Cultures of Science 2018, 1(1): 1–13

Scientific culture and the construction of a world leader in science and technology

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Abstract

Scientific culture provides a solid foundation and is an important indicator of a world leader in science and technology. This article explores the meaning and structure of scientific culture and expounds its role in the development of the economy and society. It focuses on the importance of scientific culture in the construction of a world leader in science and technology through a brief review of the process of the development of global science powers. Based on that analysis, the author proposes that in China's journey to become a world leader in science and technology, we should take scientific culture as the foundation and the only way to develop our scientific cause.

Key words

Culture, scientific culture, social function, world leader in science and technology

Without a world-class scientific culture, it is impossible for a country to become a world leader in science and technology. This has been demonstrated by the rise of modern science since the Renaissance and the development of science and technology in the United Kingdom, Germany and the United States. But there are two questions: How does scientific culture support the rise of a world-class technological power? What are its internal mechanisms and determining factors?

This paper discusses these two questions. The author welcomes ideas about the issues raised.

1. Culture and scientific culture

Faced with the external world, humans generally direct the process of intellectual creation in two directions. One is thoroughly exploring the inherent development laws of things; and the other is abstracting data from the external forms of things. These two points combine to form the whole meaning of humans' spiritual life. Among such intellectual creation, scientific culture, as a crystallization of intellectual activities, is playing an increasingly decisive role in the development of human society.

1.1 Culture as a way of life

Various academic schools hold different ideas about the precise meaning of culture, and more than 340 definitions have been noted (Wang & Zhu, 2006). From the perspective of empirical study, some scholars have argued that culture is a set of customary beliefs and

values that is handed down through the generations by ethnic groups, religious groups and social organizations. From the perspective of theoretical study, some have argued that culture means a kind of belief about the results brought about by human behaviour, which may be modified by the next generation or by experiment (Alesina & Giuliano, 2015).

The American scholar GM Robinson divides culture into cultural concepts (such as beliefs, values and styles), cultural behaviour (for example, languages, gestures, customs and foods) and cultural products (such as literature, folk tales, art, music and handcrafts) (Robinson & Lu, 1995).

Of all the ideas about culture, I most admire those of Chinese scholars Qian Mu and Liang Shuming. They think that culture is 'a life': a human life, and a collective and public human life (Qian, 1969); culture includes all that we need to live, which means that it is an extremely practical thing (Liang, 2011). In general, culture is a way of life.

1.2 The various levels and dimensions of culture

As a way of life, culture mainly refers to the concepts, values, behaviours and institutional patterns that are unique to and inherited by a society. It includes various dimensions and levels, such as:

- languages, traditions, values, attitudes, beliefs, behavioural norms and prevalent opinions
- social habits, and social systems and regimes that adapt to those habits
- embodiments in physical tools and creations.

In real life, culture is intangible but affects the way we think and behave at all times. We live in culture. It always influences and restricts us while we are at the same time changing and developing it through our behaviours. Based on this fact, the Hangzhou Declaration, *Culture: Key to sustainable development*, issued by UNESCO in May 2013, stressed that culture should be included in all development policies and plans (Liu & Feng, 2013).

1.3 Culture in different times and of different groups

In real life, culture shows clear differences in features at different times and for different groups. Such differences and features are evident in:

- *the pursuit of values*, which includes our outlook on the world and life and directly decides our sense of values
- *the mode of thinking*, which includes our perspectives and ways in which we think, analyse and act when facing a problem, and directly decides the range, depth and level of our thought
- *patterns of behaviour*, which include behavioural norms such as ways of solving problems, communicating and behaving, and decide the environment and range of our activities and the way we handle matters
- *language style*, which includes the language system we use and the way we communicate with others
- *an external form or a carrier*, which displays the values and behavioural norms in the culture, and so can be called 'cultural infrastructure'
- *interests in life*, which include appreciation of and preferences in art, music and so on.

A particular lifestyle is formed under particular socio-economic conditions. There are some differences in lifestyles in different historic periods, social groups and social classes, but lifestyles in different ages have some things in common, and the lifestyles of different social groups and social classes also influence and relate to each other.

