CHINA SCIENCE AND TECHNOLOGY
NEWSLETTER

Department of International Cooperation
Ministry of Science and Technology(MOST), P.R.China

No.18
September 25 2014

Minister Wan Highlights the Importance of Science, Technology and Innovation in China

As international competition is more intense than ever, capability in science, technology and innovation concerns a nation's future. It is a cornerstone of China's modernization drive and the Chinese nation's rejuvenation. In a recent interview, Wan Gang, Vice Chairman of CPPCC and Minister of Science and Technology, aired his views on how to pursue innovation-driven development and improve China's capability in science and technology.

Reporter: The Chinese nation is known for ingenuity and innovation. Innovation is high on the agenda of the Chinese government. Over the years, China has made impressive achievements in research. What are those landmark achievements?

Wan Gang: China always attaches great importance to science, technology and innovation. Since reform and opening-up policy started, the Central Government has developed many programs in the regard. In 2006, China issued the National Medium- and Long-term Scientific and Technological Development Program (MLP), the first of its kind in the 21st century, setting out the goal of building China into an innovative country. The 18th CPC Congress proposed the strategy of innovation-driven development, adding momentum to science, technology and innovation activities.

Over the years, China has substantially boosted its capability in science and technology. Science and technology is playing a bigger role in spurring economic and social development. Cutting-edge research results are flourishing in basic sciences and key areas, which have attracted world attention.

From 2006 to 2013, China's total R&D spending, R&D personnel, and research results saw considerable increase. In 2013, domestic valid invention patents

Monthly-Editorial Board:Building A8 West, Liulinguan Nanli, Haidian District, Beijing 100036, China
Contact: Prof.Zhang Ning E-mail: zhangn@most.cn hixiaosun@163.com http://www.caistc.com

totaled 590,000, up 9.3 times over 2006. Science papers published in international journals ranked the world's No.2, with the number of citations rising to No.5. Technology contract volume nationwide was 746.9 billion yuan, an increase of 4.1 times. Revenue from main products of high-tech industries exceeded 11 trillion yuan, an annual average growth of more than 10 percent.

In 2013 in basic research, anomalous quantum Hall effect was observed in experiment for the first time, which can ensure spontaneous, one-way, orderly movement of electrons in zero magnetic field. The phenomenon of 4 quark particles was discovered, attracting the attention of international physics community. CiPS cell and tumor marker "heat stock protein 90α" were discovered, opening new avenues for regenerative medicine and anti-tumor drug research. A new material called cubic boron nitride, which is even stiffer than diamond, was first synthesized. These achievements in quantum science, particle physics, life sciences, nano-technology are moving to the world cutting-edge level.

In high-tech field, we developed the fastest computer-Tianhe II, achieved successful Tiangong-Shenzhou space docking, the soft landing of Chang'e 3 on the moon, and deep-sea diving device for scientific application. In terms of major R&D projects, TD-LTE 4G telecommunication has been licensed for operation, and the projects on major equipment, next-generation nuclear power, new drug development, water pollution control and infectious disease monitoring have achieved notable progress, driving the growth of emerging industries. All these R&D achievements have boosted national strength and people's morale.

Reporter: We know on what level China's science, technology and innovation is standing at in the world before we put related policy in practice. The Ministry of Science and Technology has conducted a comprehensive survey on the facts and figures. Would you brief us on this?

Wan Gang: Last year, we pooled more than 8,000 experts, from both home and abroad, to conduct surveys on MLP, major R&D projects, and international technology competition. Among the 1,149 technologies in 10 areas surveyed, 195 or 17 percent are already leading the world, and 355 or 31 percent are not far short of, or even running neck to neck with the world-class level. Still 599 or 52 percent are lagging behind and have some catching up to do, but 94 percent are narrowing their gap with the world-class level. This is the overall picture. Thanks to years of hard work, China is now poised to become a strong country in science, technology and innovation.

