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构建科技创新开放环境

Sharing Innovation and Shaping the Future Towards an Open Environment for Scientific and Technological Innovation

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Mission
Inspire Innovative Ideas
Spread Innovative Thoughts
Augment Innovative Spirits
Vision
Becoming a Global Exchange Platfomm for Scientific and·Technological Innovation
Function
A Hot Spring Bubbling with Innovative Ideas
A Bellwether of Global Technological Advancements
A Booster of Global Technological Cooperation
A Gravitational Field for Global Innovation Talents
A Hub for Global Technology Transfer

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Opening Ceremony & Main Forum of the 17th Pujiang Innovation Forum 2024

Sharing Innovation and Shaping the Future: Towards an Open Environment for Scientific and Technological Innovation

Editor's note: *The 2024 Pujiang Innovation Forum was held in Shanghai during September 7-10. With the theme of "Sharing Innovation and Shaping the Future: Towards an Open Environment for Scientific and Technological Innovation", the forum includes Opening Ceremony & Main Forum, 24 Sub-forums, two Exhibitions (Global Tech-matching Fair (InnoMatch EXPO) and WeStart Global Entrepreneurial Investment Conference (WeStart)), two Special Dialogues (Young Scientists Symposium and Women Scientists Symposium), the Youth Innovation HUB (Y-HUBs), Results Release, etc. Pujiang Innovation Observation will bring together wonderful viewpoints and important discussions of forum guests, and share achievements of the forum in multiple issues. This bulletin summarizes the viewpoints of the guests at the Opening Ceremony & Main Forum for your reference.*

CHEN Jining
Secretary of the CPC Shanghai Municipal Committee

SONG Junji
Vice Governor of Shandong Province

Peter MAJOR
Vice Chair of the UN Commission on Science and Technology for Development

Today, a new round of technological revolution and industry transformation is flourishing, the paradigm of scientific research has undergone major changes, and global scientific and technological innovation has entered an unprecedented intensively active period. In the meantime, human development is facing increasing severe challenges such as geopolitical conflicts, weak growth and climate change, and there is an urgent need to strengthen global scientific and technological cooperation and open sharing, and address global problems jointly using a technological approach. The 2024 Pujiang Innovation Forum will implement the guidelines of the congratulatory letter of General Secretary XI Jinping thoroughly, and strive to become an important window for global scientific and technological cooperation and exchanges with the mission of "enlightening innovative ideas, communicating the innovation concept, and motivating the innovation spirit". The guests present agreed that we should continue to adhere to the global scientific and technological cooperation philosophy of opening-up, inclusiveness, mutual benefit and sharing, promote global scientific and technological opening-up and cooperation unswervingly, forward-looking planning, and frontier deployment, expand diversified global scientific and technological cooperation channels, create high-level platforms and carriers for global scientific and technological cooperation, integrate actively into the global innovation network, participate deeply in global scientific and technological governance, promote reform, development and innovation through opening-up, create a more globally competitive open innovation environment, and further serve the goal of building China's globally leading scientific and technological strength, and realizing Chinese modernization.

I. Opening-up and cooperation: An inevitable trend of the times

On the one hand, an open environment for scientific and technological innovation is an inevitable choice called for by the times. CHEN Jining, Secretary of the CPC Shanghai Municipal Committee, pointed out that scientific and technological progress is a global and epochal task, and opening-up and cooperation is an inevitable choice. China will further implement the international science and technology cooperation initiative, and create an open, fair and just innovation environment that further benefits humanity through technology together with other countries. In his congratulatory

1 **The Chinese guests present include** CHEN Jining, Secretary of the CPC Shanghai Municipal Committee; WAN Gang, Vice President of 13th CPPCC National Committee and President of China Association for Science and Technology; YIN Hejun, Minister and Secretary of the CPC Leading Group of the Ministry of Science and Technology of China; GONG Zheng, Mayor of Shanghai; ZHAO Qizheng, former Director-General of the State Council Information Office; BAI Chunli, Academician of the Chinese Academy of Sciences and Former President of the Chinese Academy of Sciences; XUE Qikun, Academician of the Chinese Academy of Sciences and President of Southern University of Science and Technology; SONG Junji, Vice Governor of Shandong Province; Kim Siang KHAW, Tsung-Dao Lee Fellow, Shanghai Jiao Tong University; BAI Rui, Associate Professor at School of Life Sciences, Westlake University, etc.; foreign guests include László BÓDIS, Deputy State Secretary, Ministry of Culture and Innovation of Hungary; Ádám Istvan Kiss, President of the National Research, Development and Innovation Office of Hungary; Peter MAJOR, Vice Chair of the UN Commission on Science and Technology for Development; Daniel Almeida, Secretary-General of the Ministry of Science, Technology and Innovation of Brazil; Mark WALPORT, Vice President of the Royal Society; Hasan Mandal, President of the World Association of Industrial and Technological Research Organizations; Leroy HOOD, Member of the National Academy of Sciences, The National Academy of Engineering, The National Academy of Medicine, American Academy of Arts and Sciences, Foreign Member of The Chinese Academy of Sciences, etc.

letter, Hungarian President Tamas Sulyok said that China and Hungary support innovation through multiple channels, cooperation and exchanges are driven by instinct, and we should benefit the two peoples and humanity jointly through opening-up, exchanges and cooperation. YIN Hejun, Minister and Secretary of the CPC Leading Group of the Ministry of Science and Technology of China, emphasized that global scientific and technological progress stems from mutual learning and joint creation among scientists from different countries. The trend of multi-level coverage, multidisciplinary integration and multi-phase technology interconnection of scientific knowledge is increasingly prominent, scientific research is increasingly comprehensive, complex and integrated, and creating an open environment for scientific and technological innovation is more important and necessary than ever. Peter MAJOR, Vice Chair of the UN Commission on Science and Technology for Development, mentioned that national innovation systems should be integrated into the broader international framework, and all countries should set specific goals that are aligned with global trends to ensure that they participate fully in the global scientific and technological innovation ecosystem. László BÓDIS, Deputy State Secretary, Ministry of Culture and Innovation of Hungary, said that major global scientific and technological innovation achievements are not realized alone, but through cross-border cooperation.

On the other hand, an open environment for scientific and technological innovation is a key move to address global challenges. Scientific and technological innovation is an important force for humanity to address risks and challenges, and promote peaceful development jointly. Peter MAJOR pointed out that international cooperation is crucial for bridging gaps between developed and developing countries, and it is necessary to ensure that all countries participate fully in the global scientific and technological innovation ecosystem. YIN Hejun said that global problems such as climate change, food security and energy security need new solutions from technology urgently. The development of emerging technologies brings about ethical and security risks, so there is an urgent need to establish a global governance system for scientific and technological innovation cooperation. GONG Zheng, Mayor of Shanghai, mentioned that human development is facing major challenges such as geopolitical conflicts, weak growth and climate change, and there is an urgent need to strengthen global scientific and technological cooperation and open sharing, and address global problems jointly using a technological approach. Mark WALPORT, Vice President of the Royal Society, thought that to accelerate scientific and technological innovation, and address challenges such as climate change, new virus transmission, biodiversity loss and population aging, global cooperation in fields such as new energy, artificial intelligence, quantum science and space science is necessary. WAN Gang, President of China Association for Science and Technology, pointed out that climate change is a major common challenge for global scientific and technological innovation, and we should introduce technologies with an open and inclusive

Hasan MANDAL
President of the World Association of Industrial and Technological Research Organizations

GONG Zheng
Mayor of Shanghai

YIN Hejun
Minister of Ministry of Science and Technology of the People's Republic of China

László BÓDIS
Deputy State Secretary, Ministry of Culture and Innovation of Hungary

WAN Gang
Vice President of 13th CPPCC National Committee, President of China Association for Science and Technology

BAI Chunli
Academician of the Chinese Academy of Sciences, Former President of the Chinese Academy of Sciences

Sir Mark WALPORT
Vice President of The Royal Society

XUE Qikun
Recipient of the State Preeminent Science and Technology Award in 2023, Academician of the Chinese Academy of Sciences, President of Southern University of Science and Technology

mind, and go global with the wisdom of cooperation and mutual benefit to create an open, fair, and non-discriminatory international environment, and address the common challenges of humanity jointly.

II. Sharing innovation: An inevitable move towards win-win cooperation

First, creating an innovation cooperation platform has become a global consensus. YIN Hejun pointed out that China has established scientific and technological cooperation relationships with 161 countries and regions, entered into 118 bilateral and multilateral intergovernmental agreements on scientific and technological cooperation, and joined over 200 international organizations and multilateral mechanisms. Hasan Mandal's organization is an international technological organization established in 1970, and a cooperative network composed of 70 countries and 160 members, with the mission of building a global innovation family to address global challenges jointly. SONG Junji, Vice Governor of Shandong Province, said that a number of high-level platforms are being established in Shandong at a faster pace, some national marine laboratories have been established in Qingdao, forming a system of 21 national key laboratories, 9 provincial laboratories and 277 provincial key laboratories, and these bases and platforms are the core entities for Shandong's scientific and technological cooperation. WAN Gang, President of China Association for Science and Technology, pointed out that China is creating an open industry platform in clean energy and new energy vehicles, and joint venture partners are deepening opening-up and cooperation, and increasing investment in China to promote the foreign cooperation of the industry chain.

Second, practical achievements are made in major cooperation projects. YIN Hejun pointed out that China has participated in nearly 60 international major science programs and major science projects, organized international major science programs such as "Deep-time Digital Earth" and "Ocean Negative Carbon Emissions", implemented the Belt and Road Science, Technology and Innovation Cooperation Action Plan deeply, held the first Belt and Road Conference on Science and Technology successfully, released a world-oriented international science and technology cooperation initiative, and made fruitful achievements in international cooperation driven by major projects. BAI Chunli proposed that the Institute of Solid State Physics, Chinese Academy of Sciences in Hefei has conducted joint research on the superconducting tokamak and participated in the International Thermonuclear Experimental Reactor (ITER) project – a national major science project, and cooperation in major projects has become a main lever for the Chinese Academy of Sciences to conduct global scientific and technological cooperation. Kim Siang KHAW, Tsung-Dao Lee Fellow, Shanghai Jiao Tong University, pointed out that research in the muon field requires practical cooperation across disciplines and fields from research institutions around the world in order to overcome challenges and realize high-precision measurement.

Third, the global flow of innovation factors is the key support. YIN Hejun

pointed out that creating an open environment for scientific and technological innovation, realizing the efficient flow of innovation factors, and utilizing global innovation resources with high quality is more important and necessary than ever. Peter MAJOR pointed out that scientific and technological innovation and development factors include physical and digital infrastructure required for innovation, as well as human and knowledge resources that drive scientific and technological progress. Promoting international R&D cooperation, pooling resources, sharing knowledge, and encouraging technology and knowledge transfer can promote the solving of the most urgent global challenges from climate change to pandemics. SONG Junji mentioned that Shandong is building an innovation and entrepreneurship community of "government, industry, academia, research, finance and application", keeping improving the policy system with strong support, and deeply promoting the three national level reform pilots of science and technology rewards, achievement evaluation, and talent evaluation. The ecosystem featuring opening-up, inclusiveness, mutual benefit and shared innovation is flourishing.

III. Deep participation: The only way to integrate into the global innovation network

First, promote forward-looking planning and frontier deployment. CHEN Jining emphasized the need to adhere to long-termism, deepen technological deployment, maintain strategic agility, promote high-risk and high-value basic research vigorously, explore new organizational forms of scientific and technological innovation actively, and activate innovation entities. In particular, it is necessary to strengthen the principal role of enterprises in scientific and technological innovation, and the development of key and common technologies, deepen the R&D of frontier and disruptive technologies, and strive for significant original and disruptive achievements. BAI Chunli thought that it is necessary to strengthen the comprehensive deployment of forward-looking and fundamental research, especially the deployment of some non-consensus frontier fields, and create an innovation environment for free exploration, so that major innovative achievements can emerge constantly in an open and inclusive environment. XUE Qikun pointed out that the current era of mega data and information requires stronger computing power. Quantum computers have a very promising prospect, and require the interdisciplinary integration of physics, electronic devices, computer science, etc., and the joint efforts of scientists, engineers and entrepreneurs around the world.

Second, create high-level carriers for global scientific and technological cooperation and exchanges. László BÓDIS pointed out that education and talent exchanges are crucial, and we should provide exchange and cooperation platforms for young engineers, entrepreneurs and scientists, build a future-oriented innovation network, and train next-generation innovators together with innovation partners. Leroy HOOD proposed to improve medical and

Leroy E. HOOD
Member of the National Academy of Sciences, The National Academy of Engineering, The National Academy of Medicine, American Academy of Arts and Sciences, Foreign Member of The Chinese Academy of Sciences

Kim Siang KHAW
Tsung-Dao Lee Fellow, Shanghai Jiao Tong University

BAI Rui
Associate Professor, School of Life Sciences, Westlake University

Launch Ceremony of China-Hungary Science Innovation Day

Launch Ceremony of the Fund for Future Industries in Shanghai

healthcare levels in a data-driven manner, minimize medical treatment costs, extend high-quality medical technologies represented by phenome technology to developing countries, and enable humanity to share open innovation achievements by initiating long-term research projects such as the Human Genome Project, and leveraging global technological cooperation. SONG Junji emphasized that Shandong will strive to create an open environment for scientific and technological innovation, deepen all-round cooperation with worldwide scientists and entrepreneurs in platform building, mechanism breakthroughs and achievement transformation, and gain surging momentum for innovation-driven high-quality development jointly.

Third, build diversified channels for global scientific and technological cooperation. YIN Hejun pointed out that we should keep deepening global intergovernmental and nongovernmental scientific and technological cooperation, promote cooperation in scientific and technological innovation among countries along the Belt and Road deeply and practically, focus on joint research on nationwide problems and challenges, and participate actively in global innovation governance. László BÓDIS said that Hungary has set three major goals to build a more globalized R&D and innovation system, namely strengthening and expanding global scientific and technological cooperation and co-creation, helping more enterprises enter foreign markets to help innovative export-oriented enterprises succeed, and introducing research and innovation activities into Hungary. In addition, Mark WALPORT pointed out that strengthening international technological cooperation requires a strong research funding support framework and a regulatory system that supports future scientific alliances.

International Human Phenome Forum

Phenome and Precision Medicine

Editor's note: *With the theme of "Phenome and Precision Medicine", the International Human Phenome Forum under the 2024 Pujiang Innovation Forum conducted in-depth discussions on the implementation progress of the Major International Science Program on the Human Phenome, and the current status and future trends of human phenome research and precision medicine. This bulletin summarizes the viewpoints of the guests at the International Human Phenome Forum for your reference.*

TIAN Mei

Executive Dean of the Human Phenome Institute, Fudan University; Vice President of the Shanghai International Human Phenome Institute; Professor, and President of the World Molecular Imaging Society (WMIS)

Leroy E.HOOD

Member of the National Academy of Sciences, The National Academy of Engineering, The National Academy of Medicine, American Academy of Arts and Sciences, Foreign Member of The Chinese Academy of Sciences

YE Weimin

Professor of Karolinska Institutet, Sweden; Vice President of Fujian Medical University

LIU Mofang

Professor of Shanghai Institute of Biochemistry and Cell Biology, Chinese Academy of Sciences

The human phenome refers to the collection of all biological traits in the human body from embryonic development to growth, aging and death. Precise phenome measurement is significant for understanding life and promoting medical progress, and will bring about a huge transformation in the biopharmaceutical industry. The guests present agreed unanimously that currently, human phenome research has entered an innovation breakthrough stage, and should focus on cross-scale, full-cycle precise measurement of the human body system in large-scale population cohorts, promote global collaboration through major international science programs, explore correlations among genes, the environment and phenotypes, and associated regulatory mechanisms, and draw a future "navigational chart" for life sciences.

I. Strategic significance of phenome research

First, phenome research provides "new ideas" for deciphering the human life code. As the next strategic commanding point in the life and health field following genomics, the phenome covers biological traits from embryonic development to aging and death comprehensively. TIAN Mei, Executive Dean of the Human Phenome Institute, Fudan University, emphasized that revealing microscopic mechanisms of macroscopic phenotypes is a core issue in biomedical research. LIU Mofang, Professor of Shanghai Institute of Biochemistry and Cell Biology, Chinese Academy of Sciences, Chinese Academy of Sciences, pointed out that phenome research helps to understand gene regulation mechanisms in the process of cell genesis and development in organisms, and reveals basic biological phenomena of organisms systematically.

Second, phenome research and in-depth phenotype measurement provide a "new solution" for precision medicine. Leroy HOOD, Member of the National Academy of Sciences, The National Academy of Engineering, The National Academy of Medicine, American Academy of Arts and Sciences, and co-founder of the Institute of Systems Biology, pointed out that modern technology and means of precise measurement provide scientific methods for individualized health management, and human phenome research can capture key biological signals at the early stage of pathogenesis, thereby realizing precise prevention and treatment, and promoting the shift from the "disease centered" approach to a "health centered" one. LYU Ming, Executive Director of the Clinical Research Center, Shandong University, thought that human phenome research is the key to precision medicine as it can realize the shift from "one drug for multiple people" to "person-specific prescriptions". TIAN Mei pointed out that prior research has shown that 30 percent of phenotypes have age and gender differences, and future human phenome research will attempt to measure normal values of various phenotypes of normal Chinese people of different age groups, and formulate targeted health standards for BMI, blood sugar, blood pressure, etc. that are suited to the features of Chinese

people. LIU Mofang proposed that human phenome research can be applied to the early warning of individual fertility decline effectively.

Third, phenome research provides a "new driving force" for the upgrading of the biopharmaceutical industry. Delving into phenotype data can help scientists discover new drug targets, biomarkers, and mechanisms more quickly and accurately, and accelerate scientific and technological innovation, and new drug development. TIAN Mei thought that human phenome research can serve as the cradle of innovative drug R&D, especially in drug target recognition, biomarker discovery and mechanism exploration for Chinese people. LIU Mofang proposed that human phenome research provides new ideas for the development of male infertility drugs.

II. Future trends of global phenome research

In terms of research directions, priority should be given to the analysis of correlations among genes, the environment and phenotypes. Such correlations reveal complex interactions between genes and the environment, and how they affect individual biological traits jointly. TIAN Mei pointed out that the core of human phenome research is revealing comprehensive effects of genes and the environment on individual biological traits. YE Weimin, Professor of Karolinska Institutet, Sweden; Vice President of Fujian Medical University, and LIN Xu, Chief Professor in Hangzhou Institute for Advanced Study, University of Chinese Academy of Sciences (CAS); Professor, Shanghai Institute of Nutrition and Health, Chinese Academy of Sciences(CAS), emphasized that pathogenesis depends on combined effects of genes and the environment with lung cancer, obesity and other diseases as examples.

In terms of methods and tools, AI empowers the efficient analysis of multidimensional data deeply. Leroy HOOD pointed out that artificial intelligence and big data technology are crucial in phenotype research; big data technology supported by artificial intelligence not only helps physicians process massive data, but also improves diagnostic accuracy, predicts potential disease risks intelligently, and turns ordinary physicians into experts with long-term health management capabilities. YE Weimin pointed out that it is necessary to conduct refined population cohort research, obtain more

LIN Xu

Chief Professor in Hangzhou Institute for Advanced Study, University of Chinese Academy of Sciences (CAS); Professor, Shanghai Institute of Nutrition and Health, Chinese Academy of Sciences(CAS)

TAO Weishuo

Vice Dean of the Human Phenome Institute, Fudan University

TIAN Qiang

Senior Research Scientist at ISB

Launch Ceremony for the International Human Phenome Project Series: Book Unveiling

Interactive Dialogue

accurate phenome data at different scales, and improve data quality and analytical accuracy using artificial intelligence technology. LIN Xu pointed out that it is necessary to conduct accurate measurement and quantitative indicator analysis of multidimensional data such as individual glycolipid metabolism and gut microbiota by integrating multi-omics technology, artificial intelligence technology, and wearables.

In terms of organizational model, the level of global collaboration will be further improved through major international science programs. According to TIAN Mei, human phenome research is a type of systematic, integrated and engineered research that should be promoted through global collaboration such as major international science programs to realize precise measurement and systematic analysis of large-scale populations in different parts of the world on the same standard scale, and draw a "human phenome reference map" that provides a new "navigational chart" for future life science exploration. Currently, significant progress has been made in the first phase of the program, and the outcome of "four firsts" has been achieved, namely the first cross-scale, multidimensional and one-stop precision measurement platform for the human phenome, the first set of multi-omics standard substances, the first deep phenome cohort for natural populations, and the first batch of human phenome navigational charts.

III. Suggestions for promoting global phenotype research

On the one hand, promote the deep integration of multiple fields and create a new paradigm for human health research. There is an urgent need to integrate technological forces from fields such as biology, informatics and big data in human phenome research to accelerate scientific discoveries and technological breakthroughs. TIAN Mei thought that the complexity of human phenome research requires the in-depth interdisciplinary integration of technologies, including frontier technologies such as molecular imaging and spatial omics. LIN Xu also pointed out that the combination of multi-omics with precision nutrition and precision health will promote human health research and help realize all-round health management from individuals to groups.

On the other hand, strengthen policy guidance for data openness and the formulation of sharing standards to realize the all-round sharing of global research data. The effective progress of human phenome research would have been impossible without global data sharing. Establishing a standardized data sharing mechanism, formulating relevant laws and ethical norms, and ensuring the uniformity, security and compliance of data is an important guarantee of efficient cooperation. YE Weimin pointed out that establishing a large-scale biological sample library and connecting province-wide medical big data can realize effective data sharing and long-term follow-up, and establish interdisciplinary and cross-regional data collaboration. TIAN Mei proposed that human phenome research relies on unified standards and technical specifications to ensure the smooth integration of scientific research work among countries. LIN Xu also thought that formulating policies to promote data sharing and standardization is crucial for generating high-quality research findings.

Women Scientists Symposium

Innovation: Promoting the High-quality Development of Female Scientific and Technological Talents

Editor's note: *With the theme of "Innovation: Promoting the High-quality Development of Female Scientific and Technological Talents", the Women Scientists Symposium under the 2024 Pujiang Innovation Forum invited domestic and overseas women scientists to conduct in-depth discussions on topics such as giving play to the role of women strategic scientists, and the training of leading scientific and technological talents, and young female scientific and technological talents. This bulletin summarizes the viewpoints of the guests at the Women Scientists Symposium for your reference.*

ZHU Zhongming
Deputy Secretary of the CPC Shanghai Municipal Committee

WANG Hongyang
Academician of the Chinese Academy of Engineering and Member of the World Academy of Sciences

PENG Yan
Part-time Vice Chairman of the Shanghai Women's Federation

ZHANG Haixia
Distinguished Professor under the Chang Jiang Scholars Program

JIN Yanzi
Director of the Science and Technology Committee of Hudong-Zhonghua Shipbuilding (Group) Co., Ltd., and Chief Expert of China State Shipbuilding Corporation Limited

JIAO Shuhong
Professor at the University of Science and Technology of China, and Fellow of the Royal Society of Chemistry

Female scientific and technological talents have become a force essential to global scientific and technological innovation. Currently, over 33 percent of global researchers are female, and there are over 40 million female scientific and technological talents in China, accounting for 45.8 percent. The agglomeration effect of high-level female scientific and technological talents is significant, original achievements keep emerging, and the power of female scientific and technological talents is increasingly prominent. The guests present agreed unanimously that acuity and resilience unique to women can help women scientists shoulder important scientific research tasks. In the future, it is necessary to further address their concerns such as the shortage of high-end female talents, pregnancy, and breastfeeding, and implement special supporting policies for female scientific and technological workers properly.

I. Women have become a core force driving scientific and technological innovation

One of the inherent advantages of female scientific and technological talents is their unique research perspective and thinking. WANG Hongyang, academician of the Chinese Academy of Engineering and member of the World Academy of Sciences, pointed out that women's unique perspective and thinking help promote scientific and technological innovation and development, and women's participation in science and technology is an important way to influence the world by leveraging their potential. WAN Ruixue, distinguished research fellow and doctoral supervisor at the School of Life Sciences, Westlake University, called on women to free their minds and burdens, assume responsibility for creation bravely, and give full play to their natural advantages of carefulness, seriousness and perseverance in scientific and technological innovation. DU Ling, CEO of Surface Intelligent Technology (Shanghai) Co., Ltd. and director of the Shanghai Federation of Overseas Chinese Entrepreneurs, thought that entrepreneurship is not only a career choice, but also a life attitude and spiritual pursuit, and is also gender-neutral, which means that women also have the potential and capacity to become excellent entrepreneurs.

Second, China has made remarkable achievements in the development of female scientific and technological talents. Currently, China has made significant achievements in promoting gender equality and women's development in

WAN Ruixue
Distinguished Research Fellow and Doctoral Supervisor at the School of Life Sciences, Westlake University

DU Ling
CEO of Surface Intelligent Technology (Shanghai) Co., Ltd. and Director of the Shanghai Federation of Overseas Chinese Entrepreneurs

JIANG Yuan
Chairman and Founder of PNC Technology, and Supervisor of the Shanghai Association of Women Entrepreneurs

ZHU Meifang
Academician of the Chinese Academy of Sciences, Dean of the School of Materials Science and Engineering, Donghua University

ZHU Meiping
Chief Scientist and Research Fellow at the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

ZHOU Tongyu
Chairman of Weida Hi-tech Holdings Co., Ltd. and Vice Chairman of the Shanghai Federation of Industry and Commerce

the field of science and technology, where the proportion of female members in national societies of the China Association for Science and Technology rose from 24.5 percent in 2017 to 34.2 percent in 2022. In recent years, the All-China Women's Federation, the Ministry of Science and Technology, etc. have issued policies to support the development of female scientific and technological talents successively. Local governments have also introduced a series of policy measures to create a better policy environment for female scientific and technological talents to exert their competencies. ZHANG Haixia, distinguished professor under the Chang Jiang Scholars Program, recipient of special government allowances from the State Council, and professor at Shandong University, mentioned that Shandong has eased the age limit for applicants of the provincial natural science foundation, extended project closing deadlines for women during pregnancy and breastfeeding, and strengthened incentives and recognition for female scientific and technological talents.