1.4 Scientific culture as scientists' lifestyle

In the 16th and 17th centuries, natural philosophers and natural historians set about establishing societies, combining rational exploration and empirical study to form a new scientific method, and developing the ideals, beliefs and principles of the scientific community. Consequently, scientific culture came onto the historical stage.

Scientific culture is formed with the emergence of science and technology and develops in tandem. It is not science *per se*, but a unique perspective, system of values and mode of thinking through which we understand and develop science. It is obviously different from other types of culture, such as religion, literature, art and morality (Xie, 2003).

The English scholar CP Snow proposed the concept of 'scientific culture' in 1959 and believed that scientists belonging to the same scientific culture had common values and standards of behaviour. For instance, one of the criteria for the correctness of a new scientific theory or law is its reproducibility and verifiability; also, the value of a paper lies in its originality, so plagiarism is not allowed. The spiritual connotations of scientific culture include:

- free exploration, bold criticism and innovation
- seeking truth from facts, not following authorities blindly
- opposing all falsification, striving for feasibility and adhering to rationality
- valuing the principles of justice, popularization, innovation, normalization, tolerance and cooperation (Peng & Peng, 2007).

From this perspective, we can see that scientific culture is a system of values, modes of thinking and institutional, behavioural and social standards that develops in scientific activities. It is the lifestyle of the scientific community. Scientists are the leaders and practitioners of the forms and fashions of scientific culture, and their scientific and technical activities lay a solid foundation for the development of scientific culture.

1.5 The features of scientific culture

Scientific culture has the following distinct characteristics that are different from those of other social cultures:

- *Practicality:* Scientific culture is always connected with the development of science and technology, as well as practical activities of the scientific community led by scientists.
- *Precision and logic or rationality:* Some scholars believe that, of the knowledge systems of all human cultures, the scientific culture is undoubtedly the best in its systematic nature and precision, as well as its quantity and quality (Li, 2017).
- *Independence or endogeneity:* It stems from the scientific community and is driven and affected by the development of science and technology, relatively independently from the influence of other social factors.
- *Inheritance:* It is passed from generation to generation through customs. For example, in the development of a school, the principal values and modes of thinking are inherited along with skills and methods. As time passes, a tradition is eventually formed.
- *Penetration:* Scientific culture is not confined to scientific organizations and the scientific community. It also refers to the wide spread and application of scientific knowledge, methods, values and ethical ideas in other social and cultural fields, which may cause either cultural integration or cultural conflict.

1.6 The influence of scientific culture on the public

The public's understanding, acceptance and simulation of the scientific community's lifestyle is also an important part of scientific culture. The advanced nature and rationality of scientific culture enable it to be an influential model for people's behaviour. Hence the public will, consciously or not, understand, appreciate, accept and even simulate the way of living, working and thinking of the scientific community. Thus, scientific culture includes not only scientists but also other people who recognize the values and modes of thinking of that culture and follow them in their behaviours.

The aim of developing scientific culture is to enable us to work and live following scientific principles and methods, to create more knowledge of science and technology, to enjoy the convenience it brings and to improve the quality of life.

2. The social function of scientific culture

Scientific culture came into being with the emergence of modern science and has developed in tandem with it. In this process, it gradually became the core of modern civilization and culture and now influences people unconsciously. Snow (1959) believed that culture was something that made people act in the same way without thinking, and this marked its significance. What, then, is the social function of scientific culture?

2.1 Maintain people's pursuit of scientific truth

Scientists engaged in scientific research hold a common value: the continuous pursuit of scientific truth. This is a scientist's belief. In research work, it is of great importance for scientists to hold to scientific belief (AAAS, 2001). Scientists' adherence to academic freedom, truth and integrity is crucial for the healthy development of science and technology. They believe that the study and open communication of scientific findings, hypotheses and ideas are at the core of research activities and effectively ensure the accuracy and objectivity of research output (UNESCO, 1974).

