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# CHINA

## Science popularisation on the road forever

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This chapter outlines modern science popularisation across a span of nearly 70 years. The authors take the timeline as the guide, unfolding the story of modern science popularisation development in three stages. Considering the predominant role that the Chinese government has played, this chapter puts more emphasis on government policies and guiding principles for science popularisation and the effects they have brought about.

## 1. Sailing: The starting point and context of modern science popularisation in China (1949–78)

Since the late 19th century, science was integrated into Chinese culture, but this changed radically in 1949 with the founding of the new China. Before 1949, science was invited to China by a small number of groups and oriented towards the elite,[1] which opened the door for science and science popularisation in China (Ren, Yin and Li, 2012). After 1949, science popularisation in China started to be institutionalised, with the government as the main driving force and the public as the target. This closely related to

1 There are two main ways and stages for science entering China. One is Western missionaries spreading Western science and technology to Chinese scholar-bureaucrats along with Christianity before the 20th century. The second is the new culture movement in the early 20th century when Chinese avant-garde intellectuals advocated democracy and science and promoted establishing many science and technology associations within the intellectuals' communities with the purpose of developing scientific research and popularisation to save the country.

the specific political, economic and cultural background at that time. This government-led model has contributed to the rapid development and success of science communication in China (Office for Implementing the Action Plan, 2018), though with many problems.

## 1.1. The institutionalisation of science popularisation in China

When the People's Republic of China (PRC) was founded in 1949 there were a thousand things to be done, and science popularisation was located in a specific context. On the one hand, science and technology attracted worldwide attention during World War II, and the Chinese government and elites were fully aware of its importance for national development and international competition. On the other hand, the new China faced multiple development dilemmas: in politics, it was important to consolidate power and stabilise social order; in the economy, it was urgent to achieve industrial development; in culture, it was necessary to improve people's education levels and eliminate feudal superstitions. All of this greatly strengthened the position of science and technology, regarded as important means to achieve economic development, promote social stability and enlighten the people. The government, scientists and the public were full of expectations for science and technology, especially the public that maintained a high level of interest in scientific knowledge. 'There has never been such urgent demand for science in China as today … Scientists, technicians, skilled modern workers and literate farmers are needed' (Guo, 1950). These demands provided internal impetus for the development of science popularisation.

In such a context, science popularisation in China developed rapidly. It changed from government-led to government-driven, with the driving force being a combination of government, and science and technology associations.

### 1.1.1. Government-leading mode: The Science Popularisation Bureau of central government

In September 1949, scientists suggested that we should 'work hard to develop natural science so as to serve the construction of industry, agriculture and national defense. Encourage scientific developments and inventions, popularise scientific knowledge' (Chinese People's Political Consultative Conference Committee, 1949). This was written into the *Common Program of Chinese People's Political Consultative Conference* (taken as the temporary constitution). Taking this as the key tenet, the central government set up the Science Popularisation Bureau (SPB) in November 1949 to explore science popularisation in China. That began the government-leading mode of science popularisation, in which resources were managed by administrative means. After two years' exploration and practice, when workers, farmers and cadres were the main target, and lectures, exhibitions, book editing and technical training were the main forms, it was realised that 'it is not enough to rely on the government alone. There must be mass organisations, and the scientific community and all sectors of society mobilised to form a mass science popularisation campaign' (Zhang, 2001). 'It's not necessary to have a special science popularisation institution in government, and the new science popularisation association could undertake its work' (China Association for Science and Technology, 2002). Thus, the SPB was disbanded in October 1951, and the government-leading mode of science popularisation with an administrative bureau in charge came to its end.

### 1.1.2. Science popularisation mode 'driven by government, operated by associations': The establishment of CAST

In August 1950, the Chinese Natural Scientific Representatives' Conference convened in Beijing. At the conference, the National Federation of Natural Science Associations and the National Association for Science and Technology Popularisation came into existence, with the former taking scientific research development as its core task, and the latter taking scientific knowledge popularisation. It was pointed out that scientists should serve the people and national economy, and science associations should coordinate their work towards national economic and cultural construction. In September 1958, the National Federation of Natural Science Associations and National Association for Science and Technology Popularisation merged into one organisation named China Association for Science and Technology (CAST), to adapt to the scientific and technological innovation movement in the Great Leap Forward,[2] and satisfy public demands for science and technology. CAST began to take on the responsibility of popularising science in China and the political function of participating in the political consultation system of the Chinese Communist Party (CPC) as a people's organisation. The responsibility was closely related to the political function.

At that time, the model for science popularisation in China was 'driven by government, operated by associations', and the institutionalisation of modern science popularisation was set (Yin, 2008). China's science and technology associations and science popularisation entered a new era. Lots of local science associations were established in provinces, cities, autonomous districts,

2 'Great Leap Forward' refers to the nationwide movement in China from 1958–60. Unrealistic economic production plans were made and put into effect despite of the low productivity level at that time.

counties, industrial and mining corporations, enterprises, communes, schools and units. They were initiated by scientists under the guidance of the government to promote scientific research and popularisation. A large stable network for science popularisation was formed and carried out by government and science associations at national or local levels, pushed forward by the combination of government administration and associations (Shen, 2002).