II. Main obstacles to the development of female scientific and technological talents

First, the shortage of high-level female scientific and technological talents is still prominent. Accelerating the development of high-level women scientists is the first priority in the high-quality development of female scientific and technological talents, because the proportion of women scientists among high-level scientific and technological talents is still relatively low. ZHU Meiping, chief scientist and research fellow at the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, pointed out that in 2022, 50 percent of higher education students and over half of graduate students were female. However, during 1998-2022, only 8.97 percent and 10.37 percent of leaders of major projects and outstanding young scientists of the National Natural Science Foundation of China, and 6.87 percent and 5.25 percent of academicians of the Chinese Academy of Sciences and the Chinese Academy of Engineering were female, respectively. PENG Yan, part-time Vice Chairman of the Shanghai Women's Federation, also pointed out that among the 74 newly appointed academicians of the Chinese Academy of Engineering in 2023, only one was female.

Second, the suspension in scientific research arising from

LI Xin
Deputy Director-General of Ministry of Science and Technology

SONG Li
Member of the Secretariat of the All-China Women's Federation

TAI Liehong
Director of the Women's Development Department of the All-China Women's Federation

childbirth, pregnancy and breastfeeding seriously hinders the career development of women scientists. The age range of 30-40 years is a critical stage for high-quality scientific research findings, and the suspension in scientific research arising from childbirth, pregnancy breastfeeding puts women at a disadvantage in academic competition, and becomes an implicit turning point in their scientific research career. In February 2024, Nature published an article calling on people to recognize the difficulties faced by worldwide mothers in the academic community, and pointed out that changes led by mothers will benefit the whole academic community. JIANG Yuan, Chairman and Founder of PNC Technology, and supervisor of the Shanghai Association of Women Entrepreneurs, thought that balancing pregnancy and career development is a major challenge faced by female scientific and technological workers today. ZHU Meiping pointed out that according to a questionnaire survey conducted by the Shanghai Women's Federation, 46 percent of the 737 interviewed female scientific and technological workers thought that childbirth will affect their career development seriously, and some women have to give up frontline scientific research work after childbirth.

III. Suggestions for promoting the high-quality development of female scientific and technological talents

First, bridge the "last mile" of supporting policies for female scientific and technological talents. JIAO Shuhong, professor at the University of Science and Technology of China, and fellow of the Royal Society of Chemistry, suggested that relevant policies be further refined, and the proportion of women in talent and technology projects be increased, so that more women scientists can be seen. ZHANG Haixia expected all authorities to strengthen overall coordination, and make grassroots scientific research institutions introduce individualized specific measures to ensure that policies are implemented practically.

Second, address concerns of female scientific and technological talents during pregnancy and breastfeeding. ZHU Meiping proposed to establish a research return fund for women that encourages women to resume scientific research work as soon as possible after breastfeeding, and expand the pool of high-level female scientific research talents. LI Xin suggested that support for women's scientific and technological work during pregnancy and breastfeeding be strengthened, a special action to reduce the burden of young scientific researchers be initiated, and research institutions be encouraged to set up baby care rooms, provide childcare services, create a fertility-friendly working environment, and create better conditions for female scientific and technological talents to carry out scientific research work.

Third, fully motivate female scientific and technological talents for innovation and entrepreneurship. ZHOU Tongyu, Chairman of Weida Hi-tech Holdings Co., Ltd. and Vice Chairman of the Shanghai Federation of Industry and Commerce, proposed to establish a special fund together with female entrepreneur organizations to support sustained exploration by talents with jump and innovative thinking around national pillar industries. JIANG Yuan suggested that special awards for female technology entrepreneurs be set up to provide them with targeted support.

Science and Technology Policy Forum

Science and Technology Finance Policies and Practices

Editor's note: *With the theme of "Science and Technology Finance Policies and Practices", the Science and Technology Policy Forum under the 2024 Pujiang Innovation Forum invited renowned domestic and overseas experts and scholars to conduct in-depth discussions on topics such as building a comprehensive system of science and technology finance policies. This bulletin summarizes the viewpoints of the guests at the Science and Technology Policy Forum for your reference.*

QIU Yong
Vice Minister of the Ministry of Science and Technology

WANG Ping
Vice Secretary-General of the Shanghai Municipal Government

WANG Changyuan
Vice Director of the Monetary Credit Research Department
Shanghai Head Office, People's Bank of China

Karlo van Dam
Representative of the Dutch Ministry of Economy

Science and technology finance is the bridge and link between technology and industries. Since the 20th CPC National Congress, science and technology finance policies that focus on building a science and technology finance system compatible with scientific and technological innovation, and driving the deep integration of scientific and technological innovation, and financial innovation have received increasing attention from all parties. The guests present agreed unanimously that a science and technology finance system, mechanism and policy environment that is compatible with scientific and technological innovation should be built with the policy orientation of early-stage, small-scale and long-term investment, and hard technology to promote communication and interactions between the technology and financial communities, drive the deep integration of scientific and technological innovation, and financial innovation, and develop science and technology finance vigorously.

I. New trends in global science and technology finance development

(1) Cephalization of participating enterprises: More and more technology giants are maintaining their competitive advantages by investing in and incubating startups. ZHAO Changwen, President of National Academy of Development, Sun Yat-sen University, Chair Professor, pointed out that technology giants are shifting from the backend to the frontend gradually to participate directly in enterprise incubation. These technology giants promote and support the growth of scientific and technological innovation startups actively using their own resources and technological advantages by establishing internal incubators or investment arms. This practice not only accelerates the development and commercialization of innovative technologies, but also brings new growth points and competitive advantages to technology giants themselves.

(2) Platform-based operation models: More and more new platforms that know more about finance than technology enterprises and technology than banks are participating in the full development cycle of enterprises. Emerging platform enterprises are becoming a bridge connecting scientific and technological innovation, and financial capital gradually based on their profound understanding of the technology field and expertise in financial services. These platforms not only provide funding and resource support in all growth stages of technology enterprises. Moreover, they integrate resources from all parties to provide enterprises with full-lifecycle financing services, promote effective matchmaking and interactions between scientific and technological innovation, and financial capital, and accelerate the transformation and industrialization of scientific and technological achievements. Taking "Guangdong Technology Financial" as an example, ZHAO Changwen pointed out that by leveraging the power of Nebula Capital actively, Guangdong Technology Financial is committed to promoting the growth of technology startups. In addition, Guangdong Technology Financial is committed to deepening full-lifecycle

support for enterprises, and developing industry-leading enterprises by extending, supplementing and strengthening the industry chain actively.

(3) Hard technology-oriented investment targets: Strong financial support is provided to leading technology enterprises dedicated to key core technology R&D. QIU Yong, Vice Minister of the Ministry of Science and Technology, emphasized that science and technology finance policies must be formulated and implemented closely around breakthroughs in key core technologies to meet national strategic tasks and requirements. Since the opening of the STAR Market five years ago, the total amount raised through initial public offerings (IPOs) has reached 910.8 billion yuan, in which "hard technology" industries account for nearly 89%. WANG Ping, Vice Secretary-General of the Shanghai Municipal Government, proposed that Shanghai is tackling "stranglehold" technologies and developing innovative products, and has established a supporting mechanism covering all aspects of research and production of technology enterprises. Karlo van Dam, Representative of the Dutch Ministry of Economy, mentioned that with an initial capital of €1.5 billion, the Dutch government encourages more private capital investment in scientific and technological innovation through public capital guidance and leveraging to focus on the R&D and innovation of clean technologies jointly.

II. Current new challenges in science and technology finance

First, the current management and operation system can hardly meet future development needs. CUI Xisu, Senior Deputy Manager of the Corporate Banking Department, China Construction Bank, pointed out that finance is introduced into technology primarily to solve the problem of risks, and existing management and operation mechanisms in the financial sector need further improvement. KUANG Yanhua, General Manager of the Investment Banking Department, China CITIC Bank, thought that the current risk compensation and risk-taking system in science and technology finance is not sound enough, and in practice, subsequent compensation for risk sharing funds is not fully compatible with the whole guarantee system. WANG Changyuan, Vice Director of the Monetary Credit Research Department Shanghai Head Office, People's Bank of China, proposed that scientific and technological innovation is characterized by high risks and high return, and the risk sharing and benefit sharing mechanisms should be further improved for scientific and technological finance.

Second, the growth environment for "patient capital" needs improvement urgently. WANG Changyuan pointed out that in face of uncertainties in scientific and technological innovation, financial institutions often have concerns, making it difficult to form long-term and stable investment. The current market environment inevitably leads to the insufficient supply of patient capital, a low proportion of early-stage and small-scale investment, and insufficient investment relaying. CHEN Haipeng, Vice Director of Shanghai Institute for Science of Science, emphasized the importance of "patient

ZHAO Changwen
President of National Academy of Development, Sun Yat-sen University, Chair Professor

CHEN Haipeng
Vice Director of Shanghai Institute for Science of Science

XIE Min
Director of Ministry of Science and Technology

SHEN Wenjing
Deputy Director-General of Ministry of Science and Technology

Ceremony of the Joint Research Center for S&T Finance

capital" in science and technology finance, and proposed that resources of subsidiaries of major commercial banks should be fully utilized to stimulate their potential in long-term investment. Through such capital injection, enterprises can be motivated to focus on the creation of long-term value and the R&D of core technologies, thereby providing stable and sustainable financial support for scientific and technological innovation.

Third, the shortage of future oriented "finance + technology" interdisciplinary talents is prominent. WANG Changyuan pointed out that practitioners in the field of science and technology finance should not only understand technology, but also know how to predict prospects of the technology market. WANG Ping thought that the diversification and segmentation of the technology field means that financial practitioners should have a deep understanding of technological paths of different tracks. WEI Fanjie, General Manager of the Shanghai Fund for Future Industries, proposed that the fund is actively looking for experts with outstanding competencies and profound knowledge in deep incubation and scientific research exploration. They should not only have keen insights into frontier technologies, but also be able to provide strategic guidance and resource support for enterprises. ZHAO Nan, Deputy General Manager of the Corporate Finance Department, Bank of China, pointed out that currently, technology enterprises involve nearly 100 industry sectors and nearly 1,500 industry subsectors, and how to identify these emerging industries and tracks quickly, and how to build professional teams that match them in the whole system of financial institutions are challenges to be addressed.

3. Suggestions for promoting the high-quality development of science and technology finance in China and Shanghai

By the end of June 2024, Shanghai had established three major industry funds of funds and a fund for future industries with a total size of 100 billion yuan, and there were 137,000 existing loan science and technology enterprise accounts throughout the city, with a total loan balance of 1.24 trillion yuan. At the opening ceremony of the forum, the Shanghai Fund for Future Industries was launched with an overall size of 10 billion yuan. In the future, it will boost confidence in the early-stage technology investment market through government-led investment guidance, and promote the transformation of excellent achievements at the source of innovation into new quality productive forces. On this basis, the experts present suggested that:

On the one hand, improve China's science and technology finance ecosystem, and create a development environment friendly to "patient capital". CHEN Haipeng proposed that scientific and technological innovation requires continuing

Roundtable Forum

support from patient capital, breakthroughs have to be made in mechanisms, channels and models in the future, and the government's technology layout should be connected strategically with market investment institutions to create a continuing investment model of "guidance of financial technology investment + market relaying + social capital inflow". KUANG Yanhua proposed that for smaller and earlier startups, more play should be given to the role of government guidance funds, and greater confidence created to promote social capital investment. ZHAO Nan proposed that appropriate due diligence mechanisms should be introduced in key areas such as credit, risk approval and the authorization system.

On the other hand, Shanghai should take the lead in building a full-chain, all-factor and full-process science and technology finance service system. (1) Shanghai should improve the service matrix of science and technology finance policies, leverage the role of multi-level capital markets, strengthen support for the whole chain of "fundraising, investment, management and withdrawal", and enhance the underlying support of insurance for tackling "stranglehold" technologies and developing innovative products. (2) Shanghai should target frontier technologies and future industries, make good use of the three major industry funds of funds and the future industry fund, and guide social capital to strengthen industry chain supplementation, stabilization and enhancement collaboratively. (3) Shanghai should develop and gather interdisciplinary talents, provide strong financial service support for the sustained innovation and long-term development of enterprises through synergies between intelligent tools and professionals, and promote the clustering of worldwide talents, capital, technologies and other innovation factors in Shanghai.

Innovation Culture Forum

Delve into the Essence, and Develop Culture and Technology Synergy

Editor's note: *With the theme of "Delve into the Essence, and Develop Culture and Technology Synergy", the Innovation Culture Forum under the 2024 Pujiang Innovation Forum invited experts from various fields in Hungary, the U.S., the UK, China and other countries to conduct in-depth discussions on what innovation culture is, how to develop innovation culture, and who will develop innovation culture. This bulletin summarizes the viewpoints of the guests at the Innovation Culture Forum for your reference.*

Culture and technology complement each other in harmony. A high-quality cultural environment is fertile land for scientific and technological innovation in a country, and constant scientific and technological innovation is also enriching and reshaping social culture constantly. How to discover and develop a culture that drives scientific and technological innovation based on the understanding of the pattern of science and technology development has become a hot topic of concern to all fields around the world. The guests present agreed unanimously that culture is the "keystone" of scientific and technological innovation, and cultural diversity and interdisciplinary nature have become current characteristics of innovation culture. We should plan scientific and technological innovation properly, strengthen science popularization in the new era, create an open, inclusive, patient and willing-to-listen innovation atmosphere, and promote the two-way deep integration of culture and technology.

I. Current status of integration: A consensual discourse system for technological development led by innovation culture is taking form.

On the one hand, it has become a global consensus that technological development is led by innovation culture. LI Zhengfeng, professor at Tsinghua University, pointed out that scientific research is integrating into the corporate innovation system, the social innovation network and the national innovation system gradually, and promoting the integration of science and innovation cultures, shaping what science and technology culture looks like in the new era jointly. Tom Stafford, professor at the University of Sheffield in the UK, mentioned that transparency in scientific research and fairness in resource allocation are core topics in today's science and technology culture, and the progress of science and technology culture not only relies on technological innovation, but also has to be driven through fair institutional support and more open scientific research organizations. XU Jian, Vice Dean of the School of Media and Communication, Shanghai Jiao Tong University, said that the innovation culture of a city is an important force that shapes the city's scientific and technological innovation IP, and Shanghai's innovation culture centered on open thinking and collaborative innovation has promoted the development of the city's innovation spirit.

On the other hand, technology empowers the development of global exchanges in innovation culture deeply. GUO Zhe, Director of the China Science and Technology Museum, proposed to maximize human well-being by adhering to the philosophy of coexistence and co-prosperity, and explore the ways of science culture in the East and the West, build a bridge of scientific and technological exchanges across countries and regions, and address science culture differences between ancient and modern times, and between China and the West by finding out the Chinese cultural context. This will provide inexhaustible impetus to global scientific prosperity and new technological civilization. Paul Burrows, Secretary-General of the World Association of

ZHANG Biyong
Member of the Party Group of the Ministry of Science and Technology, President of Science and Technology Daily

Paul Burrows
Secretary-general, World Association of Industrial and Technological Research Organizations (WAITRO)

GUO Zhe
Director of China Science and Technology Museum

Tom Stafford
Professor, University of Sheffield, UK

TIAN Jietang
Minister and Researcher, Department of Industrial Economy, Development Research Center of the State Council

LI Zhengfeng
Professor, Tsinghua University

Bulcsu Gödri
Head of Business Development, SZTETTC Technology Transfer Company of the University of Szeged

Steven Hoffman
Famous Silicon Valley Investors, Founder of Founders Space

Industrial and Technological Research Organizations, emphasized that cultural diversity itself is an innovative advantage that brings together different perspectives and expertise from around the world, and is both globally relevant and able to solve local practical problems. Bulcsu Gödri, Head of Business Development, SZTETTC Technology Transfer Company of the University of Szeged, thought that technology and culture should not be opposed, but be integrated seamlessly to promote meaningful and sustainable development jointly.

II. Fusion trend: Future industries call for innovation culture strongly.

First, the down-to-earth technology industry needs an unrestrained innovation culture. TIAN Jietang, Minister and Researcher, Department of Industrial Economy, Development Research Center of the State Council, pointed out that the three rare factors for future industries are forward-looking and sustained "non-consensual" research investment, dedicated research talents run from scientific discoveries through industry innovation, and investors with a forward-looking strategic vision. Top comprehensive universities should not only focus on the short-term "stranglehold" issue, but also attach importance to future-oriented needs, and develop an innovation culture that adapts to future industries actively based on the national long-term development strategy. Paul Burrows thought that innovation is not only the driving force of scientific and technological progress, but also the lifeline of sustainable industry development, and innovation culture has become a core strategy for enterprises and society to address global environmental and social challenges.

Second, an inclusive and open cultural atmosphere sparks innovation. Steven Hoffman, Famous Silicon Valley Investors, Founder of Founders Space, pointed out that the key for enterprises to create an innovation culture is to provide a space for free expression, and trial and error to talents, because an innovation team that is too big is likely to become bureaucratic and stifle innovation. Psychological security is the foundation of innovation. Only by creating an environment full of trust and support, and establishing a culture of mutual trust can innovators put forward creative ideas boldly. Bulcsu Gödri emphasized that the most transformative innovations often stem from the convergence of interdisciplinary and diverse perspectives, and encouraging teams to explore freely in an open and inclusive environment helps break conventional thinking and is crucial for modern enterprises to address complex challenges. The corporate leadership should create a trustful and respectful environment, and support teams to take creative risks and break inherent boundaries boldly.

Third, deep interdisciplinary integration stimulates innovative changes. Steven Hoffman pointed out that the key to innovation today often lies in discovering new links among existing resources other than inventing new things, and meeting points of different disciplines are often the source of creativity and innovation. When talents from different backgrounds come together, the clash

WANG Yuan
Former Executive Vice President of Chinese Academy of Science and Technology for Development

Panel Talk

of thoughts can inspire new ideas, and help enterprises and teams keep innovating and changing. Bulcsu Gödri thought that introducing the interdisciplinary "strategy+" philosophy consciously can help break technological silos, and drive experts in various fields to discover problems and propose solutions from multiple perspectives. LIU Chao, Deputy General Manager of the Investment Banking Department, Agricultural Bank of China Shanghai Branch, pointed out that scientific and technological innovation has brought unprecedented changes to the financial sector, and promoted innovation in financial products and services. The coupled symbiosis of finance and technology confirms the key role of innovation culture in interdisciplinary and cross-industry cooperation.

III. Integration path: Opening up a new landscape of hard technology empowered by cultural soft power

First, improve public scientific literacy and create a foundation for innovation culture. ZHANG Biyong, Member of the Party Group of the Ministry of Science and Technology, President of Science and Technology Daily, pointed out that innovation culture holds an increasingly important position in the national innovation system, and science popularization plays an irreplaceable role. We should fully leverage the advantages of new media to improve public scientific literacy and create a broad social foundation. GUO Zhe mentioned that China's current science popularization focuses mainly on young people, but is inadequate for farmers, industrial workers and other groups, which requires further systematic planning.

Second, communicate innovation models to highlight the cultural legacy of China. ZHANG Biyong pointed out that innovation culture is not ungrounded, but should be displayed through specific matters and live cases. Readers will not only see the thinking, innovation, dedication and diligence of scientific and technological workers, but also feel the connotations and characteristics of innovation culture in the new era. The innovation process should be combined with excellent traditional Chinese culture to highlight its profound legacy. TIAN Jietang said that the innovation tradition of Chinese culture has a long history, and the profound legacy of traditional culture has also inspired scientific and technological innovation.

Third, advocate technology for good and carry out responsible innovation. GUO Zhe pointed out that technological development should not rely simply on hard work, and instead, a scientific research spirit with faith and reverence should be built to promote technology for good. Scientific and technological workers must build up the philosophy of responsible innovation, assume appropriate social responsibilities, and avoid potential risks arising from technology. Tom Stafford thought that research culture in the UK is facing problems such as insufficient transparency and inappropriate evaluation criteria, and to this end, open research should be strengthened, the national evaluation mechanism adjusted, a responsible research standard formulated, etc. In addition, research institutions should also encourage diversification to ensure that scientific research not only serves economic interests, but also contributes to public interests and sustainable social development.

Regional Innovation and Development Forum

Sci-tech Innovation Centers, the Engine for High-quality Regional Development

Editor's note: *With the theme of "Sci-tech Innovation Centers, the Engine for High-quality Regional Development", the Regional Innovation and Development Forum under the 2024 Pujiang Innovation Forum, the guests present discussed in depth how to deeply implement major regional strategies and coordinate development, accelerate the development of globally competitive industry clusters and economic growth poles around the building of regional scientific and technological innovation centers. This bulletin summarizes the reports of the guests at the Regional Innovation and Development Forum for your reference.*

Promoting the building of international and regional scientific and technological innovation centers in a coordinated manner is a major arrangement to deepen the implementation of the innovation-driven development strategy, and accelerate the building of China's science and technology strength. Under the new situation and requirements, regional scientific and technological innovation centers play an important role in promoting the improvement of national scientific and technological strength. The guests present agreed unanimously that by strengthening the flow of technological innovation factors, regional scientific and technological innovation centers can form advantages that complement those of international scientific and technological innovation centers, build a hierarchical linkage innovation landscape, undertake major scientific and technological tasks in the national innovation system, pool key factors, and promote the overall improvement of regional and national scientific and technological strength.

I. Focusing on new hotspots: Defining the functional positioning of regional scientific and technological innovation centers

First, regional scientific and technological innovation centers have received widespread attention from all communities. In the research community, LIU Dongmei, Secretary of the Party committee of Chinese Academy of Science and Technology for Development, thought that China's scientific and technological innovation centers can be divided into three types: international scientific and technological innovation centers that focus on basic research, and scientific and technological innovation; national scientific and technological innovation centers that focus on applied research, cover larger regions and support the high-quality development of key industries; and regional scientific and technological innovation centers in one province or adjacent provinces that are aligned with national strategies through provincial resources, and focus on promoting technology application, and the innovation and development of regional key industries. In the government community, XIE Min, Director-General of Ministry of Science and Technology, pointed out that building dynamic scientific and technological innovation centers is an important means for countries to seize the opportunity of the technological revolution and enhance national innovation capacity, and regional scientific and technological innovation centers are an integral part of the national regional innovation strategy, and a key move in building China's science and technology strength, and implementing the innovation-driven strategy. In the industry community, Lynn Li, Elsevier Senior Vice President and President of Greater China, said that different cities have their own advantages in discipline and industry development, which are reflected in talent pooling, scientific research foundation, strategic layout, policy support, etc. She thought that through the building of regional scientific and technological innovation centers, these cities can work more closely and fully leverage their respective advantages.

Second, the building of regional scientific and technological innovation centers

XIE Min
Director-General of Ministry of Science and Technology

WU Zhiqiang
Academician of Chinese Academy of Engineering, German Academy of Science and Engineering, the Royal Swedish Academy of Engineering Sciences, Professor of Tongji University

Gary Hack
Professor of University of Pennsylvania

LIU Dongmei
Secretary of the Party committee of Chinese Academy of Science and Technology for Development

Che Weng Keong
President of Administrative Committee of The Science and Technology Development Fund (FDCT) of Macao

Alexandre Villain
Vice Secretary of Secretariat for Science, Technology and innovation, Brasília, Brazil

Lynn Li
Elsevier Senior Vice President and President of Greater China

TONG Xiaohua
Vice President of Tongji University, Academician of Chinese Academy of Engineering

should be the core essence of regional coordinated development. LIU Dongmei said that scientific and technological innovation centers are an important engine for high-quality development, with the key characteristics of intensive scientific and technological innovation resources, concentrated innovation activities, solid innovation strength, and broad coverage. XIE Min pointed out that regional scientific and technological innovation centers can reduce scientific and technological innovation costs, improve system efficiency, and accelerate the regional process from basic research to industrialization through large-scale organization and collaboration by leveraging the economy of scale and agglomeration effects. WU Zhiqiang, Academician of Chinese Academy of Engineering, German Academy of Science and Engineering, the Royal Swedish Academy of Engineering Sciences, Professor of Tongji University, pointed out that the combination of the same innovation DNA (regional scientific and technological foundation) and different innovation factors (scientific and technological talents, technologies, capital, and policy support) is the key to innovation. Regional scientific and technological innovation centers have become an important cradle of scientific and technological innovation, attracting high-end talents and venture capital, and promoting the coordinated development of the regional economy, and science and technology.

II. Grasping new trends: Accelerating the integration of regional scientific and technological innovation resources

International practice has shown that the key to regional innovation is the collaboration between the supply and innovation chains. In the future, it is necessary to maintain competitive advantages by upgrading innovation concepts rapidly and attracting top talents. Gary Hack, Professor of University of Pennsylvania, shared development experience of typical innovation regions in the U.S. such as Cambridge and MIT, and pointed out that the success of regional scientific and technological innovation centers depends on the close cooperation between the supply and innovation sectors, and the operation of innovation centers must receive policy support from the government. In addition, universities play a crucial role in supporting the commercialization of startups and the supply of infrastructure. He emphasized that these innovation centers ensure their leading position in global scientific and technological competition by pooling top talents and promoting the application of new technologies. Alexandre Villain, Vice Secretary of Secretariat for Science, Technology and innovation, Brasília, Brazil, pointed out that Brasilia promotes regional development through integrated scientific and technological innovation policies, and focuses on three key projects: the Innovative Technology Initiative, the Renewable Technology Initiative, and the Technological Talent Training Program. These projects have enhanced Brasilia's technological strength greatly by combining technological innovation with sustainable development. It is expected that by 2025, the

HUO Jiazhen
Executive Vice Dean and Professor of Chinese Academy of Science & Technology Management, Tongji University

Panel Discussion

talent demand of Brasilia's technology industry will be met, and the Renewable Technology Initiative will promote the development of the circular economy, and save water resources and crude oil significantly. He emphasized that the multi-party cooperation between the government, enterprises, and research institutions not only promotes the development of the local circular economy, but also enriches the talent reserve of the technology industry through technical training.

