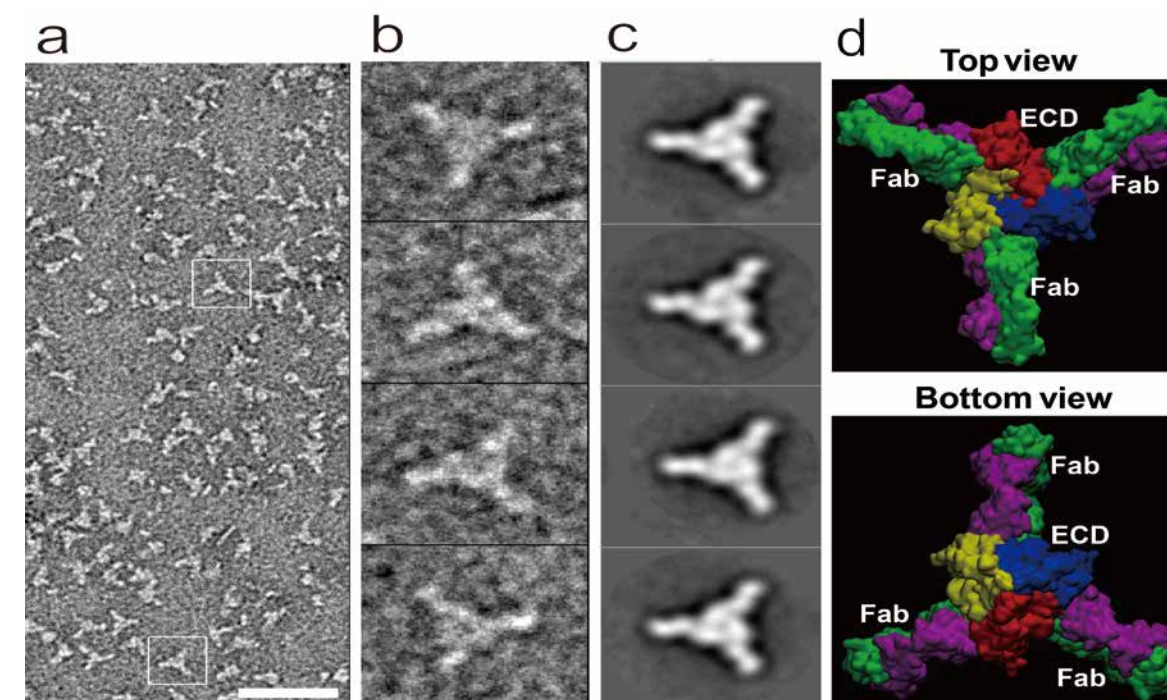


Fig 1. Negative-staining EM analysis of the hASIC1a & ASCo6 complex, with molecular dynamics (MD) simulation of the complex

Functional studies revealed that ASCo6-IgG1 is able to inhibit acid-induced opening of the ASIC1a channel in a dose-dependent way. Moreover, it blocks the transport of cations including calcium influx ($IC_{50} = 2.8$ nM). As a proof-of-concept in vivo, ASCo6-IgG1, administered three hours after ischemia, showed an effective protection of the brain cells from death in MCAO mice (Figure 2). Patch-clamp studies further demonstrated that, unlike the PcTx1 peptide, which binds to the acidic pocket of ASIC1a and induced an alkaline-shift in both the activation and the steady-state desensitization (SSD) curves of pH, ASCo6-IgG1 inhibited the channel in a non-competitive manner.