## 1.2. Formation of the top-down mass science communication model

Through continuous exploration, China had formed a top-down, large-scale and mass-oriented science communication mode. During this period, China's science popularisation was 'combined with production, combined with reality and make every effort to be extensive', and 'serve[d] production through vigorously mass scientific and technological professional activities' (Deng, 2008). 'The science popularisation first must be a massive movement ¼ must accommodate the urgent demands then and there ¼ must be concentrated rather than dispersed so as to get better effects' (Zhang, 2001).

These mass science popularisation activities could be divided into two levels. The first was an anti-illiteracy campaign, popularising basic knowledge of natural sciences to the public and encourage them to know science and learn science. The second level focused on the state and the actual conditions of industrial and agricultural production, popularising practical knowledge and imparting skills training to raise productivity. The latter, in particular, was the focus of science popularisation in China during this period. For example, 1959 to 1961 were continuous lean years in agriculture in China due to unrealistic economic production plans, bad seasons and poor farming techniques, and the country suffered severe food shortages. In this context, CAST took 'serving agriculture as its long-term principal task' (Deng, 2008), and organised staff to help farmers with experimental activities. It performed agricultural science popularisation and training, and played an important role in supporting national industrial and agricultural production. Science popularisation was developing from basic knowledge popularisation to the combination of basic knowledge popularisation and technology promotion, and with practicality as its core concern.

Forms of science popularisation were mainly speeches, lectures, broadcasts, exhibitions and periodicals and magazines (i.e. popular forms that could directly connect to people). The statistic showed that there had been 72 million speeches, 170,000 exhibits and 130,000 films and slides during the period 1950–58, with an attendance of 1 billion (Ren and Zhai, 2012).

Science in the media was dominated by popular science books, followed by periodicals and newspapers. Statistics of the National Bibliography[3] from 1949 to 1965 listed 24,036 popular science books. Basic knowledge of natural science accounted for about 9 per cent, medicine and health care 11 per cent, transportation 40 per cent, agriculture and forestry 37 per cent, and children's books about 3 per cent (Liu, 2010). Science popularisation for agriculture and industry were also important categories for popular books. The *100,000 Whys* series created a miracle in Chinese popular science book publishing, introducing scientific knowledge in the form of questions and answers on common natural phenomena in daily life. From 1961 to 1964, 5.8 million copies were published. By 1978, over 10 million copies had been printed and they became best-selling popular science books. There were two main reasons: a lot of scientists got involved in revising the series to increase the readability; and the education level for all was generally low and *100,000 Whys* could be easily read by both adults and teenagers. Most important, of course, was the Chinese public's hunger for scientific knowledge.

At the same time, science periodicals, magazines and newspapers for the public developed fast. By 1965, the number of popular science periodicals and magazines had grown from less than 10 in the early days of the new China to 55 (Liu, 2010): *Knowledge is Power, Amateur Astronomer, Aviation Enthusiasts* and *Aerospace Knowledge* are examples. In 1958, 19 local associations for science and technology launched science and technology newspapers. Closely following the national political and economic development situation, these newspapers communicated basic knowledge to the public and became quite popular.

Radio and television were welcomed as new forms of communication and loved by the public. In September 1949, Bei Ping XinHua radio station (renamed China National Radio in December 1949) established the first popular science radio program in China, *Popular Natural Science Lecture*. The broad direction was to 'popularise science education, broadcast all sorts of natural science common sense systematically', and the program committed 'service to production and construction; improve the scientific and technological knowledge of the audience; propagate dialectical materialism and helping the audience to establish Marxist world outlook; popularise physiological health knowledge' (Liu et al., 1991). In 1953, on the basis of the earlier *Popular Natural Science Lecture*, China National Radio launched the program *Science Knowledge*, which established the model of science broadcasting in China. Since

3 The National Bibliography is the only yearbook catalogue in China. It has been compiled year by year since 1949 and purports to be a comprehensive enumeration of all books published in that year. It is a necessary reference book for publishing houses, libraries, information materials, scientific research and teaching departments.

then, radio stations successively launched science radio programs, forming a huge popular science radio network covering a vast area. According to China National Radio, popular science programs had a great impact on listeners. By 1966, *Science Knowledge* was one of the top 10 programs.

In 1960, China established the first science TV programs *Scientific Knowledge* and *Medical Consultant*, aiming to 'spread basic knowledge and serve life and production' (Yang, 1998). The programs usually asked scientists to impart scientific knowledge to the audience, and the topics generally involved people's daily production and life, such as 'electric shock first aid', 'the use of household appliances', 'breeding the long-haired rabbit' and so on. Although the form was relatively monotonous, it laid a foundation for the development of science and education TV programs. The social influence of early TV science programs was limited, mainly because China's TV infrastructure was inadequate and people could not afford expensive TV sets. However, TV became a 'teacher' to impart knowledge, providing the psychological conditions for the audience to respect and accept the programs unconditionally.