Domestic practice has shown that the focus of regional innovation is to promote integrated development through the guidance of innovation centers and interregional collaboration. In the future, more attention should be paid to advantage complementation among regions and the efficient sharing of innovative resources in order to fully tap the potential brought by the rise of emerging cities. LIU Dongmei pointed out that through advantage complementation and coordinated development in the Beijing-Tianjin-Hebei region, and driven by scientific and technological innovation centers in Beijing, Tianjin ranks fifth in China in terms of innovation level, and Hebei has realized significant improvement. Shanghai has improved the innovation capacity of the Yangtze River Delta significantly through its radiation effect, and the region is extremely vigorous in innovation. Lynn Li mentioned that scientific research achievements of Beijing and Shanghai are leading globally, driving the efficient integration and output of scientific and technological resources. Shenzhen demonstrates the strong potential of emerging cities in scientific and technological innovation, and has become an important supporting force for regional innovation and development in China with an average annual growth rate of 19%. XIE Yongqiang, Chairman of the Administrative Committee, Macao Science and Technology Development Fund, said that Macao has become an important force in promoting regional integration in scientific and technological innovation for its unique international advantages and policy support from the Guangdong-Hong Kong-Macao Greater Bay Area. He pointed out that the establishment of the Guangdong-Macao In-Depth Cooperation Zone in Hengqin has promoted the sharing of scientific and technological resources, and the economic coordination between Macao and the mainland, and set an example of regional innovation system building.

III. Creating new engines: Arousing regional innovation and integration momentum

First, leverage the unique advantages of the city and deeply integrate into regional development. WU Zhiqiang said that as an international scientific and technological innovation center, Shanghai should accept outstanding talents with a broad mind, promote the overall development of regional science and technology, economy, and society, and form "plateau-style" advantages with strong attraction to high-end scientific and technological talents, a high conversion rate of original scientific research achievements, and active and prosperous venture capital ecology. XIE Yongqiang proposed that Macao should leverage its unique advantages of "one country, two systems", the low tax system, the free economy, and cultural integration to support the building of the science and technology corridor.

Second, accelerate the construction of basic knowledge infrastructure to support the development of scientific and technological innovation centers. Lynn Li thought that knowledge infrastructure not only includes hardware facilities such as research institutions, talents, venture capital and scientific research funds, scientific infrastructure and large-scale scientific facilities, but also covers intangible support, such as online collaboration platforms for the government,

researchers and entrepreneurs. It is necessary to guide the formulation and implementation of scientific research strategic planning, and create a broad platform to promote more extensive knowledge sharing, exchange and co-creation using a digitalization-driven intelligent planning approach.

Third, make unified planning to promote regional innovation and development systematically. WU Zhiqiang pointed out that in regional innovation and development, it is necessary to pay attention to the effective allocation of innovation resources and optimize regional innovation resources through an intelligent allocation system. LIU Dongmei thought that promoting regional innovation and development requires efforts in three aspects: (1) coordinating the building of international scientific and technological innovation centers, promoting the creation of strategic emerging industry clusters in Beijing, Shanghai, and the Guangdong-Hong Kong-Macao Greater Bay Area, and building a future industry development ecosystem; (2) creating innovative growth poles and growth belts, promoting the agglomeration of emerging industry factors, forming an ecosphere of new quality productive forces, and enhancing the resilience and security of regional industry and supply chains; and (3) carrying out pilot reforms in key regions, promoting the transformation of scientific and technological achievements, breaking institutional barriers, and improving the transformation efficiency of scientific and technological achievements.

High-quality Development of National Innovation Demonstration Zones Forum

Deepen Institutional Reforms and Develop New Quality Productive Forces at a Faster Pace

Editor's note: *With the theme of "Deepen Institutional Reforms and Develop New Quality Productive Forces at a Faster Pace", the High-quality Development of National Innovation Demonstration Zones Forum under the 2024 Pujiang Innovation Forum invited experts and scholars from government departments, high-tech zones as well as universities and research institutions to conduct in-depth discussions. At the Forum, the "Zhangjiang Declaration" on High-Quality Development of National Independent Innovation Demonstration Zones was released for the first time, and the Yangtze River Delta National High-tech Industrial Development Zone Alliance was established. This bulletin synthesizes the viewpoints of the guests at the High-quality Development of National Innovation Demonstration Zones Forum for your reference.*

WU Jiaxi
Deputy Director-General of the Planning Department of the Ministry of Industry and Information Technology

ZHAI Jinguo
Deputy Director of Science and Technology Commission of Shanghai Municipality

TIAN Yulong
Member of the former Party Leadership Group and Chief Engineer of the Ministry of Industry and Information Technology

BAI Jinfu
Former Director of the Economic Bureau of the Central Policy Research Office of the CPC Central Committee

As experimental fields for China's reform and innovation, National Independent Innovation Demonstration Zones (hereinafter referred to as "NIDZs") fully play a leading role in carrying out independent innovation and pilot testing, developing new industries, and creating new growth drivers, thereby providing a powerful innovation engine function for realizing high-level technological self-reliance and self-improvement, and promoting high-quality development. The guests present unanimously agreed that the high-quality development of NIDZs should rely on policy advantages, continuously increase empowerment efforts, and meet the requirements of the development of new quality productive forces, playing a key role in deepening scientific and technological institutional reforms and developing new quality productive forces at a faster pace in the new era.

I. Construction achievements: Initial formation of characteristics in of five major NIDZs

In the past 15 years, the number of NIDZs in China has reached 23, involving 60 cities in 21 provinces, municipalities and autonomous regions, covering 66 national high-tech zones. China has basically achieved the transformation from "quantitative increase" to "qualitative improvement" in terms of resources-based innovation, from "strength accumulation" to "capability leaps" in terms of reform and innovation, and from "breakthrough at the point" to "wide-spread diffusion" in terms of collaborative innovation.

Zhongguancun National Independent Innovation Demonstration Zone. ZHANG Yulei, Member of the CPC Leading Group and Deputy Director of Beijing Municipal Science & Technology Commission, Administrative Commission of Zhongguancun Science Park, pointed out that in the past 15 years, Zhongguancun has continuously strengthened original innovation, implemented the action plan for securing its leading position in basic research, and centering on the four basic research fields of mathematics, physics and chemistry, as well as seven applied basic researches and X interdisciplinary basic researches, promoted the combination of basic research and industrial development. By launching pilot programs, Zhongguancun has implemented the special action plan for achieving breakthroughs in nine core technologies in key fields, and become the first in China to propose the "4.0 Era" of entrepreneurship incubation, sparking a new wave of "hard technology" innovation and entrepreneurship. In addition, it has boosted the principal role of enterprises in innovation, with approximately 50,000 enterprises born every year, and it has provided a series of support for research and development investment, growth, and other aspects.

Zhangjiang National Independent Innovation Demonstration Zone. ZHAI Jinguo, Deputy Director of Science and Technology Commission of Shanghai Municipality, pointed out that Zhangjiang has actively launched pilot programs, and made exploration in formulating innovative policies such as the

bonded regulatory model for integrated circuits and the pilot scheme aiming to establish a system of permit-holders for the sale of pharmaceuticals. About 20% of the reform measures replicated and promoted nationwide by the State Council come from Shanghai's experience. Zhangjiang National Independent Innovation Demonstration Zone has enhanced the agglomeration effect of leading industries. In 2023, the scale of the integrated circuit industry in this Zone accounted for 20% of the national total; the cumulative number of the approved China's innovative drugs and innovative medical devices in this Zone accounted for 20% of the national total; and the number of large models put on records and online accounted for about 20% of the national total. With 8% of Shanghai's land area, this Zone has gathered 80% of Shanghai's high-end talents, 80% of Shanghai's foreign-funded research and development institutions, and 80% of Shanghai's companies listed on the STAR Market.

Hangzhou National Independent Innovation Demonstration Zone. YU Jun, Member of the CPC Leading Group and Deputy Director of Hangzhou Municipal Science and Technology Bureau, mentioned that with the strong support of China's ministries and commissions, more than ten Hangzhou's reform measures have been replicated and promoted nationwide; and Hangzhou has pioneered the technology-based enterprise credit rating mechanism and the enterprise innovation points-based system based on the enterprise's innovation capabilities, which have been applied in technology-based enterprises nationwide. Hangzhou has continuously strengthened the supply-side, and planed and constructed "Big Science" facilities, provincial laboratories, and new research and development institutions. It has improved the demand-side, reinforced the principal role of enterprises in scientific and technological innovation, and continuously expanded the scale of technology-based enterprises. And it has optimized the service-side, and established and improved the service system for the commoditization and application of scientific and technological advances throughout the entire chain.

Changsha-Zhuzhou-Xiangtan National Independent Innovation Demonstration Zone. ZHOU Bin, Member of the CPC Leading Group and Deputy Director of the Department of Science and Technology of Hunan Province, mentioned that the construction of Changsha-Zhuzhou-Xiangtan has gained the reputation of "independent innovation Changsha-Zhuzhou-Xiangtan phenomenon". In terms of scientific and technological finance, Changsha-Zhuzhou-Xiangtan National Independent Innovation Demonstration Zone strongly supports credit loans, and it has established the system of "one pool, one system, one fund, and one platform". In terms of military-civilian integration, its service system of "one research institution, one park, one company, and one fund" has become a pioneering measure for military-civilian collaborative innovation in China. And in terms of enterprise innovation, it has promoted the pilot of the enterprise points-based system and become one of the 13 pilot regions in China.

Chengdu National Independent Innovation Demonstration Zone. LU Tiecheng,

LV Wei
Former Director of the Innovation Development Research Department of the Development Research Center of the State Council

ZHANG Yulei
Member of the CPC Leading Group and Deputy Director of Beijing Municipal Science & Technology Commission, Administrative Commission of Zhongguancun Science Park

ZHANG Wei
Vice President of the Chinese Academy of International Trade and Economic Cooperation

LV Xianzhi
Party Secretary and Director of the Torch Center of the Ministry of Industry and Information Technology

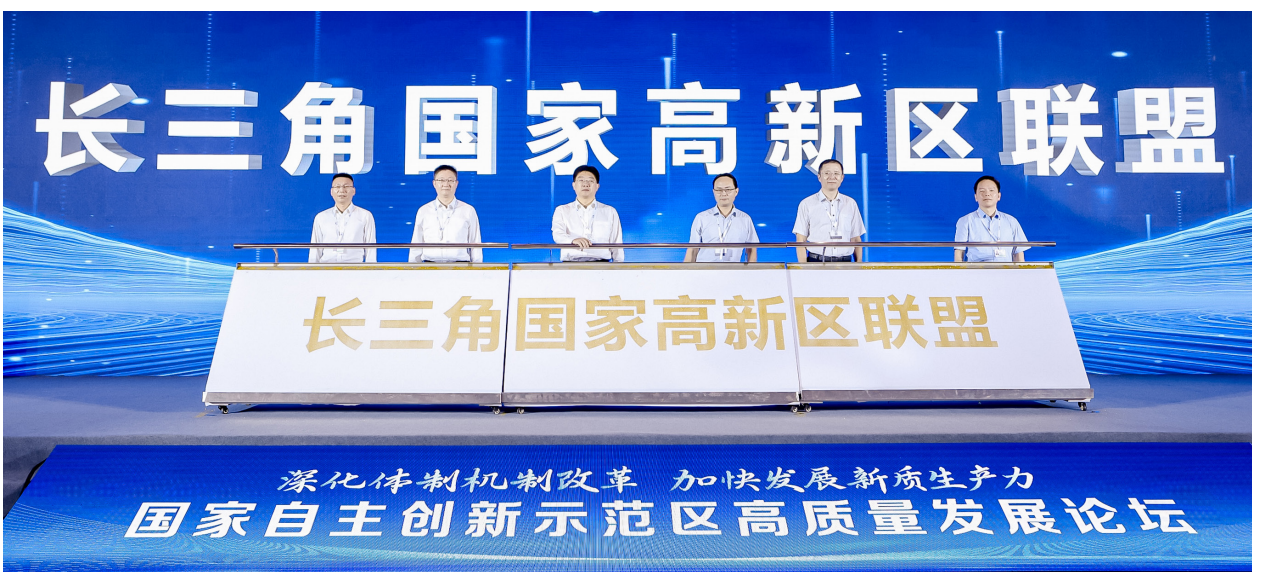
ZHU Xinghua
Director of the Park Division, Planning Department, Ministry of Industry and Information Technology

Announcement of the "Zhangjiang Declaration" on High-Quality Development of National Independent Innovation Demonstration Zones.
Announcer: WU Jun, Deputy Director of the Administrative Committee of Zhangjiang Science City in Shanghai

Deputy Secretary of the Party Working Committee and Deputy Director of the Administrative Committee of Chengdu Hi-Tech Industrial Development Zone, pointed out that Chengdu adheres to the orientation of independent innovation, enables advancement through technology, sticks to the construction of innovation strategic platforms, upholds the clustering of specialized parks, and bolsters the development of strategic hinterland. Centering on the cultivation of enterprise market players and the full chain of the cross-field integration of multiple industries, Chengdu has established seven major working mechanisms, including enhancing the capacity of driving innovation, further implementing the pilot-scale action plan, fostering "hard technology" enterprises, supplying application scenarios, expanding future industrial development space, creating future industrial ecosystem, and improving future industrial governance mechanisms.

II. Future priority: Focusing on characteristics, create the upgraded version of NIDZs

Currently, China has entered a stage of high-quality development, and the development of NIDZs faces new tasks and missions. BAI Jinfu, Former Director of the Economic Bureau of the Central Policy Research Office of the CPC Central Committee, proposed that we should carefully summarize the successful experience and main practices since the establishment of NIDZs, give full play to policy advantages and the diverse characteristics of the system, adapt to the requirements of productivity development, create new quality parks, and comprehensively enhance the level of innovation and development in the new era.



Ceremony for the Establishment of the Yangtze River Delta National High-tech Industrial Development Zone Alliance

Introduction to the Development and Reform Situation of the National Independent Innovation Demonstration Zone on Its 15th Anniversary.
Presenter: HE Nianchu, Deputy Director of the Torch Center of the Ministry of Industry and Information Technology

Innovation Panel

First, NIDZs should be further integrated into national development strategies, creating new quality productive forces. LV Wei, Former Director of the Innovation Development Research Department of the Development Research Center of the State Council, pointed out that NIDZs should first align with national regional coordinated development strategies and major regional strategies, and develop in a multi-level mode; align with institutional reforms, systematically design a new round of reform plans, and create the upgraded version of NIDZs; and align with the development of high-tech zones, improve the evaluation system of NIDZs, and focus on evaluating the implementation and experience of reforms. WU Jun, Deputy Director of the Administrative Committee of Zhangjiang Science City in Shanghai, proposed that we should further give into fully play the key role of NIDZs in achieving greater self-reliance and strength in science and technology, accelerate the layout and construction of some major innovation platforms, pool global high-level talents, and strive to become an important carrier of national new quality productive forces. WU Jiaxi, Deputy Director-General of the Planning Department of the Ministry of Industry and Information Technology, proposed that NIDZs should pioneer as a demonstration for the development of new quality productive forces tailored to local conditions, strengthen basic cutting-edge research, make breakthroughs in key technologies, plan future industries, create high-tech industrial clusters, and open up more new fields and new arenas.

Second, we should insist on engraving opening up into the genes of NIDZs, and take the lead in demonstrating high-level opening up. WU Jiaxi proposed that we should deepen exchanges and cooperation among NIDZs, improve the mechanism of north-south cooperation, and promote cross-regional sharing of talent, funds and technology, etc. We should take a global perspective, establish a system of institutions and policies with international competitiveness, continuously create a first-class business environment that is market-oriented, legalized, and internationalized, and promote international cooperation on innovation chains, industrial chains and supply chains. ZHANG Wei, Vice President of the Chinese Academy of International Trade and Economic Cooperation, pointed out that NIDZs have significant genes for opening up, and we should strengthen regional cooperation, optimize regional layout for opening up, consolidate the leading position of the eastern region in opening up, and improve the level of opening up in the central and western regions. We should improve the mechanism for high-quality Belt and Road cooperation, further reform the systems for inward and outward investment, focus on the opening up of the service sector, and create a fair competition environment for inward investment.

Third, we should continue to increase empowerment efforts, and take the lead in deepening institutional reforms. BAI Jinfu emphasized that the achievements of NIDZs stem from opening up, empowerment, and pioneering efforts. For the purpose of maintaining the leading position of NIDZs in reform and opening up, and further consolidating their roles as the leaders of China's innovation and development and the key hubs in the global innovation network, we should continuously increase the efforts of empowerment and delegation of power, and by strengthening the policies for "pilot testing", stimulate the drive for innovation, promote the application of scientific and technological advances, thereby setting a new benchmark for innovation and development globally.

China-Hungary Forum

Editor's note: *At the China-Hungary Forum under the 2024 Pujiang Innovation Forum, experts and scholars from various fields in China and Hungary conducted in-depth discussions on medical industry innovation, technological innovation capability enhancement, and innovation cooperation on Western and traditional Chinese medicine, etc. This bulletin synthesizes the viewpoints of the guests at the China-Hungary Forum for your reference.*

This year marks the 75th anniversary of the establishment of diplomatic relations between China and Hungary, and the leaders of the two countries have officially announced that the China-Hungary relationship is upgraded to a comprehensive strategic partnership for all-round cooperation in the new era. Both China and Hungary attach great importance to the health and well-being of their peoples, and Hungary is also the first country in Europe to legislate on traditional Chinese medicine, supporting the promotion and application of traditional Chinese medicine in Hungary and Central and Eastern Europe. The guests present unanimously agreed that the combination of traditional medicine and modern medicine is an inevitable direction for the future development of medicine. The two countries have a deep consensus and cooperation foundation in basic research and industry-university-research collaboration. In the future, they should further deepen their understanding and exchanges, and comprehensively enhance the level of innovation cooperation.

I. The integration and innovation of traditional and modern medicine is a key conjunction point for medical and health cooperation between China and Hungary

Integrative medicine as a future discipline is a process of regression from analysis to synthesis, and it is a new medicine that combines Eastern and Western medicine. The medical model of combining disease and syndrome will have a fundamental impact on the understanding of life sciences, the transformation of medical models, and the development of global health. Taking non-alcoholic fatty liver disease as an example, JI Guang, President of Shanghai University of Traditional Chinese Medicine, pointed out that ten years ago, a new target THR-β was discovered in evidence-based traditional Chinese medicine research, and based on this, Linggui Zhugan Granules were developed. Compared with targeted traditional Chinese and Western medicine that use THR-β as a target to treat steatohepatitis ten years later, clinical trials of traditional Chinese medicine can help modern medicine obtain treatment targets that modern medicine cannot discover, and provide treatment methods that modern medicine cannot provide. YUAN Weian, Vice President of the Shuguang Hospital Affiliated with Shanghai University of Traditional Chinese Medicine, pointed out that Yale University in the United States has introduced traditional Chinese medicine in clinical research, which has solved the problem of drug resistance in the treatment of liver cancer and demonstrated the effectiveness of integrated traditional Chinese and Western medicine treatment. Although there are differences in basic theories between traditional Chinese medicine and Western medicine, both aim to treat diseases and improve health. The development of traditional Chinese medicine can provide good ideas for modern medicine, while modern medicine is also very important in explaining the effectiveness of traditional Chinese medicine. The two can achieve integrated development and mutual reinforcement.

László BÓDIS
Deputy State Secretary, Ministry of Culture and Innovation of Hungary

DAI Gang
Director-General of Ministry of Science and Technology

Péter FERDINÁNDY
Vice-Rector for Science and Innovations, Semmelweis University, Hungary

JI Guang
President, Shanghai University of Traditional Chinese Medicine

András DINNYÉS
CEO, BioTalentum Kft

Hassan CHARAF
President of Budapest University of Technology and Economics, Dean of the School of Electrical Engineering

Péter GALAMBOS
Vice-Rector for Innovations, Óbuda University, Hungary

Imre KACSKOVICS
Dean of the Faculty of Science, Eötvös Loránd University

II. The foundation for medical and health cooperation between China and Hungary is solid, and the future prospects are broad

Firstly, there are broad knowledge consensus and solid platform foundation for basic research cooperation between China and Hungary in the field of creating new traditional Chinese medicine. The Hungarian proverb that "you can find ingredients for treating diseases in the woods" coincides with the idea of "food and medicine coming from the same source" in traditional Chinese medicine culture. Károly PETÖ, Vice-Rector, University of Debrecen, emphasized that the University of Debrecen attaches great importance to the research and development of herbal medicine, and has conducted research work on plant metabolomics, development of quantitative analysis methods for plant bioactive substances, and plant microbiome, resulting in a series of achievements such as the polyphenol content of pipal tree, endophytic fungi research of horseradish, antibacterial properties of Enteromorpha prolifera, pharmacological effects of fennel, and antioxidant properties of sour cherry seed extract. ZHANG Tong, Dean of the School of Pharmacy, Shanghai University of Traditional Chinese Medicine, pointed out that China has made significant progress in the modernization of traditional Chinese medicine, and established the quality control system covering multiple levels, to ensure that every link from planting, collection and processing to production can meet high quality requirements, thus safeguarding the safety, effectiveness and controllability of traditional Chinese medicine, and laying a solid foundation for the global promotion and application of traditional Chinese medicine. YE Yang, Party Secretary and Deputy Director of Shanghai Institute of Materia Medica, Chinese Academy of Sciences, pointed out that Shanghai Institute of Materia Medica has carefully constructed a technology integration platform for discovering new medicine based on traditional herbs. Through integrating high-throughput screening technology, the platform has successfully established the bank aimed at discovering antiviral active compounds, providing strong technical support for the modernization and internationalization of traditional Chinese medicine.

Secondly, both China and Hungary attach great importance to the construction of the medical and health industry-university-research ecosystem, and have accumulated rich cooperation experience. Up to now, in-depth cooperation has been conducted between Semmelweis University and Fudan University, as well as between Óbuda University and Tsinghua University and Harbin Institute of Technology, laying a solid foundation for broader cooperation in the future. Péter FERDINÁNDY, Vice-Rector for Science and Innovations, Semmelweis University, Hungary, emphasized that Semmelweis University promotes the integration of education, research & development and medical practice, strengthens the construction of basic scientific research resources such as clinical research and development data and biological gene banks, establishes the clinical drug research and development center, promotes the transformation of scientific research and application, and builds an excellent

YE Yang
Party Secretary and Deputy Director of Shanghai Institute of Materia Medica, Chinese Academy of Sciences

Károly PETÖ
Vice-Rector, University of Debrecen

ZHANG Tong
Dean of the School of Pharmacy, Shanghai University of Traditional Chinese Medicine

WANG Xiao
Deputy Director-General of Ministry of Science and Technology

QI Jianping
Vice President, School of Pharmacy, Fudan University

Nóra RODEK
Foreign Market Director, National Innovation Agency, Hungary

scientific research ecosystem. Hassan CHARAF, President of Budapest University of Technology and Economics, Dean of the School of Electrical Engineering, pointed out that the (BME) draws on the model of the Massachusetts Institute of Technology in the United States, and regularly holds business breakfast meetings, for the purpose of establishing connections with industry players and building a knowledge exchange platform that promotes cooperation between academia and industry. Imre KACSKOVICS, Dean of the Faculty of Science, Eötvös Loránd University, mentioned that the ELTE has established deep cooperative relationships with multiple pharmaceutical enterprise groups in Hungary. This cooperation model not only meets scientific research needs, but also meets the specific requirements of pharmaceutical companies, addressing industry challenges through joint research and development. JI Guang emphasized that Shanghai has initially established the international standardization highland for traditional Chinese medicine, and issued 114 international standards for traditional Chinese medicine, making positive contributions to the global development of traditional Chinese medicine; and that Shanghai always welcomes exchanges and cooperation in the international traditional Chinese medicine community with an open attitude.

Thirdly, we should focus on future development needs, and comprehensively deepen practical cooperation between China and Hungary in the field of medical and health from the aspects of interactive mechanisms, talent exchange and project cooperation. In 2019, the World Health Organization included a chapter on traditional Chinese medicine for the first time in the 11th revision of the International Classification of Diseases (ICD-11), marking the widespread recognition of the medical value of traditional Chinese medicine worldwide. ZHANG Tong proposed that Hungary's legislation in the field of traditional Chinese medicine and the European Directive on Traditional Herbal Medicinal Products (THMPD) provides clear guidance for the registration of traditional proprietary Chinese medicines in the EU market, which is of great significance to the international development of traditional Chinese medicine. We hope to deepen cooperation with Hungary in the future and promote more Chinese herbal medicines to be granted marketing approval by the European Union. Looking ahead, LIU Jiyong, Director of the Department of Pharmacy at Fudan University Shanghai Cancer Center (FUSCC); Ildiko Galambos, Head of the R&D Center

Panel

at the University of Pannonia; Andras Dinnyes, Co-founder and Director of Bio Talentum Ltd.; and Silad Perch, Head of Innovation and Tendering at Gedeon Richter Plc., unanimously proposed that China and Hungary should establish a closer, smoother, and more flexible mechanism for the exchange of traditional Chinese and Western medicine; focusing on the development needs of both sides in the field of healthcare, universities and research institutions should exchange doctors and international students, jointly launch a series of China-Hungary international cooperation projects, and promote the integration and innovation of traditional and modern medicine worldwide.

Main Forum of 2024 WeStart Global Entrepreneurship Investment Conference

Refactoring & Renewal

Editor's note: *With the theme of "Refactoring & Renewal", the Main Forum of 2024 WeStart Global Entrepreneurship Investment Conference under the 2024 Pujiang Innovation Forum invited renowned experts from various fields at home and abroad to conduct in-depth discussions on the current situation, new challenges, and new trends of global entrepreneurial investment. This bulletin synthesizes the reports of the guests at the Main Forum of 2024 WeStart Global Entrepreneurship Investment Conference for your reference.*

CHEN Jiachang
Vice Minister of the Ministry of Science and Technology

LIU Duo
Vice Mayor of Shanghai

László BÓDIS
Deputy State Secretary, Ministry of Culture and Innovation of Hungary

TU Guangshao
Chairman, Shanghai Finance Institute

Entrepreneurial investment" is not only a booster for the growth and expansion of technology-based small and medium-sized enterprises, but also a binder for scientific and technological innovation and integrated industrial development. In 2024, the global entrepreneurial investment market is accelerating its reshaping, presenting both opportunities and challenges. The third plenary session of the 20th Central Committee of the Communist Party of China has pointed out a new direction for further deepening reform comprehensively to advance Chinese modernization. Entrepreneurial investment is embracing new opportunities and bright prospects. The experts attending the WeStart unanimously agreed that compared with the world, China's entrepreneurial investment is facing more severe new situations and challenges, but also fostering new opportunities. We should seek to break new ground amid challenges and gain new life through restructuring.