In pursuing the strategy of innovation-driven development, the key is to substantially raise China's innovation capability, and master core technologies. Only in this way can China gain a competitive edge in the future. Though China has scored some impressive achievements, we're still a follower in so many areas. We must be sober-minded, neither becoming arrogant nor belittling ourselves. In those leading areas, we must be clear about our lack of original innovation, consolidate our foundation and go further ahead. In those not-so-far-behind areas, we will do our best to make breakthroughs so as to overtake others in the shortest time possible. In those lagging areas, we will adopt a differentiated strategy, and create new comparative advantages, in an effort to catch up as soon as possible.

Reporter: This will not only bring about profound changes in production, but will deepen the reform of economic system and operational mechanism. How will science, technology and innovation stimulate reform? In order to transform research results into become real productivity as soon as possible, what changes will we have to make to the scientific and technological system?

Wan Gang: Science, technology and innovation is vital to reform. It will not only boost productivity, but also promote the adjustment of production relations and

the reform of superstructure.

China has entered a new era of development driven by innovation. New technologies and products are cropping up every day. And institutional changes that come with them are already taking place quietly. The ongoing reform in many areas is the result of development in new technologies, such as information, new energy and new materials. The emergence of microblogs and WeChat has affected the use of short messages, and facilitated the change of business models. Online shopping transforms logistics and retail businesses, shifting big shopping malls towards a combination of experience stores and entertainment centers. Online financing such as Alipay facilitates the reform of traditional financial system. Distributed power such as wind- and PV- generated electricity is bringing changes to power management system. Rural online distribution network makes it easier for peasants to buy and sell their farm products, improving traditional sales channels. The widespread use of EVs will also fuel the reform in the fields of energy, vehicle and electric power.

Science, technology and innovation unfetters productive forces and brings about profound changes in production relations. In turn, an overhaul of a series of relevant policies is necessary to pave the way for further innovation. In pursuing S&T reform, one priority is to facilitate the commercialization of research results. For this purpose, policy environment must be improved to make enterprises the main player in technological innovation. According to the revised *Law on Scientific and Technological Progress* issued in 2007, results from publicly-funded R&D projects are owned by the legal entity that undertakes the research. This gives green light to the commercialization of research results by enterprises, and, as a result, technology transactions are increasingly flourishing. Technology transaction volumes nationwide jumped from 230 billion-plus yuan to 746.9 billion yuan in 2013. And more than 80 percent were business-to-business transactions. Beijing Zhongguancun Innovation Pilot Zone was particularly notable. Last year, its transaction alone was more than 240 billion yuan, or one third of the national total.

Compared with enterprises, universities and research institutes have not been doing well in commercializing their research results. One of main reasons is that the rights for them to dispose their research results and gain profit are not clearly defined. To solve this issue, the government has conducted policy measures on a trial basis in Zhongguancun Innovation Pilot Zone. In revising the *Law on Commercialization of Research Results*, which started last year, we proposed that universities or research institutes, as the legal entities that undertake research are entitled to dispose of and profit from their research results. Accordingly, we are now developing administrative measures specific to universities and research institutes, so that relevant technology transfer mechanisms can be in place to speed up the commercialization process.

Reporter: According to statistics, China is already one of the biggest spenders on R&D in the world, and its business spending accounts for two third of its total. This shows Chinese enterprises have already become the main player in R&D investment. But in order to become the main player in technological innovation, they still have a long way to go. To achieve this goal, what should we focus on?

Wan Gang: Business spending now accounts for 76.2 percent of the gross expenditures on R&D (GERD). It shows that enterprises are becoming the main investor in technological innovation. Over 80 percent of technology transactions are carried out by enterprises. It demonstrates that enterprises' research results, besides serving the self-use purpose, have generated added value. When we look at the emerging industry, 93 percent of the 355 enterprises listed on the start-up stockmarket are high-tech ones, with a capitalization of 1.3 trillion yuan. It indicates that the innovation performance of enterprises is improving.