## 1.3. Discussion and reflection on the governmental position

Science popularisation in China during this period followed a typical governmental position. As in other countries, the public was regarded as needing to be educated and informed (Liu, 2004). To some extent, the government could justify using this approach: the deficit model of science communication was applied to China and succeeded (Fan, 2004). In 1949, the illiteracy rate of the Chinese public reached 80 per cent, and feudal superstitions and pseudoscientific beliefs were very common. The public was very homogeneous: lack of scientific knowledge, scientific attitude and scientific spirit, but holding a general attitude of love and support for science and technology and expecting to improve their living conditions through science and technology. The government recognised the urgent needs of the public and the benefit of using the 'deficit model' approach (Lewenstein, 2003) to popularise science, eliminate scientific illiteracy and help the public understand the world. The government concentrated resources and power as well as its organisational and social mobilisation ability to promote the establishment of science popularisation. This laid a foundation for its long-term development.

This government position also posed problems. First, the political environment played a decisive role in the development of science popularisation. Science popularisation had not concerned itself with the environment or laying a foundation for sustainable development, and political turbulence would have a substantial impact on it. During the 'cultural revolution' from 1966 to 1976, science popularisation in China was almost at a standstill. Second, from the standpoint of the government, science popularisation had an pragmatic aim of political construction and economic development. It paid more attention to natural science knowledge, practical technology, and skills training than scientific attitude and scientific spirit. The target groups for science popularisation were workers, farmers and civil servants, while teenagers, as important talents for future development, did not receive much attention. Furthermore, as important actors in science communication, scientists failed to play their roles fully. For political reasons, intellectuals and scientists were often at a loss about what to do. During the 'cultural revolution', a large number lost their jobs and their enthusiasm for science popularisation. For a long time afterwards, intellectuals and scientists were cautious, and their motives and positions in science popularisation were suppressed or covered up, and this hindered its development. The individual attributes and expressions of the public were often neglected, and science popularisation found it difficult to meet the personal and diversified needs of the public.

## 2. Developing: Upspring of multiple communication forms (1978–2006)

At the National Science Conference of March 1978, the paramount leader Deng Xiaoping addressed the principle that 'science and technology are productive forces'. This aroused the enthusiasm of scientists, technologists and educators and stimulated their passion. This was a turning point and ushered in a new stage for science popularisation.

For nearly 30 years, science popularisation as a term has been consolidated in the social culture and accepted by lay people. They are willing to spend time in visiting science museums, opening laboratories in universities and joining in activities during the National Science Popularisation Day (known as the Science Festival). They accept science as part of their cultural life and important in changing their lives. There are now more options for science engagement to choose from: as well as television, magazines, books and public lectures, on-site activities and interactive communication began to emerge. By 2000, as science popularisation become more visible as a social and cultural behaviour, science communication research emerged as a subfield of science and technology studies in China and gradually became a relatively independent domain of research (Xu, Huang and Wu, 2015).

## 2.1. Science popularisation infrastructure: From the first S&T museum to a system of S&T museums with Chinese characteristics

Represented by the opening of Bengbu Science and Technology Museum (1984) and the last-stage project of the China Science and Technology Museum (1988) in the 1980s, the first science and technology museums in China emerged. Defined as 'comprehensive multifunctional places to hold science and technology activities', they served as places for exhibitions, science education and communication, S&T training and consultation, S&T activities for youth, etc. (Cheng, 2014).[4] But the education function of S&T museums was weak and, by the end of 2000, only 11 out of more than 320 S&T museums took exhibition education as their predominant function (Zhu et al., 2011).

The science popularisation investments and venues could not meet the demands in different regions for a considerable time due to general economic conditions. Nor could residents in outlying regions and remote rural places afford to go to cities to visit museums because of the geographical and traffic conditions. In order to satisfy demands of districts that could not afford to construct S&T museums, or those that could afford neither exhibits nor the maintenance of museums even if they had the buildings, CAST launched the Science Wagon project in 2000, sending science exhibits to villages as travelling displays. By the end of 2012, more than 600 science wagons have provided travelling exhibitions at 90,000 sites.

CAST started another project named Mobile Science Museums in 2010, sending science popularisation exhibits, show boards, video materials and scientific experiment tool kits to small cities and counties on demand. These exhibits can be displayed anywhere appropriate for public visits, not necessarily in museums. Grassroot infrastructures for science popularisation had been constructed to expand the coverage of the public science popularisation service. By the end of 2010, there were 212,500 science popularisation galleries, 68,000 science and technology popularisation sites in urban communities and 370,000 in rural villages (Ministry of Science and Technology, 2010). In addition, since the creation of the China Digital

4 The functions and tasks of S&T museums were defined as 'comprehensive multifunctional places for science and technology activities' in both the work report and the *Proposed Regulations on Management of S&T Museums* issued at the Symposium for Management of S&T Museums in May 1989 (Cheng, 2014).