I. The challenges faced by entrepreneurial investment in China

Firstly, the trend of global capital transfer to the United States and Europe is apparent. In the current international competition, emerging markets are facing dual pressures of both capital outflow and insufficient innovation momentum, which places them at a disadvantage in the global innovation and entrepreneurship landscape. Michael CHARLTON, Former Chief Investment Officer, Department for International Trade, UK, pointed out that venture capital investment is a very important part of the global economy. As of 2023, the scale of global venture capital investment reached US$445 billion. The United States remained a leader in the global venture capital market, with its startups attracting US$230 billion in venture capital, accounting for over half of the global total. About 60% of the venture capital invested in the United States was provided by venture capitalists with an investment of over US$100 million. European startups also attracted US$120 billion in venture capital, far more than the pre-COVID-19 level. In contrast, the capital attractiveness of emerging markets such as China was clearly insufficient.

Secondly, China's investment market environment is facing a profound adjustment. With the transformation of China's economic development model, China's equity investment market is facing many challenges. The traditional investment strategies, fundraising models, and exit mechanisms of investment institutions are no longer suitable for the rapidly changing economic environment. The lack of integrated investment and financing platforms and coordination mechanisms hinders the efficient flow of capital to the technology sectors that require the most support, thereby limiting the role of scientific and technological innovation in driving economic transformation. LI Jiaqing, President of Legend Capital Management Co., Ltd., pointed out that with the gradual disappearance of the demographic dividend, the traditional model relying on cheap labor is difficult to sustain. Scientific and technological innovation has become a key engine of economic growth. Investment

institutions need to adapt to the new development model, to strengthen the control of various links such as fundraising, investment, management and exit, and to build the integrated platform for supporting scientific and technological innovation and industrial upgrading.

Thirdly, the mismatch between supply and demand of funds in the science and technology investment and financing system is prominent. How to achieve effective allocation of resources between scientific and technological innovation investment and the banking and financial system is an important issue currently facing us. TU Guangshao, Chairman of Shanghai Finance Institute, pointed out that although technology startups and innovative enterprises have a huge demand for venture capital and private equity investment, the diversification of investment structure is still insufficient, leading to the concentration of capital flow in some industries and the formation of the phenomenon of "capital pileups". At the same time, due to poor exit channels, investors' enthusiasm for investing in high-risk areas has decreased, capital circulation has been hindered, and the imbalance between supply and demand of funds has been further exacerbated. In addition, the private equity market continues to experience a downturn. SHAN Junbao, Chairman, China Capital Investment Group, pointed out that in the first half of 2024, the size of funds raised in China's private equity market decreased by 23% year-on-year, the total amount of funds raised decreased by 39% year-on-year, and the number of exit cases decreased by 64% year-on-year. Difficulties in raising funds, prudent investment and blocked exit channels have formed bottlenecks in the entire chain, limiting the efficient circulation of funds and the release of innovation vitality.

II. Future strategic direction of entrepreneurial investment

The first is to anchor the strategic goal of serving new quality productive forces. WANG Hong, Deputy General Manager of Shanghai Stock Exchange, pointed out that the Central Committee of the Communist Party of China attaches great importance to the development of new quality productive forces and the optimization of scientific and technological financial services, and that China Securities Regulatory Commission continues to improve the institutional mechanisms for the capital market to serve scientific and technological innovation. In recent years, the STAR Market has highlighted the characteristics of "hard technology" and accelerated the development of new quality productive forces. DAI Minmin, President of Shanghai State-owned Capital Investment Co., Ltd., pointed out that patient capital is an important pillar for supporting scientific and technological innovation and developing new quality productive forces. Scientific and technological innovation usually involves high risks, large investments, and long cycles, requiring long-term stable capital investment.

The second is to actively transform the role, direction and strategy of investment institutions. LI Jiaqing pointed out that under the new development

WANG Hong
Deputy General Manager, Shanghai Stock Exchange

GUO Yike
Principal Vice-Chancellor, Hong Kong University of Science and Technology

DAI Minmin
President, Shanghai State-owned Capital Investment Co., Ltd.

SHAN Junbao
Chairman, China Capital Investment Group

CHEN Wei
Chairman, Shenzhen Oriental Fortune Capital Investment Management Co., Ltd.

LI Jiaqing
President, Legend Capital Management Co., Ltd.

YAN Junjie
Founder, MiniMax

Michael CHARLTON
Former Chief Investment Officer, Department for International Trade, UK

landscape and environment, the role of investment institutions has undergone significant changes. Investment institutions not only need to provide financial support, but also need to play a more active role in technological and industrial innovation. By providing more specialized services, they should create the systematic service platform, and contribute to building infrastructure that supports the development of new quality productive forces. GE Liang, Deputy General Manager, Sci-Tech Finance Department, Shanghai Pudong Development Bank Head Office, pointed out that investment institutions should integrate all financial factors and resources, and cover the full lifecycle services of technology enterprises to enhance the sustainability of their long-term development. WU Shichun, Founding Partner of Plum Ventures, pointed out that when selecting investees, investment institutions should distinguish "unicorns" into "unicorn tigers" and "unicorn pigs", and focus selecting high-growth innovative investees for entrepreneurial investment, to avoid wasting resources on projects with insufficient potential.

The third is to cultivate long-term capital and optimize scientific and technological demand and financial supply allocation. CHEN Wei, Chairman, Shenzhen Oriental Fortune Capital Investment Management Co., Ltd., pointed out that it is crucial to build a multi-level long-term capital supply system involving banks, insurance, social security, and fund of funds, etc.; and state-owned capital should take the lead in playing the role of patient capital, and promote the coordinated development of government-guided funds and market-oriented fund of funds. We should, through policies such as tax incentives, encourage long-term participation of social capital in entrepreneurial investment, vigorously promote the development of secondary funds, and establish a diversified, smooth, convenient and efficient venture capital fund exit mechanism. TU Guangshao emphasized that we should promote precise matching between technology demand and financial resources, ensure that financial services align with the development stage and needs of technology-based enterprises, achieve a balance between risk and return, and coordinate positioning and functions. We should enhance the overall synergy of the financial system in serving the technology industry by strengthening financial product innovation and optimizing the coordination mechanism of financial institutions.

III. Specific measures for building new paradigms for entrepreneurial investment

The first is to further leverage the role of the STAR Market as a link. WANG Hong pointed out that we should continue to give full play to the experimental field function of the STAR Market, strengthen its "hard technology" positioning, give priority to supporting the listing of the "hard technology" companies on the STAR Market that achieve breakthroughs in core technologies in key fields, and optimize the system of the financing of the companies listed on the STAR Market by selling equities and issuing

MI Lei
Co-founder, CASSTAR

GE Liang
Deputy General Manager, Sci-Tech Finance Department, Shanghai Pudong Development Bank Head Office

bonds and the mergers and acquisitions of such companies. We should deepen systematic and multidimensional services, and promote synergy in promoting development. We should enrich the system of diversified products including stocks, bonds, funds, and REITs, and provide full-chain and full-life cycle financial services for technology-based enterprises. We should strengthen "patient capital", vigorously develop index-based investment, and optimize the normalized mechanism for connecting with venture capital institutions.

The second is to enhance the core competitiveness of state-owned capital. DAI Minmin pointed out that we should fully leverage the functional role of state-owned capital, actively implement national strategies, accelerate the layout of forward-looking strategic emerging industries, master cutting-edge core technologies, and unleash the new power for industrial development. We should give full play to the role of state-owned capital as a "barometer", bravely assume the responsibilities of organizers for achieving breakthroughs in technologies, innovation resources integrators, and industry layout leaders, integrate internal and external resources through market-oriented methods, move faster to shore up weak links in the industrial and supply chains, and contribute to modernizing the industrial system. We should help patient capital to land in terms of investment, follow-up, and exit, etc.,

Roundtable Dialogue 1

WU Shichun
Founding Partner, Plum Ventures

FANG Na
Assistant to President, National Silicon Industry Group

and shield for enterprises to go through the cycles.

The third is to build an ecosystem of scientific and technological innovation and venture capital investment. TU Guangshao pointed out that we should vigorously develop equity investment, especially venture capital investment, expand the size of investment in science and technology, enhance science and technology investment capabilities, support various types of investment entities, and guide more long-term funds. MI Lei, Co-founder, CASSTAR, pointed out that we should build the distinctive technology entrepreneurship systems such as "research institutions + early investment + entrepreneurial platforms + post-investment services", and establish the rainforest ecosystem for "hard technology" innovation and entrepreneurship. FANG Na, Assistant to President, National Silicon Industry Group, pointed out that sufficient venture capital investment can support enterprises to continuously invest in research and development, and achieve technological breakthroughs through integration of resources. Only investors with the same underlying logic and long-term strategic consensus can work hand in hand with the company and become real boosters in the long-term development of the company.

Roundtable Dialogue 2

Unicorn Innovation and Development Forum

Focus on Unicorns Growth for New Chapter of New Quality Productive Forces

Editor's note: *With the theme of "Focus on Unicorns Growth for New Chapter of New Quality Productive Forces", the Unicorn Innovation and Development Forum under the 2024 Pujiang Innovation Forum, experts and scholars from unicorn enterprises, investment institutions, new economy think tanks, and government authorities conducted in-depth discussions on development experience and paths of unicorn enterprises. This bulletin summarizes the viewpoints of the guests at the Unicorn Innovation and Development Forum for your reference.*

SHOU Ziqi
Vice Chairman of the All-China Federation of Industry and Commerce, Vice Chairman of the Shanghai CPPCC, Chairman of the Shanghai Federation of Industry and Commerce, President of the Shanghai General Chamber of Commerce

BAI Jie
Deputy Director-General of the High-tech Department of the Ministry of Industry and Information Technology

WANG Huajie
Secretary of Shanghai Songjiang District Committee of CPC

Jonathan Ortmans
President of Global Entrepreneurship Network

With scientific and technological innovation as the core, and driven by high-level talents and capital, unicorn enterprises can promote the deep integration of the innovation, industry, capital and talent chains. As typical representatives of new quality productive forces, they play an important role in opening up new fields and tracks, leading future industry development, etc. The guests present agreed unanimously that we should focus on application scenario traction, technology and finance empowerment, policy and institutional optimization, etc., to provide full-lifecycle policy and institutional support for unicorn enterprises, promote regional economic and industry development, and write a new chapter of high-quality development in China.

I. New development trends of worldwide unicorn enterprises

Based on the current global situation, unicorn enterprises have become an important force in promoting high-quality economic development. Jonathan Ortmans, President of Global Entrepreneurship Network, said that unicorn enterprises play the role of breaking boundaries and injecting vitality into economic development in a country constantly, and are also an important measure of the overall level of innovation and entrepreneurship of a country. BAI Jie, Deputy Director-General of the High-tech Department of the Ministry of Industry and Information Technology, pointed out that as representatives of the new economy, new business formats and new models, unicorn enterprises are characterized by fast development and high growth potential, and have become a new force in promoting the development of new quality productive forces. SHOU Ziqi, Vice Chairman of the All-China Federation of Industry and Commerce, Vice Chairman of the Shanghai CPPCC, Chairman of the Shanghai Federation of Industry and Commerce, President of the Shanghai General Chamber of Commerce, pointed out that unicorn enterprises are already holding a core position in the industry chain, driving the transformation and upgrading of the whole industry chain, and forming an explosive point for industry development through their own scientific and technological innovation, and product R&D.

Today, China is becoming the main carrier for the growth and development of worldwide unicorn enterprises. The Development Tracking Report of Chinese Unicorn Enterprise (2016-2024) released by Great Wall Enterprise Institute reveals that the total number of Chinese unicorn enterprises rose from 131 in 2016 to 375 in 2023, and the total valuation rose from $487.6 billion in 2016 to $1.2383 trillion in 2023.They have made significant contributions to China's economic growth and industry development. Jonathan Ortmans thought that globally, Chinese unicorn enterprises are leading in development, with a growth rate ahead of those in most countries. Among the 700 unicorn enterprises around the world, over 370 are based in China. In 2023, the global share of new Chinese unicorn enterprises almost doubled, with nearly 75 percent of the unicorn enterprises around the world based in China and the U.S.

With leading frontier technologies, unicorn enterprises are becoming the main force driving disruptive innovation. HE Yu, Chairman of CIQTEK, pointed out that quantum technology has become a key development direction for global frontier technological exploration and future industry upgrading. Precise quantum measurement technology will bring transformative opportunities for the take-off of the high-end scientific instrument industry. CHEN Rui, CEO of Startorus Fusion, proposed that breakthroughs in controlled nuclear fusion technology will not only change the energy industry, but also have disruptive impacts on various industries such as agriculture, environmental rehabilitation, climate change, and aerospace. LIN Lin, Founder and CEO of Huihe Healthcare, proposed that Huihe Healthcare can realize heart valve repair without surgery, and promote breakthroughs in high-end medical device R&D by replacing thoracotomy with vascular intervention.

HE Yu
Chairman of CIQTEK

LIN Lin
Founder and CEO of Huihe Healthcare

CHEN Rui
CEO of Startorus Fusion

XIONG Weiming
Founding Partner of China Growth Capital

II. Current difficulties and challenges faced by unicorn enterprises in development

On the one hand, the global "capital winter" has brought severe challenges to the development of unicorn enterprises. XIONG Weiming, Founding Partner of China Growth Capital, pointed out that various transactions at the fundraising and withdrawal sides in the global capital market are taking on a downtrend. As of March 2023, the annual rate of return of worldwide VC funds was -13 percent, and both China and the U.S. were facing the challenge of scarce capital to support startups. WU Wensheng, President of Great Wall Enterprise Institute, mentioned that new Chinese unicorn enterprises underwent a decline in both growth rate and financing, the number of new unicorn enterprises dropped from 98 in 2022 to 72 in 2023, and the number of newly financed unicorn enterprises dropped from 137 in 2022 to 106 in 2023. XIONG Weiming also pointed out that the structural problems in China's capital market have further exacerbated the financing difficulty of unicorn enterprises. In 2020, the top ten unicorn enterprises in terms of A-share market capitalization were still mostly in the energy, finance and beverage sectors, while the ten 10 ones in terms of U.S. stock market capitalization during the same period were mostly technology companies such as Apple and Microsoft.

On the other hand, inadequate policy support affects the rapid growth of unicorn enterprises greatly. QI Lei, CFO of MediTrust, pointed out that the biopharmaceutical industry does not lack scenarios and customers, but lacks stable support from the medical security system. Patients cannot afford high costs of innovative drugs, which restricts the innovation willingness of innovation-oriented pharmaceutical enterprises seriously. Innovation in the field of life and health cannot be achieved without tolerance and support from government authorities such as medical regulation and financial regulation. XIONG Weiming thought that excessive window guidance and short-term policies may distort market pricing and social expectations, result in confusion in the positioning of the government, institutions and enterprises in the

WANG Fenyu
Director and Deputy General Manager of Great Wall Enterprise Institute

Introduction of Songjiang District
Presenter: WANG Jing, Deputy Secretary of Shanghai Songjiang District Committee of CPC, Mayor of Shanghai Songjiang District

innovation system, and affect the healthy growth of unicorn enterprises.

III. Suggestions for promoting the high-quality development of unicorn enterprises

First, expand the size of patient capital through stable top-level design. There are still many problems in China's venture capital market as compared to those of developed countries. XIONG Weiming proposed that on the one hand, it is necessary to establish a more diverse and inclusive capital market to solve the withdrawal problem, and guide funds to leverage more social capital; on the other hand, it is necessary to establish a market environment conducive to the development of patient capital, truly ease the censorship system, and replace short-term window guidance with stable institutional and policy design. This will provide tax incentives for patient capital targeting "hard technologies, strangleholds and alternative technologies" at all levels such as GP and LP, and encourage more social capital to participate actively in early-stage investment in China's large scientific and technological innovation ecosystem.

Second, accelerate the growth of unicorn enterprises through application scenarios. LI Wei, Founder and CEO of Hyperchain Technology, pointed out that good application scenarios and trials by the government are particularly important for startups. WEI Qiong, Founder and Chairman of MS Energy, pointed out that government support for enterprises should be more focused on application scenarios rather than direct financial subsidies. High-quality startups often lack good application scenarios, and scenario support will enable high-quality enterprises to generate real quantitative data and prove their corporate value to the market. HE Yu proposed that there are

Dialogue 1

Release of Report
Presenter: WU Wensheng, President of Great Wall Enterprise Institute

Release Ceremony

many application scenarios to be developed in precise quantum measurement, such as magnetocardiographs, ultra-sensitive in-vitro testing, clinical medical imaging, aerospace, and dark matter exploration. HU Xiaoping, Co-founder of Flexiv Robotics, pointed out that the main characteristic of disruptive innovation enterprises is their new application scenarios, which requires greater support for application scenarios from the government.

Third, improve the growth environment of enterprises through timely policy sharing and data interconnection. In terms of policy extension and popularization, YUAN Ye, Co-founder of Reexen Technology, proposed that small and medium-sized enterprises are inferior to listed companies in access to government policies, and there is insufficient interpretation and publicity on policies related to returned talents. It is necessary to keep communication channels with competent authorities unobstructed, and conduct communication more actively. ZHANG Yu, CEO of TopXGun Robotics, proposed that a large number of unicorn enterprises have founding teams with a science and engineering background, so a more inclusive and proactive innovation service environment is needed urgently. In terms of data sharing, LIANG Liang, Co-founder of Theseus, pointed out that the government should promote more systematic, normative and open data governance in top-level design, strengthen normative governance in sharing mechanisms, profitmaking mechanisms, etc., and support enterprises to carry out data applications in emerging fields such as AI big models and key industries such as automotive.

Dialogue 2

Frontier Technology Development Forum

Frontier Technology: Shaping the Future and Innovation Cooperation

Editor's note: *With the theme of "Frontier Technology: Shaping the Future and Innovation Cooperation", the Frontier Technology Development Forum under the 2024 Pujiang Innovation Forum invited domestic and overseas experts, government authorities and enterprise representatives from various fields to conduct in-depth discussions on the development of frontier technologies and global cooperation. This bulletin summarizes the viewpoints of the guests at the Frontier Technology Development Forum for your reference.*

With the accelerated evolution of a new round of technological revolution and industry transformation, global scientific and technological innovation has entered an unprecedented active period. Frontier technology fields represented by AI, quantum technology, genetic technology, new energy, new materials, deep-sea exploration, etc. are flourishing, and have far-reaching influence on the whole scientific and technological innovation system, and human society. The experts present unanimously thought that the development of frontier technologies provides new opportunities to promote the transformation of the times and address global concerns. We should strengthen the analysis and judgment of the layout of frontier technologies, give full play to the role of corporate innovation entities, accelerate breakthroughs in frontier technologies with a scenario-driven approach, release the driving force of innovation entities through the reform of scientific and technological institutional mechanisms, and explore new models of frontier technology development in which cooperation and competition coexist actively.

I. Frontier technologies are driving profound changes in the economy and society

Frontier technologies are empowering numerous industries deeply. Frontier technologies are changing operation models and development paths of conventional industries profoundly. For example, in multiple industries such as healthcare, education, transportation, finance, and manufacturing, the application of AI technology has not only improved production efficiency and service quality, but also spawned new business models and industry ecosystems. David Srolovitz, Academician of the National Academy of Engineering, USA; Dean of the Faculty of Engineering at the University of Hong Kong, pointed out that AI technology has helped us accelerate data generation and material design, predict material properties, performance and other attributes, and shorten material design and development lead times greatly.

Breakthroughs in frontier technologies will disrupt the global industry landscape. Currently, frontier technologies in various fields are interacting, integrating, and relaying in breakthroughs, accelerating the formation of new industry ecosystems and reshaping the development landscape. GAN Yong, Academician and Former Vice President of the Chinese Academy of Engineering, pointed out that the extreme of AI technology is computing power, and the extreme of computing power is electricity, super AI will become an "abyss" of electricity demand, and AI cannot develop without breakthroughs in energy technology in the future. David Srolovitz said that breakthroughs in energy technology will have profound influence on the aerospace industry; given that 40 percent of the weight of aircraft comes from the fuel carried, more efficient and lightweight fuel can reduce the weight of the aircraft structure greatly, and small changes in energy materials will bring big profits.

LONG Teng
Vice Minister of the Ministry of Science and Technology

GAN Yong
Academician and former Vice President of the Chinese Academy of Engineering

Dan Stamper-Kurn
Professor at the University of California, Berkeley; Director of the California Quantum Computation Challenge Research Institute

David Srolovitz
Academician of the National Academy of Engineering, USA; Dean of the Faculty of Engineering at the University of Hong Kong

YOU Zheng
Vice Chairman of the China Association for Science and Technology, Academician of the Chinese Academy of Engineering, President of the Huazhong University of Science and Technology

Hassan CHARAF
President of Budapest University of Technology and Economics, Dean of the School of Electrical Engineering

TANG Guangfu
Academician of the Chinese Academy of Engineering, Director of Huairou Laboratory

TAN Tianwei
Academician of the Chinese Academy of Engineering, President of Beijing University of Chemical Technology

Frontier technologies will reshape the rules of economic and social operation in the new era. On the one hand, frontier technologies will redefine the rules and standards for addressing physical measurements and social problems. Dan Stamper-Kurn, Professor at the University of California, Berkeley; Director of the California Quantum Computation Challenge Research Institute, pointed out that quantum computers can solve some problems that may never be solved by classical computing, and evidence of existence can hardly be found directly for new materials proposed in some theories, but quantum simulator technology can be used for simulation verification. On the other hand, breakthroughs in frontier technologies will change the underlying logic of economic operation. GAN Yong pointed out that the new energy industry and supply chains are based on the development and utilization of mineral resources and materials, and after entering the 2050 "carbon neutrality" era driven by new energy, the global economy will also shift from a "fuel driven" one to a "material driven" one.

II. Global trends and key directions in the development of frontier technologies

New energy and AI are the core focus of current global frontier technology development. GAN Yong pointed out that current international competition in technologies and industries focuses on two lines: One is China's future energy technology based on its advantages in new energy, and the other is globally leading AI technology based on computing power and large models in the U.S. The development of AI relies highly on the development of new energy and energy storage technologies, and the two main lines will intertwine to affect the future global competitive landscape. TANG Guangfu, Academician of the Chinese Academy of Engineering, Director of Huairou Laboratory, pointed out that the large-scale development of clean energy, the clean transformation of fossil energy, and the comprehensive utilization of multiple energy sources are the key to promoting the transformation of China's energy from the coal era to the renewable energy era, and realizing the goal of carbon neutrality. We should promote the diversified development of geothermal energy, wave energy, biomass energy and other energy sources according to local conditions, and reduce dependence on a single energy source. Hasan MANDAL, President of the World Association of Industrial and Technological Research Organizations, Rector of lstanbul Technical University, pointed out that humanity has experienced six waves of innovation, and the current sixth wave is defined as the "green and digital transformation" wave.

Biotechnology and chip technology are common fundamental technologies essential to the development of future industries. For biotechnology, TAN Tianwei, Academician of the Chinese Academy of Engineering, President of Beijing University of Chemical Technology, said that the bio-manufacturing industry is one of the most promising technologies to realize sustainable development, has prominent features such as renewable raw materials,

ecofriendly processes, and product designability, and involves many important sectors in the national economy, such as energy, chemicals, materials, food, agriculture, and medicine. It is predicted that 70 percent of products around the world can be produced biologically by the end of this century. For chip technology, YOU Zheng, Vice Chairman of the China Association for Science and Technology, Academician of the Chinese Academy of Engineering, President of the Huazhong University of Science and Technology, pointed out that microsystem technology is an important direction beyond the Moore era. The U.S., Europe and other countries attach great importance to the R&D of common fundamental technologies such as integrated intelligent microsystem design. DARPA has a dedicated microsystem technology office (MTO), which leads the diversified development of microsystem technology through systematic, long-term and intensive investment under the leadership of the government.

The development of quantum technology is full of infinite and disruptive possibilities. FANG Xiang, President of the National Institute of Metrology, China, pointed out that the development of quantum technology changed the International System of Units in 2019 fundamentally, and quantized transformation will make optimal measurement possible anywhere and anytime, and also make the unification of all quantities possible. Dan Stamper-Kurn said that ultra-cold atom technology is an emerging technology that is expected to achieve breakthroughs in quantum simulation and quantum sensor materials, and provide support for a wide range of quantum information, implying an extensive application prospect.

III. Relevant suggestions

First, explore a frontier technology development model in which cooperation and competition coexist. Frontier technologies cannot develop without international cooperation and open innovation; open markets and international standards should be taken as a bridge to overcome competition and barriers, and accelerate the formation of an institution-based open scientific and technological innovation ecosystem. LONG Teng, Vice Minister of the Ministry of Science and Technology, pointed out that international cooperation is mandatory for promoting scientific and technological innovation. Only by keeping strengthening scientific and cultural exchanges with countries around the world, and enhancing mutual friendship can we accomplish the global and contemporary task of scientific and technological progress. Dan Stamper-Kurn pointed out that there are many debates and differences regarding the long-term development and application of quantum technology, and further breakthroughs cannot be achieved without the progress of basic sciences. That's also an important reason why many foreign scholars seek cooperation and collaboration in China. Hasan MANDAL pointed out that frontier technology development faces complex and diverse challenges, and only through cooperation can these challenges be overcome.

Hasan MANDAL
President of the World Association of Industrial and Technological Research Organizations, Rector of Istanbul Technical University

FANG Xiang
President of the National Institute of Metrology, China

ZHENG Jian
Director-General of Ministry of Science and Technology

FU Xiaofeng
Deputy Director-General of Ministry of Science and Technology

Second, accelerate the upgrading efficiency of frontier technologies through scenario applications. Scenario applications can discover technological problems constantly, promote technology upgrading, and expand the scope of application. As for new energy, GAN Yong said that the proportion of strategic emerging industries in China is growing rapidly, providing the most prosperous application scenarios for new energy. In the AI field, the U.S. has advantages in algorithms, computing power, and data. China should fully leverage its advantages in application scenarios, and accelerate the implementation and achievement transformation of application scenarios in fields such as autonomous driving, intelligent finance, smart healthcare, and manufacturing. YOU Zheng pointed out that the key to accelerating research on microsystem technology is choosing design tools, integrated processing equipment and technology, and testing application scenarios as breakthrough points.

