China

China's Science, Technology and Education

Xi Qiaojuan & Zhang Aixiu
Translated by Lei Jing

CHINA INTERCONTINENTAL PRESS

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COMPILED BY XI QIAOJUAN AND ZHANG AIXIU

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著　　者／席巧娟　张爱秀
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Foreword

Through its reform and opening to the outside world, China has worked an economic miracle and boosted its comprehensive strength, enhancing its standing in the international community. As more and more people around the world are eager to know and understand China, we have compiled the China Series, aiming to provide a shortcut for readers to get the basic facts about this country.

The 12 titles in this series cover China's geography, history, politics, economy, culture, law, diplomacy, national defense, and society, as well as its science, technology and education; its environment; and its ethnic groups and religions. These writings will help readers acquire a basic knowledge of China.

It is our hope that this series will enable readers to get a general idea about China:

Chinese history, culture and civilization, which is the oldest continuous major civilization in the world;

China's basic conditions—the world's largest developing country with a huge population, a country that is developing unevenly on a poor economic base; in light of these conditions, China is following its own path to sustainable development while learning from other civilizations; and

China's future—led by the Chinese Communist Party, the Chinese people are focusing their efforts on economic development and carrying on reform and opening-up; they are building a harmonious society in their own country and working for a harmonious world with lasting peace and common prosperity.

We expect that through these books our readers will begin a new journey of discovery—understanding China.

January 2010

Contents

Preface:
Revitalizing the Country through Science, Technology and Education

China had witnessed two significant events in 2008 that drew global attention. One was the 29th Olympic Games, successfully held in Beijing. IOC president Roger described it as an "unmatchable" event. From the opening ceremony to the closing ceremony, from the Olympics to the Paralympics, these "high-tech Olympics" fully displayed the country's charm. Did you know that much of the high-tech equipment used in the Olympics was invented in Chinese universities? Examples include the panoramic intelligent simulation scheduling system, the cauldron ignition system, the dynamic fireworks during the opening ceremony and the completely electric bus.

The other event was on September 27, when astronauts in the Shenzhou-7 manned spaceship made a space walk, making China the third country after Russia and the United States to master extravehicular space technology. This large, complex and highly integrated manned space flight embodied the wisdom and painstaking work of thousands of people and

