To Make a Study of Science Popularization Modes Conducted by Chinese Academy of Sciences

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***Abstract*--The thesis tries to make a systematic review of science popularization (hereafter referred to SP)work conducted by Chinese Academy of Sciences over the years, and simultaneously makes an in-depth analysis of its policies, operating system, its contents, its operating modes, its media operation, as well as its featured activities. The thesis, based on the aforementioned review and analysis, tries to delve into the issue concerning how science popularization is conducted, the problems needed to be resolved currently, and finally puts forward some good advice in terms of how to give full play to a better performance of SP work carried out by research institutes in China.**

I. INTRODUCTION

To popularize scientific knowledge, improve public scientific awareness, and increase scientific literacy for all the citizens is an important responsibility for research institutes. Chinese Academy of Sciences (CAS) is the highest academic institution in the field of natural sciences, the academy now has a batch of first-class professional experts, has a solid foundation in related sciences research, has the ability to produce the latest scientific achievements, and has an array of up-to-date research equipments. Because of those factors above, CAS has many advantages in committing itself to scientific popularization work. Under the guidance of related important national SP policies and regulations over the years, CAS has planned and carried out a number of lager scaled SP activities by taking advantage of its available resources. Therefore, the thesis is to do a research into the issue about how SP activities are carried out by research institutes in China by taking CAS as a specific case.

II. SP LAWS AND REGULATIONS

In order to promote scientific literacy at a national level, some major law, regulation, and outline have been put into place as follows:

National Law on Science Popularization of People's Republic of China was officially enacted on 29th, June, 2002 , it is the first kind of such law in the world even until now. The remarkable event marks the fact that SP cause has entered into a legalized track and period for its booming development. *Outline of the National Scheme for Scientific Literacy* was enacted on 6th, February, 2006, it is the first official document guiding the national development of scientific literacy, it arranged main targets, tasks, and measures in an overall picture during the 11th five year plan period.

In order to further implement *National Law on Science Popularization of People's Republic of China*, *Outline of the National Scheme for Scientific Literacy* and *Outline of the National Medium and Long Term Development*, CAS formulated and issued a *Long and Mid-term Development and Planning Outline on Science Popularization of CAS (2006～2020)*, the outline clearly states that 1.CAS must take the vigorous promotion of SP as a great social responsibility, that 2. efforts must be made to make full use of SP resources available in CAS and 3. give full play to the exemplary and leading role of CAS in the promotion of SP. As a result, CAS are motivated to set up a good and sound example in the promotion of scientific knowledge and approaches [1].

III.SP SYSTEMS

Under the guidance of related SP policies and regulations, CAS has formed a relatively complete set of SP system, the system includes a leading work team, SP promoters, SP targets, SP ways, and SP media, etc. During our research, it is found that CAS has established a leading team and office in charge of organization work, its target is to introduce scientific achievements to the public. At present, in order to further strengthen impacts of SP activities, CAS is busy with preparing to set up a SP Bureau , its main responsibility is defined to give managing, guiding, organizing and coordinating support to institutes affiliated to CAS. A large number of scientists and engineers have become the main force in this regard. All in all, CAS carry out multi-facet SP activities to the public through multi channels.

- SP promoters: academicians, retired scientists, scientists and engineers, and volunteers, other sources, etc.
- SP targets: public-oriented, especially teenagers-oriented.
- SP content: popularize the latest technological advancements, the hotly-debated scientific issues, the scientific endeavors, spirits and knowledge to the public, among them, the most important one is to inform the public of something having to do with ideas, values and approaches on science.
- SP ways:
  1. Make full use of the role of such SP venues as Botanic Garden, Herbarium, Observatory, and Museum.
  2. Organize an array of scientists and scientific and technological workers to be engaged into SP activities of all kinds, efforts need to be made to further develop SP famous brands of CAS such as Public Science Day, Science and China Tour Lecture Team Academicians, Retired Scientists SP Lecture Team, etc.

3. Help the public to stay away from their mysterious, cold and even estranging sense about high-notch technology so that the public can be easily exposed to those technologies as much as they can.