Science and Technology Museum (CDSTM) in 2006, more than 40 S&T museums have constructed a sub-website of CDSTM. Some have science popularisation columns on their websites, forming a platform for the public.

The different layers of science museum resources use the design concept of a 'modern S&T museum system with Chinese characteristics' (Cheng, 2014), to meet different public demands in regions with unbalanced economic, educational and cultural levels. The China Science and Technology Museum is the central designer and allocates exhibition resources in the national museum system. It provides S&T education and demonstration services for people visiting the museum in Beijing, and duplicates its resources and sends them to remote places. Similarly, the large and medium-sized museums in provincial capitals provide services for local citizens and the small museums that cannot afford to update their exhibitions regularly. The mobile science museums and science wagons radiate out across the country. In remote places, galleries and rural libraries are like S&T information distribution centres. For netizens there are digital S&T museums. Most S&T museums' materials are shared and cyclically utilised: larger museums provide small grassroots centres with technical services such as exhibition content and personnel training.

Businesses also began to pay attention to science popularisation. The China Aerospace Industry Corporation established the China Youth Space Science Popularisation Fund; the Sony Corporation set up the first experiential S&T museum in Asia, Seek Dream in Sony at the Oriental Plaza in Beijing; the Shenyang Aircraft Industry (Group) Co. Ltd. created the Aviation Science Exhibition Area; the Qingdao Haier group established an open S&T museum. The categories and layers of the science popularisation infrastructure system have become multidimensional.

## 2.2. Public-engaging science popularisation activities

Besides science communication in museums, activities like S&T Week, Science Popularisation Day, S&T festivals and so on were reaching more people. For example, activities implemented by larger cities in China in 1994 ran for two months with more than 40 cities participating. The International Week of Science and Peace, and summer camps like World Population Day, World Environment Day and International Ocean Year, all attract extensive participation. CAST launched 85,000 science popularisation activities from 1995 to 2000, with an attendance of more than 70 million (China Association for Science and Technology, 2002). The following activities have the most extensive influences:

- Science and Technology Week: mass S&T activity approved by Chinese government in 2001 and carried out nation-wide in the third week of May. The organising committee comes from 10 or more departments and organisations like the Ministry of Science and Technology, the Propaganda Department of CPC Central Committee, and CAST.
- National Science Day: science popularisation activities held initially on 29 June 2003 by CAST for the implementation of the *Law of PRC on Science and Technology Popularisation* to celebrate its anniversary (NPC, 2002). The date was changed to the third weekend in September in 2005, so that all people (especially students) could participate.

## 2.3. Further development of the institutionalisation of science popularisation

In the period 1978–2006, science communication and popularisation experienced great development. At the macro level, it was the urgent demand for science and technology development that drove progress, and the rapid development of science popularisation was closely supported by the policies of the Chinese government.

With the development of the socialist market economy in China in the 1990s, the importance of science popularisation increased as all areas had urgent demands for science and technology. At the Fourth National Representative Conference of CAST in 1991, Jiang Zemin, then the General Secretary of CPC Central Committee, pointed out that the economic growth of China should rely on science and technology development and the promotion of workers' scientific literacy. This was a major requirement for reinforcing science popularisation work in China. It was proposed in the work report by CAST to CPC Central Committee in 1993 that:

> Science and technology popularisation is a public activity involving the whole society. There should be laws to regulate its importance, status, tasks, as well as the rights and duties of government, social entity and personnel on it. We suggest that the *Law of the People's Republic of China on Popularisation of Science and Technology* should to be formulated and issued. (Cui, 2010)

Since it takes a long time to produce a law, the *Instructions on Strengthening Engagement in Science and Technology Popularisation* (hereinafter the *Instructions*) was issued by the State Council on 5 December 1994 to give instructions for the general principles, central tasks and main measures of science popularisation (Central Committee of the Communist Party of China and the State Council, 1994). The idea was to put science popularisation on a strategic level for the country. It was the first programmatic document on science popularisation issued jointly by CPC Central Committee and State Council after the founding of the new China and the document guiding science popularisation work before the issue of the *Law of PRC on Science and Technology Popularisation* (NPC, 2002).

Facing the challenges of science popularisation losing its priority among some local governments and superstitions gathering strength since the 1980s, the *Instructions* call for the governments at each level to place science popularisation on their working agendas. Science popularisation engagement was to be included in the State's ninth 5-year plan and in local, economic, science and technology programs. The construction of science museums, science centres and public spaces for science popularisation activities were to be supported. It demanded that sensationalist media reporting on superstitions and pseudoscience were to be opposed. In this document, science popularisation is regarded as the approach to advancing the 'material civilisation' as well as 'mental civilisation' of the nation and an indispensable way to fostering the new generation (Shi and Zhang, 2012).