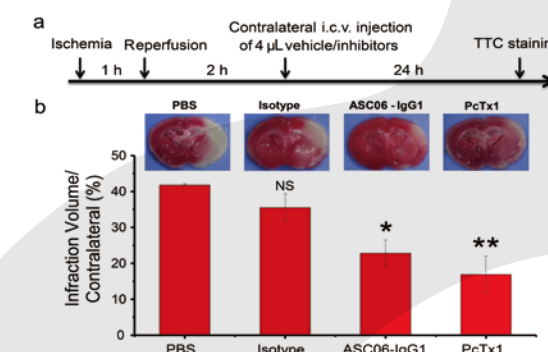
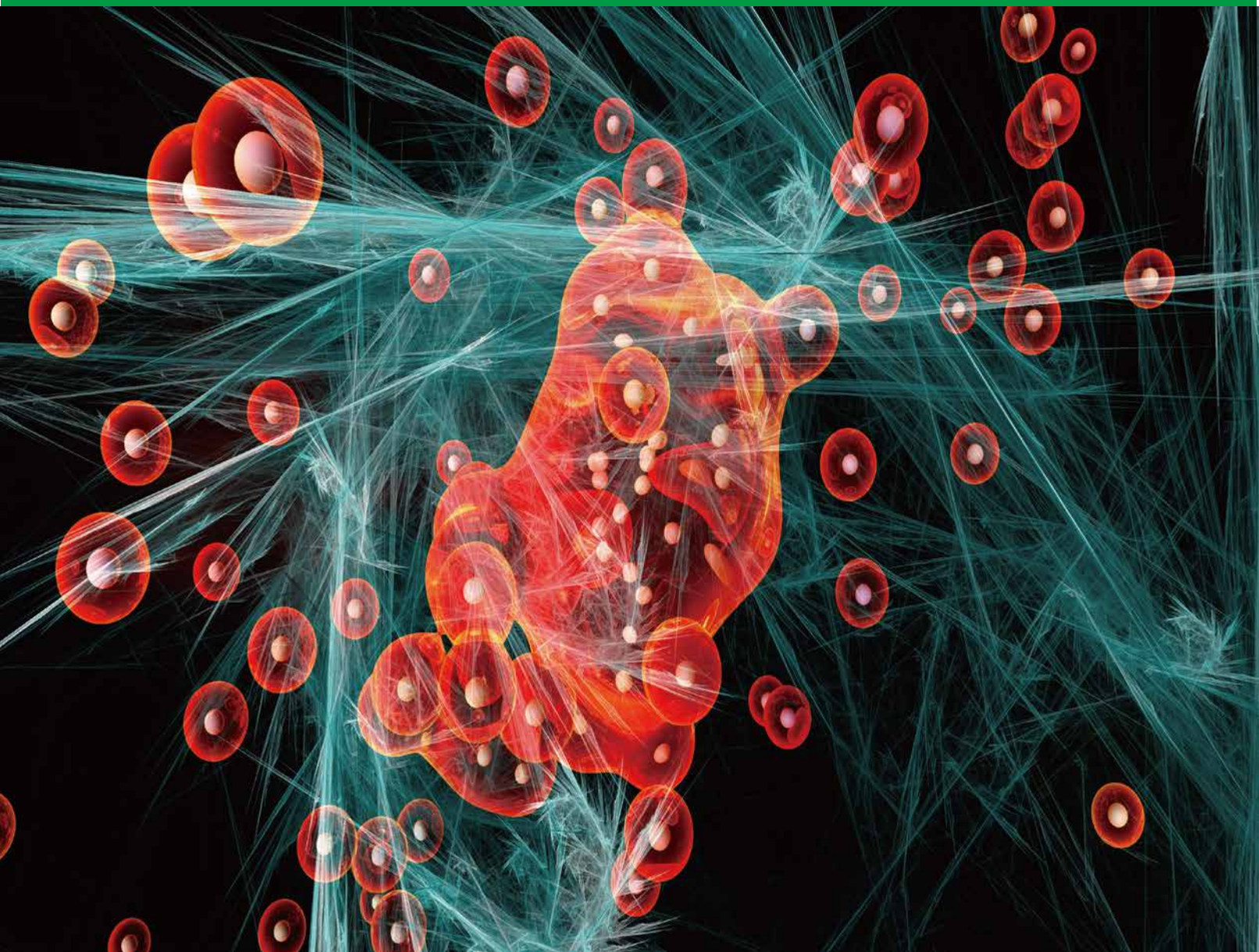