- SP media: New Media, SP Periodicals, Newspaper, Books, Videotapes , etc.

IV. SP ROUTES

Routes are very important to SP activities. In the following context, it is to introduce how SP activities are carried out by CAS through SP bases, SP media, and Some featured SP activities.

A.SP bases

Botanic Gardens, Herbarium, Observatory, and Museum are usually regarded as the main channels, they are open to the public on a long-term basis. These are the good places where the general public can learn much information having to do with science and technology.

Taking Botanic Garden as an example

Those gardens with diversified plant species and beautiful sceneries are regarded as good and ideal places for the promotion of SP to the public. In order to help the public to have an easy access to the gardens, Botanic Garden SP network committee was thus established in 2003, additionally, China Botanic Garden Website was set up ,you can see a large number of exhibitions put and posted there. The internet follows the latest development in plant sciences, and informs the public of SP activities in advance, so that the information posted on all kinds of botanic gardens can be fully shared among them. The content is mainly focused on ecological environment preservation, and knowledge in connection with plant sciences.

Botanic gardens have also conducted a number of large-scale SP activities, for example, Beijing Botanic Garden hosted its first creation embossed exhibition where we saw scientific research and SP perfectly combined. Specifically, it directly dyed the plant cells and tissues through the intravital staining techniques, by doing so, the problem of discoloration was resolved after the flowers were being dried and stored for a long span of time. SP team combined the techniques of embossing, painting and photography, producing a physical landscape painting style featured by a newly creative embossing pattern. This kind of SP activity, a combination of scientific research and SP, has yielded good social effects and reactions, because of its good social impacts, it was reported by such media as TV, internet, etc, time and time again [2].

B.SP media

SP media is generally composed of National Science Library of CAS, China SP exhibition, and SP books.

1. **The Role of SP of National Science Library of CAS**

The library was founded in March, 2006, all kinds of information related to scientific culture was made in a digitalized manner there. With respect to SP, it has SP lecture, SP exhibition, SP works promotion, and SP special columns, etc. The library focuses on the promotion of social value about scientific research, humanistic spirit of science team, as well as the culturally colorful life of scientists, etc.

2. **China SP exhibition**

CAS sets up its first SP website (China SP exhibition) in China in 1999. The website, one of the biggest one in China currently, consists of a number of SP resources such as virtual museums aiming to introduce knowledge on science and technology, several SP columns, and new media SP forms. China SP exhibition attracts a wide range of attention from the public with its systematic knowledge on science and its interesting and vivid performing form. At present, it is endeavoring to promote the construction of interactive platform and the construction of online exhibition display for such items as Virtual Freiflughalle, Paleontology Museums, Microbial Museums, Virus Museums, Planetarium and Virtual Botanic Gardens, etc.

In a nutshell, information posted on websites of public and authoritative research institutes is highly credible and popular among the public, it is viewed as a good way for the public to gain daily information about science and technology.

3. **SP books**

Originally-produced SP books from CAS win National science and technology award almost every year since SP award was included into that award in 2004. For example, *Footprint of Human Evolution* and *the Unveiling of Black Box Brain Secret* planned by CAS in 2005 were all awarded the 2nd National prizes for their contribution to progress in science and technology. *Wild Amazon* won the second prize in 2006, a series of books on *Physics Change the World* won the second prize in 2007. More than 30 varieties of SP books were produced in 2012, the circulation was pretty close to 0.7 million copies, among them, 3 won the national-level awards.

C. Some featured SP activities

Some famous and featured SP activities from CAS are Public Science Day of CAS, Science and China Tour Lecture Team of Academicians, and Retired Scientists SP Lecture Team, etc.

1. Public Science Day of CAS

Public Science Day is an important component of National Science and Technology Activity Week, it is an important activity for the promotion of SP in CAS. CAS initially hosted Public Science Day in May, 2005.That activity was hosted some day every May after 2005, it has successfully held such activity for 9 consecutive years up to now. The main content of such activity is to open scientific

research institutions to the public, additionally, other colorful and fruitful activities are open to the public, for example, open the key labs, and give reports on SP, etc. By doing so, more and more people ,especially the young can gain easier access to scientific research institutions so that they can have a idea of the latest development of science and technology, feel the interesting process of scientific research, as well as share the benefits brought about by scientific achievements. At the same time, the researchers are doing their utmost to further bolster the public awareness that they contribute what they have learnt to the society and return what they have achieved to the public.