Fireworks during the Opening Ceremony of Beijing Olympic Games

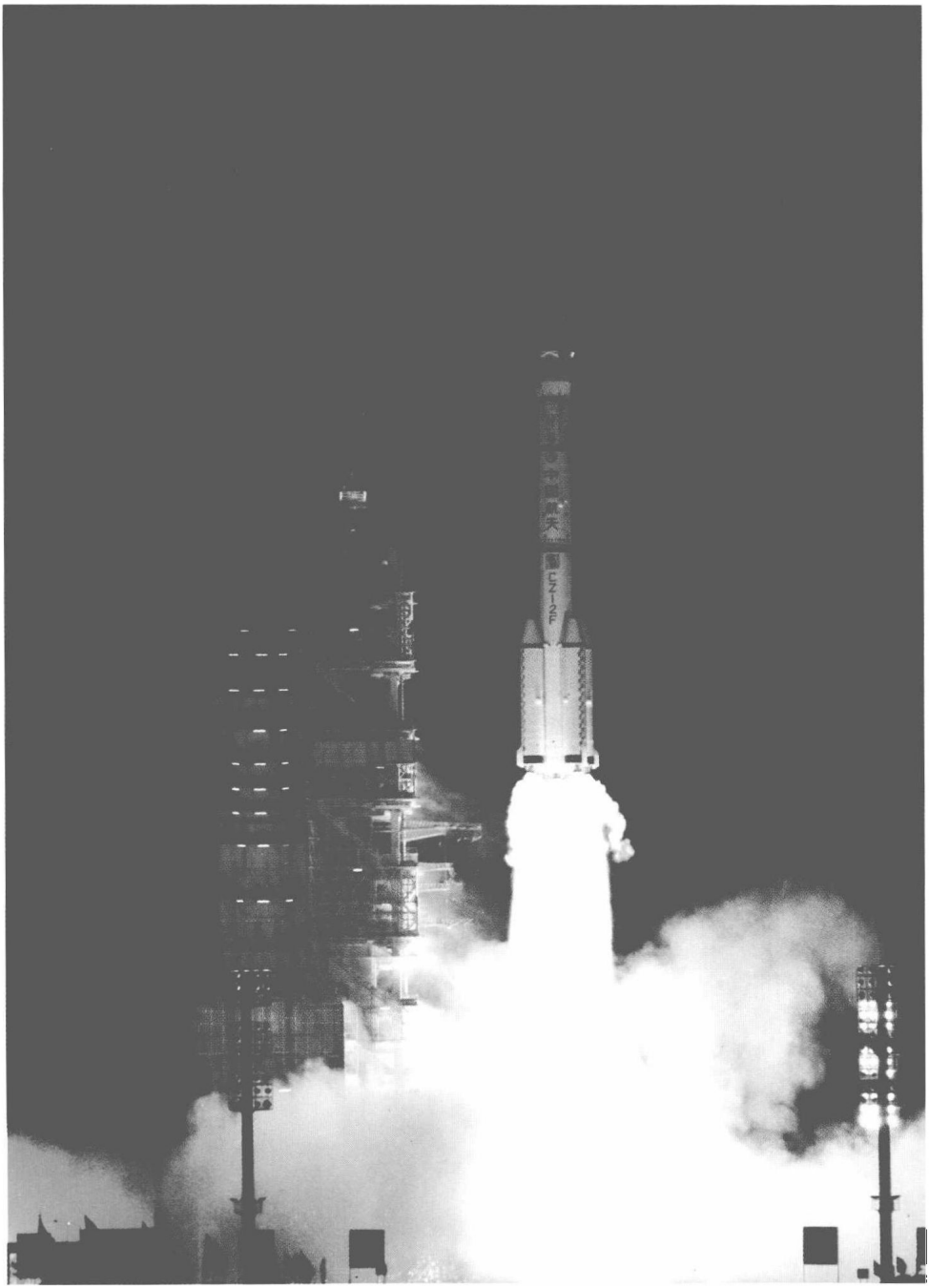
hundreds of thousands of scientific and technological efforts. As a result, President Hu Jintao, during the meeting to celebrate the complete success of the Shenzhou-7 manned space mission, emphasized that education should be given strategic priority and developed vigorously to lay a solid foundation for the development of innovative talents.

In science and technology develop rapidly, the popularization of science and technology can set the level of productivity and culture and the ability of a nation to innovate. In the history of mankind, major scientific discoveries and technological inventions have had great influence on society.

When the final analysis, today's international competition is focused on scientific and technology talent. Before 1949, the level of scientific and technological development was rather low. There were only about 30 specialized research institutions and less than 50,000 scientific and technological personnel. Primary school enrolment was only 20% while illiteracy was as high as 80%. During the early years after the establishment of the People's Republic of China, the nation's science and technology had to be rebuilt from the "ruins."

The Chinese government put forward a slogan: Marching towards science. It also adopted a series of strategic initiatives to accelerate the development of science, technology and education. These strategies resulted in breakthroughs in science and technology that led to a historic leap in education that quickly changed the backward state of the country's science, technology and education.

On May 24, 1977, Deng Xiaoping noted that "compared with developed countries, the science and technology and education of our country has lagged far behind for 20 years... We must lay equal emphasis on science and technology and education. We must strengthen these two aspects from primary schools, to middle schools, to universities... We should 'walk on our two legs,' paying attention to both popularization and



Launch of Shenzhou-7 Manned Spaceship

improvement."

Since the reform and opening-up, China has established and implemented a strategy of revitalizing the country through science, technology and education. Development has been rapid. Consequently, the country has become a world leader in a number of areas while witnessing vigorous development in education. It has built the largest national education system in the world, laying a reliable foundation and creating the impetus to propel economic and social development forward while enhancing the national power and international competitiveness.

Modern developments in these fields depend on the thorough implementation of the strategy to develop and revitalize China through science and technology and education—a long-term strategy. This means giving science and technology and education strategic importance in the economic and social development of the country. It requires advanced science and technology and a well-developed educational system, continuous knowledge innovation and high quality workers that can drive and support economic and social development to achieve the objective of realizing socialist modernization and moving towards a knowledge economy. All these have laid a solid foundation for China's peaceful rise and the nation's great revival in the 21st century.