Fig 2. Neuroprotective effect of the ASIC1a specific antibody on the ischemic mice model

Drs. Zha Zhaoli, Francesco Zonta, Zhao Lixia and Damiano Burrato as well as SIAIS graduate students Yuan Chao and Tao Dongping; and Shanghai Jiao Tong University School of Medicine graduate students Zuo Xiaokun, Song Xinglei and Huang Chen contributed to the study. Many research teams, such as Dr. Li Guangwei’s team and Dr. Hu Qin’s team at Shanghai Jiao Tong University School of Medicine, Dr. Nie Yan’s team at Roger Kornberg’s lab, and Dr. Yang Bei’s team at Ian Wilson Lab at SIAIS provided constructive and intellectual input and support. In addition, the platforms of Protein & Gene, Informatics, Cell sorting, Imaging, and HTS from SIAIS and Electron Microscopy System at National Facility for Protein Science in Shanghai (NFPS), Zhangjiang Lab provided technical support.



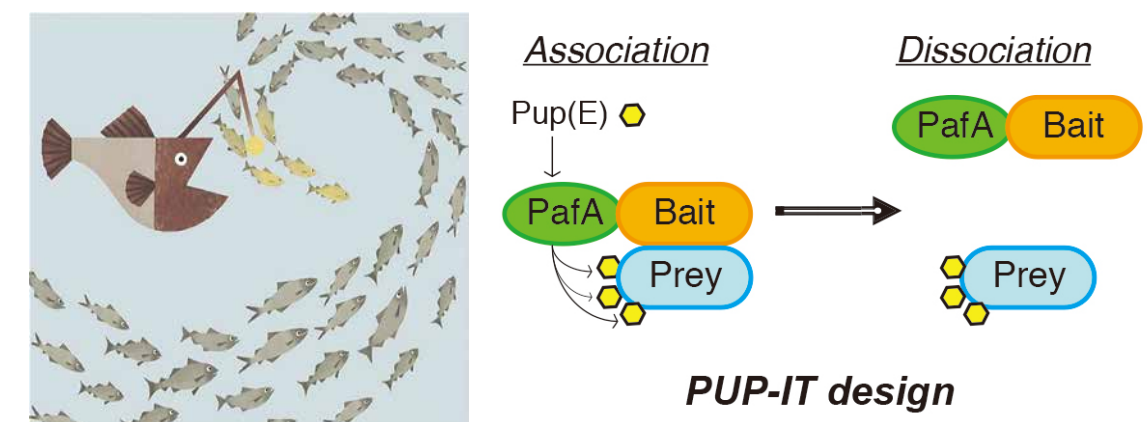
Novel Proximity Tagging System Published in Nature Methods

Cell and cellular organelles communication are often controlled by the membrane protein interaction. Despite the many existing methods to detect protein-protein interactions (PPIs), there are still challenges in detecting membrane PPIs. Transient and weak PPIs are mostly associated with membrane receptor-mediated signaling pathways. Mass spectrometry-based membrane protein interaction studies have also not been widely successful, due to the poor solubility of membrane proteins or the loss of PPIs during sample preparation. In recent years, protein proximity-tagging methods, such as APEX and BioID, have been applied in membrane protein studies with great results.