For example, Botany institute of CAS successfully hosted CAS Public Science Day on the day ranging from 18th to 19th, May, 2013. It received more than 10000 visitors in total, handed out 30 pamphlets and 20000 papers concerning knowledge having to do with genetic modification, more than 500 visitors actively participated in prize-given ask and answer session[3].

Some institutes are open to the public on Science Day when all kinds of SP activities are held. There the public have the chance to get closer to experimental instruments in labs, high-tech achievements and researchers. Since its first opening to the public in 2005, its social impacts have increased day by day. For instance, the number of institutes opening to the public, academicians and researchers participating in SP promotion, and the public attending it has increased exponentially year on year. Among them, the cumulative number of the targeted public they have received has approached 2 million until now, the number of the coverage of the targeted public has increased immensely, 83% higher than that in 2005. The number of the targeted tended to be maintained at a stable level since 2009, reaching 0.3 million. All in all, such kind of activity has greatly improved scientific literacy for the public as a whole.

Such well developed countries as Germany, USA, etc ,have always been attaching great importance to having the public kept informed of the latest fruits and achievements of science and technology, more importantly, they view SP work as one of the most important routine wok. In this way ,they favor to approach the public by hosting such SP activities as Public Open Day, SP Lectures, as well as Science and Technology Fair, to name but a few.

A GLIMPSE OF PUBLIC SCIENCE DAY OF CAS OVER THE YEARS

Time	Name	Theme	Modes	Number of participation
May,15th, 16th ,2004	First Beijing Public Science Day	Focus on scientific innovation, create SP brand	23 scientific research institutes open to the public, 18 academicians communicated with the participates on the spot	20000
May,14th, 15th, 2005	First Public Science Day	Scientific innovation for the people, constructing a harmonious society in an all round way	58 scientific research institutes open to the public, 21 academicians and more than 100 scientists communicated with the public, more than 500 working staff and 300 volunteers participated in it	120000
May, 20th, 21st, 2006	The 2nd Public Science Day	Science and technology promotes the construction of an innovative country	76 scientific research institutes open to the public, more than 30 academicians and 600 scientists communicate with the public	220000
May,19th, 20th, 2007	The 3rd Public Science Day	Science and technology promotes the construction of an innovative country	82 scientific research institutes open to the public, Chinese state councilor , leaders from 19 ministries and 1200 public attended the opening ceremony	250000
May,17th, 18th, 2008	The 4th Public Science Day	Science and technology promotes the construction of an innovative country	Nearly 90 scientific research institutes hosted a variety of SP activities, 14 Botanic Gardens and 12 museums held SP featured activities with CAS	250000
May, 16th, 17th,2009	The 5th Public Science Day	Scientific innovation promotes national economic development	91 scientific research institutes open to the public for free, at that time Beijing Olympic village SP education garden hosted launching ceremony on opening research institutes and universities to the public	300000
May, 15th, 16th, 2010	The 6th Public Science Day	Scientific innovation promotes national economic development	91 scientific research institutes open to the public, 32 academicians, 970 scientists, more than 1000 SP workers, 2500 SP volunteers attended it, 211 lectures were held	300000
May, 18th, 19th, 2011	The 7th Public Science Day	Scientific innovation benefits the wellbeing of the people	scientific research institutes such as museums, labs, etc open to the public	320000
May, 19th, 20th, 2012	The 8th Public Science Day	Scientific innovation benefits the wellbeing of the people	Nearly 100 scientific research institutes open to the public, 15 academicians, 820 scientists , and more than 2000 volunteers attended it .	260000
May, 18th, 19th,	The 9th Public Science Day	Science and technology spearheads the future	Nearly 100 scientific research institutes held SP activities	The number is still yet to be announced