Third, keep strengthening the role of enterprises as the main body in frontier scientific and technological innovation. Dan Stamper-Kurn pointed out that many new enterprises in the U.S. are entering frontier technology research fields boldly, and participating actively in laboratory stage technology R&D, while there are relatively fewer similar enterprises in China. Hassan CHARAF, President of Budapest University of Technology and Economics, Dean of the School of Electrical Engineering, said that research activities in Hungary are often organized through consortia, including many small technology enterprises, and such collaboration can accelerate the development and upgrading of application scenarios and systems substantially.

International Synthetic Biology Innovation Forum

Editor's note: *The International Synthetic Biology Innovation Forum under the 2024 Pujiang Innovation Forum conducted in-depth discussions on the application potential of synthetic biology in green chemistry, biomedicine, one health and other fields, research progress and trends in synthetic biology, and future development thoughts. This bulletin summarizes the viewpoints of the guests at the International Synthetic Biology Innovation Forum for your reference.*

JIN Qinxian
Director of Beijing-Tsinghua Industrial R&D Institute, Chairman of the Strategic Development Committee, Shanghai Synthetic Biology Innovation Center

Greg N. Stephanopoulos
W.H. Dow Professor of Chemical Engineering and Biotechnology, Director of Metabolic Engineering Laboratory, Massachusetts Institute of Technology (MIT)

Martin Fussenegger
Professor of Biotechnology and Bioengineering at the Department of Biosystems Science and Engineering (D-BSSE) of the ETH Zurich in Basel as well as at the University of Basel

DING Kuiling
President of Shanghai Jiaotong University, Academician of Chinese Academy of Science

Synthetic biology uses research concepts in engineering science to design, modify and even resynthesize organisms purposefully, thereby promoting the leap from understanding life to designing life, and leading the sustainable development of the global bio-economy. The guests present agreed unanimously that synthetic biology is accelerating its penetration and application in fields such as green chemistry, biomedicine, and one health, and providing important solutions for promoting environmental sustainability, curing difficult diseases, and empowering one health development. In the future, synthetic biology will further focus on exploring new raw materials, developing new technologies, synthesizing new molecules, creating new quality productive forces, making breakthroughs in core bottlenecks, and creating everything biologically.

I. Significance of developing synthetic biology

First, promote the green transformation and upgrading of the chemical industry: Reshape the future of the sustainable chemical industry. Greg N. Stephanopoulos, W.H. Dow Professor of Chemical Engineering and Biotechnology, Director of Metabolic Engineering Laboratory, Massachusetts Institute of Technology (MIT) pointed out that replacing chemical synthesis with biosynthesis empowers the green transformation and sustainable development of the chemical industry through the development of synthetic biology. Holly Lei, Senior Vice President, Covestro Group, President, Covestro China, pointed out that the synthesis of bio-based materials is characterized by a green, low-carbon and ecofriendly process, and renewable raw materials, which can reduce carbon dioxide emissions effectively.

Second, boost new breakthroughs in biopharmaceuticals: Accelerate drug R&D and mass production, and promote the realization of precision medicine. Matthew DeLisa from Cornell University proposed that synthetic biology can help better decipher complex proteomic information, accelerate the discovery of new drug targets and mechanisms, and empower the development of monoclonal antibodies, vaccines, and other drugs. YE Haifeng, Vice Dean of the School of Life Sciences, East China Normal University, pointed out that genetically modifying cells, and redesigning and synthesizing intelligent gene network regulatory systems using synthetic biology will provide new solutions and strategies for disease diagnosis and treatment. PAN Jing, Director of the Department of Hematology and Tumor Immunotherapy, Beijing GoBroad Hospital, pointed out taking the CAR-T cell therapy as an example that modifying and regulating the genome of human cells can realize efficient, precise and individualized cancer treatment.

Third, empower the leapfrog development of the one health industry: Support the generation of innovative achievements in fields such as functional food, cosmetics, and medical cosmetology. WENG Jingke, Professor at Northeastern University pointed out that the development of plant synthetic biology can promote the discovery and efficient synthesis of functional

Matthew DeLisa
Professor of Smith Chemical and Biomolecular Engineering at Cornell

Holly Lei
Senior Vice President, Covestro Group, President, Covestro China

Panelist 1

Panelist 2

molecules. LIU Yanjun, Founder and Chairman of Shanghai Bao Pharmaceuticals Co., Ltd., and SHEN Di, Asia-Pacific Senior Manager of Personal Care Solution Development and Innovation, BASF New Materials GmbH, both proposed that the development of synthetic biology technology provides strong support for the mass production of key active ingredients such as hyaluronidase and amino acids used in cosmetics or medical cosmetology.

II. Future trends of global synthetic biology research

On the raw material side, explore alternatives to food crops and promote sustainable development. Greg N. Stephanopoulos pointed out that fixing carbon dioxide as a raw material can further generate oil substances, which can be used as aviation fuel and automotive fuel. The guests present also proposed using biomass or other waste raw materials to replace food crops such as corn and wheat, which can realize resource recycling while reducing costs.

On the technical side, develop new synthetic biotechnology to realize the precise control of biological processes. Martin Fussenegger, Professor of Biotechnology and Bioengineering at the Department of Biosystems Science and Engineering (D-BSSE) of the ETH Zurich in Basel as well as at the University of Basel, demonstrated the cell modification technology that combines synthetic biology and cytogenetics, which can realize the precise regulation of cellular functions. Matthew DeLisa pointed out that the application of new technologies such as cell-free protein synthesis and targeted protein degradation can provide important technical support for synthesizing new molecules and tackling the problem of "non-druggable" targets. Prof. Seeram Ramakrishna from the National University of Singapore emphasized that the cross fusion of synthetic biology and nanotechnology has broad application prospects in biomedicine fields such as drug delivery and medical imaging.

On the R&D side, AI technology can be utilized to enhance

Panelist 3

Panelist 4

the rational design capacity of living systems, and create molecules that could not be synthesized in the past and high-value molecules. The guests present pointed out that designing proteins that do not exist in nature or modifying existing proteins based on specific functional needs will lead to disruptive development in fields such as biomedicine, agricultural breeding, bio-manufacturing, and biological environmental protection. DING Kuiling, President of Shanghai Jiaotong University, Academician of Chinese Academy of Science, pointed out that building an AI-aided design platform for the high-throughput synthesis of industrial enzymes and strains helps realize the efficient green creative of active substances.

On the production side, break through key bottlenecks to address the challenge of mass production. Greg N. Stephanopoulos pointed out that regulating metabolic pathways through metabolic engineering and other means, improving biosynthesis rate and yield, and addressing the challenge of mass production is the only way for the commercialization of synthetic biology products. DING Sheng, Director of the Global Health Drug Discovery Institute, pointed out that the universal spot CAR-T therapy has advantages such as industrial production, low cost, and short lead time, and is a key direction for future development.

III. Suggestions for advancing synthetic biology research

On the one hand, break through the conventional disciplinary research framework, and accelerate synergies between chemistry and biosynthesis. DING Kuiling pointed out that breaking disciplinary barriers, and conducting synergistic synthesis between chemistry and biology helps realize the efficient activation, cleavage, and recombination of chemical bonds. He suggested promoting the deep integration between chemical synthesis and biosynthesis from theory to technology, establishing a new paradigm for synthetic biology research, and exploring new spaces for the development of synthetic biology.

On the other hand, strengthen interconnection, and build a synthetic biology ecosphere. The guests present pointed out that the development of synthetic biology relies on support from different stakeholders such as the government, universities, enterprises, and financial institutions. It is advised to create a synthetic biology ecosphere in which the innovation, industry, talent and capital chains are integrated deeply by giving policy guidance, building technology platforms jointly, providing funding support, and pooling the wisdom of the academic and industry communities.

Global Health and Development Summit

High-Quality Development of Global Health Empowered by Innovative Diagnostics

Editor's note: *With the theme of "High-Quality Development of Global Health Empowered by Innovative Diagnostics", the Global Health and Development Summit under the 2024 Pujiang Innovation Forum invited experts and scholars from international organizations, government departments, scientific research institutions, and enterprises, etc. to conduct in-depth discussions on global health and development needs and on promoting fair access to innovative diagnostic products for global health, contributing Shanghai's strength to the high-quality development of global health. This bulletin synthesizes the viewpoints of the guests at the Global Health and Development Summit for your reference.*

LI Xin
Deputy Director-General of Ministry of Science and Technology

ZHENG Zhijie
Director, China Country Office, Bill & Melinda Gates Foundation

SHI Xiaoming
Deputy Director of Chinese Center for Disease Control and Prevention

David Boyle
Head of Diagnostics, PATH

With the rapid development of cutting-edge technologies such as artificial intelligence, gene sequencing, and instant testing technology, the research and development and application of innovative products for global health have ushered in an unprecedented golden period, greatly enhancing the effectiveness of global health governance. General Secretary XI Jinping has emphasized that in the context of global health and development, we have the responsibility for making greater contributions to human health. The guests present unanimously agreed that the global health crisis is becoming increasingly severe, and the demand for more accurate, simpler, faster and more affordable testing technologies and tools is becoming more urgent. More diverse and targeted international cooperation is needed to achieve the overall improvement of human health level.

I. The latest progress in the research and application of global innovative diagnostic products

Faced with the continued challenges of emerging and re-emerging infectious diseases, health inequalities and other issues around the world, the research and development and application of innovative diagnostic products can not only improve the efficiency and accuracy of disease diagnosis and reduce the misdiagnosis rate, but also promote the rational allocation of medical resources and bring better and more efficient medical services to remote areas and vulnerable groups.

(1) In terms of technological research and development, the application of artificial intelligence technology rapidly improves product performance. SUN Kun, Dean, Xinhua Hospital affiliated to Shanghai Jiao tong University School of Medicine, pointed out that the diagnostic accuracy of cloud-based artificial intelligence stethoscopes is as high as 97%, greatly improving the auscultation ability of community-level doctors. The stethoscope based on the large body sound language model can be used not only for congenital heart disease screening, but also for early detection of diseases such as childhood pneumonia and enteritis. ZHENG Zhijie, Director, China Country Office, Bill & Melinda Gates Foundation, mentioned that AI-assisted reading of chest X-rays technology has significantly reduced the dependence of traditional chest X-ray screening on professional technicians, saved time and economic costs, and improved diagnostic efficiency. WENG Ruifen, Deputy Chief Executive Officer & Chief Technology Officer of the Diagnostics Development Hub (DxD Hub) in Singapore, mentioned that the application of digital technology in multimodal clinical information analysis effectively supports clinical decision-making and helps doctors better manage patients. Sulaby Dorsey, Senior Program Officer for EDGE at the Bill & Melinda Gates Foundation, emphasized that the digital development of diagnostic tools should deeply understand user needs at the foundational level, and take advantage of AI technology to further optimize the effectiveness and use of

diagnostic tools after data collection and validation.

(2) In terms of production and manufacturing, we should promote localized production to reduce costs and improve product accessibility. Taslimarif Saiyed, CEO of the Center for Cell and Molecular Platforms (C-CAMP), said that the India's diagnostic sector has significantly reduced the production cost of reagents through localized production, with many products now priced at less than 10% of their original levels. This has enabled small and medium-sized enterprises to obtain high-quality reagents at lower costs, greatly improving the accessibility of diagnostic tools. Amadou Sall, CEO of the Pasteur Institute in Dakar, Senegal, pointed out that the IPD is promoting the improvement of Africa's vaccine immunization autonomy through the MADEBA project and it is committed to localizing and industrializing diagnostic products. These initiatives significantly enhance Africa's ability to independently supply vaccines and diagnostic tools.

(3) In terms of innovative products, significant improvement has been made in their performance, sensitivity and convenience. David Boyle, Head of Diagnostics, PATH, pointed out that the breakthroughs in polymerase chain reaction (PCR) technique and genome sequencing technology have provided strong support for the advancement of modern diagnostic tools. The performance improvement of modern diagnostic tools is not only reflected in detection accuracy, but also in reducing the misdiagnosis rate and accelerating the processing speed. XIA Han, CEO, HUGO Biotech, explained the evolution of TB Easy (the Company's tongue swab diagnostic product). From the international standard to the loop-mediated isothermal amplification (LAMP) method and rifampicin resistance detection, and then to the tNGS drug resistance detection method proposed by the World Health Organization in 2023, the sensitivity and convenience of the product have been greatly improved. ZHUANG Yanwen, Director of InTec Global Health, shared the Company's innovative new product Cellcall. By improving antigen analysis performance, Cellcall has greatly enhanced the specificity and sensitivity of diagnosis, and become another milestone in the improvement of diagnostic performance of the product in this field.

(4) In terms of scenario applications, the application scenarios have expanded from infectious diseases to public health risk monitoring, and are becoming increasingly broad. SHI Xiaoming, Deputy Director of Chinese Center for Disease Control and Prevention, pointed out that the wastewater-based epidemiology (WBE) detection technology is not only applied to the monitoring of infectious diseases, but also extended to fields such as chemicals, drug resistance genes, and drugs, and is an important tool for public health risk monitoring. At present, many countries around the world have implemented large-scale wastewater surveillance for epidemic monitoring and risk assessment of transnational population movements. Galuh Budhi Leksono Adhi of the Tuberculosis Prevention and Control Working Group in Indonesia stressed that, from the diagnosis of high-burden diseases (such as tuberculosis)

Taslimarif Saiyed
CEO of C-CAMP

WENG Ruifen
Diagnostics Development (DxD) Hub

Bahati Ngongo
Central and Western Africa Regional Representative, Bill & Melinda Gates Foundation

Amadou Sall
CEO of the Pasteur Institute in Dakar, Senegal

SUN Kun
Dean, Xinhua Hospital affiliated to Shanghai Jiao tong University School of Medicine

XIA Han
CEO, HUGO Biotech

CAO Jinghua
Director of the International Cooperation Committee, Chinese Society of Biotechnology; Former Director General of Bureau of International Cooperation, Chinese Academy of Science

to the use of primary medical institutions, the wide applications of innovative diagnostic tools in the world, especially in low- and middle-income countries, have demonstrated their high adaptability, and achieved remarkable results in the primary medical system of underdeveloped countries.

II. Global challenges faced by innovative diagnostic products

On the one hand, the funding for the research and development of diagnostic products remains insufficient. Stubborn infectious diseases such as tuberculosis and malaria persistently challenge the detection capabilities of existing technologies, and the emergence of new infectious diseases requires innovative technological breakthroughs, all of which require a large amount of capital to be invested in the research and development of diagnostic products. ZHENG Zhijie pointed out that according to the World Health Organization's estimation, although 70% of medical decisions rely on diagnostic results, only 3% -5% of the global medical budget is used in the diagnostic field. WENG Ruifen mentioned that venture capital investment usually focuses more on drug development, while funding for diagnostic product research and development is seriously insufficient. Omar Najim, Executive Director of Healthcare and Life Sciences at United Al Saqer Group (UASG), pointed out that in the past, African, Middle Eastern, South American, and Asian countries mainly relied on diagnostic technologies from developed countries, while there was a serious lack of investment in localized diagnostic technology research and development. Bahati Ngongo, Central and Western Africa Regional Representative, Bill & Melinda Gates Foundation, emphasized that the lack of investment has hindered product innovation and R&D for neglected diseases.

On the other hand, the accessibility and distributional fairness of diagnostic products need to be improved urgently. Amadou A Sall mentioned that since the discovery of yellow fever virus in 1927, many new dangerous pathogens have been constantly discovered, and there is an urgent need globally to introduce more equitable and sustainable diagnostic products, especially in resource-limited regions such as Africa. In Africa, 99% of vaccine products rely on imports, while only 5% of diagnostic and medical equipment reagents are locally produced, resulting in a high degree of external dependence. ZHENG Zhijie said that despite the existence of many effective detection technologies and products, fair access on a global scale remains a challenge. David Boyle, Head of Diagnostics, PATH, pointed out that nearly 50% of the global population lacks access to diagnostic tools, especially in low - and middle-income countries where only 19% of patients can enjoy the most basic diagnostic services. SUN Kun mentioned that congenital heart disease is one of the important causes of child mortality, and many low-income countries have insufficient early screening and diagnostic capabilities, leading to an increased risk of missed diagnosis.

Panel Discussion

III. Relevant suggestions

The first is to reduce R&D costs through data resource sharing and create a full chain R&D service system. Taslimarif Saiyed pointed out that we should bring together governments, enterprises and suppliers by establishing the digital market platform, and we should utilize existing resources to build infrastructure and knowledge systems, which can greatly enhance the ecosystem of the diagnostic sector. Bahati Ngongo said that in clinical research, using digital systems to share research data can reduce R&D costs by 40-60%. He also stressed that digital platforms play an important role in technology sharing and improving cost-effectiveness, and can promote the research and development and application of innovative products for global health. WENG Ruifen mentioned that the Diagnostics Development Hub (DxD Hub) in Singapore provides incubation and technical support services for diagnostic companies throughout the entire chain, from production to regulation, quality control, clinical validation, and more.Such comprehensive support system can accelerate the commercialization process of research and development, and improve overall industry efficiency.

The second is to build up production and manufacturing capabilities through international cooperation and improve the accessibility of innovative products. David Boyle mentioned that resources and technology sharing among partners can not only significantly reduce development costs, but also accelerate product launch. The PATH organization is also helping Chinese companies to explore overseas markets and provide high-quality and affordable in vitro diagnostic products. Amadou Sall pointed out that with the support of international institutions such as the Bill & Melinda Gates Foundation, the African Development Bank, and the governments of France and the United Kingdom, the IPD has successfully built up the capacity for manufacturing diagnostic tools. In particular, it has achieved significant results in epidemic response and infectious disease prevention and control. Bahati Ngongo said that China-Africa cooperation has enormous potential in the fields of technology transfer, low-cost manufacturing, and molecular diagnostics. Future collaboration opportunities include leveraging mRNA, monoclonal antibodies and artificial intelligence technologies to achieve low-cost manufacturing, and further reducing costs and improving efficiency through clinical networks.

Future Materials Forum

Interdisciplinary Innovation and Sustainable Development

Editor's note: *With the theme of "Interdisciplinary Innovation and Sustainable Development", the Future Materials Forum under to the 2024 Pujiang Innovation Forum, the attendees conducted in in-depth discussions on new materials research in fields such as future information, future energy, and future biomedicine. This bulletin synthesizes the viewpoints of the guests at the Future Materials Forum for your reference.*

QIN Wenbo
Member of the Party Committee of the Shanghai Science and Technology Work, Secretary of the Party Committee of the Shanghai Academy of Sciences

ZHANG Xian
Vice Mayor of Shanghai Minhang District

LIU Weidong
Member of the Standing Committee of the Party Committee and Vice President of Shanghai Jiao Tong University

Harald Fuchs
Member of the German Academy of Sciences, Member of the German Academy of Engineering, Professor at the University of Münster, Germany

New materials are a fundamental resource for the development of high-tech and one of the key areas of international competition. In recent years, with the advancement of scientific and technological innovation and industrial transformation and upgrading, the new materials industry in China has exhibited a rapid development trend, but it also faces challenges such as insufficient supply of key raw materials, depend on others for core technologies, and insignificant industrial agglomeration effects. The guests present unanimously agreed that the development of materials science has entered a new stage, with interdisciplinary cross-integration and biomimetic innovation becoming the most important features. The research and development of future materials will further break through traditional theoretical bottlenecks and accelerate towards intelligent and green directions. It is necessary to further strengthen policy guidance and support, and enhance industrial innovation capabilities and competitiveness.

I. The importance of accelerating the R&D and innovation of future materials

Firstly, the research and development of new materials directly promotes technological progress and industrial upgrading in various fields. The in-depth integration of new materials with new-generation information technologies such as big data, cloud computing and artificial intelligence has directly given rise to new model innovations such as smart manufacturing and smart sensing, and made the manufacturing sector higher-end and better targeted. ZHANG Yue, Academician of the Chinese Academy of Sciences and Professor at University of Science and Technology Beijing, pointed out that whether China's goals to peak carbon dioxide emissions before 2030 and achieve carbon neutrality before 2060 (China's "3060 Goals") can be achieved depends on whether the steel industry can be switched from the carbon reduction system to the hydrogen reduction system, in which the development of high-efficiency catalytic electrode materials plays a crucial role. Vadim Grinenko, Professor at Tsung-Dao Lee Institute, Shanghai Jiao Tong University, pointed out that the development of new superconducting materials has promoted the development of nuclear magnetic resonance (NMR) technology, enabling the medical community to diagnose diseases more accurately. SONG Cheng, Professor at Tsinghua University emphasized that the large bandwidth magneto-electric (ME) antenna

ZHANG Yue
Academician of the Chinese Academy of Sciences, Fellow of the World Academy of Sciences，Professor at University of Science and Technology Beijing

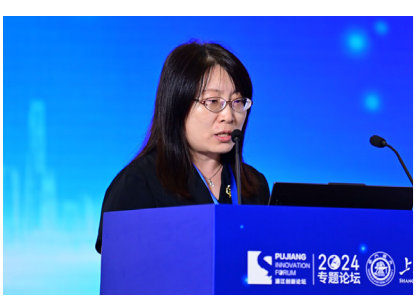
Hasan MANDAL
President of the World Association of Industrial and Technological Research Organizations

Oliver G. Schmidt
Member of the German Academy of Science and Engineering, Professor at Chemnitz University of Technology, Germany

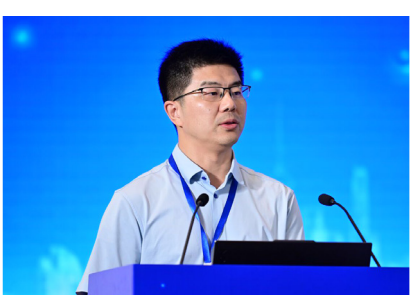
ZHANG Di
Academician of the Chinese Academy of Sciences, Professor at Shanghai Jiao Tong University

YU Yan
Professor at University of Science and Technology of China

LIU Gang
Researcher at the Institute of Metals, Chinese Academy of Sciences



JIAO Lifang
Professor at Nankai University



SONG Cheng
Professor at Tsinghua University

Vadim Grinenko
Professor at Tsung-Dao Lee Institute, Shanghai Jiao Tong University

manufactured based on the 20º Y-X LiNbO3 surface acoustic wave resonator supports the development of next-generation communication technology, enabling ordinary mobile phones to directly connect with satellites, thereby ushering in a new era of communication.

Secondly, for the purpose of overall national security, it is required to accelerate the independent research and development of new materials. ZHANG Di, Academician of the Chinese Academy of Sciences, Professor at Shanghai Jiao Tong University, pointed out that Shanghai Jiao Tong University has long focused on independent research and development of new space materials, providing support for spacecraft structures and key components, and supporting the stable operation of Tiangong-1, Chang'e probe and other outer space missions. YU Yan, Professor at University of Science and Technology of China believes that the development of emerging electrochemical energy storage technologies, such as sodium ion batteries, has enabled us to hold the core technologies of China's battery system in our hands, not subject to others.

DAI Qing
Professor at Shanghai Jiao Tong University

ZENG Xiaoqin
Professor at Shanghai Jiao Tong University

WANG Hong
Professor at Shanghai Jiao Tong University

HUANG Fuqiang
Professor at Shanghai Jiao Tong University

ZHAO Yixin
Professor at Shanghai Jiao Tong University

YU Yanlei
Professor at Fudan University

II. Key layout directions for future materials: cross-integration, smart, and eco-friendly

The first is to focus on cross-integration, and attach importance to interdisciplinary and cross-field collaborative research and development to achieve the design and preparation of high-value new materials. ZHANG Di pointed out that by combining aluminum-based materials with carbon nanotubes, we can manufacture composite materials with high specific strength and large specific modulus. Applying such composite materials to the design of key force-transmitting structures will give rise to significant military, economic and social benefits. SONG Cheng pointed out that through the coupling electromagnetism and acoustics as well as the research and development of magneto-electric antennas and magneto-dependent sensors, we can achieve the miniaturization of microwave devices at a faster pace. At the same time, we should attach great importance to drawing inspiration from nature and carrying out bionic innovation. LIU Gang, Researcher at the Institute of Metals, Chinese Academy of Sciences, pointed out that drawing on the plant inter-planting strategy in agricultural planting, such as corn + peanut, we can conduct patterned and orderly assembly of the randomly disordered photocatalytic oxidation and photocatalytic reduction material particles, thereby greatly improving the efficiency of photocatalytic total water splitting. ZHANG Di emphasized that the research and development of composite materials has progressed from material quality composite to the advanced stage of configuration composite. For example, the "butterfly wing" configuration composite material developed by simulating the fine structure of natural butterfly wings can generate light gain coupling and effects, which can be used to develop more efficient solar light absorbing materials.

The second is to focus on intelligence and develop smart materials with the functions of perception, self-repair and intelligent response to the external environment to achieve precise functional control. Harald Fuchs, Member of the German Academy of Sciences, Member of the German Academy of Engineering, Professor at the University of Münster, Germany, introduced the latest progress in his research on surface in-situ precision chemistry, demonstrating how specific surface chemical molecules can reconstruct

the atomic structure of copper metal surfaces through self-organization. Oliver G. Schmidt, Member of the German Academy of Science and Engineering, Professor at Chemnitz University of Technology, Germany, pointed out that achieving the self-sustainability, self-sufficiency, and self-reproduction is an important direction for the development of new materials. For example, the micro origami robot "ZhiZi" assembled from flexible materials, solar cells, optical induction, and micro motors can sense the environment, connect with its peers, and form various forms through self-assembling, and it can be used to perform specific tasks.

The third is to focus on eco-friendly, develop green, recyclable and low-carbon high-performance materials, and promote sustainable and high-quality development. Hasan MANDAL, President of the World Association of Industrial and Technological Research Organizations (WAITRO) and Rector of Istanbul Technical University, pointed out that in order to achieve the goal of controlling the average temperature rise of the Earth within 1.8ºC by 2050, it is necessary to vigorously promote new battery technology and renewable energy technology, both of which cannot be separated from the application of new materials. The implantable photocatalytic material $BiVO_4$ thin film developed by LI Gang exhibits many advantages such as scalability, versatility, flexibility, and recyclability. The antenna beamforming technology developed by SONG Cheng based on material innovation has successfully ensured low-power and high-performance satellite communication.

