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NPC and CPPCC delegates talk about S&T Development.

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Sustaining Growth in R&D Input

Wang Zhixue, delegate of the National People's Congress (NPC), emphasized the importance of R&D input at a meeting on the March 7th. "Input and output are closely related. If we want to turn China into a country strong in science and technology (S&T), we should keep increasing R&D input at an appropriate rate."

According to him, to become an innovative country by 2020 is the first of the three steps in making China a world-class country strong on science and technology. To achieve this goal, China should meet two key criteria: first, to have R&D investment account for 2.5% of its GDP; second, to have S&T progress contribute to 60% of economic growth. These are two aspects of input and output. At present, to ensure sustained and sufficient input is quite a challenge.

In 2015, China's R&D investment accounted for 2.06% of GDP. If we suppose the annual GDP growth sticks to no more than 6.5%, the annual growth of R&D input during the 13th Five-Year Plan should be kept above 10.6%. *The National R&D Input Statistics* jointly released by the National Statistics Bureau, the Ministry of Finance and the Ministry of Science and Technology, showed the growth of R&D investment continued to slip from 23% in 2011 to 8.9% in 2015. Therefore, to increase R&D input to 2.5% of the GDP by 2020 is quite a challenge.

Wang pointed out that the slowdown in the growth of the Central Government's R&D input has negative influence on China's endeavors to become' a strong S&T country, the innovation-driven development strategy and the supply-side structural reform. The Central Government's input is key to guide the overall R&D investment in society. It is important that the Central Government raise its R&D investment to send a clear signal to society that China is pursuing innovation-driven development. By doing so, China can better mobilize R&D input from market and social capital.

There is strong correlation between sustained high R&D input and the building of S&T strength. For instance, of the world's total USD1.45 trillion R&D expenditure in 2015, 35% or USD502.9 billion came from the United States which has kept investing about 2.8% of GDP in R&D and 1/3 of its overall R&D input has been made by the government.

Since the reform and opening-up drive, it is guaranteed by law for steadily increased R&D input, as Article 59 of the *Law of the People's Republic of China on Scientific and Technological Progress* stipulates that "the State shall steadily increase the overall financial input to science and technology…The rate of R&D funding increase from the national budget shall exceed the growth rate of regular financial revenues of the State… The total R&D expenditure shall account for an appropriate proportion in GDP, and shall be gradually increased".

Statistics show that the implementation of these provisions needs to be enhanced. Wang maintained that increasing R&D input is also a legal issue. The social environment has gradually changed under growing influence of the new development concepts and especially the philosophy of innovation-driven development. However, concrete measures should follow. We should take effective steps to sustain the appropriate growth of R&D investment, especially the input from the Central Government.

(Source: Science and Technology Daily, March 8, 2017)

Planning, Implementation and Operation of Megascience Projects

In recent years in China, a series of projects on key research infrastructure have been implemented and put into operation including the Shanghai Synchrotron Radiation Facility (SSRF), the Daya Bay Reactor Neutrino Experiment, the China Jinping Underground Laboratory, the Five-hundred-meter Aperture Spherical Radio Telescope (FAST). All these projects have effectively upgraded China's scientific research.

Chen Hesheng, head of national lab of the Beijing Electron Positron Collider (BEPC), Institute of High Energy Physics, China Academy of Sciences (CAS), shared his opinions on the rapid development of megascience projects. He maintained that we should be careful in planning major infrastructure projects. Priorities should be given to projects that serve economic growth and national security, relate to the world's cutting edges, and suit China's strengths and conditions. The state should establish science advisory committees with specific terms so as to facilitate careful assessments and feasibility studies that are necessary to map out project plans. In the selection of projects, the principle of doing something at the expense of not doing something else applies.

Professor Han Tao, Department of Physics and Astronomy, University of Pittsburg participated in the on-line discussion on building large-scale colliders. He noted that it is important to consider the project's role in promoting S&T development, industrial production and education and its technological feasibility.

Megascience projects mainly serve multi- and inter-disciplinary researches. Due to high costs and long construction periods, these projects are often developed in phases. Chen Hesheng stressed that competent departments should consider the linking-up of different phases to ensure smooth progress. For instance, although the Phase-1 China Spallation Neutron Source will soon pass the State's acceptance check, Phase-2 is still a remote future. Since Phase-2 does not involve land requisition or environment assessment, it could be launched quickly. Chen suggested that the state open a "green channel" for these projects and streamline application and approval procedures.

Wan Baonian, Vice President of Hefei Institutes of Physical Science, CAS shared his ideas on scientific research. Megascience projects should enjoy long-term, stable policy support and funding. Basic research follows its own rules and requires long-term efforts. It also has longer cycles of investment return. To promote basic research, measures should be taken to ensure researchers are able to dedicate themselves to their work over the long run.