SCIENCE AND CHINA ACADEMICIANS TOUR LECTURES DURING THE PAST 3 YEARS

Time	Number of Lectures	The number of the targeted public	Note
2012	142 lectures, a featured activity was held to commemorate its 10th anniversary	30000	Throughout 20 provinces, cities, autonomous regions
2011	More than 100	40000	——
2010	63 tour lectures, 72 academicians gave the lectures	19000	Throughout 10 provinces, cities

2. Science and China Tour Lecture Team of Academicians

Science and China Tour Lecture Team of Academicians, a high-level SP activity, is initiated by CAS together with coordinated supports and efforts from the *Propaganda Department of Central Committee of Communist Party of China*, *Ministry of Education*, *Ministry of Science and Technology*, *China Association for Science and Technology,* etc in 2002.A bridge is thus built between academicians, experts and the public through SP lectures. Academicians and experts are greatly encouraged to play their important role in SP activity. According to incomplete statistics, nearly 900 lectures participated by 1007 academicians and experts have been held until April, 2013, directly covering more than 0.4 million audiences in total.

The number of those lectures is increasing year by year , the number of the targeted public is also on its increase, with the number arriving at 40000 in 2011, 60% higher than that achieved in the previous year. The activity has gradually extended its coverage areas and regions from Beijing to nearly all parts of China. Its brand name has been well established in the field of SP activity.

3. Retired Scientists SP Lecture Team

This lecture team was set up in 1997, the team is composed of retired scientists from CAS, and of some retired experts from various ministries, institutes and universities. The number of the team now is exceeding 40, the targeted public are primary and middle school, and university students, middle school teachers, public servants, and community residents.

The lectures are presented in a scientific, popular, interesting and interactive manner. In terms of the content, the lecture team popularizes modern science and technology, the latest research development, and the relationship between science and society to the public in an easily accessible and interesting way. Regarding ways adopted in SP, scientists are engaged into communicating with the public mainly in a face-to–face manner, they hope to fully cultivate students' curiosity, inquiry, zeal and initiative in science and technology. Newly recruited lecturers must pass 3 steps until they can be admitted in the end, first step, to check lecture outlines; second step, to give trial lectures within the team; third step, to give trial lectures to teachers and students in middle schools. You can not become a member of the team until you can pass all the 3 steps[4]. Over the past 10 years, more than 100 experts wished to apply for the lecturers, but only around 40 of the total made it in the end, some of those who were refused and eliminated from the list are even including those top experts in some fields[5]. Since its establishment 16 years ago, those scientists have given more than 10000 lectures in 32 provinces, autonomous regions and municipalities directly under the leadership of central government, covering more than 4 million people nationwide. It has become an important team carrying out SP activities which tailor to the needs of the public.

RETIRED SCIENTISTS SP LECTURE ACTIVITIES

Time	Number	Targeted public	Note
2012	More than 1800	More than 0.5 million	——
2011	1469	More than 0.5 million	——
2010	1018	0.534 million	Give lectures to nearly 100 schools spread across different cities and counties in 7 provinces
2008	668	0.16 million	Give lectures to more than 60 cities and counties in 11 provinces or autonomous regions or municipalities
2007	511	90000	Give lectures in 12 provinces or autonomous regions or municipalities
2006	517	150000	——
2005	426	120000	——

The number of lectures given by the retired scientists was basically kept at an increasing rate. The increase was not so obvious during the years prior to 2008. However, the number was going upward after 2008, with lectures reaching more than 1000. It is also true for the number of the targeted public. The increase was going faster during those years after 2008, the number of the targets arrived at more than 0.5 million and tended to be kept at a stable level after 2010.

4. Set up Special Fund for CAS Annual SP Project

In order to encourage the development of SP work, CAS set up special funds for SP Project used to be applied by the institutes affiliated to it. Application categories involve how to improve SP activities, SP works and exhibition in Popular Science Venues, and research into those items. Requirements should be placed on every category, targets and contents which are set according to project must be accomplished within that year. SP activities must be high-end ones, the

amount of supporting money must be no less than 80000 Chinese RMB, the number of projects must be less than 8; SP books or works must be originally produced, money provided for writing and translation must be no less than 50000 RMB, the number in this regard must be no less than 10; SP venues getting financial support must be open to the public for at least 50 days, the supporting amount for fund must be no less than 0.25 million, the number of the projects must be no less than 10 ; research achievements must be published on high-level SP periodicals, with funds for research reaching no less than 0.1 million.