The legislation of science popularisation law did not stop at that. Investigations and research identified the current challenges of science popularisation in China:

1. there is not enough recognition of the strategic status and importance of science popularisation
2. the administrative mechanism of science popularisation does not work efficiently due to less smooth coordination between CAST (with its branches) and the relevant government departments
3. the funding of science popularisation was low and not enough to satisfy the needs of realistic work
4. there were not enough science popularisation venues and infrastructures with exhibition and education measures were lagging behind
5. science popularisation organisations were not sound, and the literacy of working staff was not high (Cui, 2010).

The legislation of the *Law of the People's Republic of China on Popularisation of Science and Technology* (hereafter the *Law*) aimed to solve these problems. The Law has six parts and 34 items, stipulating 'science popularisation is one of the long-term tasks of the nation'; and that government departments, social organisations, enterprises and institutions 'should carry out science popularisation'. In the *Law*, words like 'the country supports … science popularisation' and 'the country protects … legal rights' appear many times, bringing the importance and legality of science popularisation to national attention. It is stated that while CAST is the main social force undertaking science popularisation, the administrative S&T departments of the State Council should be responsible for compiling work plans at national level and pushing the work forward by issuing guiding policies and supervision. On the whole though, CAST is responsible for the implementation and organisation of science popularisation. The *Law* gives macro guidance on the duties of different institutions. In the third chapter, 'Social Responsibilities', guidance is given to educational institutions, schools, S&T museums, mass media, enterprises and other related entities. It is written that: 'Kinds of rural economic organisations, agricultural technology spreading institutions and rural technology associations should perform scientific and technological knowledge popularisation when spreading advanced and applicative technologies to peasants'; and 'Enterprises should perform science popularisation in their technological innovation and technician trainings, establish and open science popularisation venues and infrastructures to public if condition allows'.

Funding is crucial. If there is a shortage of funds, the *Law* would lack force and difficulties in science popularisation could not be settled. It is regretful that the *Law* does not give a clear plan on levels of funding. Unprecedentedly, though, the *Law* includes science popularisation funding in the national financial budget and requires the financial investment level to be gradually increased. This provides a legal basis for the budget and is considered a great step forward. According to the CAST *Statistical Yearbook*, the funds in 2000 and 2001 were ¥1.365 billion (about US$200 million) and ¥1.683 billion respectively, while in 2002 and 2003 it was ¥2.537 billion and ¥2.650 billion respectively (China Association for Science and Technology, 2000, 2001, 2002, 2004), reflecting strong support.

Science popularisation during this period reached a new national level because of government attention to the development of S&T. Institutionalisation became more consolidated because of legislation and policymaking. Consequently, the consciousness and capabilities of social organisations for science popularisation have been stimulated and fostered. Science popularisation infrastructure increased, the science media was well funded, large-scale science popularisation activities have been carried out, more social forces and materials have been invested, and more members of the public are benefiting.

The model of government as the 'pushing hands' has its pros and cons. The investment in science popularisation is huge but the engagement of public and science community in a real sense is questioned by some researchers. They usually criticise the 'deficit model' approach standing behind popularising science and appeal for more 'constructive' involvement from different stakeholders of S&T (Jia and Liu, 2014). Although the policies have promoted the social recognition of the importance of science popularisation, there is usually a lack of follow-up regulations that make sure the policies work in practice (Chen, 2015). But at this stage, science popularisation activities have been merged with the social life of Chinese citizens via many channels and things are shifting from serving national economic development to a more independent domain, both in the sense of a national strategy and in the form of cultural life.

## 3. Current and future: Social mobilisation and participation (after 2006)

Social media platforms are gradually replacing traditional media like books, articles and TV programs. The young generation are accustomed to receiving S&T information via cell phone apps like TikTok, Quick and WeChat news. Science popularisation is often combined with entertainment.

Since science and technology not only impact the economy and society, but are also embedded in the daily life of people; their popularisation is leading people to another understanding of the relationship between S&T and society in which people are the core concern. They are striving for robust interactions between the development of S&T and society, to ensure the greatest benefit to society in the sense of sustainable development. Thus the scientific literacy of citizens and their attitudes towards the development of science-in-society relations are becoming very important to science popularisation.

### 3.1. Outline of the National Scheme for Scientific Literacy: Network and cooperation

In the past 30 years, science popularisation in China has mainly developed in a government-driven way, and CAST has been the main body that organised activities. Since the promulgation of the *Law*, more and more government departments and social institutions have devoted themselves to science popularisation, and a lack of coordination and guidance to the work is emerging. To resolve the problem, in 2006 the State Council issued the *Outline of National Scheme for Scientific Literacy (2006–2010–2020)* (hereinafter referred to as the *Outline*), which put forward new concepts, guidelines, plans and measures for the direction of science popularisation for the next 15 years (State Council, 2006). In order to mobilise social participation, a 'broad alliance and cooperation' framework has been adopted. More than

30 national ministries, research institutes and non-government organisations such as the Ministry of Science and Technology, Ministry of Culture, Ministry of Finance, Ministry of Agriculture, Ministry of Education, Chinese Academy of Sciences and CAST have become member units of the *Outline*. The *Outline* is a long-term plan to be promoted in different regions, groups and stages. The standards of national scientific and technological literacy at different stages of development, as well as objectives, key tasks and measures have been studied, and action plans and programs drawn up.