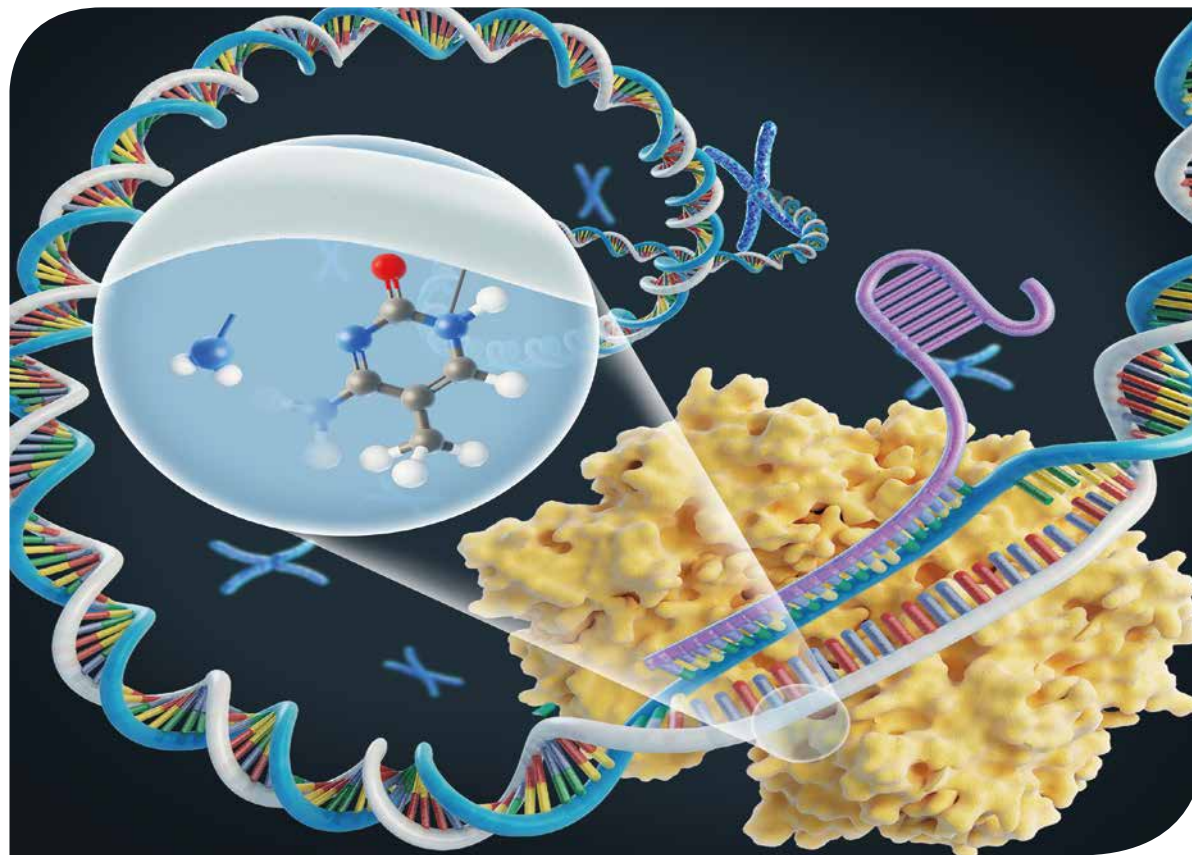
School of Life Science and Technology Assistant Professor Zhuang Min's group has developed a novel method which specifically tags the interacting "membrane proteins of interest" (MPOI) in cells. Their research regarding this new method, called PUP-IT (Pupylation-based interaction tagging) was published online on August 13th in *Nature Methods*. This research offers an alternative proximity-tagging system to study protein-protein interactions. This approach transforms transient and weak interactions into others that involve covalent binding, so that the tagged proteins can be subsequently enriched by affinity purification under denaturing conditions for mass spectrometry-based identification.

In the paper, the researchers first applied this approach to CD28, a critical co-stimulatory receptor for T lymphocyte activation. Three known CD28 binding partners and multiple potential interacting proteins were identified. In addition, this system was proven efficient in tracking cell-cell interactions. Finally, they showed that this method can be used to identify the interaction between a cell surface receptor and its ligand. The paper demonstrated a powerful tool uncovering the weak and transient membrane PPIs in cells, which will have a broad application in the future.

Graduate students Liu Qiang and Zheng Jun are first co-authors and Assistant Professors Zhuang Min and Wang Haopeng are corresponding co-authors. Their work has been mainly supported by ShanghaiTech and the National Natural Science Foundation of China.