V. EXISTING PROBLEMS AND SUGGESTIONS

Albeit CAS has achieved a lot in SP work, there still remains some room for its further improvement. Some existing problems need to be resolved in the following context as well, with some constructive suggestions put forward thereafter.

A. With respect to its organization and institution, it is not highly concentrated. As a coordinating organization, SP leading team under CAS does not have the right to manage other related institutes. This is to say, it can not manage, mobilize and organize them effectively. As a result, in order to enhance effectiveness of SP activities, CAS is advised to increase its organizing and managing power, more importantly, CAS is also advised to strengthen its managing and supervising power of its affiliated institutions .

B. As far as funds are concerned, although CAS requires all other institutes to hand out a certain percentage of funds to help labs and institutes, etc, to be open to the public on a regular basis, yet it does not specify in an official written form the amount of fund, the forms it will use to open to the public, and the effects it will achieve[6]. The number of institutions who receive support of the yearly special funds for SP activities is limited, for example, regarding the project on the upgrading of exhibitions of Popular Science Venues, the support amount of fund is generally less than 0.25 million Chinese RMB, and the number of project receiving the supporting funds is around 2. In order to have this problem resolved, it is suggested that CAS stipulate some official documents ,clearly specifying the amount of fund coming from its affiliated institutions into SP activities, the main tasks they have to accomplish ,and the effects of SP activities.

C. The size of professional SP team is pretty smaller, the institutes which are not open to the public lack a team of stable SP promoters. In some cases, administrative working staff act as SP promoters concurrently, incumbent researchers are squeezing themselves to be engaged into such activities, plus, a large proportion of the retired researchers and volunteers are engaged into SP activities. Apart from the aforementioned factors, most of the institutions which are not open to the public regularly even have not established offices in charge of SP work. Considering the constrained factors above, SP activity guide and direction is advised to be formulated.

D. An evaluation and incentive system is to be further perfected. At present, no third party has the right to supervise and assess the performance of the activity, nor no proper assessment is made to gauge the performance of SP promoters. Those have seriously jeopardized their enthusiasm to participate in such activities. As a matter of fact, Scientific and technological researchers actively participate in SP activities in some developed countries after they finish the tasks having to do with science and technology. This is an important component comprising the whole evaluation and assessment system, because they have a lot to do with their performance and achievements in the research. For example, "such countries as Germany, Belgium, and Austria attach great importance to conducting a regular evaluation of the large-scale SP activities with huge investments, however, China is just in its initial stage in this regard."[7] Therefore, it is important to include SP performance indicator into the overall evaluation system, to include SP performance into performance assessment and professional title appraisal of scientific and technological researchers, and to resolve the problems concerning how to mobilize research institutions and researchers to participate in such activities. If all the aforementioned measures are taken, a good environment is likely to be created for establishing a long-term mechanism governing the sound development of SP endeavors.

VI. SUMMARY

It is very important and necessary for research institutes to actively get involved into SP work, by doing so, it is good for the social development, and the development and improvement of institute themselves. CAS, in an active response to the strategic requirements for revitalizing China through science and technology, is enthusiastically engaged into SP activities from multi channels by taking full advantage of its available resources. More importantly, it actively endeavors to build a new type relationship between science and the public. The public are inspired to participate in science, understand science and have the right to know effects it will have. CAS has already formed some featured SP activities so far, we witness a growing number of the covered targets, impacts of such activities is increasing year by year too. However, mode and routes used for the promotion of SP activities carried out by research institutes have their own limits and problems under the new context. For instance, the organization building, financial support, personnel training, and evaluation system, etc, need a complete set of supporting measures, the zeal of scientists and engineers need to be further cultivated, and the available resources need to be further integrated. Only in this way can a good job be done in the immense promotion of SP capabilities in China.

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