Integrity is not unique to science, but it is the basis of scientific thinking and scientific work (AAAS, 2001). Scientists' pursuit and exploration of scientific truth will not vary with consanguinity, geography, nationality, religion or social status. These values included in scientific culture guide outstanding people with high intelligence to discard vulgar values such as social status, reputation, wealth, comfort and ease, and to engage in laborious scientific undertakings. Thus, people with different temperaments, predilections, interests and talents can trust each other, communicate and cooperate with each other, appreciate, praise and help each other, forming a community in which people have similar goals and working styles (Hu, 2014). A genuine scientist believes that scientific truth has a supreme value and will seek truth at all costs.

2.2 Guide people's thinking

In one sense, culture is a collective mode of thinking that distinguishes one group from another. The most important function of scientific culture is to transform primitive thinking into logical thinking, and then into scientific thinking (Xiao, 2007). The developmental level of scientific culture has influence on the ways in which researchers seek truth, as well as which subjects they choose and how they carry out research.

Scientific thinking has the following characteristics:

- *Stress the importance of experiment and observation.* To find the internal laws of things, people should think reasonably and logically on the basis of reliable experiments, observation and the achievements of predecessors and contemporaries (Peng & Peng, 2007).
- *Seek reproducibility and verifiability.* Only things that have been verified can be regarded as scientific knowledge. Verifiability is a mark of science. It means that one or more conclusions can be deduced from a statement plus a certain number of initial conditions, and those conclusions can be compared with the results of observation and experiment (Fei, 2004).
- *Be sceptical and critical.* This is the soul of science. All existing theories should be ready to be verified by experience, and anyone in the scientific community is entitled to test them.
- *Use scientific methods.* Scientific methods such as observation–induction, experimental study and hypothetical–deductive methods ensure the continuous development of science. The combination of rationality and experience is one of the essential features that distinguishes scientific culture from other cultures.
- *Adhere to a unique mode of thinking or language system.* A scientist should try to describe facts with clear words, explain the world by systematic theory, be precise and logical in structure, and be able to make predictions about the future.

2.3 Normalize people's research behaviour

The procedures and norms of scientific activities are parts of a culture. They ensure the attributes of scientific knowledge and the differences between scientific culture and others. Michael Mulkay believes that scientific culture is typically a set of social norms and knowledge that are not subject to environmental constraints. Those norms are typically a series of rules that explicitly define certain types of social behaviour (as cited in Liu, 2012). Generally, the institutional norms of scientific culture include both formal institutional regulations and informal rules of behaviour. The norms consist of the following specific items:

- *Norms for project applications.* These include discovering real problems, designing feasible study plans, convincing sponsors through normative procedures, ensuring the truthfulness and reliability of the submitted information, and being ready for peer review.
- *Norms for conducting experiments.* The primary objective of scientific practice is to discover scientific facts by observation and experiment. Scientific facts must be based on reliable observation, rigorous reasoning and the verification of results. These requirements are further divided into specifications of experimental design and experimental procedures, and an emphasis on repeated experiments. The time, location, environment, process, means and results of observations and experiments should be clearly recorded for mutual verification and evaluation, and for repeated observation and experiment (Fei, 2004).
- *Norms for cooperation and exchange.* In theoretical studies, in-depth academic interaction is needed to inspire scientific creation and exchanges of ideas among scholars (Yuan, 2007). Communication in any other form is no substitute for face-to-face academic exchange, which has its own specific procedures and norms. Additionally, scientific research requires collective cooperation, but whether scientists can treat themselves and others properly is the key to its success. In the age of big science studies, the norms for scientists' cooperation,

communication, assessment and supervision are particularly important (Yan, 2002).

- *Norms for thesis publishing.* Scientists publish their theses mainly to report their research progress and record their research findings for the scientific community to conduct repeated verification and accumulate knowledge and to confirm ownership of a scientific discovery. Therefore, scientists are obliged to use authentic data and scientific methods and make logical conclusions in their theses. Science and technology journals are responsible for establishing editorial boards with highly qualified specialists to review the papers submitted and make decisions on publishing matters.
- *Norms for ethics.* Robert K Merton believed that the objectivity of science was supported by scientific methods, norms and systems, rather than ethics and integrity (as cited in Li, 2008). However, scientific research is an activity with high levels of uncertainty. It requires a wealth of funds and labour and must create pathways for successors. Therefore, scientists should have a higher moral standard than the general public. They are 'neat freaks'. In particular, modern science comes into conflict with some traditional ethics in such fields and procedures as transgenics, cloning, gene editing, synthetic cells, artificial intelligence, contraception, human anatomy, organ transplants, animal experimentation and *in vitro* fertilization. These have big impacts on social morality and ethics, so it is especially necessary that scientists strictly follow scientific norms and ethics.