The implementation of the *Outline* is in the form of action plans and capacity-building projects. The key social groups include teenagers, farmers, the urban workforce, leading cadres and civil servants. It is expected that the improvement of scientific literacy of the key groups will promote that of the whole nation. Capacity-building projects are targeted at the weak points of science popularisation, and include projects to improve science education and training in residential communities, informatisation, infrastructure, popular science industry and human resource training.

In the 10 years since the issue of the *Outline*, science popularisation in China has indeed witnessed a rapid growth in human, financial and material input, as well as great achievements. For example, according to the data from the national surveys on civic scientific literacy conducted by CAST, the proportion of Chinese citizens with basic scientific literacy shows a rapidly growing trend: from 3.27 per cent in 2010 to 6.20 per cent in 2015, and projected to grow to 8.47 per cent in 2018 (Office for Implementing the Action Plan, 2018). A simple change of number cannot explain the characteristics of science popularisation in China, and we still need to look into it from a more multidimensional perspective.

## 3.2. Science communicator training

Since these matters became more important, professional training for communicators and researchers has gained urgency. It can be traced back to the 1980s when universities began to set up science communication majors, including training programs for undergraduates, master's students and a few doctorates. Most universities focus more on theoretical research aimed at cultivating students with knowledge of natural sciences, humanities and social sciences, equipping them with skills of science writing and using the media. Graduates are mostly science journalists, editors and freelancers involved in science books and magazines, as well as researchers. However, in recent years, facing a shortage of science communicators, universities have invested more in science communication majors. Many universities have increased majors and the number of students enrolled and improved the training plans. At present, most universities have classified science communication majors as secondary disciplines under journalism, communication and philosophy.

In China's '985 Project' universities,[5] there are two types with professional education related to science communication. One runs their program independently, such as Peking University, University of Science and Technology of China, Beijing Institute of Technology, Hunan University, University of Chinese Academy of Sciences, Fudan University and China Agricultural University. The other seeks to cooperate with CAST and other organisations and includes universities such as Beijing Normal University and Tsinghua University. The training programs of science communicators in these universities are mostly for undergraduate and master's degrees, and only a few universities have doctoral training programs majoring in philosophy of science and technology. In local colleges and universities, there are a few like Zhengzhou University and Zhongyuan University of Technology that also have master's programs (Mo, 2006).

In 2012, CAST and the Ministry of Education initiated their training program for a master's degree in science communication. Ten key universities were selected and, for the past six years, they have focused their training programs in science education, popular science product design and professionals for the science media, mostly to meet the needs of S&T museums. These programs intend to use the resources of pilot universities and museums in designing training programs and materials, sharing teachers and innovating the training model.

Up to July 2017, 571 postgraduates have been enrolled in six pilot universities. In 2015 and 2016, 306 students graduated from these universities with an employment rate of 94.38 per cent. They mostly went to enterprises, S&T museums, primary and secondary education institutions, government departments, universities and some went on to doctoral degrees. Among them, 14.1 per cent of the graduates went to S&T museums, while 13.7 per cent went to work in S&T enterprises (Department of Science Popularisation, 2017).

## 3.3. Science popularisation model

During the first 10 years of the 21st century, many scholars of science communication discussed and debated the concepts and models of science popularisation and compared them to developed countries. They believed that the concept and model in China was something between traditional

5 This refers to universities that are included in the national plan to be given resources to become high-level universities.

science popularisation and the public understanding of science—that is to say, between the top-down model (which represented the national standpoint) and the deficit model (which represented the standpoint of the science community). In some cases, the science communication model shows the traits of the dialogue model (which represented the standpoint of the public) (Liu, 2009). It is not easy to give a definitive answer to this question. In fact, the ideas and approaches of science communication of these three models are not hierarchically ordered or ranked and are no better or worse in an absolute sense. They simply focus on different approaches in line with different communication groups, conditions and objects.

In China today, these three models coexist, and the concept of public engagement is integrated into policymaking and the concept design of science popularisation projects and activities. For example, in February 2017, the Ministry of Education issued new standards for the science curriculum that made science education compulsory from the primary school. The Ministry of Environmental Protection approved the 'Measures on Public Participation in Environmental Protection' on 2 July 2015, aimed at providing legal rights for citizens to get access to environmental information, to participate in environmental protection and to open channels for social participation (Ministry of Environmental Protection, 2015). Not only are the government departments and science associations the main bodies of science popularisation, more stakeholders are getting involved. The science community and the media play a more active and influential role. Citizens' awareness of participating in science-related social affairs is growing, as shown in the protests of Xiamen PX project,[6] debates on genetically modified food and so on.

Compared with the developed countries, Chinese people utilised less critical thinking in considering what science and technology might bring to them. However, under the influence of the world campaign of science communication, the government encourages people to get involved and requests people to develop their scientific literacy in more sophisticated ways (Ren, Yin and Li, 2012).