(Source: Science and Technology Daily, March 9, 2017)

>>> Looking into China's Aerospace S&T

► Human Space Flight Program: Era of Space Station

Bao Weimin, CPPCC member, head of S&T Committee, China Aerospace Science and Technology Corporation (CASTC), said that Tianzhou 1 will be the debut mission for a cargo spacecraft to supply fuel in orbit to the space station. The space station will orbit the Earth at the height of 380 to 400 km. Gravity and thin air will lead to orbital attenuation.

This mission will test key technologies including cargo transportation, on-orbit propellant resupply and fast automated rendezvous and docking. During the mission, Tianzhou 1 will orbit on its own for about 3 months and together with Tiangong 2 for about 2 months after their rendezvous. At the end of the mission, Tianzhou 1 will leave the orbit and fall back to a pre-set sea area while Tiangong 2 will remain in orbit and continue its experiments.

If the mission succeeds, it will lay a solid foundation for establishing a Chinese space station. China's human spaceflight program will enter an era of space station.

(Source: Science and Technology Daily, March 4, 2017)

► Sustained Improvement on Spacecraft

At 7:53, 3rd, March 2017, China Aerospace Science and Industry Corporation (CASIC) has launched, in Jiuquan Satellite Launch Center, Tiankun 1, a new experimental satellite. On the occasion of the 5th session of the 12th CPPCC National Committee, Wei Yiyin, CPPCC member, vice president of CASIC said that this launch represents that CASIC has the ability to independently build various kinds of typical spacecraft and platforms. This launch also lays the technology foundation for Hongyun and other commercial spaceflight programs.

CASIC Second Academy spearheaded in building Tiankun 1, the first satellite with full independent IPR of CASIC. Tiankun 1 centers on its highly integrated electronic system and carries visible light, infrared, microwave and other remote sensing and communications payloads. The successful launch of Tiankun 1 can enhance China's ability to support rapid launch and multi-functional integrated application as well as China's quick response ability to quickly access spatial information during emergencies.

(Source: Science and Technology Daily, March 4, 2017)

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► China's Future Mars Exploration Program

On 3rd, March 2017, Ye Peijian, CPPCC member, advisor on Mars Probe System, CASTC expressed that the prototype stage of China's first Mars exploration program (Mars expedition) is progressing smoothly. China will launch its first Mars probe in the second half of 2020 and is expected to finish the first expedition by 2020.

China approved the Mars exploration program in January 2016 and a prototype was completed in June that year. The prototype is a probe that could be able to go to Mars. After various tests including destructive ones, a real probe will be built.

The Whitepaper of China's Space Activities released at the end of 2016 elaborated on China's deep-space exploration program. China will explore Mars and small asteroids, bring back samples from Mars, and further explore the Jupiter system. China may orbit its spacecraft higher and further. Ye pointed out that around 2020, China will try to launch spacecraft that orbit at around 100 to 150 AU (astronomical unit, the distance from Earth to the Sun).

(Source: Science and Technology Daily, March 4, 2017)

► Developing Basic Research on Space Science

Gu Yidong, NPC delegate, senior advisor of the Technology and Engineering Center for Space Utilization, CAS, made an appeal when interviewed by the *Science and Technology Daily*. He maintained that in space exploration, China should prioritize basic research.

For the public, the 2017 "schedule" for launching spacecraft is still exciting: China will launch Tianzhou 1 in April and Chang'e 5 in November; over the whole year, China will launch several satellites for communication, meteorological information and earthquake monitoring; the Long March rocket family will appear publicly for 28 times. But according to Gu Yidong, space exploration incorporates three parts: first, space technologies including the technology to produce and launch rockets, satellites and other spacecraft; second, application of space technologies for actual benefits such as communication and meteorological monitoring; third, space research whose purpose is not specific technologies or applications but exploration and discovery of new laws and phenomena. Space exploration has become a critical beachhead for cutting edge basic research. Fruitful results can be expected in life sciences, physics, astronomy, materials science etc.

(Source: Science and Technology Daily, March 13, 2017)

Developing AI and Promoting Industrial Transformation

► Enhancing Support for R&D in Chips

Before the NPC inaugurated, Deng Zhonghan, CAE member, board chairman of Vimicro has been interviewed by the *Science and Technology Daily* and mentioned that AI development for the next five years would be exciting. He said that during the 13th Five Year Plan period, AI would influence more aspects of social life including e-commerce, security monitoring, healthcare and bio-technology.

"Chips are the source of AI progress. Those who win on chips win on AI", Deng said. "Developing the chips with ultra-high computing ability and in line with market conditions has become the key to AI competitions." Deng has been dedicated to chip research for a long time. Vimicro has rolled out and mass produced China's first AI chips of neural network processing.Deng suggested that the Ministry of Science and Technology should take the lead in further supporting the independent R&D on chips and the National Development and Reform Commission（NDRC）and Ministry of Finance should offer their support by facilitating program approval and funding. China should increase its investment in independent chip development through the National Integrated Circuit Industry Investment Fund. While prioritizing chip-manufacturing enterprises, China should offer more funding to chip design enterprises.

