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## Eight Highlights of Minister Wan Gang's Answers to the Press



On March 11th, 2017, a press conference was held in the Press Center of the Fifth Session of 12th National People's Conference. Dr. Wan Gang, Minister of Science and Technology took questions from Chinese and foreign press on the implementation of the innovation-driven development strategy in 2016 and major work in 2017. The highlights of Minister Wan's answers are summarized as follows:

### ► 1. Turn the priorities of science and technology related work from planning to full implementation

2016 marked a milestone in our national scientific and technological undertaking and the implementation of Innovation-driven Development Strategy. Over the year, the Central Committee of the Communist Party of China (CPC) and the State Council convened national conference on science and technology, the biennial conference of the Chinese Academy of Sciences and Chinese Academy of Engineering, and the 9th national congress of the China Association for Science and Technology. *The Plan for Implementing the National Strategy of Innovation-driven Development (hereinafter referred to as "the Plan")* was issued. President Xi Jinping called for efforts to develop China into a country strong in science and technology and rolled out a three-step roadmap.

2017 will be a year of significance in the development of CPC and the country. The science and technology community need to do its utmost to prepare for the convening of the 19th CPC National Congress. To deliver the National Strategy of Innovation-driven Development and *the 13th Five-Year Plan on National Scientific and Technological Development*, our priorities in 2017 should be shifted from planning and deployment to full implementation. We have already unveiled detailed measures.



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### ► 2. Reflect upon the direction and priorities of our work among compliments

2016 was an extraordinary year for China's science, technology and innovation (STI). In general, the overall strength of our national science and technology has been continuously enhanced, further encouraging economic and social development. The reform of the scientific and technological mechanism was advanced steadily with marked progress. A series of policies were under implementation.

Premier Li pointed out in *The Report on the Work of the Government* that the innovation-driven development strategy was carried out, generating a number of world-leading outputs in the field of science and technology, boosting emerging industries, stimulating the transformation and upgrading of traditional industries and driving economic growth. There have been widespread entrepreneurship and innovation activities across China. With the participation and the support of the society, the young people are realizing their entrepreneurial and innovation dreams. Moreover, groups of high-level craftsmen and professional farmers are growing, making contributions to Chinese brands and product quality. The report stresses the importance to upgrade real economy through innovation. These contents of the Report won waves of applause, but we, as governmental authorities, must remain calm-headed and reflect upon our directions and priorities among praises.

This year will be another important year for the implementation of the Plan. It requires us to shoulder more responsibilities by putting in place a mechanism of correcting mistakes so that all types of scientific and research institutes, innovative enterprises and universities could be more responsible. We need to improve service abilities so as to save time for scientific and technological personnel. We need to gather more cases and help S&T personnel better understand the new policies. In order to deliver policies, we also need to align various policies and connect different links.

We must tackle the grassroots problems. As to reducing charges of internet and improving network speed, related authorities and enterprises have proposed their action plans. From the perspective of science and technology, we need to further accelerate the research and development of 5G mobile telecommunications to enable quicker and wider internet access.

To boost mass entrepreneurship and innovation, we must further support large enterprises, prestigious universities, research institutes and young people to develop specialized maker spaces with a view to realizing young entrepreneurs' dreams at a faster pace in a down-to-earth manner. Also, we must make more efforts in terms of talent cultivation. Since innovation-driven development is in essence talent-driven development, we shall not only pay attention to attracting worldwide talents to China and participate in our innovation activities, but also nurture technology talents. More importantly, we need to encourage young skilled talents, such as craftsmen and professional farmers, to contribute to scientific and technological innovation.



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### ► 2030 major STI projects about to be launched

According to the Plan and the 13th Five-year Plan, China will roll out a series of major S&T projects closely associated with national long-term development and people's livelihood by 2030, which will add to the 2006 national major S&T projects and form a systemic plan combining long-term and short-term goals.

The 2006 major projects and 2030 STI projects are aligned in priority areas, focusing on five areas of electronic information, advanced manufacturing, energy and environment, biology and health, and maritime development. According to basic principles adopted in selection of major projects, the selected major projects need to be of strategic importance, in key areas, forward-looking and feasible. The 16 major projects launched in 2006 will come to an end by 2020, while the 2030 projects started in 2016 will last till 2030. The two arrangements overlapped in timescale.

In the field of electronic information, we deployed four major projects for 2030 on quantum communication and computer, cyberspace security, integrated information network and big data. In the field of advanced manufacturing, we deployed three projects on aviation engine and gas turbine, intelligent manufacturing and robotics, and new materials.

Up till now, the project on aviation engine and gas turbine has already been launched, and formulation of implementation arrangements has been started for projects on deep-sea "space station", space-air-ground integrated information network, quantum communication and computer, and brain science and brain-like studies. It is estimated that all these projects will be implemented in two years.

### ► 4. As for the reform of research funding, we need to do more in services and less in examination

Reform of research funding is an integral part of the institutional reform of national scientific and technological programs. It has remained a topic of great concern for the science and technology circle how can we make the most of the funds and meanwhile reduce the burden of fund management on scientific and technological personnel. Now that specific measures have been introduced to improve the management of research funds, we will request sound management of funds according to standards, stress openness and transparency of fund expenditure, emphasize legal persons' liabilities and streamline inspections and reviews. In general, our future practices will focus more on services and less on review so that universities and research institutes will have more autonomy in fund management.