At present, public scientific literacy refers to the following abilities:

- To possess knowledge of scientific content, method, thoughts and ethos.
- To apply this knowledge to resolve practical problems and participate in public affairs concerning science and technology.

6 In 2007, citizens in Xiamen initiated a series of demonstrations and protests against the new factory construction of the P-Xylene Project that could be harmful to their health. Several hearings on this matter have been held with the participation of policymakers, government officials, scientists and the citizens in Xiamen.

The multidimensional perception of science and technology and their functions in society expands the public's understanding of science and technology. Chinese people have come to realise the interactive relationship between science and the world, and the way it changes with a more comprehensive perspective.

Although public scientific literacy is being given more importance in the overall development of society by the government, the Chinese science community seems to fall into a dilemma when it comes to science popularisation. They usually recognise science popularisation as their social responsibility and an important part of their job in addition to their research, but not very many scientists like to communicate what they are doing to the public, especially when invited to do so in formal channels like TV interviews or newspaper reports. They prefer to act as 'informal risk communicators' in situations such as conversations between friends, neighbours or fellow travellers, in order to earn more trust from the public (Zhang, 2015). In May 2016, the National Conference on Science and Technology Innovation, the General Assembly of Academicians of Chinese Academy of Sciences and Chinese Academy of Engineering, and the Ninth National Congress of CAST were held together. On this occasion, Chinese leaders put forward the statement that 'science popularisation should be attached the same importance as that of science and technology innovation' (Xi, 2016). As the second largest economy in the world at present, if China wants to realise the transformation and upgrading of its economic development, it will not only depend on the driving force of science and technology innovation but also on the understanding, support and participation from the public in the process of innovation. To make the innovation process, economic growth and the public's quality of life work in a coordinated and sustainable way, science popularisation can obviously be of great help. But how to go about this, how science popularisation and science innovation can really become the two wings of the same bird, how the science community might be motivated to become powerful and active social actors for science popularisation, these are the crucial issues to be further studied.

## References

Central Committee of the Communist Party of China and the State Council. (1994). Instructions on Strengthening Engagement in Science and Technology Popularisation. *People's Republic of China Yearbook, 1995* (pp. 335–37).

Chen, T. (2015). Looking into science popularisation system from the perspective of governmental policies and social cooperation. *Science Popularisation Study*, *1*, 49–55.

Cheng, D. (ed.). (2014). *Research on modern S&T museum system with Chinese characteristics*. Beijing: China Science and Technology Press.

China Association for Science and Technology. (2000). *Statistical Yearbook*. Beijing: China Statistics Press.

China Association for Science and Technology. (2001). *Statistical Yearbook*. Beijing: China Statistics Press.

China Association for Science and Technology. (2002). *Statistical Yearbook*. Beijing: China Statistics Press.

China Association for Science and Technology. (2004). *Statistical Yearbook*. Beijing: China Statistics Press.

Chinese People's Political Consultative Conference Committee. (1949). The Common Program of the Chinese People's Political Consultative Conference. The first plenary session of the Chinese People's Political Consultative Conference. Official statement published in *People's Daily* (30 September), p. 2.

Cui, J. (2010). Looking into the background and course of promulgation of Law of PRC on Popularisation of Science and Technology. *CAST Forum*, *281*(12), 2–3.

Deng, N. (2008). *Development and Responsibility: the 50 years of CAST* (pp. 57–73). Beijing: China Science and Technology Press.

Department of Science Popularisation. (2017). Work Report on Master Degree Programme Pilot (unpublished).

Fan, H. (2004, 9 January). Interpretation of 'traditional science popularisation'. *Science Times*, p. 3.

Guo, M. (1950). Science Popularisation and Improvement. *Newsletter of Science Popularisation* (restricted publications of Science Popularisation Bureau).

Jia, H. and Liu, L. (2014). Unbalanced progress: The hard road from science popularisation to public engagement with science in China. *Public Understanding of Science*, *23*(1), 32–37.

Lewenstein, B. V. (2003). Editorial. *Public Understanding of Science*, *12*, 357–58. doi.org/10.1177/0963662503124002.

Liu, G., Cai, Y.,Wang, H., Song, G. and Yang, Y. (1989). *Selected works of popular science broadcasting*. Beijing: Academic Publishing House.

Liu, H. (2004). On the Perspectives in Science Popularisation and the Tenets of Science Communication [in Chinese]. *Studies in Dialectics of Nature*, *8*, 76–80.

Liu, H. (2009). Three models and three stages of science communication in China. *Science Popularisation Study*, *2*, 10–18.

Liu, X. (2010). A study on the history of science popularisation of Peoples' Republic of China (PhD dissertation). University of Science and Technology of China.

Ministry of Environmental Protection. (2015). *Measures on Public Participation in Environmental Protection*. Retrieved from www.mee.gov.cn/gkml/hbb/bl/201507/t20150720_306928.htm.

Ministry of Science and Technology. (2010). *Chinese Popular Science Statistics* (pp. 49–52). Beijing: Scientific and Technical Documents Publishing House.