2.4 Normalize science assessments

Science assessment and its awards system decide why and how people carry out scientific activities, so they are also at the core of scientific culture. They have the following features:

- *An emphasis on the decisive role of the ownership of a new discovery*. The scientific community's pursuit of priority and its emphasis on it was first noted by Merton, but the controversy about priority emerged in the time of Newton. Some scholars believe that originality is an important mark of scientific culture, so scientists and the scientific community value priority (Li, 2017). Confirmation of priority means that the person who first publishes and discloses a new discovery will obtain the priority of that discovery. The reward for priority may be professional promotion, an increase in salary, a larger research budget, scientific awards, or the honour of having the discovery named after the discoverer, but recognition and respect from peers are more common and direct rewards. In such a reward system based on precedence, scientists compete to be the first even more fiercely than do athletes (Wang, 2006).
- *An emphasis on the fundamental role of recognition from peers and peer review.* Peer review is a mechanism that results in recognition from peers, which is a 'hard currency' in the scientific culture. In the strict peer review system, members of the scientific community regard individual reputation as the most important thing and seldom rely on officials and authorities (Li, 2017). In particular, scientific awards based on recognition from peers are supreme honours for which scientists strive. Such awards and recognition are parts of behavioural norms, for they tell people who is excellent, which behaviours should be recognized, and what should be done and not be done. If it is based on peer review and recognition from peers, recognition from the society and the government can be more encouraging and influential.

- *Respect for intellectual property.* Ownership of a scientific discovery is a special property right that encourages the creation of public knowledge. It is the basic property right of the scientific system. In comparison, patents for inventions and rights to trade secrets are property rights that encourage the creation of private knowledge. To compare a patent with a right to trade secrets: the former means disclosure of knowledge, while the latter means maintaining confidentiality; the former is the basic property right of the technological system, while the latter is a basic property right of the corporate system. The knowledge creation system of the whole society is a combination of the above three systems (Wang, 2006). Scientists should protect their own intellectual property and respect the intellectual property of others. In thesis publishing, the rules of signature, quotation, citation and referencing, and the rank order of patent certificates and science rewards, are all indicators of the protection of intellectual property.

2.5 Normalize the application of scientific achievements

Scientific outputs include papers, patents and technical know-how. Papers are published and available for reference, bringing social benefits, while patents and technical know-how may bring great commercial benefits when they are used for developing new products and techniques and program design.

This requires scientists to comply with a strict code of conduct when they use scientific achievements:

- *Scientists should not be excessively driven by material gains.* Of course, they can make profits from their scientific research, but that should not be the only or even the primary aim. Particularly in the case of theoretical study, when a paper is published, it will become a part of public knowledge and the common wealth of society, so its findings may be used repeatedly and freely by anyone and shared by society as a whole. In this case, the confirmation of precedence will be the best reward for the scientist. Therefore, Ernest Rutherford believed that wealth was given to industrialists while fame was given to scientists (as cited in Yan, 2002). The excessive pursuit of material gains will cause direct damage to all the elements of the scientific spirit, for example, weakening people's pursuit of truth, damaging the complex process of rational empirical study, yielding to 'bigwigs', reducing cooperation and hindering creativity. An effective measure to reduce the excessive pursuit of material gains is to guarantee relatively advantageous material conditions for scientific endeavour (Yang, 2011).
- *Scientific achievements should be used to promote human welfare.* Demand is the major impetus for the development of modern science and technology. Scientific discoveries, technological progress and scientific applications have created huge space and limitless potential for the development and progress of society. The application of scientific achievements should aim at expanding the range of human welfare while maintaining the appropriate balance between social and individual benefit—neither hindering and restraining the innovative passion and creative vitality of scientists, nor damaging common interests and the fundamental interests of the public.
- *There should be reasonable limits on the application of scientific achievements.* Scientific progress is a double-edged sword. The inappropriate use or the abuse of scientific achievements tends to bring about disastrous results, especially when they are used in events that may lead to