The "Belt and Road" Seminar

Belt and Road Initiative Joint Laboratories to Advance Sci-Tech Innovation in the World

Editor's note: *With the theme of "Belt and Road Initiative Joint Laboratories to Advance Sci-Tech Innovation in the World", the "Belt and Road" Seminar under to the 2024 Pujiang Innovation Forum, experts and scholars from China, South Africa, Brazil, Saudi Arabia and other countries conducted in-depth discussions around practical experience, future needs, cooperation suggestions, etc. regarding the establishment of joint laboratories. This bulletin summarizes the viewpoints of the guests at the "Belt and Road" Seminar for your reference.*

DAI Gang
Director-General of Ministry of Science and Technology

Ophelia Hayford
Minister, Ministry of Environment, Science, Technology, Ghana

YE Yang
Deputy Director, Shanghai Institute of Materia Medica, Chinese Academy of Sciences; Director, China-Serbia "Belt and Road" Joint Laboratory on Natural Products and Drug Discovery

Mohamed-Elamir Fathy Hegazy Sayed Khalaf
Director, Regional Development Centres, Academy of Scientific Research and Technology, Egypt

Building joint laboratories is an important way to promote scientific and technological cooperation among countries along the Belt and Road. Currently, China has established 53 joint laboratories with countries along the Belt and Road to promote joint R&D in key fields, organize technology demonstration and extension actively, train scientific and technological talents jointly, and boost scientific and technological cooperation under the Belt and Road Initiative. The guests present agreed unanimously that in the future, scientific and technological cooperation under the Belt and Road Initiative should be taken to a new stage by promoting in-depth and practical scientific and technological cooperation under the Belt and Road Initiative, strengthening the building of a multilateral network, and creating a bridge for cultural exchanges and identity with joint laboratory building being the lever.

I. Joint laboratory building injects new momentum into the Belt and Road

First, joint laboratory building opens up a new path of scientific and technological cooperation under the Belt and Road Initiative. Joint laboratory building is a new model of Chinese-foreign scientific and technological cooperation, which integrates resources from all parties to address technical challenges faced by countries along the Belt and Road jointly, accelerate the transformation and application of scientific and technological achievements, and promote regional scientific and technological progress, and economic development. Mohamed-Elamir Fathy Hegazy Sayed Khalaf, Director, Regional Development Centres, Academy of Scientific Research and Technology, Egypt, said that China and Egypt have signed a laboratory agreement to support the establishment of regional renewable energy development centers, and promote the transfer of renewable energy technologies, promoting the diversified development of energy in Egypt and unleashing new vitality in the country greatly. ZOU Jinbai, Deputy Director, Department of Smart Tech, Director of the School of Railway Transportation, Shanghai Institute of Technology; Director, International Joint Laboratory on the China-Laos Railway Project, said that the China-Laos Railway Joint Laboratory values the training of talents in the field of rail transit in both countries, and deepens scientific and technological cooperation through talent training for railway safety assurance technology, mobile equipment monitoring and intelligent analysis technology, intelligent analysis and early warning platform development, etc. YE Yang, Deputy Director, Shanghai Institute of Materia Medica, Chinese Academy of Sciences; Director, China-Serbia "Belt and Road" Joint Laboratory on Natural Products and Drug Discovery, pointed out that the laboratory fully combines Serbia's resource advantages with China's technological advantages, and injects new momentum into the medical scientific and technological innovation under the Belt and Road Initiative.

Second, Belt and Road joint laboratories have become a key force in

addressing global challenges jointly. Currently, major challenges such as climate change, healthcare, and food security pose a serious threat to the sustainable development of humanity. China keeps expanding the cooperation space to address global challenges with the goal of sticking to high standards and sustainability, and benefiting people's livelihoods by working hand in hand with countries along the Belt and Road. Mlungisi Cele, Acting Head, National Advisory Council on Innovation, South Africa, said that strengthening cooperation in scientific and technological innovation among countries is the key to addressing major challenges such as global transformation, climate change, energy-water-food, and geopolitical crises. ZHANG Yonghe, Deputy Director, Innovation Academy for Microsatellites of Chinese Academy of Sciences (Chinese Responsible Unit of the China-Portugal STARLab), said that the China-Portugal Joint Laboratory gives full play to the advantages of Portugal's marine resources and China's advanced aerospace technology, and contributes both countries' wisdom and technological power of the two countries in build a community with a shared future for mankind through advantage complementation, and mutually beneficial cooperation. Theis Ivan Solling, Professor, Director of Center for Integrated Petroleum Research, King Fahd University of Petroleum and Minerals, thought that only by strengthening international cooperation can we address global change and uncertainties of the global energy market, and address energy security challenges jointly.

ZHANG Yonghe
Deputy Director, Innovation Academy for Microsatellites of Chinese Academy of Sciences (Chinese Responsible Unit of the China-Portugal STARLab)

Amilcar Rabelo de Queiroz
Professor, Federal University of Campina Grande, Brazil

II. Joint laboratories lead the new future of scientific and technological cooperation under the Belt and Road Initiative.

First, strengthen the building of a multilateral cooperation network based on the joint laboratory building. DAI Gang, Director-General of Ministry of Science and Technology, pointed out that the Ministry of Science and Technology will continue to promote international scientific and technological exchanges, tap innovation growth potential together with all countries, strengthen innovation partnerships, and let innovation achievements benefit all peoples. Ophelia Hayford, Minister, Ministry of Environment, Science, Technology, Ghana, said that Ghana will continue to promote the building of the Belt and Road joint laboratory, and strengthen multilateral network partnerships in the future. YE Yang pointed out that the China-Serbia Joint Laboratory has established an alliance for natural products and new drug discovery with other regions within the Balkan Peninsula. It is advised to absorb more biopharmaceutical companies, accelerate natural product R&D and technology transfer, and strengthen multilateral cooperation relationships by establishing an industry alliance.

Second, promote in-depth and practical joint laboratory building by adhering to the principle of joint consultation, joint building and sharing. Ophelia Hayford suggested that both sides should focus on establishing joint research and innovation centers in the fields of renewable energy, agriculture, and digital technology to provide solid support for China and Ghana to address

Theis Ivan Solling
Professor, Director of Center for Integrated Petroleum Research, King Fahd University of Petroleum and Minerals

ZOU Jinbai
Deputy Director, Department of Smart Tech, Director of the School of Railway Transportation, Shanghai Institute of Technology; Director, International Joint Laboratory on the China-Laos Railway Project

Mlungisi Cele
Acting Head, National Advisory Council on Innovation, South Africa

LIU Dongmei
Party Secretary, CASTED

ZENG Fang
President, SISTM

local and global challenges. Mohamed Hegazy said that the China-Egypt Joint Laboratory has made significant achievements in sustainable energy, biomass power plants, international training, and personnel exchanges. He pointed out that in the future, technical support for Egypt should be strengthened, multidisciplinary investment promoted, and more advanced equipment introduced to improve the joint R&D level, and address large-scale complex challenges.

Third, create a bridge for cultural exchanges and identity, and take scientific and technological innovation cooperation to a new stage. ZHANG Yonghe said that the China-Portugal Joint Laboratory is gradually turning into an international research platform other than one dominated by the Chinese Academy of Sciences to further expand its global influence. In addition, it will promote cultural identity and understanding between China and Portugal, and take scientific and technological innovation cooperation to a new stage through cultural exchanges such as short videos.

Young Scientists Symposium

Editor's note: *At Young Scientists Symposium under the 2024 Pujiang Innovation Forum, ten outstanding young scientists from different fields conducted in-depth discussions around carrying on the scientist spirit and shouldering the mission of building a strong country bravely. This bulletin summarizes the viewpoints of the guests at Young Scientists Symposium for your reference.*

LONG Teng
Vice Minister of the Ministry of Science and Technology

CHEN Jie
Vice Mayor of Shanghai

BAI Lei
Young Scientist at Shanghai Artificial Intelligence Laboratory

GONG Ming
Young Researcher at Fudan University

The scientist spirit is valuable spiritual wealth gained by scientific and technological workers through long-term science practice. In this critical period of promoting the building of a socialist modern powerful country and the great cause of national rejuvenation through Chinese modernization, young scientists should uphold the patriotism-based scientist spirit, dedicate themselves to our country, and overcome challenges in science and technology bravely. Around how to create favorable academic ecology, the young scientists present agreed unanimously that they should keep conducting mission-oriented, problem-oriented and long-term scientific research, and suggested creating better conditions for young talents to realize their dreams through differentiated talent training, optimized resource allocation, reform of scientific research evaluation, and innovation environment improvement.

I. Practical requirements for carrying on the scientist spirit in the new era

(1) Being down-to-earth and problem-oriented is the basic connotation of the scientist spirit. ZHENG Qinghua, President of Tongji University, pointed out that as scientific researchers, we should seek, explore and study real problems, and in this process, explore real methods, produce real results, make real contributions, and realize real self-value. GONG Ming, Young Researcher at Fudan University, pointed out that homogenization in academic research is increasingly prominent, some innovative studies with real potential are drown out, and finding and supporting heterogeneous and truly innovative studies is necessary for the future.

(2) Meeting challenges and long-termism are inherent requirements of the scientist spirit. LONG Teng, Vice Minister of the Ministry of Science and Technology, pointed out that scientific research should be oriented to long-termism rather than a fast-track approach. Some academicians have not been included in any talent program such as the National Science Fund for Distinguished Young Scholars and the Changjiang Scholars Program, and have even not received any national award, but still have been elected successfully for their strong scientific research capabilities and outstanding contributions. Associate professor LI Kun, Associate Professor at Tsinghua University proposed that in the allocation of research funds, greater support should be given to original, long-term and diversified studies. JIANG Junhai, President of Dongfang Jingyuan Electron Co., Ltd., proposed that it is necessary to keep exerting the influence of mainstream media to create an atmosphere that recognizes and pursues scientists in society.

(3) The core essence of the scientist spirit is to assume responsibility bravely and be mission-oriented. BAI Lei, Young Scientist at Shanghai Artificial Intelligence Laboratory, proposed that young talents should be encouraged to volunteer, and more young researchers working at the frontline should be given an opportunity to serve as project leaders. GONG Ming proposed that currently, more young scholars are still undertaking youth projects or playing

the role of implementing scientific research practically in major projects, but not playing a core role in major projects yet. It is necessary to further engage young talents in major projects, and give young people an opportunity to lead such projects. LI Shaoqian, Deputy Director of the Navigation Satellite System Institute, Innovation Academy for Microsatellites of Chinese Academy of Sciences, proposed that young scientists should be invited to take the lead, and multiple young teams be supported to innovate boldly in parallel in key and difficult technology fields.

XU Yuan
Researcher at Shenzhen International Quantum Academy

YIN Jun
Professor at Nanjing University of Aeronautics and Astronautics

LI Shaoqian
Deputy Director of the Navigation Satellite System Institute, Innovation Academy for Microsatellites of Chinese Academy of Sciences

LI Kun
Associate Professor at Tsinghua University

II. Key restraints on the development and succession of the scientist spirit

First, insufficient support for basic research affects the enthusiasm of young talents for devoting themselves to research. GAO Shan, Professor at Ocean University of China proposed that many project applications are increasingly focused on the application and transformation of results, but not all achievements can be transformed immediately, and not all scientists are good at both research and transformation. It is necessary to leave a reserved space for basic research and give more patience to researchers who focus on basic research. XU Yuan, Researcher at Shenzhen International Quantum Academy, proposed that basic research is the cornerstone of scientific and technological innovation, and only with a solid foundation can a building stand firm. We should strengthen the construction of and investment in scientific research infrastructure, and improve the level of scientific research equipment.

Second, the lagging paradigm of scientific research management consumes much energy for young talents. BAI Lei pointed out that application for scientific research projects tends to be lengthy and complex, which affects the efficiency and quality of project application seriously, and also increases the burden on applicants and reviewers. XU Yuan pointed out that there are still problems such as complex approval processes and non-transparent use of funds in scientific research project management, and suggested further simplifying scientific research management processes, reducing unnecessary administrative intervention and excessive steps, and allowing researchers to spend more time and energy on scientific research. GONG Ming proposed that many academic conferences are tending formalistic, and even becoming a burden in academic social interactions. It is necessary to optimize the conference selection mechanism, merge some similar conferences, and improve the quality of conferences.

Third, the mismatch of innovation resources is adverse to the rapid growth of young talents. BAI Lei pointed out that the current allocation of achievements, contribution evaluation, scientific research ecology, etc. both at home and abroad are unfavorable for interdisciplinary and cross-team organized research. Many awards only consider first authors, and for doctoral graduates, their first employers or the number of papers published during their doctoral studies are considered. XU Yuan pointed out that current research directions and resources in some fields are too concentrated, while research in some

SUI Shaochun
Party Secretary of Chengdu Aircraft Industrial (Group) Co., Ltd. of Aviation Industry Corporation of China, Ltd.

JIANG Junhai
President of Dongfang Jingyuan Electron Co., Ltd.

GAO Shan
Professor at Ocean University of China

GU Guoying
Professor at Shanghai Jiao Tong University

emerging and basic fields is relatively insufficient. "Follow-suit" and "hotspot-pursuing" research prevails, which is likely to result in a waste of resources.

III. Keeping creating a free and inclusive innovation environment for young scientists

First, attach importance to the building of a classified evaluation system for scientific research. YIN Jun, Professor at Nanjing University of Aeronautics and Astronautics pointed out that currently, scientific research evaluation activities are still guided by explicit indicators such as hats, papers and rewards, and a new classified evaluation system suited to the pattern of scientific research activities has not been established yet. GAO Shan proposed that scientific research resources should be evaluated and allocated based on the value of scientific research, so that young talents can make truly innovative and creative achievements with passion and expectations. BAI Lei proposed that researchers should be evaluated in more dimensions, and differentiated evaluation methods should be explored by reference to the Oscars, such as "Best Director", "Best Group Performance", and "Best Music".

Second, improve the long-term talent evaluation system suited to the growth pattern of young talents. LI Kun suggested establishing a sustainable evaluation system for young scientists, and using the "baton" to encourage scientific researchers to conduct research oriented to long-term development. JIANG Yugang, Member of the Standing Committee of the Party Committee and Vice President of Fudan University, proposed that the university has set up the honorary academic position of "Xianghui Young Scholar", and replaced conventional evaluation with performance-based evaluation for outstanding young talents, where interim academic summarization is conducted once or twice over a long period, with focus on the working status and research progress of young talents.

Third, create differentiated talent training paths. ZHENG Qinghua proposed to distinguish between the two talent training methods of the "long sword type" and the "aircraft carrier type", where the sword edge of "long sword type" talents can reach depths, heights and thicknesses that are impossible for others." Aircraft carrier type" talents are

JIANG Yugang
Member of the Standing Committee of the Party Committee and Vice President of Fudan University

ZHOU Cheng
Deputy Secretary of the Party Committee of Shanghai Jiao Tong University

ZHENG Qinghua
President of Tongji University

characterized by a broad vision and a broad mind, and can play the platform role of uniting and organizing all types of talents. GAO Shan proposed that in the building of organizational platforms, attention should be paid to the training of associated professional technicians, who should be offered stable positions and high salaries, otherwise frontline researchers would have to become versatile and cannot concentrate on their main research tasks.

Fourth, ensure the fair and reasonable allocation of innovation resources. XU Yuan proposed to provide young talents with more project application opportunities, career development guidance, and international exchange opportunities. GU Guoying, Professor at Shanghai Jiao Tong University, proposed that local young talents should be given the same opportunities and treatment as overseas talents in order to better retain top local talents. ZHOU Cheng, Deputy Secretary of the Party Committee of Shanghai Jiao Tong University, proposed that the university is optimizing the talent training pyramid, and providing support to talents at different development stages through a hierarchical talent program. XU Yuan proposed to strengthen the management of the mental health of scientific researchers, and improve their working and living conditions, and benefits.

Shanghai International Computational Biology Innovation Forum

Empowering Biopharmaceutical Innovation with Computational Biology

Editor's note: *With the theme of "Empowering Biopharmaceutical Innovation with Computational Biology", the Shanghai International Computational Biology Innovation Forum under to the 2024 Pujiang Innovation Forum, the guests present conducted in-depth discussions on computational biology and its applications to biomedicine R&D. This bulletin summarizes the viewpoints of the guests at the Shanghai International Computational Biology Innovation Forum for your reference.*

Computational biology is an interdisciplinary field that studies biology using computer technology. With the rise of AI technology, the discipline has realized leapfrog development, and is redefining the underlying logic of biomedicine R&D. The guests present agreed unanimously that computational biology is driving a new paradigm shift in life science research from an "experience-driven" one relying on experiments to a "data-driven" one. We should promote the high-quality development of computational biology, and empower innovation in biomedical technology and industry upgrading by allocating core factors and resources, attracting worldwide talents, and controlling the commanding point of innovation.

I. Computational biology empowers the development of life sciences and biomedicine deeply

(1) Crack the code of life and reveal the complex life regulation network. Péter Ferdinandy, Vice Rector for Science & Innovations, Semmelweis University, Budapest, Hungary, pointed out that multi-omics analysis can help identify key regulatory factors in molecular networks, and a microRNA that affects the outbreak and development of myocardial infarction has been discovered. Qiao Nan, Chief Scientific Officer of Healthcare, Huawei Cloud Computing Technologies Co., Ltd., pointed out that developing multi-omics data analysis tools and applying them to potential pathogen discovery has important value for the identification and prevention of infectious diseases. ZHAO Xingming, Professor at Fudan University, proposed that conducting comprehensive analysis of genomes, transcriptomes, metabolomes, microbiomes and radiomics is crucial for systematic research on mechanisms of brain diseases.

(2) Promote the paradigm shift in biomedicine R&D to empower new drug discovery. Computational biology can perform preliminary screening through computers, eliminate meaningless samples, and then validate them using biological methods, which can shorten drug development lead times and reduce costs significantly. WANG Shihang, representative of the award-winning team at ShanghaiTech University, pointed out that the Geminimol model developed by them can screen 18 million compound molecules in the original database quickly, accelerating the discovery of new active compounds significantly. QIAO Nan proposed that the application of AI technology can save 70 percent of drug design time and increase the success rate by 10 times.

(3) AI+ healthcare improves full-lifecycle health management and service capabilities. QIAO Nan proposed that with the rapid development of large models, it is now possible to consider building a clinical service large model that integrates clinical regulations, clinical knowledge graphs, and differential diagnosis and treatment habits. WANG Jian, Director of the Department of Neurology, Huashan Hospital affiliated to Fudan University, proposed that AI empowers the clinical diagnosis and treatment of Parkinson's disease by combining AI with molecular imaging and computer vision-based behavioral

GAO Zhaobing
Professor, Shanghai Institute of Materia Medica, Chinese Academy of Sciences; Vice President, Chinese Academy of Sciences Shanghai Branch; Director, State Key Laboratory of New Drug Research

Péter Ferdinandy
Vice Rector for Science & Innovations, Semmelweis University, Budapest, Hungary

QIAO Nan
Chief Scientific Officer of Healthcare, Huawei Cloud Computing Technologies Co., Ltd.

WANG Jian
Director of the Department of Neurology, Huashan Hospital Affiliated to Fudan University

ZHAO Xingming
Professor at Fudan University

LI Jizong
Director of Shanghai Center of Biomedicine Development

analysis, which can help realize the early diagnosis and treatment of Parkinson's disease.

II. Speeding up algorithm upgrading and realizing full-lifecycle embedding in drug development are future key directions to be focused on in computational biology.

On the technology side, algorithms are validated and iteratively optimized through feedback from wet experimental data. The Shanghai International Computational Biology Innovation Competition focuses on the application of AI to the development of ion channel drugs, and applies an innovative competition system that combines dry and wet experiments in order to verify algorithms practically and promote their iterative optimization. GAO Zhaobing, Professor, Shanghai Institute of Materia Medica, Chinese Academy of Sciences; Vice President, Chinese Academy of Sciences Shanghai Branch; Director, State Key Laboratory of New Drug Research, pointed out that the continual improvement of molecular activity through algorithm upgrading will help truly analyze the functions of the GluN1/GluN3A subtypes that have not been fully studied in the NMDA channel family, and accelerate the development of candidate drugs.

On the application side, computational biology should be embedded into the whole lifecycle and process of drug development precisely.(1) In terms of original target discovery, computational biology has advanced the in-depth understanding of pathological mechanisms of diseases greatly, and provided a new perspective for the identification of new targets and the screening of biomarkers. GAO Zhaobing pointed out that the lack of original drug targets is a prominent problem in China's original drug R&D field. The research team at the Shanghai Institute of Materia Medica attaches great importance to the key role of computational biology and AI in promoting the development of original drugs, and has discovered four new ion channels using relevant technology platforms. QIAO Nan proposed that by combining AI technology and molecular dynamics simulation, we can calculate structures of targets or the binding of targets to ligands more accurately, and improve the efficiency of target discovery. (2) Regarding the discovery and design of new molecular entities, QIAO Nan said that the application of AI technology has lowered the threshold of drug design, and allowed researchers to apply new tools and methods to drug design conveniently.

III. Suggestions for promoting the innovation and development of computational biology

First, allocate core factors and resources, and establish a multimodal database and an AI driven drug development platform. ZHAO Xingming proposed building a multi-disease, cross-dimensional multimodal brain science data platform for the Chinese population, and collecting full-lifecycle gene, image behavior and cognitive data covering the population systematically to analyze mechanisms of brain diseases deeply. GAO Zhaobing reported on an ion channel drug development platform that combines computational biology and AI, and demonstrated its application to the discovery of novel ion channels. Péter Ferdinandy reported on a proprietary AI driven drug development platform that can be used for drug discovery for multiple diseases such as cardiovascular diseases and cancer.

Second, run the Computational Biology Innovation

Award Ceremony 2023 Shanghai International Computational Biology Challenge

Competition properly to attract more talents from the AI industry to the biomedicine field. The Shanghai International Computational Biology Innovation Competition aims to select a number of outstanding talents and organizations, and attract them to Shanghai, thereby selecting projects and talents to empower innovation in biomedical technology and industry development. GAO Zhaobing pointed out that a large number of teams with innovative and disruptive thinking emerged, and an array of creative technological routes that can integrate AI into drug discovery effectively were proposed at the competition. The competition is expected to be a good beginning of the future cause of promoting the development and innovation of candidate drugs through further technological upgrading.

Aerospace and Marine Advanced Science and Technology Forum

Editor's note: *At the Aerospace and Marine Advanced Science and Technology Forum under the 2024 Pujiang Innovation Forum, renowned domestic experts and scholars conducted in-depth discussions on the current status and future trends of advanced science and technology development. This bulletin summarizes the viewpoints of the guests at the Aerospace and Marine Advanced Science and Technology Forum for your reference.*

Climate change is a severe challenge faced by humanity, and requires joint efforts from all countries around the world. The aerospace and marine fields cover multiple aspects such as space, atmosphere, marine research, and advanced equipment manufacturing, and collaborative innovation in these fields will play a crucial role in addressing global challenges such as climate change and energy shortage. The guests present agreed unanimously that advanced science and technology is the key to promoting the high-quality development of aerospace and marine scientific research. In the future, the focus should be on applying data science and AI technology to model and deeply analyze massive data, and realize more efficient scientific research and technological applications through a multidisciplinary integrated space-air-ground-sea observation and communication system.

I. Addressing global climate change requires cooperation in scientific and technological innovation

First, the demand for innovation in aerospace and marine technology driven by global climate change is increasing. HAN Zhen, Director of Shanghai Estuary Marine Surveying and Mapping Engineering Technology Research Center, Shanghai Ocean University, pointed out that as ecologically vulnerable areas, worldwide coastal zones have been affected by the rapid development of industrialization and urbanization, which has not only changed land use types and industry structures, but also led to significant changes in the offshore environment. There is an urgent need for effective monitoring using emerging technologies such as satellite remote sensing technology. TANG Jie, Director of Asia-Pacific Typhoon Collaborative Research Center, pointed out that according to the World Meteorological Organization, one third of worldwide cyclones are from tropical regions, half of which arise from typhoons, becoming one of the major threats to global public safety. However, there are still limitations in existing meteorological observation technologies and means of monitoring. Robertus Heru Triharjanto, Director of the Aerospace Research Center, National Research and Innovation Agency (BRIN), Indonesia, further emphasized that climate change is causing increasingly severe damage to Indonesia's coastal ecosystems, with some small fishing villages disappearing and food output declining. To address this challenge, there is an urgent need for Indonesia to develop a more accurate remote sensing technology to better monitor sea level rise, and changes in forests and mangroves.

Second, cooperation in scientific and technological innovation has become a consensus in addressing environmental and climate change. Joaquim João Sousa, Senior Researcher of Institute for Systems and Computer Engineering, Technology and Science, pointed out that cooperation in global open source innovation helps train next-generation Earth observation satellite leaders to address global challenges such as climate change, energy shortage, and limited resources. Ali AL Shehhi, Director of the National Space Science

HU Haiying
President of Innovation Academy for Microsatellites of CAS, China

QU Wei
Deputy Director, Shanghai Municipal Commission of Science and Technology, China

Ali AL Shehhi
Director of the National Space Science and Technology Center (NSSTC), United Arab Emirates University

NIE Jie
Professor at Ocean University of China

Robertus Heru Triharjanto
Director of the Aerospace Research Center, National Research and Innovation Agency (BRIN), Indonesia

HAN Zhen
Director of Shanghai Estuary Marine Surveying and Mapping Engineering Technology Research Center, Shanghai Ocean University

Joaquim João Sousa
Senior Researcher of Institute for Systems and Computer Engineering, Technology and Science

Bradley Allen Weymer
Tenure Track Associate Professor, School of Oceanography, Shanghai Jiao Tong University

and Technology Center (NSSTC), United Arab Emirates University, said that global innovation cooperation in space technology has brought many new opportunities, including joint satellite mission development, joint spaceflight science programs, joint building of key laboratories, and satellite data sharing. ZHANG Yonghe, Vice President of Innovation Academy for Microsatellites of CAS, China, pointed out that STARLab, an aerospace and marine research platform jointly built by China and Portugal, focuses on solving major problems and challenges such as cosmic exploration, global climate change, and the blue economy.