Nature Biotechnology Publishes Base Editing Research

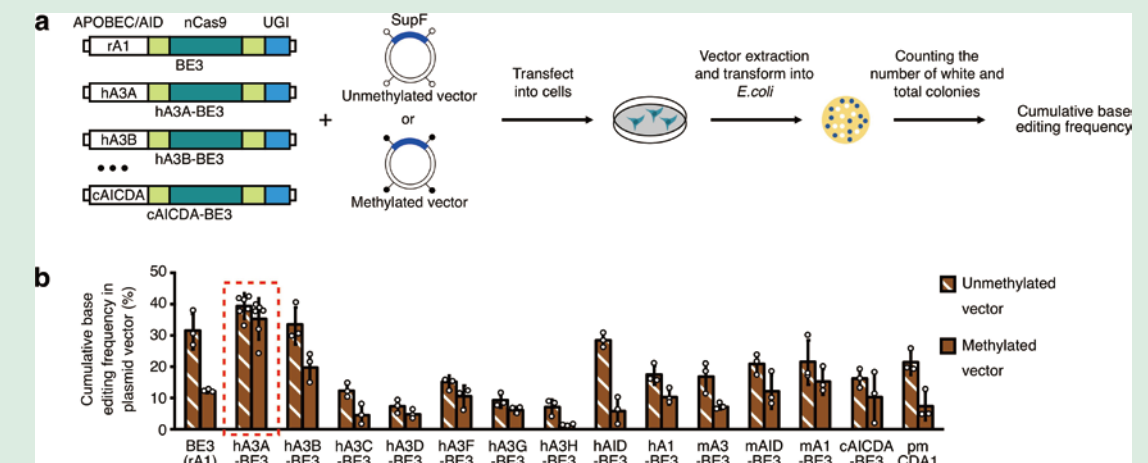


A team of scientists led by Dr. Chen Jia and Dr. Huang Xingxu from ShanghaiTech's School of Life Science and Technology and Dr. Yang Li from the CAS-MPG Partner Institute for Computational Biology at the Chinese Academy of Sciences have developed a series of novel base editors (BEs) using a spectrum of cytidine deaminases from different species, including human APOBEC3A (hA3A). Their work, entitled "Efficient base editing in methylated regions with a human APOBEC3A-Cas9 fusion," was published online in *Nature Biotechnology* on August 20th.

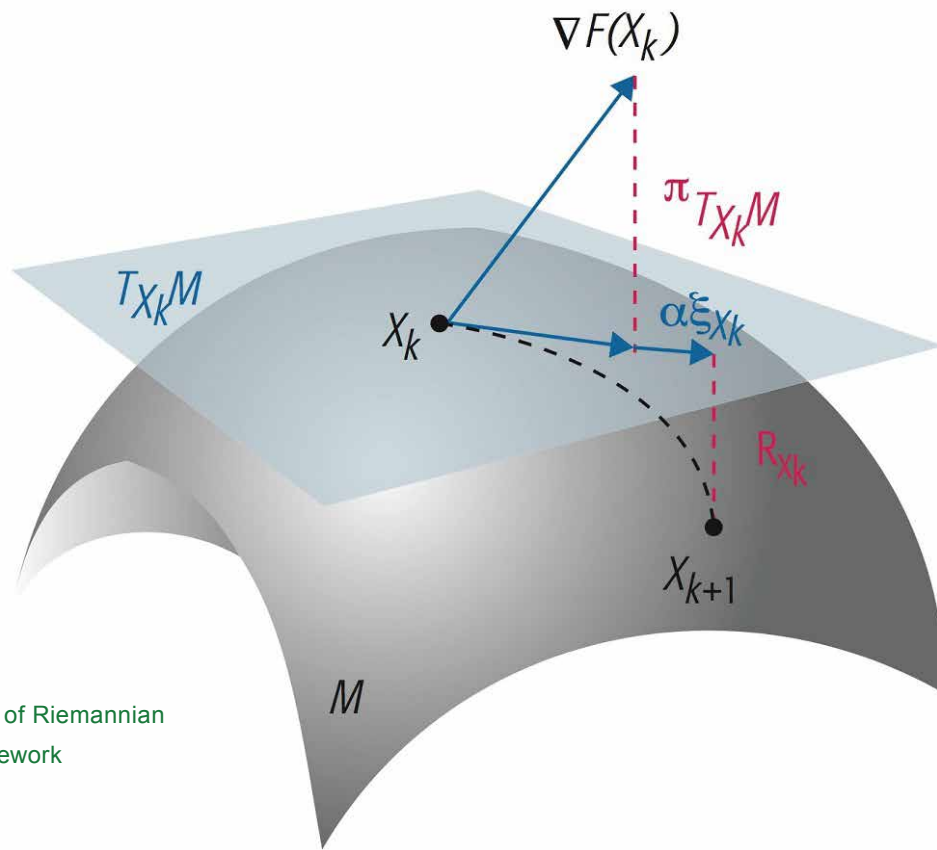
Base editors (BEs) are developed by combining different nucleotide deaminase family members, including cytidine deaminase family members, for example the apolipoprotein B mRNA-editing enzyme, the catalytic polypeptide-like (APOBEC) or activation-induced deaminase (AID) and adenosine deaminase family members like adenosine deaminase acting on RNA (ADAR), with the CRISPR-Cas system (e.g., CRISPR/Cas9 and CRISPR/Cpf1). Various BEs have been used for targeted C-to-T/A-to-G base editing in different species. Numerous human diseases have been reported to be driven by point mutations in genomic DNA. With recently developed BEs, these disease-related point mutations can be corrected, providing new therapeutic options. The newly-developed base editing technology has been highlighted by *Science* as one of its Top 10 breakthroughs in 2017.