But a closer look at enterprises' R&D investment structure reveals that more than 90 percent goes to experiment and development, and less than 1 percent is used for research on basic sciences and forward-looking technologies for industrial use. According to analysis, China's conversion of basic research results into leading technologies is about 25-30 percent, lower than that in developed countries such as the U.S., Japan and Germany. In China, 71 percent of leading technologies are still in the laboratory (31 percent) or in the trial phase (40 percent). But in developed countries, over 70 percent are in the stage of commercialization. These figures show that China still lags far behind developed countries in terms of knowledge creation, technology, product to market development. Enterprises are particularly notable for deficiency in capacity for original innovation capability. We need to focus on five aspects in order to substantially boost enterprises' innovative capability. We will:

1. Establish a market-based mechanism for technological innovation. We should strengthen the linkage between S&T policy and economic policy. Policies should be in place to incentivize corporate innovation, such as better implementing pre-tax deductions of R&D expenditures and improving approaches to increase R&D expenditures. Based on the market demand, such a mechanism that enterprises decide on their own what R&D projects to launch, fund and be jointly carried out, and the government subsidizes the projects will be established.

2. Guide enterprises to boost their technological innovation capability. We will set up national engineering research centers and laboratories in flagship enterprises, and encourage the forming of industrial technology innovation alliances featuring industry-university-research institute collaboration, in a bid to create an innovation chain with clear split of roles and responsibilities and a risk- and benefit-sharing industrial chain.

3. Step up support for innovation activities by small enterprises. We will increase guarantee funds and VC financing for high-tech small- and medium-sized enterprises (SMEs), allocate a bigger share of SME Dedicated Fund and pool more private capital to support SMEs' innovation activities, and encourage young scientists and university graduates to start their own businesses.

4. Put in place a mechanism to promote collaborative innovation. We will deepen the reform of research institutes and universities to bring the government, industry, universities, research institutes and users closer. We aim to leverage each's strengths, facilitate their collaboration on the basis of shared risks and benefits, and provide subsidies to them.

5. Increase government spending on the research of basic science, frontier sciences with great strategic importance and key generic technologies. We will adjust government spending structure on R&D in a timely manner, and give greater attention to top-level planning, personnel training and base building. We will provide steady support to R&D projects on a sustained basis, with the focus on basic and frontier sciences, high-tech, the fields related to social benefit and public welfare such as agriculture, eco-environment, environment protection and health.

In developed countries, government spending is an important part of gaining breakthroughs in generic technologies. For example, the development of search algorithms, which made Google's search engine possible, was financed by the U.S. Federal government. The main technologies which iPhone is based on, from wireless communications, the Internet, microelectronics, touch screen, to text-to-speech, were financed by the government in their early stages. Therefore, more government spending on R&D should be channeled to key generic technologies of the future. Meanwhile, we will further reform the scientific and technological management system, and shift the roles of the

government. We will follow *the Guidelines on Improving Central Government-Financed Research Projects and Funding Management* to form an open, transparent, and strong management system with clearly defined roles and responsibilities.

Reporter: Yes, pooling financial resources nationwide for key generic technology R&D should be the consensus. In a critical period of changing economic growth mode, restructuring economy and facilitating economic development, how could China fully tap the potential of science, technology and innovation (STI) to serve its overall economic development?

Wan Gang: Industrial restructuring should rely on the core driver of STI. Innovation should prevail in all dimensions, including management system, operation mechanism, industrial policy, technology, product, business model and financial policy, with all these links connecting to each other. It is only through constant innovation that we could facilitate the elevation of our industries from the lower end to the middle and high end of the global industry and value chain.

We will act quickly to foster strategic emerging industries. On one hand, we should give full play to the leadership role of the National S&T Major Projects, facilitate the R&D, demonstration and application of S&T Major Project, boost innovation of business model and speed up the transformation of research findings into productivity. On the other hand, we should continue to strengthen R&D and application of key generic technologies, and support the development of strategic emerging industries and the innovation of major projects. We will endeavor to master core industrial technologies like big data, smart robot, energy-saving and new energy vehicles, clean fuel and bio-medicine, so as to gain a competitive edge in industrial development.

We will facilitate the transformation and upgrading of traditional industries. In steel industry, non-ferrous industry, light industry and textile industry, we will step up our efforts in promoting advanced and applicable technologies that conserve energy, reduce emission and optimize industry upgrading. We will implement the S&T projects concerning the IT application in manufacturing industry and demonstration projects of new-generation digital control, strengthen development of scientific instruments, enhance the innovation capacity of machinery equipment companies, and accelerate industrial transformation and upgrading.