large-scale destructive wars, biological or ecological disasters and complex ethical and legal problems. Thus, scientists should have strong humanistic feelings; strictly abide by relevant policies, laws and regulations; adhere to scientific ethics; and guarantee people's right to know so as to prevent the inappropriate use or the abuse of scientific achievements.

2.6 Socialize the values and behavioural norms of the scientific community

The public's trust, understanding and support are necessary for the maintenance of scientific social systems and the development of scientific research. This is the socialization process of the culture of the scientific community, which includes the following aspects:

- *Society endows the scientific community with a certain degree of autonomy.* Only when scientists have responsibilities for the society they serve can society provide long-term and stable support for scientific research (Han, 2008). The traits of scientific spirit, such as universality, sharing, absence of bias and methodical scepticism, are in fact a set of values and behavioural norms that constrain scientists' behaviour. They are expressed in terms of regulations, preferences, permissions and prohibitions and are legalized through institutional values. These indispensable norms, conveyed through warnings and examples and reinforced through preferences, are internalized by the scientist, and thus form his or her scientific conscience (Merton & Lin, 2000). The requirement of scientific research for free exploration, and the establishment of the strict, self-disciplined mechanisms of the scientific community, make it both necessary and possible for society to endow the scientific community with a certain degree of autonomy.
- *The norms of the scientific community are recognized and accepted by the general public.* The socialization of the scientific community's culture shows that the public is willing to respect, appreciate and accept the core content and important aspects of that culture and take them as behavioural norms and values. This willingness makes the key content of the scientific community's internal culture become a part of society's culture, and so scientific culture becomes popular culture, which is in fact the process of popularization of science. In this sense, it is too narrow to limit the popularization of science to the popularization only of scientific knowledge. It also includes the dissemination of the scientific spirit, scientific methods and scientific thought.
- *The scientific community's discourse system is popularized.* On the one hand, the scientific community's discourse system has expanded to all aspects of human life through scientific achievements and has become an important part of humans' living environment; on the other hand, scientists should explain the cultural content of science, introduce it into public discourse through the mass media and guide people in changing their way of thinking. In developing countries, when this transferred scientific culture collides with local traditional culture, a new kind of scientific culture will appear, which should in one sense be a popular culture with distinct national characteristics.

3. The function of scientific culture in the construction of world leaders in science and technology

A 'world leader in science and technology' is a concept comparable to a 'world science centre'. Japanese historian of science Mintomo Yuasa believed that a country that produces

more than 25% of the world's scientific achievements can be called a world science centre at that time (as cited in Shi and Gong, 2012). World leaders in science and technology are those countries that are not necessarily world science centres, but similar to them in their developmental level of science and technology. History shows that the development of scientific culture determines to a large extent the speed at which a world leader in science and technology can be built and the level that can be achieved.

3.1 Scientific culture and the rise of world science centres

A world science centre rises on the premise and basis of scientific and cultural changes.

According to Mintomo Yuasa's point of view, the modern world science centre has shifted from Italy (1504–1610) to the United Kingdom (1660–1750), to France (1760–1840), to Germany (1875–1920), and to the United States (1920 to the present) (as cited in Zeng, 2009).

Using data from *The Timetables of Science*, Davies (2005) summarized the distribution of scientists in time and place from 988 to 1988, including nearly 10,000 major scientific events and more than 3,300 scientists. He found that Italian scientists, represented by Galileo, were in the dominant position in world science field before 1600. In France, the development of mathematics from 1601 to 1660 was due mainly to the simultaneous existence of Descartes, Fermat and Pascal in that period. The United Kingdom made the largest contribution (34%) to world scientific knowledge from 1661 to 1800.