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### ► 5. Development plan of artificial intelligence (AI) about to be issued

For years, the Ministry of Science and Technology has been actively pushing forward the development of AI technology through a series of scientific and technological programs. A number of projects were funded in key technologies on intelligent computer system, intelligent robots, automated information processing, intelligent transportation, smart grid and smart cities. AI has genuinely been on a fast development track and it will lead economic and social development, thus improving our lives, in particular in the sectors of precision medicine and aging care.

For the next step, we will shift our focus on key cross-disciplinary technologies, such as information technology, human-machine collaboration, swarm intelligence and open studies. We are inviting experts from the academia, businesses and innovative enterprises, including some young entrepreneurs, to collectively work out a national AI development plan. This plan aims at applying AI to economic development, social wellbeing, environmental protection and national security. The central government will launch a project to explore basic research, core and generic technologies of AI. This project must be open, with knowledge exchange and sharing platforms, an open software platform, an open source hardware platform and professional maker spaces. We are working with related partners to draft such a plan, which will be available very soon.

### ► 6. Emphasize the non-profit nature of technological results transformation

The ownership of service invention has remained in the spotlight. *The Law on Promoting the Transformation of Scientific and Technological Achievements* promulgated in October 2015 resolved this issue to some extent by explicitly stipulating that over 50% of net revenues gained from the application and transformation of the scientific and technological achievements from projects supported by national finance should be shared by inventors.

The transformation of scientific and technological achievements has dual nature, namely the nature of both individual profits and social wellbeing. When we promote the translation of the results, we should stress more the non-profit nature of the process. For example, *the Bumper Harvest Project* gathers varied applicable agricultural results and promotes them extensively in 14 cities by seven departments, bringing together fine varieties, measures and fields so as to improve the food production and farmers' incomes. Take the numerical control project as another example, we digitalize and upgrade automated and semi-automated manufacturing machines in small and medium enterprises (SMEs). Through digital and information technology, we could utilize the Internet to provide customized products.

A large number of scientific and technological personnel and agricultural technical task forces (TTF) go to the countryside, helping farmers raise chicken and develop e-commerce. Apples and dates in Shanxi, Chinese wolfberry in Ningxia, navel orange in Jiangxi, horse industry in Xinjiang and yak in Tibet are examples of how the agro-technicians apply achievements to localities to drive local development.

The transformation of scientific and technological achievements is actually an important link of scientific and technological innovation and plays a pivotal role in triggering innovation in many industries.



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### ► 7. High-tech zones as pilots and pioneers

The national innovation demonstration zones and high-tech zones are pioneers of China's high-tech industry. They are the "new" and "high-tech" stories with Chinese characteristics. According to statistics, the 146 high-tech zones have been given strong growth momentum. In the time span of the 12th Five-year Plan, their business revenues grew by 17% annually. In 2016, revenues totaled 28 trillion yuan, a year-on-year increase of 11.5%. Gross industrial output also climbed by 10.3%. These zones have become pioneers of innovative development in many regions. More importantly, they are the testing ground for national institutional reform. In 2016, high-tech zones took the lead in carrying out pilot projects on the translation of R&D achievements. Many good practices have been accumulated. Last year, a pilot scheme on venture loans was launched and further stimulated high-tech development.

High-tech zones are essential carriers of the national drive of entrepreneurship and innovation. Under the leadership of innovation demonstration and high-tech zones, the number of makerspaces across the nation has reached 4298. Together with over 3600 incubators for tech enterprises and 400 plus accelerators, an entire service network for startup incubation has been formed, serving over 400,000 startups and teams. The system has also enabled near 1000 enterprises to be listed and created 1.8 million job opportunities. This demonstrates the positive impacts from innovation and entrepreneurship on job creation. For the next step, it is important to further leverage the leading role of high-tech zones. Firstly, pilot projects are to be carried out in line with policies; secondly, these zones will continue to serve as role models for industrial development; and lastly, high-tech industries will be given momentum to go global. China also welcomes overseas teams with shared interest to launch their pursuit of innovation and entrepreneurship in its high-tech zones.



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### ► 8. Good Mainland-Hong Kong connections of science, technology and innovation

The Ministry of Science and Technology has highly valued cooperation between the Chinese Mainland and Hong Kong in the fields of science, technology and innovation. The Ministry has been committed to promoting pragmatic and in-depth exchanges and cooperation across the board. A solid foundation has been laid and the cooperation has been productive. In 2004, the Ministry signed an *Agreement on Establishing a Scientific and Technological Cooperation Committee between the Chinese Mainland and Hong Kong* with the former Commerce, Industry and Technology Bureau of HK and agreed that the Committee would meet every year to discuss the annual cooperation plan. Within this framework, major cooperation includes the following: in the building of R&D bases, the Ministry has assisted HK in establishing 16 partner labs of the state key labs and six branches of national research centers of engineering technologies. In project research, since 2006 till now, the Ministry has approved 472 HK researchers to participate in national scientific and technological programs. For personnel mobility, 192 HK researchers and scientists have been selected into the expert database of national scientific and technological programs. In terms of science and technology awards, projects accomplished or mainly completed by HK scientists and researchers won six national prizes for natural science and five national awards for S&T progress in 2016. Among these, HK researchers were the principal awardees of 3 of the national prizes for natural science. The data indicate that HK scientists and researchers have already been closely working with their mainland counterparts.