Education and R&D System

China's R&D System

Since the 1980s, as China began to focus on developing its economy and shifted from a planned economy to a market economy, its scientific and technological policies were correspondingly adjusted. The country's R&D system experienced institutional reform. The government-led central planning system underwent changes and a new science and technology system gradually took shape.

The new system is based on the idea that "economic construction should rely on science and technology, and scientific and technological work must be oriented to economic construction." Features of the system include a clear division of labor and a benign relationship among governmental scientific and technological institutes, industry research departments and institutions of higher learning. At the same time, the system helped private technology enterprises develop rapidly.

Major scientific research institutes

China's research system is mainly driven by scientific and technological efforts from state-owned research and development institutions, institutions of higher learning and enterprises.

State-owned research and development institutions

State-owned research and development institutions are an important driver of China's research and development.

Established on November 1, 1949, the Chinese Academy of Sciences is not only the highest science and technology academic institution, but also the national development center of natural science and high-tech comprehensive research. A large number of China's best scientists converge in the affiliated research institutions of Chinese Academy of Sciences. They work

on basic research, social welfare research, high-tech research and development; and initiate new high-tech industry. In the past 60 years, the Chinese Academy of Sciences has achieved a series of major research results such as the development of "Two missiles plus one satellite"; which greatly contributed to the country's science and technology development, national economy and social development, and national defense.

The institute has also recruited more than over 45,000 post-graduate students and educated plenty of technologically innovation talents. The Chinese Academy of Sciences has a team of high-level scientific talents with 37,000 professional technical personnel. Among them, 256 are academicians of the Chinese Academy of Sciences, among them are 53 academicians of the Chinese Academy of Engineering.

As a national agricultural scientific research institute, the Chinese Academy of Agricultural Sciences shoulders the tasks of researching the nation's most important infrastructure, the foundation, research and application of high-tech industries. The academy includes 39 research institutes, one graduate school and the China Agricultural Science and Technology Press. Among the 39 research institutes, 16 work on crop farming, 10 work on aquaculture, 8 focus on economic and environmental resources, and 5 on agricultural engineering and new and high-tech. Chinese Academy of Agricultural Sciences owns 2 state key laboratories, 20 key department laboratories,

Data Link

"Two Missiles plus One Satellite"

The "Two Missiles plus One Satellite" program resulted in great accomplishments and produced cutting-edge technology in the second half of 20th century.

The program resulted in the successful production and test of China's first atomic bomb on October 16, 1964, the first hydrogen bomb on June 17, 1967, and the successful launch of its first man-made satellite on April 24, 1970.

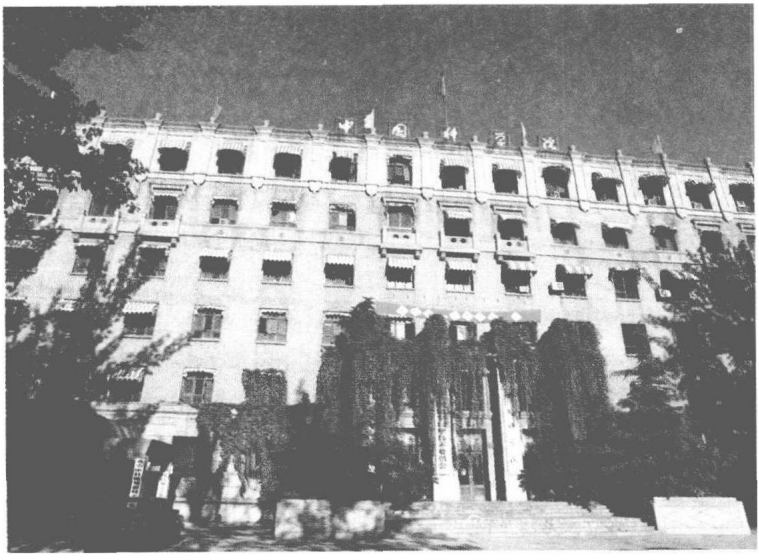
Mao Zedong meets with Qian Xuesen. Qian Xuesen (1911–2009) was a Meritorious Scientist of China's "Two Missiles plus One Satellite" program. He was one of the pioneers of human space-ship technology research and the founder of Engineering Cybernetics in China. He was the most prominent figure in applied science of the 20th century and was known as "China's Father of Space," "Father of China's Missiles" and "King of Rockets."