By analyzing disease-related T-to-C mutations that can be theoretically reverted to thymines by BEs, the research team found that roughly 43% of them are on cytosines in the context of CpG dinucleotides. It is well known that C of CpG is usually methylated in mammalian cells, and the methylation of C strongly suppresses the cytidine deamination activity of some APOBEC/AID deaminases. Previously developed BEs using rat APOBEC1 (rA1) cytidine deaminase were inefficient in editing cytosines in highly-methylated regions. To construct BEs for efficient C-to-T base editing in highly methylated regions, the researchers developed a series of BEs by fusing Cas9 nickase with a dozen different APOBEC/AID deaminases, and then they showed that most of these BEs can be used for C-to-T base editing. Importantly, a novel BE using hA3A (hA3A-BE) and its engineered versions with narrower editing windows can mediate efficient C-to-T base editing in regions with high methylation levels, as well as in other examined regions within different contexts. Overall, these newly developed hA3A-BEs can comprehensively induce efficient base editing in all the examined contexts, including both methylated DNA regions and GpC dinucleotides.

This study was supported by grants from the National Natural Science Foundation of China, the Ministry of Science and Technology, the Shanghai Municipal Science and Technology Commission, and ShanghaiTech University.



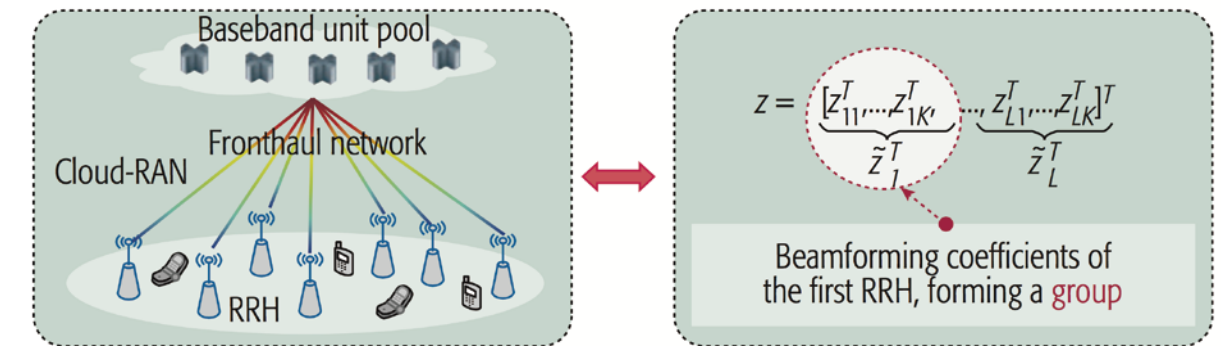
a) Construction of various BEs and screening for efficient base editing in highly methylated regions
b) hA3A-BE3 can induce efficient base editing in highly methylated regions