II. Future development trends of aerospace and marine technology, and relevant suggestions

First, multiple key technological directions are emerging in the field of aerospace and marine technology. WANG Shuxiang, Director of the Deep Sea Science and Information Technology Research Laboratory, Institute of Acoustics, Chinese Academy of Sciences, said that future breakthroughs in marine information technology are expected to create an underwater navigation "constellation" based on Beidou navigation, and realize high-precision positioning for unmanned underwater vehicles (UUVs) and other underwater vehicles, as well as large-scale, long-endurance and low-cost deep-sea navigation and positioning. NIE Jie, Professor at Ocean University of China, said that the marine climate forecast system involves large-scale physical movements, and microscopic, fast dynamic events (sea waves, breezes, etc.), which are coupled with one another, requiring the creation of a more complex and powerful prediction model. Bradley Allen Weymer, Tenure Track Associate Professor, School of Oceanography, Shanghai Jiao Tong University, pointed out that existing technologies such as satellite imagery, LiDAR, drones, and remotely operated vehicles can hardly realize the precise observation of the coastline environment. Combining remote sensing with near-surface data is a promising solution. Ahmet Hamdi TAKAN, Space Technology Expert at the Turkish Space Agency, mentioned that lunar and deep space exploration missions are facing numerous challenges, including launching and propulsion technologies, landing dynamics and ground maneuverability, extreme conditions, autonomous operation, and other technological problems.

Second, interdisciplinary research has become an important path of innovation in aerospace and marine technology. Bradly Allen Weymer pointed out that this has benefited from new technology. With the optimization of existing geophysical tools, and the development of new technologies, advances in satellite imaging, machine learning, AI, and statistical modeling have driven the integration of geophysical imaging and satellite remote sensing technology. Joaquim João Sousa said that the automatic image analysis of synthetic aperture radars (SARs) on Earth observation satellites faces challenges in ground observation, but AI-based applications are driving technological

TANG Jie
Director of Asia-Pacific Typhoon Collaborative Research Center

Ahmet Hamdi TAKAN
Space Technology Expert at the Turkish Space Agency

WANG Shuxiang
Director of the Deep Sea Science and Information Technology Research Laboratory, Institute of Acoustics, Chinese Academy of Sciences

SHU Rong
Secretary of Innovation Academy for Microsatellites of CAS, China

ZHANG Yonghe
Vice President of Innovation Academy for Microsatellites of CAS, China

Farid Gamgami
Deputy Director, Key Laboratory for Satellite Digitalization Technology of CAS, China

breakthroughs, and boosting global climate and environmental monitoring. Farid Gamgami, Deputy Director, Key Laboratory for Satellite Digitalization Technology of CAS, China, pointed out that the world's first 3D printed rocket (Terran 1) was launched in March 2023, with 85 percent of its components made by 3D printing; 3D printing technology has shortened the time of conventional rocket propeller design and production from six months to five days. Realizing this technology requires high-strength special-purpose 3D printing materials, a process control system driven by AI, efficient sensors, and an efficient analysis system.

Third, innovative achievements of aerospace and marine technology will match diverse application scenarios. Robertus Heru Triharjanto pointed out that Indonesian government agencies apply remote sensing satellite technology extensively, where mapping agencies update national maps, the Ministry of Agriculture evaluates agricultural land and crop yields, the Ministry of Public Works monitors infrastructure, and the Ministry of Marine Affairs and Fisheries monitors illegal fishing, all through satellites, while provincial and regional governments analyze socioeconomic conditions through the geographic information system (GIS). Joaquim João Sousa mentioned that Earth observation satellites are applied extensively to global climate and environmental monitoring, including the monitoring of water resources, vegetation, crops, forest fires, and geological disasters. TANG Jie said that the space-air-ground-sea multimodal monitoring platform collects massive data, enabling us to gain a deeper understanding of impacts of typhoons on the urban environment, and improve the accuracy of typhoon prediction by 5-20 percent.

Fourth, promote innovation and development in the aerospace and marine fields through the in-depth application of AI and in-depth cross-border R&D cooperation. NIE Jie suggested strengthening the application of AI to marine big data analysis, and climate and environmental prediction models, especially through the use of deep neural networks and data-driven models, which can improve the prediction accuracy of climate and the marine environment significantly, and realize refined and intelligent marine scientific research. Joaquim João Sousa suggested strengthening global cooperation and open source innovation cooperation to promote the further development of Earth observation technology. He pointed out

that AI and machine learning technologies have great potential in improving image resolution, temporal resolution, and data aggregation and analysis capabilities. Ali Al Shehhi pointed out that cross-border cooperation still faces many challenges, such as export controls, differences in technology transfer mechanisms, and inconsistent process regulation practices, which should be addressed through international policy coordination to provide further new paths for global response to climate change and sustainable development.

Quantum Technology Forum

Light of the Future: Technological Innovation in Quantum Computing and Quantum Devices

Editor's note: *With the theme of "Light of the Future: Technological Innovation in Quantum Computing and Quantum Devices", the Quantum Technology Forum under the 2024 Pujiang Innovation Forum invited top experts, scholars and corporate representatives from global quantum technology fields to conduct in-depth discussions on achieve breakthroughs in core and key quantum technologies and promoting the industrialization of quantum technology. This bulletin synthesizes the viewpoints of the guests at the Quantum Technology Forum for your reference.*

SHANG Yuying
Deputy Secretary General of the Shanghai Municipal People's Government

FU Xiaofeng
Deputy Director-General of Ministry of Science and Technology

Artur Ekert
Fellow of the Royal Society, Professor of Oxford University, Founding Director of Centre for Quantum Technologies

PAN Jianwei
Academician of the Chinese Academy of Sciences, Distinguished Professor at University of Science and Technology of China

Quantum technology covers future application prospects such as quantum computing and simulation, quantum communication, quantum measurement and quantum technologies. As one of the most cutting-edge and disruptive fields in world science and technology, quantum technology is leading a new round of technological revolution and industrial transformation, and constantly changing the face of the world. The guests present unanimously agreed that significant progress and new breakthroughs have been achieved in key fields such as quantum computing, quantum communication, and quantum precision measurement. Looking ahead, multidisciplinary cross-integration research will provide a broader prospect for the innovation of quantum technology. We should strengthen close cooperation among universities, research institutions, and enterprises, and accelerate the transformation of quantum technology from theory to practice, and from laboratory to market.

I. The importance of developing quantum technology

Firstly, a consensus has been reached that quantum technology is a new arena for future technological competition. Quantum technology has attracted widespread attention and serious concern worldwide. Governments around the world have incorporated quantum technology into the core of their national science and technology strategies, striving to gain a leading position in this field by increasing investment and support. FU Xiaofeng, Deputy Director-General of Ministry of Science and Technology, pointed out that countries around the world take quantum technology as a key component of their national strategic scientific and technological strengths, and integrate it into the overall planning of their national scientific and technological innovation. Such global strategic layout not only highlights the importance of quantum technology, but also heralds a new arena for future technological competition.

Secondly, the application of quantum technology will have a disruptive impact in multidisciplinary fields. PAN Jianwei, Academician of the Chinese Academy of Sciences, Distinguished Professor at University of Science and Technology of China, pointed out that fast speed is the overwhelming advantage of quantum computing, while traditional computers cannot complete the same task in a reasonable time, which will bring about disruptive improvements to the economy and society. SHANG Yuying, Deputy Secretary General of the Shanghai Municipal People's Government, emphasized that quantum precision measurement is not only the core technology in the field of quantum science, but also the key to promoting the development of the frontiers of science and technology. Quantum precision measurement technology can improve the sensitivity and accuracy of measurements, which is crucial for basic physics research, gravitational wave detection, global positioning systems and other fields that require high-precision measurements.

Thirdly, the development of quantum technology will give birth to new industries and business models. McKinsey predicts that quantum computing

Dan Stamper-Kurn
Professor at the University of California, Berkeley; Faculty Scientist in the Materials Sciences Division at the Lawrence Berkeley National Laboratory

Jaewook Ahn
Professor at the Department of Physics of Korea Advanced Institute of Science and Technology

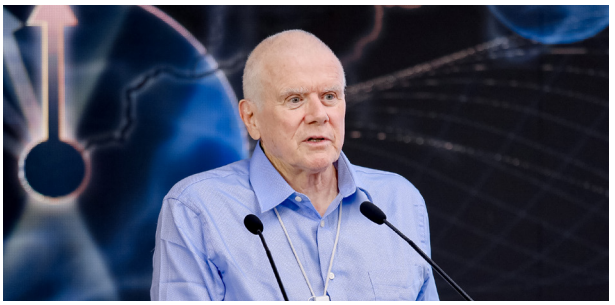
YOU Li
Professor at Tsinghua University

XIE Xincheng
Academician of the Chinese Academy of Sciences, Director of the Interdisciplinary Center for Theoretical Physics and Information Sciences at Fudan University, Chair Professor at Peking University

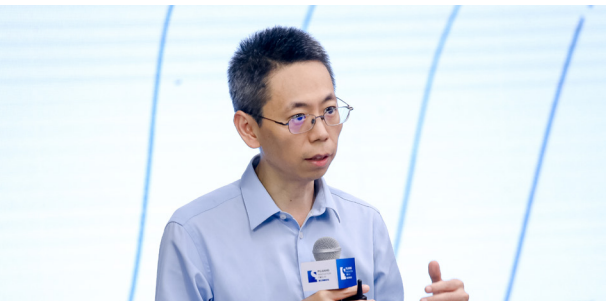
may reach a market value of US$300-700 billion by 2035, with clear demand in areas such as AI, drug development, and materials R&D. MI Lei, Co-founder, CASSTAR, proposed that global quantum companies have experienced significant growth since 2016.According to the data in the "Research Report on the Development Trend of Quantum Computing (2023)" released by China Academy of Information and Communications Technology in 2023, the number of global quantum computing companies has exceeded 400, reflecting the high recognition and active investment of the potential of quantum technology worldwide. In the "Action Plan for Shanghai to Build a Future Industrial Innovation Highland and Develop and Expand Future Industrial Clusters", Shanghai has specially introduced relevant policies centering quantum computing, quantum communication, and quantum measurement, for the purpose of strengthening support for the entire chain layout and actively fostering the quantum technology industry.

II. The latest progress and trend of quantum technology innovation

(1) In the field of quantum computing: Research focusing on the role of light in quantum computing. Jaewook Ahn, Professor at the Department of Physics of Korea Advanced Institute of Science and Technology, pointed out that as a strongly focused laser beam, the optical tweezer can achieve the construction of the entire light trap, thereby achieving atomic acceleration, single atom throwing and catching, and atomic flight after Rydberg atomic collisions in a convenient way. Peter Drummond, Fellow of the Australian Academy of Science, Professor at Swinburne University of Technology, pointed out that atoms can interact with light, communicate with light, and become objects of light manipulation, which is the important significance of atoms. Immanuel Bloch, Academician of the German academy of sciences, Professor at the Ludwig-Maximilians-Universität München, Director of the Max Planck Institute of Quantum Optics, pointed out that by combining crystal lattices with optical tweezers and classifying atoms in the crystal lattice, we can achieve indefinite continuous manipulation of atomic arrays in principle, proving the feasibility of combining crystal lattices with optical tweezers. Dan Stamper-Kurn, Professor at the



Peter Drummond
Fellow of the Australian Academy of Science, Professor at Swinburne University of Technology



MI Lei
Co-founder, CASSTAR

Peter Domokos
Member of the Hungarian Academy of Sciences

James Shaffer
Chief Scientist of the Quantum Valley Ideas Laboratory

University of California, Berkeley; Faculty Scientist in the Materials Sciences Division at the Lawrence Berkeley National Laboratory, pointed out that we can observe the rotation of lanthanide atoms under the action of light, and various reactions including repulsion and instability can arise. It is expected that more new elements can be found through this mediating method.

(2) In the field of quantum communication: Communication security is a key area that requires breakthroughs. PAN Jianwei pointed out that the challenge we face in large-scale secure quantum communication comes from security vulnerabilities caused by imperfect real devices. Such vulnerabilities may come from imperfect single photon sources or detectors, which are the security vulnerabilities we may face. Artur Ekert, Fellow of the Royal Society, Professor of Oxford University, Founding Director of Centre for Quantum Technologies, pointed out that if the information comes from a device or entity that you do not trust, you will not use its communication methods at all. Conversely, if the information comes from a device or entity that you trust, you can plug and play and use it straight out of the box. This makes us to reflect on today's communication methods from another novel perspective.

(3) In the field of quantum precision measurement: Take advantage of the entangled quantum state to improve quantum measurement accuracy. YOU Li, Professor at Tsinghua University pointed out that multi-bit quantum entanglement can be generated through the evolution of unrelated classical states through interactions. In this state, the measurement results of individual bits (particles) are interrelated, and the average error of multi-particle ensembles may be less than the classical limit or shot noise, thereby exceeding the classical accuracy limit. James Shaffer, Chief Scientist of the Quantum Valley Ideas Laboratories in Canada, pointed out that the Rydberg atomic sensor uses highly excited atoms as antennas, has automatic calibration capabilities, can measure and read optical values, and has high precision and stability in the field of RF sensing.

III. Recommendations for promoting the development of quantum technology

On the one hand, we should strengthen multidisciplinary cross-integration, and stimulate new research ideas and solutions by promoting in-depth cooperation and knowledge sharing in different disciplines such as physics, computer

Immanuel Bloch
Academician of the German academy of sciences, Professor at the Ludwig-Maximilians-Universität München, Director of the Max Planck Institute of Quantum Optics

SHI Guoyue
Vice President of East China Normal University

WU Haibin
Professor at East China Normal University

LU Zhaoyang
Professor at USTC Shanghai Institute for Advanced Studies

science, and engineering. Such interdisciplinary collaboration not only can broaden research horizons, but also can promote the development of innovative technologies, providing a solid foundation for achieving breakthrough progress in quantum technology. By building diversified research teams and collaborative work mechanisms, we can more effectively integrate resources from all parties, jointly explore the infinite possibilities of quantum technology, and promote the sustained prosperity and rapid development of practical applications in this field.

On the other hand, we should improve policy guidance, financial support and the in-depth integration of industries, academia and research, effectively promote the transformation of quantum technology from scientific research results to practical applications, and accelerate the development of the quantum industry. MI Lei believes that quantum computing is a key area for the industrialization of quantum technology, and it has significant advantages in meeting the continuous pursuit of computing power in the development of artificial intelligence technology. Therefore, in order to achieve the widespread application and commercial value of quantum computing, it is necessary to build a strong industrial ecosystem, which includes coordinated efforts from multiple aspects such as policy support, capital investment, talent cultivation, technology research and development, and market demand. Through such in-depth integration of multiple entities, quantum computing is expected to play an important role in solving complex scientific problems and promoting industrial upgrading.

Future Energy Forum

Promoting Technology Revolution of Future Energy Accelerating Green and Low-carbon Transition and Development

Editor's note: *With the theme of "Promoting Technology Revolution of Future Energy, Accelerating Green and Low-carbon Transition and Development", the Future Energy Forum under the 2024 Pujiang Innovation Forum invited renowned experts and scholars from home and abroad to conduct in-depth discussions on the latest research results and practices of future energy technology innovation. This bulletin synthesizes the viewpoints of the guests at the Future Energy Forum for your reference.*

Future energy is the key to winning the opportunity of a new round of technological revolution and industrial transformation. We should actively develop clean energy, promote the green and low-carbon transition of the economy and society, a secure and reliable energy guarantee for the construction of Chinese modernization, and make greater contributions to jointly building a clean and beautiful world. The guests present unanimously agreed that the development of future energy technology that is driven by innovation, economically feasible, and supported by security will inject new vitality into innovative development. We should have an accurate understanding of the global trend of future energy development, strengthen future energy technology innovation and international cooperation and exchanges, and open up new arenas for future energy.

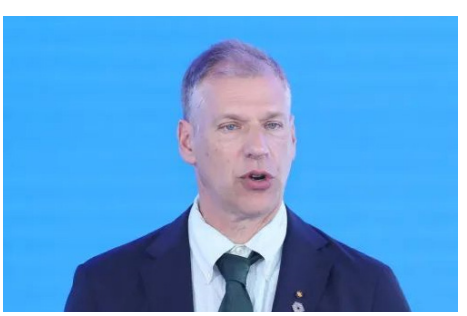
I. The latest trends of future energy technology development

Firstly, the energy structure focuses on innovative breakthroughs in hydrogen energy, green fuels, and future nuclear power. In terms of hydrogen energy, BAO Xinhe, Academician of Chinese Academy of Sciences, President of University of Science and Technology of China, pointed out that the production of hydrogen from alkaline electrolyzed water has achieved commercial application. For example, in automotive-grade hydrogen energy and fluctuating renewable energy, proton exchange membrane electrolyzed water hydrogen production has shown advantages. Internationally, PEM electrolyzers have been partially commercially used, and solid oxide electrolyzed water hydrogen production technology has reached the state of prototype demonstration operation, becoming the focus of research and development in Europe and the United States. Michael Moeller, Executive Director China Project Development of Siemens Energy Global – Gas Services, believes that hydrogen combustion in gas turbines can achieve zero emission discharge of carbon dioxide while compensating for the fluctuation of renewable energy. In terms of green fuels, HUANG Zhen, Academician of Chinese Academy of Engineering, Dean of Research Institute of Carbon Neutrality, Shanghai Jiao Tong University, proposed that future development directions include producing green ammonia by mixing the nitrogen in the air and the hydrogen produced from electrolyzed water, producing methanol through carbon dioxide hydrogenation, and producing green fuels through electrocatalysis of carbon dioxide. WEI Wei, Vice-president of Shanghai Advanced Research Institute, Chinese Academy of Sciences, proposed that the production of green methanol and sustainable aviation fuels from biomass fermentation or gasification has been in the stage of partial commercial production and construction, but most are still in the stage of research and demonstration. Replacing carbon dioxide with renewable green electricity, and synthesizing green fuels by reaction of nitrogen and water, will promote energy structure optimization and the rise of new industries. In terms of future nuclear power, LUO Bixiong, Chief Scientist of China Energy Engineering Group Co., Ltd, believes that commercial fast reactors can be achieved before 2035. In the future, key breakthroughs should be made in technologies

HUANG Zhen
Academician of Chinese Academy of Engineering, Dean of Research Institute of Carbon Neutrality, Shanghai Jiao Tong University

Joan Cordiner
Fellow of the Royal Academy of Engineering, Head of School of Chemical, Materials and Biological Engineering at the University of Sheffield

WEI Wei
Vice-president of Shanghai Advanced Research Institute, Chinese Academy of Sciences



Daniel Kammen
Academician of the American Academy of Arts and Sciences, Professor at the University of California, Berkeley

LIU Yong
Chief Scientist of China National Nuclear Corporation, Director of the Science and Technology Committee of Southwestern Institute of Physics

LUO Bixiong
Chief Scientist of China Energy Engineering Group Co., Ltd

BAO Xinhe
Academician of Chinese Academy of Sciences, President of University of Science and Technology of China

Michael Moeller
Executive Director China Project Development of Siemens Energy Global – Gas Services

including advanced reactors, advanced materials, and advanced post-treatment, such as molten salt purification, and actinide separation and purification.

Secondly, power and energy technological innovation has exhibited the trend of development through parallel multiple routes. LIU Yong, Chief Scientist of China National Nuclear Corporation, proposed that all the strategies of major countries worldwide focus on achieving commercial use of fusion energy by the middle of this century, and China's controllable nuclear fusion is entering the stage of engineering verification (experimental reactor).However, currently there are three major technological challenges: steady-state self-sustaining operation of combustion plasma, high-energy-resistant neutron bombardment and high-heat composite materials, and tritium breeding and self-sustaining circulation; as well as three major engineering challenges: strong-field high-temperature superconducting magnets, plasma operation and control, and heat conduction. HUANG Zhen put forward a prospect for future green power for ship engineering and ocean engineering, and pointed out that short-distance ferries and small ships can use hydrogen energy; that inland waterway transportation and coastal short-distance vessels with a higher tonnage can use electric propulsion; and that long-distance engines with a capacity of 10,000 kilowatts can use green fuels, while traditional diesel engines require the addition of carbon capture systems.

Thirdly, innovative and diversified technological paths for energy storage should be pursued simultaneously. LUO Bixiong pointed out that China's main compressed air energy storage technology route is zero carbon emission non-supplementary combustion compressed air energy storage systems. In the future, compressed air energy storage technology will develop towards larger single units (600-1000MW), higher efficiency (70-75% electricity-to-electricity conversion rate), longer duration (continuous discharge time from across days to cross months), and more flexible (liquefied compressed air energy storage, and liquefied carbon dioxide compression energy storage). HUANG Zhen proposed that zero carbon electricity for hydrogen production and synthetic fuel not only provides green fuel, but also it is a new type of energy storage method that can achieve cross-seasonal and large-scale wide area sharing.

Fourthly, carbon dioxide capture, utilization, and sequestration (CCUS) should be explored through economically feasible technological paths. BAO Xinhe believes that the possible paths for carbon dioxide capture, utilization, and sequestration (CCUS) include photochemical processes, thermal catalytic processes, and electrocatalytic processes. Among them, CO produced by co-electrolysis of carbon dioxide and water using the medium- and high-temperature proton membrane electrolyzer, which is combined with green hydrogen to produce synthesis gas, and achieving zero emissions in coal chemical and CO2 conversion processes, are feasible technical paths at present.

II. The transformation of research and development achievements focuses on the economic feasibility of various technological routes, emphasizing safety and controllability

The first is to pay close attention to whether the revenue is substantial and promotion is convenient. WEI Wei proposed that with respect to the technologies of producing synthesis gas through CO2 and hydroelectric chemistry + producing SAF through Fischer-Tropsch synthesis, calculating at the current SAF selling price of CNY20,000/t and the electricity price of CNY0.2/kWh, the annual operating revenue can reach nearly CNY100 million; calculating at the electricity price of CNY0.5/kWh, the annual operating revenue can reach nearly CNY200 million. HUANG Zhen pointed out that the costs of electrolytic methanol and green ammonia are CNY0.188-0.275/MJ and CNY0.191-0.269/MJ, respectively, which are on par with that of traditional ammonia (CNY0.172/MJ) but slightly higher than that of heavy diesel. The cost of green fuels largely depends on the costs of hydrogen sources (green electricity) and carbon sources (biomass and carbon capture), global carbon constraints such as EU carbon tariffs, carbon quotas, and carbon rewards and punishments, as well as the zero marginal cost characteristics of green electricity.

The second is to pay close attention to whether the benefits are significant and the prospects are optimistic. BAO Xinhe proposed that industrial system carbon emissions account for 69.9%, of which 21% are from the steel industry. The steel industry can decarbonize iron through reducing iron using hydrogen and electro-depositing iron using acidic solution. It is expected that the electricity consumption of the two path will reach 4,500 kWh/t Fe in the future, which is economically feasible, technically non-challenging, and has a feasible overall prospect. The long-term cost forecast for producing methanol through carbon dioxide hydrogenation can reach CNY2,259/ton, and the cost will gradually decrease with the decrease of the electricity price, the increase of methanol scale, and carbon subsidy policies. In terms of green hydrogen production, improving the efficiency and reducing the electricity price are key.

The third is to pay close attention to technological innovation, risk pre-control, safety and security, and resource sustainability. Joan Cordiner, Fellow of the Royal Academy of Engineering in the UK, proposed that industrial decarbonization requires an increase in risk preparedness for emerging technologies, such as introducing new policies and regulatory systems, as well as formulating new standards on a predictive basis. HUANG Zhen believes that in addition to engine availability, large-scale production economy, fuel availability, and completeness of legal standards, safety is also a key factor for the large-scale application of green fuels. LUO Bixiong pointed out that

HUANG Zan
Director of Shanghai New Energy Center for Technology Transfer and Industry Promotion

pressurized water reactors/fast reactors and thermal reactors form a "binary system" and have become the main nuclear power reactor types for superimposed development, ensuring the safe and efficient utilization of uranium resources, thereby achieving energy security in China.

III. Recommendations for Shanghai to Promote Future Energy Development

The first is to develop a localization plan for green fuels in Shanghai. WEI Wei pointed out that Shanghai's biomass resources are limited, which restricts its ability to produce green fuels from biomass. Under such circumstances, Shanghai should prudently deploy the biomass synthetic fuel path, and define that the technical route and industrial layout of Shanghai's green fuels have important strategic significance.

The second is to improve the utilization rate and utilization methods of renewable energy in Shanghai. Renewable energy can not only provide electricity for hydrogen production, but also serve as an important path for converting carbon dioxide. Currently, Shanghai has great potential for development in the field of deep-sea offshore wind power. If Shanghai can use 20% of its green electricity for green fuel production, it will provide strong support for the development of Shanghai's green fuel industry. LUO Bixiong also suggested that the source of green fuel can make full use of wind power and biomass resources in the Northeast China. Northeast China has abundant wind power resources and sufficient biomass reserves. Producing hydrogen by integrating biomass, wind energy and solar energy and then transporting hydrogen to Shanghai is a feasible path. Meanwhile, Hunan Province, Hubei Province, and Jiangxi Province in the middle and lower reaches of the Yangtze River are also important places for sources of biomass.

Web 3.0 Innovation Forum

Editor's note: *At the Web 3.0 Innovation Forum under the 2024 Pujiang Innovation Forum, experts and scholars from governments, research institutions and leading enterprises conducted in-depth discussions on Web 3.0 frontier trends, practical cases and solutions, etc. This bulletin synthesizes the viewpoints of the guests at the Web 3.0 Innovation Forum for your reference.*

The rapid development of the digital economy relies on the sharing, circulation and efficient collaboration of large-scale and high-value data, which provides sustained momentum for the entire economic system.The underlying technologies of Web 3.0, such as blockchain and privacy computing, provide strong technical support for the prosperity and sustainable development of the data element market. The guests present unanimously agreed that through the distributed collaboration mechanism, Web 3.0 not only supports decentralized management of data, but also protects the privacy of data subjects and achieves fair distribution of data element value. We should strengthen the exploration of basic theories, improve infrastructure construction, accelerate the R&D and innovation of Web 3.0 technology, create an industrial ecosystem, and build a Web 3.0 governance system with the participation and co-governance of all concerned parties.