6 national crop improvement centers, 27 national and departmental quality supervision, inspection and testing centers, 1 national crop germplasm resource centre, 11 national crop germplasm centres, a wild resource gardens, and 26 agriculture and animal husbandry testing grounds.

Located at the foot of Yuquan Mount west of Beijing, the Chinese Academy of Forestry Sciences was set up in 1958. It is a comprehensive, multidisciplinary, social welfare oriented research institute. The institute is directly under the State Forestry Administration. The academy consists of 12 research institutes, 3 research and development centers and 4 forestry experimental centers spread across 11 provinces. Its major tasks are focusing on forestry application research and researching infrastructure and new technology, development and soft sciences. The forestry academy also focuses on key and basic technological forestry issues to develop modern forestry platforms. Its major research fields include: forest cultivation, forest ecology, environment and protection, resource management, wood processing and utilization, chemicals, insects, forestry economics, science and technology information.

Established in 1956, the Chinese Academy of Medical Sciences is China's only state-level academic centre focused on medical science. It is also a comprehensive scientific research institution. The academy is linked to the Chinese Peking Union Medical College. The two rely on each other and are mutually complementary. They improve each other in both education and research. In the academy, there are 18 research institutes (and two branch institutes), including clinical research institutes, preclinical medicine research institutes, angiocardiopathy institutes, medical institutes, medical information institutes, cancer research institutes, pharmaceutical biological research institutes, microcirculation research institutes, five branch academies, seven clinical hospitals and five colleges.

The China Environmental Science Research Institution was founded on December 31, 1978, and is an affiliate of the Ministry of Environmental Protection. It has made many national scientific and technological accomplishments in the fields of



The Chinese Academy of Sciences at No. 52, Sanlihe Rd., Beijing.

To implement the concept of Green Olympics, electric buses were used during Beijing Olympics to provide transportation services for athletes and officials.

basic theory of environmental science, basic theory of application and high-tech R&D. The institute has formed an environmental science innovation system that focuses on atmospheric environmental research, water environment research, ecological environment research, environmental engineering technology research, environmental safety research, cleaner production and circular economic research. The academy has set up four research institutes, two research centers, five R&D institutions and two technical service institutes, covering eighteen subjects and three key ministerial-level laboratories. Its research staff includes three academicians of the Chinese Academy of Engineering, 40 researchers and more than 100 doctors. It has created an environmental science and engineering doctoral program with the Beijing Normal University, and has five master degree tracks and one postdoctoral workstation.

Other than the institutions mentioned above, there are many other state-owned R&D institutions, such as the Research Institute of Weapons Science, China Academy of Building Research, etc..

Institutions of higher learning

Like in many other countries in the world, research conducted by institutions of higher learning in many scientific research fields, especially in the study of basic theories of natural science and humanities, is important.

In recent years, research on applied theories has seen a rapid development in Chinese universities. Research conducted by famous universities such as Tsinghua University, Peking University, Zhejiang University and Fudan University has taken a leading position at home and is increasingly enjoying a world-class reputation.

In the process of cooperating with research institutions and enterprises elsewhere, China has formed a unique mode of development by doing researches in universities and then rapidly putting the research results into practice in manufacturing. In other words, theory is used to solve a problem in production and the experience is then used to enrich the existing theories. Through this mode, competitive products are made and research results are quickly used to produce goods that the market demands.

The rise in the role and position of university research in recent years is self-evident. During the Tenth Five-Year Plan period (2001–2005), state universities won a combined 75 state-level natural science awards, accounting for 55.07% of the total awards; 64 state technological invention awards, 64.4% of the total, and 433 national scientific and technological progress awards amounting to 53.57% of the total. Among those awards, one was a first prize in natural science and two first prizes in state technological invention. The latter broke a six-year long winning streak by the same institute.

Universities have played a significant role in the country's scientific and technological progress. The former Minister of Science and Technology Xu Guanhua praised: "Universities have become the main force of China's basic research and an