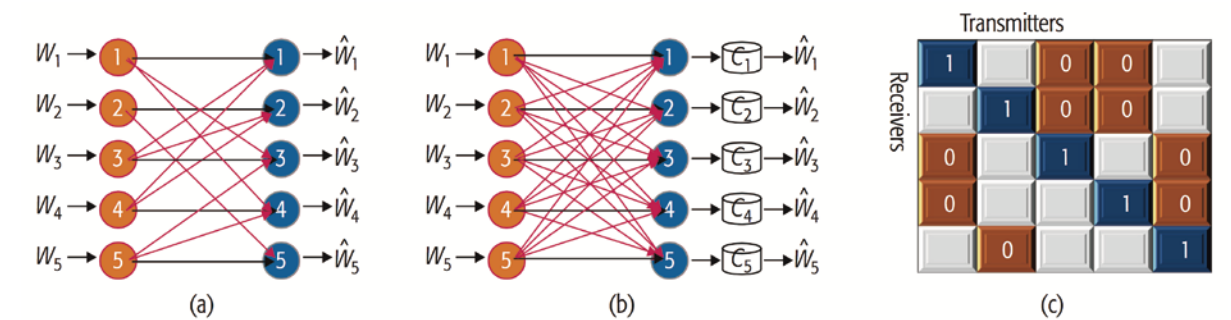
A schematic view of Riemannian optimization framework

SIST Assistant Professor Shi Yuanming and his collaborators at HKUST and Tsinghua University have recently developed large-scale sparse and low-rank frameworks for optimizing across the communication, computation and storage resources in ultra-dense networks (UDNs), thereby providing principled ways to design communication-efficient mobile artificial intelligence (AI) systems and intelligent internet-of-things (IoT) networks. Their exciting results were recently published as “Generalized Sparse and Low-Rank Optimization for Ultra-Dense Networks” in *IEEE Communications*.

In UDNs, large-scale network adaptation plays a pivotal role in effectively utilizing densely deployed radio access points to support massive mobile devices. For various network adaptation problems in UDNs, the solution vector is expected to be sparse in a structured manner (e.g., radio access point selection results in a group sparsity structure). To illustrate the powerfulness of the generalized sparse representation and scalable optimization paradigms, the researchers presented representative examples of group sparse beamforming for green Cloud-RANs, and structured sparse optimization for active user detection and user admission control. In particular, their work on green Cloud-RANs won the 2016 IEEE Marconi Prize Paper Award.



Group sparse beamforming for green Cloud-RAN design



Generalized low-rank model: (a) topological interference management; (b) cache-aided interference channel

UDNs are highly complex to optimize, and it is critical to exploit the available network side information. For examples, network connectivity information, cached content at the access points, and locally computed intermediate values for wireless distributed computing, all serve as exploitable side information for efficiently designing coding and decoding in UDNs. The researchers provided a generalized low-rank matrix modeling framework to exploit the network side information, which helped to efficiently optimize across the communication, computation, and storage resources. A general low-rank optimization problem was further established by incorporating the network side information to design communication efficient UDNs.

To address the algorithmic challenges for the sparse and low-rank modeling frameworks in UDNs, for the general convex optimization problems, the researchers developed a principled two-stage framework with the capability of providing certificates of infeasibility, enabling parallel and scalable computing via the operator splitting method. For the nonconvex low-rank optimization problems, they developed a Riemannian optimization framework by exploiting the manifold geometry of fixed-rank matrices to achieve fast convergence rates and scalability. Their work on large-scale convex optimization paper won the 2016 IEEE Signal Processing Society Young Author Best Paper Award.

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SIST Assistant Professor Published in IEEE Communications

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