I. Drive the development of Web 3.0 through technological innovation and scenario applications

(1) Technological innovation: promoting the construction of core infrastructure for Web 3.0. The rise of Web 3.0 relies on underlying technologies such as blockchain and privacy computing, which provide a solid foundation for data security, trusted circulation, and privacy protection. Hassan CHARAF, President of Budapest University of Technology and Economics, pointed out that blockchain, digital assets, decentralized identity, verifiable credentials, privacy-preserving computing, zero-knowledge proof and the like are the underlying technologies of Web 3.0, which will collectively support distributed collaboration and privacy protection. CHENG Xiuzhen, Dean and Professor of the School of Computer Science and Technology, Shandong University, emphasized that blockchain is a key infrastructure to ensure the trustworthiness and security of Web 3.0. She further pointed out that as the underlying technical support for artificial intelligence, meta computing provides powerful computing capabilities for multi-scenario applications of Web 3.0 through three dimensions including elastic computing power, trusted data, and intelligent algorithms. ZHENG Zhiming, Academician of the Chinese Academy of Sciences, Professor at Beihang University, stressed the importance of privacy computing and pointed out that privacy computing is related to national security, economic order and social governance; furthermore, by combining privacy computing with blockchain technology, we can build a credible data circulation platform adapted to the era of big data. YU Yu, Professor at Shanghai Jiao Tong University pointed out that secure multi-party computation, federated learning, and trusted execution environment are the three core technological routes for privacy computing. And he proposed that post quantum cryptography technology will be the key to dealing with future quantum computing attacks and ensuring data security.

(2) Scenario application: Technology nurtures the industry and empowers the real economy. The technical application of Web 3.0 is gradually moving

QU Wei
Deputy Director, Shanghai Municipal Commission of Science and Technology, China

ZHENG Zhiming
Academician of the Chinese Academy of Sciences, Professor at Beihang University

CHEN Jing
Chief Expert of Shanghai Academy of Future Internet Technology, Professor at Tsinghua University

CHENG Xiuzhen
Dean and Professor of the School of Computer Science and Technology, Shandong University

YU Yu
Professor at Shanghai Jiao Tong University

LI Chao
Professor at Beijing Jiaotong University

CHEN Lianggui
General Manager of Shanghai United Credit Services

LIAN Li
Chief Expert of Blockchain and IoT at China Pacific Insurance (Group) Co., Ltd

from theory to practice, and Web 3.0 has been widely used in many fields such as energy, finance, and government affairs, promoting the continuous evolution of technological innovation and service models. Hassan CHARAF pointed out that Web 3.0 has been widely used in fields such as digital assets, energy network facilities and public services. These applications are driving technological innovation and accelerating the transformation of service models. ZHANG Bo, Vice President of Shanghai Puxin Future Internet Technology Institute, pointed out that through the in-depth integration of blockchain, privacy computing and distributed network common service technologies, the ChainWeaver platform can establish a secure, credible and controllable data flow link in a big data environment, to ensure privacy security and efficient access to dark data. LIAN Li, Chief Expert of Blockchain and IoT at China Pacific Insurance (Group) Co., Ltd, pointed out that blockchain can achieve blockchain-based storage traceability, data collaboration, and value sharing. China Pacific Insurance (Group) Co., Ltd. has launched innovative services such as the Pacific Insurance Digital Collection Platform, Digital Safe Box, Blockchain Intelligent Settlement of Claims, and Agricultural Insurance Service Chain, further enhancing the efficiency and transparency of industry services. CHEN Jing, Chief Expert of Shanghai Academy of Future Internet Technology, Professor at Tsinghua University, emphasized that the integration of blockchain and AI not only helps improve the security of blockchain systems, but also effectively identifies potential security risks and provides more reliable technical support for data sharing.

II. Challenges faced by the development of Web 3.0

In terms of theoretical development, ZHENG Zhiming pointed out that as one of the core technologies of Web 3.0, privacy computing faces multiple theoretical challenges, including how to establish new basic mathematical theories to support privacy computing, how to explore efficient computing methods guided by rule-based games, and how to address privacy computing issues in non-rule-based games scenarios. In addition, how to measure individual privacy through information psychology, and how to evaluate group privacy through information sociology, are currently important theoretical issues that need to be addressed in the field of privacy computing. Hassan CHARAF believes that with respect to Web 3.0, the issue of data usage responsibility in open source platforms for has not been effectively resolved, and the lack of a unified data platform also hinders the improvement of data circulation efficiency. Therefore, there is an urgent need to establish a more efficient data circulation mechanism.

In terms of technological breakthroughs, CHEN Jing said that blockchain technology faces a series of challenges, including the complexity of smart contracts, adaptability to economics and finance, privacy and security, and the scalability of the technology. She also emphasized the new technological challenges brought about by the combination of blockchain and AI. LIAN Li pointed out that the development of blockchain technology requires finding a balance among distributed architecture, security, and scalability, which

Hassan CHARAF
President of Budapest University of Technology and Economics, Dean of the School of Electrical Engineering

ZHANG Hang
Shanghai Academy of Future Internet Technology

are the main technical bottlenecks faced by blockchain in its widespread application.

In terms of data acquisition and governance structure, Zhang Bo mentioned that due to the involvement of many security and privacy issues, many high-value dark data cannot be effectively used, resulting in huge waste of data resources. How to break through this dilemma has become an urgent problem to be solved. CHEN Lianggui, General Manager of Shanghai United Credit Services, pointed out that blockchain technology will play a central control system role in the future intelligent revolution, but its governance mechanism still needs to be further improved. LI Chao, Professor at Beijing Jiaotong University pointed out that there are multiple risks in Web 3.0 on-chain governance, including "hostile takeover" attacks, "centralization" issues, and "election manipulation". In addition, off-chain governance faces the core issue of "who shall govern", which is also a difficulty in the construction of the Web 3.0 ecosystem.

III. Relevant suggestions

The first is to deepen the exploration of basic theories and accelerate the development of technological innovation. ZHENG Zhiming proposed that priority should be given to exploring the basic mathematical theories of complex systems and system security that support privacy computing, and to promoting innovations in privacy computing technologies such as federated learning, cross-domain security collaboration, and software and hardware integration. Meanwhile, we should develop evolutionary game modeling based on irrational assumptions, enhance the application of Ex Post Nash Equilibrium and dynamic adaptive privacy incentive algorithms, and further explore privacy measurement and evaluation theories from the perspectives of information psychology and sociology, for the purpose of constructing a whole-process privacy protection framework.

The second is to strengthen infrastructure construction and improve the Web 3.0 industry ecosystem. CHEN Lianggui suggested that we should move faster to tackle key problems and make innovative breakthroughs in core technologies of blockchain, encourage leading enterprises to cooperate with universities and research institutes, and establish research and development platforms such as blockchain laboratories and innovation centers. In addition, we should build the blockchain incubation platform, form a healthy development model of "government sets the stage, enterprises perform", leverage the advantages of leading enterprises, and accelerate the construction of basic chains. Meanwhile, the government should increase its support, and guide enterprises in sectors such as finance, new energy and industrial manufacturing to go on-chain, promote the coordinated development of the whole industrial chain, and create a healthy blockchain ecosystem.

The third is to define the governance entities and encourage all concerned parties to participate in Web 3.0 governance together. LI Chao pointed out that we should uphold the principle of "governance based on collaboration, participation, and common gains", and encourage community members to actively participate in governance, reaching a broad social consensus. Meanwhile, we should, by designing a reasonable economic incentive model, enhance the enthusiasm and contribution of participants. CHEN Lianggui also suggested that we should intensify efforts to introduce high-end blockchain talents from both domestic and foreign sources, and encourage universities to offer relevant courses and to work together with enterprises, vocational schools, and training institutions to jointly cultivate blockchain professionals, for the purpose of continuously improves the quantity and quality of talents.

Meet TR35 Summit 2024 & MIT Technology Review 35 Innovators Under 35 Asia Pacific Award Ceremony

Editor's note: *At the Meet TR35 Summit 2024 & MIT Technology Review 35 Innovators Under 35 Asia Pacific Award Ceremony under the 2024 Pujiang Innovation Forum, academic leaders, young scientific and technological talents, and outstanding persons of investment institutions from around the world, including China, Singapore, Malaysia, and India, conducted in-depth discussions on cutting-edge technology trends and share innovative experiences. This bulletin synthesizes the viewpoints of the guests at the Meet TR35 Summit 2024 & MIT Technology Review 35 Innovators Under 35 Asia Pacific Award Ceremony for your reference.*

In the broad context of increasingly fierce global technological competition, countries around the world have set the focus of their talent cultivation policies on cultivating young scientific and technological talents, giving them more trust, better assistance, and stronger support, and encouraging them to take the lead, play the leading role, and make greater contributions to their respective countries' scientific and technological innovation and industrial development. The guests present unanimously agreed that we should take leading the world's future as our vision, and support outstanding young talents to break down disciplinary and technological barriers, to actively participate in international innovation cooperation, and to shoulder the mission of promoting technological progress and benefiting all mankind.

I. With the vision of leading the world's future, identify outstanding young talents

Taking a future-oriented vision, and guiding young talents to aim high. For the purpose of building a diversified innovation ecosystem and promoting cross-border and cross-regional collaborative innovation, MIT Technology Review has specially established the selection of young scientific and technological talents -"Innovators under 35" (TR35) Asia Pacific, with commitment to identifying young talents who are able to meet global challenges and are full of confidence in the future of science and technology, and helping them interpret the power of innovation with practical actions. JIN Qinxian, Director, Beijing-Tsinghua Industrial R&D Institute; Chairman, the Strategic Development Committee, Shanghai Synthetic Biology Innovation Center, pointed out that centering on important issues faced by all mankind such as infinite energy, infinite lifespan, and infinite intelligence, the selection of TR35 young talents encourages breaking the national boundaries of scientific research, identifying new scientific and technological innovation stars from different countries and regions, and promoting the characteristics of young talents who stand up to challenges, dare to break new ground, and are proactive and open-minded.

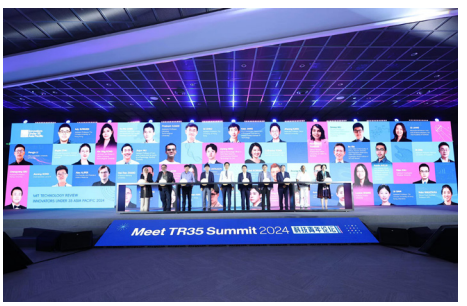
Continuously optimizing the selection criteria, and encouraging young talents to show their own strengths. The MIT Technology Review TR35 selects young scientific and technological talents from five dimensions: "influence, innovation, ambition, future potential, and communication". In addition to basic research and technological innovation, the selection scope also focuses on young talents' contributions in technology application, product transformation, social impact, and other aspects. The finalists form five lists of young scientific and technological talents: "Visionaries, Pioneers, Inventors, Humanitarians, and Entrepreneurs".

II. Young scientific and technological talents should strengthen outward connections and enhance their cross-border integration capabilities

The first is to actively carry out interdisciplinary cooperation and exchanges

Opening Session
Vincent CHEN, Co-Publisher, MIT Technology Review China (Left)
Mat Honan, Editor-in-Chief, MIT Technology Review (Right)

Release Ceremony
Presenter: Landy ZHANG, Associate Publisher, MIT Technology Review China; Co-founder of Shanghai Talent Rising Technology Co., Ltd.



2024 Innovators Under 35 Asia-Pacific Award Ceremony

Star Pulse | New TR35 Selected Participants Showcase

Peak Dialogue

Teck Peng LOH
Fellow, the Singapore National Academy of Sciences; Fellow, the Academy of Sciences Malaysia; Distinguished University Professor, Nanyang Technological University

WENG Jingke
Director, Institute for Plant-Human Interface; Professor of Chemistry, Chemical Biology, and Bioengineering Affiliated Professor of Chemical Engineering, Northeastern University

and accelerate the march towards the frontiers of science and technology. ZHANG Chengqi, Pro Vice-Chancellor and Distinguished Professor, University of Technology, Sydney; General Chair for the 2024 International Joint Conference on Artificial Intelligence (IJCAI), pointed out that cross-sector technological cooperation is more conducive to generating direct value. For example, the machine spider jointly developed by the Tokyo Electric Power Company Holdings, Inc. and the University of Technology Sydney, can reduce the risk of manual tower climbing for maintenance. Agata Blasiak, Former Head of Digital Health Innovation, the N.1 Institute for Health. Institute for Digital Medicine (WisDM), National University of Singapore, pointed out that by solving problems such as cross-border digital transmission and data standards, and strengthening interdisciplinary research cooperation in digital health integration, patients can be better treated. Dominika Wilczok, Coordinator, the Longevity Education Hub; Journalist, BioPharmaTrend; Researcher, Duke University and Duke Kunshan University, pointed out that being candidly open about research goals and actively sharing knowledge with others during the scientific research process are the key to driving technological progress. Hyeon Jeong Lee, Assistant Professor, Zhejiang University, pointed out that the key to cross-sector cooperation lies in understanding the other party's discourse system and way of thinking; we can deepen our interdisciplinary understanding ability by immersing ourselves in knowledge systems from different fields, and then we can break down disciplinary and sector boundaries.

The second is to actively carry out cross-regional cooperation and exchanges to promote common progress in scientific and technological innovation. Seeram Ramakrishna, Professor, National University of Singapore (NUS); Foreign Member, Chinese Academy of Engineering, pointed out that science knows no borders, regardless of gender or race. In particular, when exploring new fields, cross-regional cooperation can accelerate technological progress, and efforts should be made to break down technological blockades and protectionism, for the purpose of jointly address the challenges to the future of humanity. WANG Leyun, Professor, Xiamen University, pointed out that in terms of regional cooperation in China, technological development needs to rely on "bringing in" and "going global", introducing international outstanding talents and tapping into local advantageous talents.

The third is to continuously carry out cross-cultural understanding and communication and enhance the competitiveness and influence in scientific research. Seung Hwan Ko, Professor, Mechanical Engineering and Associate Dean of Research Affairs, College of Engineering, Seoul National University, pointed out that in international cooperation projects, it is necessary to respect and understand each other's cultural differences and maintain patience, and the most effective way is face-to-face communication, rather than simple online communication. Christine Yuan Huang, Senior Research Associate, HKU; Managing Director, HK Longevity Medical Centre ; Founder &CEO, Quantum Life, pointed out that we should communicate with people from different countries and cultural backgrounds with an open mind, and by sharing project information and scientific perspectives, work together to solve scientific problems.

III. As it takes a good blacksmith to forge good steel, young scientific and technological talents should enhance their own capabilities of breaking new ground

On the one hand, young scientific and technological talents should take concrete actions to consolidate the foundation for

Raja Noor Zaliha Raja Abd Rahman
Professor at Universiti Putra Malaysia

Thomas Knöpfel
Professor at Hong Kong Baptist University, Director of JC STEM Lab of Neuronal Circuit Dynamics

LUO Huiqian
Professor, Institute of Physics, Chinese Academy of Sciences

their work, and enhance their own capabilities of breaking new ground. ZHANG Chengqi pointed out that as young scientists, they should carefully plan their own life. They should play up strengths and avoid weakness, fully leveraging their strengths; they should have clear goals and make long-term accumulation in professional fields; they should take risks moderately and maintain a pioneering spirit; and they should fight on despite repeated setbacks, persevering in their own arenas. Dominika Wiczok pointed out that when just entering their fields, young researchers are really passionate about their work, but they usually find that progress is slower than they have expected. It is important for them to maintain patience and focus on their research until breakthroughs have been achieved. Clive Ding, Founder and CEO,Yrobot Inc., also believes that young scientific and technological talents should maintain a learning attitude, and have the ability to learn quickly and the determination to persevere when facing new problems.

On the other hand, young scientific and technological talents should have a future-oriented ambition, and be determined to be pioneers in innovative development. JIN Qinxian pointed out that only when young talents have an international vision and an open and inclusive attitude can they become international leading talents. ZHU Meifang's message to young scientific and technological talents is that they should meet four "requirements": In terms of height, they should stand tall and look far with a global vision, as people can taller than mountains, and feet can be longer than roads; in terms of breadth, they should acquire a wider range of knowledge areas, and achieve interdisciplinary and cross-sector innovation; in terms of depth, they should have dedicated research depth and original thinking; and in terms of magnanimity, they should have a broad mind to lead disciplines and teams.

Panel Discussion 1

Panel Discussion 2

Technology Commercialization Link Forum

Editor's note: *The Technology Commercialization Link Forum under the 2024 Pujiang Innovation Forum, invited experts and scholars from universities, funds, banks, and technology transfer institutions to participate in and conduct in-depth discussions on the construction of the system for the transformation of scientific and technological achievements. This bulletin synthesizes the viewpoints of the guests at the Technology Commercialization Link Forum for your reference.*

The transformation of scientific and technological achievements is a complex system engineering that requires the joint efforts of all concerned parties such as the government, enterprises, universities, research institutes, and intermediary service agencies. Deepening the reform of transformation of scientific and technological achievements and strengthening the construction of the national technology transfer system are of great significance to stimulating the vitality towards innovation and entrepreneurship across the society. The guests present unanimously agreed that China has made certain progress in the transformation of scientific and technological achievements, but there are also some problems such as supply-demand mismatch, incomplete "punishment exemption" mechanism, and insufficient supply of technology transfer talents. China should intensify reform efforts in the construction of technology transfer institutions, optimization of profit distribution mechanisms, cultivation of technology transfer talents, and cross-border technology transfer, and accelerate the transformation of high-quality scientific and technological achievements into new quality productive forces.

I. Current situation and trends

From the perspective of the types of players, advanced-level research universities play an increasingly important role in the transformation of scientific and technological achievements. According to the "Annual Report on China Science and Technology Achievements Transformation 2023 & 2024 (Universities and Research Institutes)" jointly released by the China Society of Technology Evaluation and Result Management, the Science and Technology Evaluation Center of the Ministry of Science and Technology, and the Institute of Scientific and Technical Information of China, both the projects and amounts for the transformation of scientific and technological achievements in universities and research institutes are generally on the rise, with more and more universities and research institutes breaking new records in total contract amounts for the transformation. In 2023, the total contract amounts for the transformation in 396 institutions exceeding CNY100 million, a year-on-year increase of 7.4%.In 2023, the total contract amount for the transformation of scientific and technological achievements through six ways in universities reached CNY205.44 billion. Among them, the contract amount for the transformation through transfer, licensing, trade-in and other ways as well as the number of high-value results worth more than CNY100 million were significantly higher than those of scientific research institutes.

In terms of the service system, the professionals and professional institutions for technology transfer are rapidly growing. In terms of the contingent of professionals, according to the "Annual Report on China Science and Technology Achievements Transformation 2023 & 2024 (Universities and Research Institutes)", more than half of the universities have established dedicated talent teams engaged in the transformation of scientific and

HE Defang
President of CASTEM

WEN Limin
Director of Technology Transfer and Licensing Office of Boston College

Johann Löhn
Honorary Trustee of the Steinbeis Foundation

GU Jianzhong
Deputy Party Secretary and President of Shanghai Rural Commercial Bank

Report Release 1：Release of "Annual Report on China Science and Technology Achievements Transformation 2023 & 2024 (Universities and Research Institutes)" and "Annual Report on Yangtze River Delta Science and Technology Achievements Transformation 2023 (Universities and Research Institutes)"
Publisher: NIE Biao, Director General of NCSTE

Report Release 2: Release of "Shanghai White Paper on the Commercialization of Scientific and Technological Achievements 2023" and "Shanghai Science and Technology Achievement Transformation Service Manual"
Publisher: LIU Qunyan, Chief Engineer, the Center of Science and Technology Development for Shanghai Universities

Standard Release 1: Release of National standard "Specification for Science and Technology Achievement Evaluation"
Publisher: YANG Yun, Deputy Chief Evaluator of NCSTE

Standard Release 2: Release of Local Standards ("Specification for Intellectual Property Management in Medical Institutions" and"Benchmark Value Evaluation for Complete Sets of Technologies")
Publisher: LI Li, Executive Vice President of STMA, Secretary General of Shanghai Technology Achievement Transformation Standardization Technical Committee Secretary General

technological achievements, with a talent size of over 17,000 people. In terms of professional institutions, over a quarter of universities have specially established technology transfer agencies. As of the end of 2023, a total of 1,773 universities and enterprises had jointly established research and development institutions, transfer institutions, and transformation service platforms, accounting for about one-third of the total number of reporting institutions. The number of jointly established institution platforms exceeded 19,000.

In terms of regional distribution, the Yangtze River Delta region is one of the core areas for accepting the transformation of scientific and technological achievements in China. The "Annual Report on Yangtze River Delta Science and Technology Achievements Transformation 2023 (Universities and Research Institutes)" shows that the total contract amount of scientific and technological achievements transformed in six ways by universities and research institutes in the Yangtze River Delta region in 2022 was CNY48.57 billion, accounting for about one-third of the national contract amount. In terms of provincial acceptance, Jiangsu Province and Guangdong Province have a significantly stronger attraction to the outputs of other local universities and research institutes.

II. Problems and challenges

The first is that the cognitive gap between the supply and demand sides of technological achievements is difficult to bridge. YIN Xiaobo, Associate Vice-President of the University of Hong Kong, pointed out that the transformation from scientific research to market is not a one-way process, but a cyclical and iterative process. University professors usually only focus on providing solutions, but overlook the fact that this process cannot be separated from the support of professional technical transformation talents and institutions. Johann Löhn, Honorary Trustee of the Steinbeis Foundation, noted that technology transfer services are not only a process

Establishment of Professional Committee of Technology Managers of Shanghai Technology Market Association and the Technology Manager Community

"Scientific and Technological Achievements + Warrant" Innovation Product Launch

Innovative Dialogue 1

Innovative Dialogue 2

of providing services for the transformation of scientific research achievements in universities, but also a process of providing technology consulting services for various enterprises. Only by establishing a two-way service channel can the supply side really correspond to the demand side.

The second is that the lack of the "punishment exemption" mechanism seriously restricts the transformation of research results in universities and research institutes. HE Defang, President of CASTEM, pointed out that the value evaluation of scientific and technological achievements is a long-standing unresolved problem. Issues such as the difficulty of applying the present value of earnings method and the difficulty of dividing patent value make it difficult to estimate the value of scientific and technological achievements. Without a mechanism for reducing and exempting responsibilities, relevant heads would not dare to fully support the transformation of scientific and technological achievements in situations where the value cannot be accurately estimated. GUO Shugui, President of China Technology Exchange, noted that how to resolve the concerns of university leaders after the empowerment reform is the key to opening up the path for the transformation of scientific and technological achievements in universities, so the establishment of the mechanism to ensure that those who have fulfilled their duties are not held accountable is urgently needed.

The third is the lack of high-quality professionals for the transformation. ZOU Shujun, Executive President of National Eastern Tech-Transfer Center, noted that there is still a shortage of high-quality technical managers. Under the current training model, the number of technical managers is rapidly increasing, but the quality is not yet sufficient to meet the needs of transformation. Meanwhile, technical managers lack an endorsement mechanism, making it difficult for them to enter major universities and research institutes to make achievements in scientific research projects, and it is difficult to establish trust relationships between professors and enterprises. In terms of policy support, XIE Wenhai from the Scientific and Technological Achievements and Intellectual Property Trading Center of Shenzhen Stock Exchange pointed out that there is information asymmetry between universities

and market players, which leads to high costs for technology transfer institutions and technical managers to provide services, and insufficient capacity for service enterprises. Therefore, there is an urgent need to enhance the professional service capabilities and market linkage abilities of technical managers, and to establish a system for cultivating technology managers with versatile talent.

III. Relevant suggestions

The first is to establish technology transfer institutions in combination with the characteristics of universities and research institutes. Universities and research institutes should establish the technology transfer system based on their own research laws and characteristics, and connect up the entire process from source innovation to market application. PENG Huisheng, Member of the Chinese Academy of Sciences, Assistant President and Dean of Institute of Science and Technology at Fudan University, pointed out that in view of the high proportion of basic research and the long transformation cycle in Fudan University, Fudan University specially invited young and middle-aged professors skilled in achievements transformation business to establish the technology research and development center, and to establish the technology database in colleges and departments, for the purpose of actively identifying and tapping into relatively mature technological achievements. XU Feng, Director of the Discipline Planning Department of the Ninth People's Hospital Affiliated to the School of Medicine of Shanghai Jiao Tong University, introduced that the Hospital's Achievement Transformation Office is equipped with resident legal advisors, who have helped the Hospital establish a comprehensive compliance system from creative generation to value cultivation, intellectual property protection, transformation plan formulation, and subsequent negotiations with enterprises.

The second is to optimize the mechanism for distributing the benefits of technology transfer. TIAN Tian, Vice Dean of the Industrial Technology Research Institute at Soochow University, introduced that on the one hand, a reasonable evaluation and assessment mechanism for the transformation of scientific and technological achievements should be designed. For scientific research personnel who have achieved outstanding performance in transformation and promotion services, and who have achieved significant economic benefits and industry impact, they can be directly appointed as researchers or associate researchers. On the other hand, we should establish a sustainable technology transfer system where there is a return for every contribution, and for the projects for transformation of scientific and technological achievements, it should be expressly stipulated that should be allowed to extract a 10% intermediary reward from project funds, which should be awarded to the technology service institutions or individuals who have contributed to facilitating the projects.

The third is to improve the system for training technical managers. ZOU Shujun pointed out that technical managers should be trained by sector and field. Different sectors and fields have different rules and characteristics, and there is no "one-size-fits-all" training method. In addition, it is necessary to establish the technical manager resource library, to form a unified standard evaluation mechanism for technical managers, and to further strengthen the standardization of the contingent of technical managers. WEN Limin, Director of Technology Transfer and Licensing Office of Boston College, pointed out that the training of technical managers is a complex process that cannot rely on a single system. Technical managers must develop a deep understanding of the operational mechanisms of different systems such as the law, investment, business, and government, and they must have professional knowledge in vertical fields.

The fourth is to strengthen international technology transfer and cooperation. Conor Farrelly, Emerald Strategy Partners Limited COO, proposed that the current prevalence of international protectionism and serious damage to trust relationships hinder the construction of cross-border knowledge transfer systems. He suggested strengthening cross-cultural communication through various media and carriers. XIE Wenhai suggested that China should strengthen top-level design, and coordinate the establishment of an international technology transfer network with the help of scientific research cooperation under the Belt and Road Initiative.

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