Deng held that China should transform advanced chip technology into independent standards and coordinate the innovation in technology, standard-setting and sectoral development; China should improve the mechanism where research results are transformed into IPRs and independent standards.

(Source: Science and Technology Daily, March 5, 2017)

► Establishing the Standard System for the AI Industry

Liu Qingfeng, board chairman of iFLYTEK brought two AI gadgets to Beijing: one is an AI translation machine to facilitate communication between people of different languages; the other is a real-time transcription system which can jot down the speeches of the NPC delegates.

On 5th, March, iFlYREC, this real-time transcription system was also used to turn Premier Li Keqiang's *Report on the Work of the Government* into written texts.

As an AI expert, Liu Qingfeng has made several proposals to promote the AI development. One of the proposals is that the state should establish the standard system of AI industry as soon as possible.

Liu suggested that AI technological standards and application guidelines should be set up in aspects like information and communication, computer and internet and consumption electronics and should be aligned to education, healthcare and public security. China should establish the standard system and application testing procedures for AI industry.

(Source: Science and Technology Daily, March 8, 2017)

>>> Business Development and Innovation

Forewords: During the two sessions, NPC delegates and CPPCC members had enthusiastic discussion on innovation and entrepreneurship, which drew close attention of the public.

► Zhou Guohui Talks about Entrepreneurship

Zhou Guohui, NPC delegate, Director General of Zhejiang Department of Science and Technology, talked about entrepreneurship during the two sessions. He pointed out that the core and backbone of businesses are entrepreneurs. Entrepreneurship involves confidence, attitude and commitment and has, at its core, the willingness to break new grounds and make innovations.

As China's economy is in transition, we especially need to nurture and protect entrepreneurship so that tens of thousands of businesses can become the driving engine for innovation. Entrepreneurs are the mainstay in delivering the concept of innovation-driven development. The government should provide a fair environment and pay entrepreneurs full respect to encourage them to innovate.

The *2016 Report on the Work of Government* pointed out that "protecting property rights means protecting labor, protecting invention and innovation, and protecting and developing productive forces." We should enhance the system of property rights protection. By protecting property rights of economic organizations of various ownerships and citizens, we can encourage people to start businesses, innovate and create wealth, stimulate and protect entrepreneurship, and reassure entrepreneurs in their operation and investment.

One of the key agenda items for this NPC session is to review and approve the *General Provisions of Civil Law*. Based on these provisions, we will draft the *Civil Code* with Chinese characteristics. All these are the foundation of the socialist legal system with Chinese characteristics and represent the concrete effort in protecting property rights, safeguarding contracts, integrating markets and ensuring fair exchange and competition.

(Source: Science and Technology Daily, March 9, 2017)

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► Li Yanhong on Business R&D

At a press conference of the 12th CPPCC on March 9th, Li Yanhong, board chairman and CEO of Baidu mentioned that the National Engineering Laboratory of Deep Learning Technology spearheaded by Baidu was officially launched. Other co-founders include Tsinghua University, Beihang University, China Academy of Information and Communications Technology and China Electronics Standardization Institute. Li maintained that private enterprises, SOEs, universities and research institutes have their respective advantages and private enterprises have unique R&D expertise in various fields. It is a right decision to let a private enterprise to participate in or even take the lead in the National Engineering Laboratory.

Li added that technologists like himself are different from scientists. Scientists may try to figure out questions that only few can understand but technologists create things to benefit maybe 500 million or 5 billion people. As private enterprises focus on R&D that is based on the market prospect, they have evident advantage in technologies that benefit people's wellbeing, for instance AI.

(Source: Science and Technology Daily, March 10, 2017)

► Lei Jun on Business Overseas Development

On 22nd, March, Lei Jun, board chairman of Xiaomi made his proposal to the two sessions that the government should seize the historical opportunities provided by the Belt and Road Initiative and effectively promote the overseas operation of China's technological companies.

Lei held that due to different institutions, languages, cultures, politics and other factors, the overseas outreach of many Chinese enterprises was not smooth. As different countries have different policies and laws, gaps exist in terms of national security, antitrust practice, environmental protection, labor protection, tax system and industry access. Policies and laws of a nation may also change due to external economic situation, which leads to inconsistencies. All these bring about problems, difficulties and potential risks for the overseas production and operation of China's tech-firms. Lei proposed that the government should consider dispatching "Belt and Road" coordinators in China's foreign missions to better serve enterprises' development. These commissioners can help Chinese enterprises adapt to the political and business environment of the host country as soon as possible and undertake the overseas business smoothly.

Lei maintained that institutions like China Council for the Promotion of International Trade and China Chamber of International Commerce can take the lead in building incubators in key cities alongside the "Belt and Road". By doing so, we could push forward resource integration and form a synergy among different enterprises.

(Source: Science and Technology Daily, March 13, 2017)