Mo, Y. (2006). Science communication major setting in Chinese universities. *Science Popularisation Study*, *2*, 31–35.

National People's Congress of the People's Republic of China (NPC). (2002). *Law of the People's Republic of China on Popularization of Science and Technology*. Beijing: Popular Science Press.

Office for Implementing the Action Plan Outline for Improving People's Science Literacy. (2018). *Report on the Construction of Public Science Literacy in China* (17 September). Beijing.

Ren, F., Yin, L. and Li, H. (2012). Science Popularisation Studies in China. In B. Schiele, S. Shi and M. Claessens (eds), *Science communication in the world: Practices, theories and trends* (pp. 65–79). Springer.

Ren, F. and Zhai, J. (2012). *Introduction to Science and Technology Communication and Popularisation*. Beijing: China Science and Technology Press.

Shen, Z. (2002). An investigation into the history of China's science popularisation [in Chinese]. *Science Popularisation*, supplementary issue, 5–60.

Shi, S. and Zhang, H. (2012). Policy perspective on science popularisation in China. In B. Schiele, S. Shi and M. Claessens (eds), *Science communication in the world: Practices, theories and trends* (pp. 81–94). Springer. doi.org/10.1007/978-94-007-4279-6_5.

State Council. (2006). *Outline of the National Scheme for Scientific Literacy (2006–2010–2020)*. Beijing: Popular Science Press.

Xi, J. (2016). *Strive to build the world scientific and technological power*. Speech at the National Conference on Scientific and Technological Innovation, the Conference of Academicians of the Chinese Academy of Sciences and the Ninth National Congress of the China Association for Science and Technology. Beijing: People's Publishing House.

Xu, L., Huang, B. and Wu, G. (2015). Mapping science communication scholarship in China: Content analysis on breadth, depth and agenda of published research. *Public Understanding of Science*, *24*(8). doi.org/10.1177/0963662515600966.

Yang, W. (1998). *The history of CCTV*. Beijing: Beijing Press.

Yin, C. (2008). The Differences Between Popular Science Bureau and China Association for Science and Technology. *Science Popularization Study, 4*, 65–71.

Zhang, D. (2001, 2 March). Science popularisation in China: A brief review of a century. *Times of Science and Technology*, p. 12.

Zhang, J. (2015). The 'credibility paradox' in China's science communication: views from scientific practitioners. *Public Understanding of Science*, *24*(8), 913–27. doi.org/10.1177/0963662515598249.

Zhu, Y., Cai, W. and Zhao, Y. (2011). Report on the Development of S&T Museums. In F. Ren and Z. Li (ed.), *Report on Development of Science Popularisation Infrastructures in China* (p. 53). Beijing: Social Sciences Academic Press.

## Timeline

| Event | Name | Date | Comment |
|---|---|---|---|
| First interactive science centre established. | China science and technology museum | 1988 | |
| First national (or large regional) science festival. | The first national science festival was held on 29 June 2003 | June 2003 | Since 2005, the date has been changed to the third weekend of September every year |
| An association of science writers or journalists or communicators established. | China Science Writers Association | August 1979 | May 1988: Chinese Society for Science and Technology Journalism was established |
| First university courses to train science communicators. | University of Chinese Academy of Sciences established the first master's degree in education of science communication | 2004 | The university then set up a series of courses |
| First master's students in science communication graduate. | First master's students graduated from the University of Chinese Academy of Sciences | 2007/1998 | From the late 1990s master's students in philosophy, journalism, management etc. took science communication as their research direction. The first thesis on science communication was in 1998 |
| First PhD students in science communication graduate. | There is no formal PhD degree in education of science communication in China | 1999 | Some PhD students gained degrees from 1999 in philosophy, journalism, management etc., but taking science communication as their research direction |
| First national conference in science communication. | Conference organised by Ministry of Science and Technology | February 1996 | Hosted by the Publicity Department, Ministry of Science and Technology |

| Event | Name | Date | Comment |
|---|---|---|---|
| National government program to support science communication established. | Too hard to identify | | These were many national programs but hard to find accurate records |
| First significant initiative or report on science communication. | *Instructions on Strengthening the Leadership to the Associations for the Popularisation of Science and Technology* | April 1953 | This is the first document issued by the government in regard to science popularisation |
| National Science Week founded. | | May 2001 | Occurring in the third week of May |
| A journal completely or substantially devoted to science communication established. | *Science Pictorial* | August 1933 | |
| First significant radio programs on science. | *Popular Natural Science Lecture* | September 1949 | |
| First significant TV programs on science | *Science Knowledge* and *Medical Consultant* | January 1960 | |
| First awards for scientists or journalists or others for science communication. | National Outstanding Popular Science Works Award | 1980 | |
| Date hosted a PCST conference | PCST Working Symposium, Beijing | June 2005 | |
| Other significant events | First national press on popular science publishing | July 1956 | Popular Science Press |
| | First law on science communication | June 2002 | *Law of the People's Republic of China on Science Popularisation* |

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