This year, the Ministry is working to advance in-depth innovation cooperation between the mainland and Hong Kong. For example, more support will be granted to Hong Kong scientists for their engagement in national S&T programs, to efforts of setting up Hong Kong-based partner labs and branches of national research centers of engineering technologies, and to facilitate the visits of young HK entrepreneurs to the mainland. It is hoped that more universities, research institutes and enterprises in Hong Kong could visit the mainland and carry out cooperation in science, research, business start-ups and innovation.

(Source: [china.com.cn](http://china.com.cn), March 14th, 2017)

# Scientific and Technological Achievements >>>



## >>> A Milestone Discovery of Superfluids

The team of Pan Jianwei and Chen Yu'ao from the University of Science and Technology of China worked for years, made major breakthroughs in experimental control of ultracold atoms and developed a worldclass experimental platform that can control a mixture of a bosonic superfluid with a fermionic superfluid. By developing core technologies of laser cooling, efficient magnetic transport, optical trapping and high-resolution imaging, the team blazed a new trail in obtaining the final mass-imbalance Bose-Fermi superfluid mixture within a “disk-shaped optical trap”. A rotating laser beam spun the mixture around the trap’s vertical axis, producing lattice-like patterns of vortices in both species. Their success opens new horizons of ultracold atoms, offers a unique research approach through which man can better interpret the complex quantum phenomena at the macro level and paves the way for further research in the mass-imbalance Bose and Fermi superfluid mixture. *Physical Review Letters*, a top-notch international academic journal on physics, published this important research finding in its Editors' Suggestion [Physical Review Letters 117, 145301 (2016)] and highlighted it through Synopsis at the website of the American Physical Society (APS). W. Ketterle, a Nobel laureate, viewed the finding as an impressive experiment. A. Leggett, another Nobel laureate, believed that it is a critical experiment which will undoubtedly galvanize massive theoretical research. M. Zwierlein, a professor of MIT, commented the research as a milestone in the study of superfluids.

(Source: Ministry of Science and Technology, March 16th, 2017)

# Scientific and Technological Achievements >>>



## >>> Dressing Nanodrugs with Polymer

In recent days, Chinese scientists have discovered that polyethylene glycol-functionalized (PEGylated) nanomaterials could not only serve as a transport media in targeted therapy, but is also essential in immune stimulation. This study was jointly accomplished by Professor Zhou Ruhong of the the School for Radiological and Interdisciplinary Sciences under Soochow University, and Researcher Ma Guanghui from the Institute of Process Engineering of the Chinese Academy of Science. They discovered that PEGylated graphene oxide nanosheets (nGO-PEGs) stimulate potent cytokine responses in peritoneal macrophages, despite not being internalized. Atomistic molecular dynamics simulations support a mechanism by which nGO-PEGs preferentially adsorb onto and/or partially insert into cell membranes, thereby amplifying interactions with stimulatory surface receptors. They also made large-scale simulations with supercomputers. As a result, they found that nGO-PEG indeed provokes cytokine secretion by enhancing integrin  $\beta 8$ -related signalling pathways. The present results inform that surface passivation does not always prevent immunological reactions to 2D nanomaterials but also suggest applications for PEGylated nanomaterials wherein immune stimulation is desired. Such scientific progress has never been reported before. Now the achievement has been published in *Nature Communications*, a leading international journal on natural science. It reveals new thinking of immune stimulation and is very likely to shed light on precision medicine.

(Source: Science and Technology Daily, April 7th, 2017)

# Scientific and Technological Achievements >>>



## >>> Wave Energy Converter Patented Extensively

Chinese scientists independently developed a wave energy converter (WEC) Sharp Eagle “Wanshan” with a whole set of matching technologies and equipment design. The converter has been granted invention patents in China, the U.S. and Australia and accredited by the Bureau Veritas of France, which symbolized that its technologies are ready for commercialization and the international market. According to Sheng Songwei, Deputy Head of the Ocean Energy Lab of the Guangzhou Institute of Energy Conversion of the Chinese Academy of Science, this device is 36 meters long, 24 meters wide and 16 meters high and 12 meters below the ocean surface. It has three platforms for power generation, enough to serve 500 to 1000 people on a sea island. It has been tested offshore the Wanshan island of Zhuhai and proved its ability of converting unstable waves into stable power, while also maintaining a very high rate of conversion efficiency. Meanwhile, weathered through storms, it has showcased a powerful capacity of power generation, good adaptability to the environment and sound reliability. Now the “Wanshan” converter is undergoing larger scale trials in the areas of Wanshan Archipelago.

(Source: Guangming Daily, February 15th, 2017)