China will develop modern service industry. We will give prominence to e-commerce, industrial design, cultural innovation, modern logistics, system outsourcing, manufacturing service, digital tourism, digital life and information consultation services, health service industry and aging service industry. We will develop a new S&T service industrial pattern by strengthening the building of S&T service agencies devoted to technology market, R&D and design, technology assessment, productivity increase, tech-based enterprise incubation, science financing and industrialization.

Efforts will be made in-depth studies on major strategic problems, with the focus on food security, water resources, energy security, information security, electric vehicles, high-end chips, new type engine and gas turbine, etc. We will also map out specific implementation plans, clear roadmaps and timetables, so as to accelerate the creation and application of major research findings.

We will also work to build a sound eco-system. We will strengthen efficient exploration, development and utilization of clean energy and resources, as well as development, demonstration and application of clean production technologies. We will accelerate R&D, application and demonstration of key technologies related to turning solid wastes into resources, air cleaning, sea water desalinization, green construction as well as carbon capture, utilization and storage. The Capital Blue Sky Action will be further promoted. Moreover, we will strengthen R&D of key generic technologies related to preventing air, water and soil pollution, and enhance

R&D and promotion of technologies for preventing desertification, stony desertification, soil erosion and grassland degeneration, etc.

Reporter: On the basis of home-grown innovation, we will be more open to S&T cooperation. What measures can we take to fully use the incentive mechanism of international competition for driving China's home-grown innovation?

Wan Gang: In recent years, we have been working constantly to make S&T cooperation further open and deepen S&T exchanges internationally. We have established S&T cooperative relations with 154 countries and regions, and signed 104 inter-governmental agreements on S&T cooperation. China is an active player in international mega-science projects like ITER, SKA, deep-sea drilling project, international earth observation and human genome research. At present, we are carrying out all-dimensional, multi-area and in-depth cooperation with other countries.

In a period to come, we will work harder to bring about fruitful results when opening ourselves wider to international S&T cooperation. First, China's S&T activities will continue to integrate into the global innovation network. Chinese scientists will take part in international mega-science projects and research projects, and explore the possibility of sharing global major research infrastructure. The government will ensure the further opening of national S&T programs, which will involve more overseas top-notch experts and teams. In the course of implementing the "go global" strategy, we will encourage high-level talents to work at international organizations, thus helping enterprises enhance their technical innovation capacity and gain a competitive edge in foreign trade. The Chinese government will explore new mechanisms and approaches for involving foreign-funded research institutes in our national S&T programs in the principle of equality. A transnational technology transfer platform will be built to help enterprises gain access to global resource and market. In the principle of "targeted guidance, concentrated display and closer coordination", A group of international S&T cooperation bases will be developed into a systematic network, so as to forge new forces in improving our S&T development and industrial competitiveness.

Second, the Chinese government continue to facilitate inter-governmental innovative dialogue and S&T cooperation. Last year has witnessed the holding of the 1st China-EU Innovation Cooperation Dialogue, the 4th China-US High-level Consultation on People-to-People Exchange and the 4th China-US Innovation Dialogue. Innovation dialogue has become an important mechanism for strategic exchanges between China and major powers in the world. We will push forward practical China-US cooperation in all respects like energy, agriculture, environment and humanitarian exchanges, and accelerate the building of S&T cooperation centers with Russia and middle Asian countries as well as innovation center with Europe.

Third, the government endeavor to do a good job in S&T diplomacy and international S&T assistance. Our work facilitate the building of the Silk Road economic belt and 21st-century marine silk road, upholding the strategy of open S&T cooperation. We will launch China-South Asia S&T Partnership Program, implement the items in China-ASEAN S&T Cooperation, speed up the implementation of China-Africa S&T Partnership Program, facilitate the building of state-level joint labs, strengthen transfer of advanced and applicable technologies, and attract young foreign scientists and engineers to China for R&D.

(Source: *Qiushi*, June 16, 2014)