



BRIDGING CHINA AND THE WORLD FOR THE FUTURE OF SCIENCE

A Chinese lab proposes a therapy for AIDS and leukemia through genome editing of human hema-topoietic stem cells; a US biologist aims to understand chromosomal disorders by studying the mechanism of chromosome repair in mice; and a company co-founded by US and Chinese scientists attempts to perform gene editing in pigs in an attempt to grow porcine organs that can be transplanted into humans—some of the most brilliant minds in molecular studies gather at the Advanced Technologies in Biomedicine summit, which opened on November 4, 2019 in Beijing, to present a blueprint for future developments in biomedicine.

"We see this as an exciting time where basic research discoveries are being translated into ad-vances that will have impact in the clinic," says Steve Mao, Science Senior Editor and co-organizer of the event. The meeting was co-hosted by the American Association for the Advancement of Sci-ence (AAAS, publisher of Science), the Tsing-Innovation Ecosystem (TIE), and Zhongguancun Life Science Park, with support from the Beijing Municipal Science and Technology Commission (BMSTC).

Over 400 scientists, physicians, entrepreneurs, and investors participated in the conference, which was held over two days in China's capital. It was a truly diverse event, with participants from China, the U.S., Australia, Singapore, Japan, and Saudi Arabia, among other countries.

The conference addressed some of the most groundbreaking work in biomedicine. Luhan Yang, a young entrepreneur who co-founded genome-engineering companies Qihan bio and eGenesis at the age of 29, impressed the audience with her talk on organ transplantation. "I hope to share my knowledge of advanced medical technology with teachers and students here," Yang says. "International communication is vital in biological research and for industrial application."

BAS: an international academic platform for cutting-edge research

In October 2018, BMSTC hosted its inaugural series of academic conferences and workshops to foster academic collaboration and exchanges among top international scientists. That two-month long event, called the Beijing International Academic Season (BAS), included four conferences in the fields of graphene studies, artificial intelligence, brain science, and bioscience.

"We'd like to build connections with the world's top academicians and industrial partners," says Qi-ang Xu, director of BMSTC. The key to a nation's development, according to Xu, is the develop-ment of fundamental science knowledge. "Science and technology innovation is critical to building an innovation-driven country, and fundamental studies are the source of innovation and applica-tion," he says.

An example of such efforts is the Advanced Technologies in Biomedicine summit, part of BAS 2019. "It is important that we come together to share knowledge and also to understand the particular problems and challenges facing different countries," says Mao.

While the Science editors chose the topics for the summit, TIE—an international collaborative innovation platform established by Tsinghua Holdings—acted as the summit host. TIE is committed to incubating innovation and facilitating the exchange of scientific and technological achievements between China and the world.

Hongkui Deng from Peking University spoke highly of the organizers' efforts. "At the summit, I met some of the top scientists in genome editing, stem cell studies, and disease modeling, fields that I wish to learn more about, and that we've discussed a lot," he says.

Zoom in: experimenting with future technology

In 2019, BAS included popular research fields such as quantum information technology and nano-technology. Biotechnology and artificial intelligence were highlights of the conference series.

In the Advanced Technologies in Biomedicine summit, for example, scientists talked about genome editing as a way of providing precise and predictable variations in plants, and as a tool for medical application. They also pondered the future of stem cell studies, particularly in tissue and organ generation that could be a solution to the current international scarcity of transplantable organs. The summit also devoted half a day to a discussion of powerful new single-cell sequencing technology.

"These are topics that are enabling a deeper understanding of human disease, but are also providing tools that are already starting to be used to treat diseases," explains Valda Vinson, Editor, Research at Science and co-organizer of the summit. While advanced technologies like single-cell sequencing are giving us an increased understanding of human disease, technologies like gene editing and stem cell therapy are providing the ability to intervene in these diseases.

Vinson spoke highly of MIT professor Richard Young's closing keynote speech, which gave new insights that reframe thinking about how the cell is organized. "This is new basic science that will impact our understanding of disease pathways and may change the course of drug discovery and development," she says.

The ultimate goal of the conference, as Yinuo Li, Director of the Bill and Melinda Gates Foundation China office, described in her keynote speech, is improving public health, especially through innovations that promote effective interventions in poor countries with under-developed public health infrastructure.

Beijing as an incubator for advanced technologies in biomedicine

In recent years, Beijing, a city that hosts China's top universities and academic institutions, has seen a number of major breakthroughs in the field of bioscience. In 2018, Gao Caixia and her team at the Institute of Genetic and Developmental Biology, Chinese Academy of Sciences, used CRISPR-Cas9-mediated gene editing to improve traits in plants by regulating the protein translation of endogenous mRNA of target genes.

More recently, Peking University's Hongkui Deng completed the world's first genetic editing treatment on a patient with both AIDS and leukemia. Deng's team transplanted gene-modified stem cells into the patient, who has survived for more than a year without detectable side effects. The case has been recognized as an important advance in the use of gene editing technology to treat human disease.

Some of the technologies developed by Chinese scientists are already benefiting the public. Xie Xiaoliang from Peking University invented a genome amplification method that can analyze embryonic genomes without causing damage, thus helping couples with monogenic diseases to conceive healthy offspring. The first baby conceived through this method was born in 2016. Today, over 300 families have benefited from the technology.

"Beijing has a distinctive advantage in bringing together talent," says BMSTC director Xu. As of September 2019, the city is home to 125 academicians in the biomedical field—about half of the country's total, 60,000 researchers in colleges and universities, and 80,000 employees in biomedicine-related companies. It is also building three major "science cities" in the Haidian, Changping, and Huairou districts, investing hundreds of millions of dollars. The Zhongguancun Life Science Park itself is part of the Future Science City in the Changping District, which is famous for its biomedicine research, and its advanced energy and manufacturing industries.

Meanwhile, Xu says, innovation is blossoming. The Beijing-headquartered China Biotechnology Innovation Service Alliance (ABO Alliance), an industrial cooperation established in 2005, has incubated nearly 40 companies creating products—from vaccines to animal models to antibodies—as well as services like DNA sequencing and preclinical and clinical drug evaluation.

Beyond the summit

BMSTC initiated the idea of partnering with Science/AAAS to present the conference. In building international academic platforms, BMSTC plans to make Beijing an internationally influential science and innovation center within five years.

"At present, there are still shortcomings in international science and technology innovation cooperation in the city," says Xu. He hopes that the partnership with Science/AAAS will showcase China's latest bioscience achievements to the world and boost the country's innovation capacity to international levels.

This is also the first time that Science has organized such a summit in China. "We were delighted to partner because this is consistent with the AAAS mission of advancing science and serving society globally," says Mao, explaining that the summit also aligns with the goal of Science and its family of journals to bring influential science to a global audience.

Mao believes that the impact of the summits extends further than just bioscience research. "Besides the scientific challenges that we can overcome together, we must be able to translate these ideas, knowledge, and technologies into the clinics in a responsible way as soon as possible to help people in need."



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