The main force driving Italy to become a world science centre lay in the ideological emancipation brought by the Renaissance, which made people's thinking unprecedentedly active and stimulated scientific activities and scientific ideas.

The United Kingdom became a modern science power mainly because Francis Bacon's demand to rely on experiments to understand natural science, medicine, alchemy and all things in the world became the cornerstone of significant scientific development. The Royal Society and other scientific communities became the models for modern scientific organizations, and the Lunar Society and other local science societies were unprecedentedly active (Hao, 2010). The English Puritans' emphasis on utilitarianism, socialization, orderly and persistent activity, thorough empiricism, the power and responsibility of free thinking, and anti-traditionalism were all compatible with the values of science (Ben-David, 2007).

The rise of France as a science power was closely related to René Descartes' rationalism. The government attached great importance to science and for the first time invested a lot of resources to organize scientific research and scientists.

Germany became the new science centre in the 19th century. The spirit of scientific culture advocated by such thinkers as Alexander von Humboldt and its use in the reform of the university system laid an important foundation for that progress. In universities, scientific research was endowed with high ethical values and the pursuit of truth was the topmost mission of teachers, who played the role of researchers and thus combined scientific research and teaching. The competitive university system promoted the development of a professional scientific community and the formation of scientific research standards. The peer review system that is still used today was born in German universities (Hao, 2010).

The United States became the world science centre in the first half of the 20th century, relying mainly on the guidance of scientific culture and unceasing exploration of the laws of scientific development. No longer merely free exploration by an interested scientific elite, science and technology became an excellent tool to enrich the country

and strengthen its military forces under the planning and with the support of the government, and commercial enterprises were increasingly and directly engaged in scientific activities (Fan, 2016).

From this brief historical overview, we can see that the emergence and development of modern scientific culture are closely intertwined with the revolution and systemization of modern science in Europe, and even with the process of human culture's transformation from a pre-modern form into the modern form (Yuan, 2007).

3.2 Scientific culture and institutional innovation

The institutional innovation supporting the development of world science centres relies on the guidance of scientific culture. Science is created by humans. Scientific activities are social activities, so scientific culture is the product of humans' or particular groups of humans' activities. The thinking patterns, values, behavioural norms and traditions of science formed in its history reflect its cultural connotation. Science plays its social role only when it is transformed into culture (Fu & Xing, 2016).

The development and communication of scientific culture not only legalize the continuous development of science and facilitate the public's appreciation and support of science and technology, but also create a spiritual home and principles and values for scientists to conduct scientific exploration. In general, the reasons why scientific culture facilitates the construction of a world leader in science and technology are as follows.:

- Scientific culture guides people to form a correct scientific outlook and values, convincing them that we depend on science to solve the problems that humans are confronted with. This creates a favourable social atmosphere in which people love, learn and use science.
- Scientific culture is enlightening. It makes people think from a scientific point of view and gradually develop a scientific mode of thinking.
- Scientific culture normalizes people's behaviour, making them act consciously in accordance with scientific laws.
- Scientific culture makes it easier for people to reach a consensus on the applications of scientific achievements and to have a more open, tolerant, cautious and reasonable attitude towards new things.
- Scientific culture makes people willing to support and make contributions to science, which is the impetus for scientific development.

3.3 Scientific tradition as the basis of a science and technology power

The scientific tradition is the basis for a science and technology power. It evolves from scientific culture and is the nest that incubates a new generation of scientists.

The scientific strength of a country is reflected not only in the quantity and quality of its scientific achievements, but also in its adherence to the scientific tradition. To a large extent, that tradition reflects the continuity and accumulation of scientific development, and also the inner logical consistency of scientific knowledge. Besides the heritage of scientific knowledge, the scientific tradition includes three aspects:

- *The attitude of society as a whole to scientific activities.* This attitude will be passed on from generation to generation and develop into a social atmosphere in which science is respected, upheld, loved and learned.
- *The methods of conducting scientific research.* The formation and application of those methods is the product of social history at a certain stage of development and is an integral part of scientific development.

- *The accumulation of advantages in scientific research.* This makes some universities or research institutions produce outstanding results in some research fields, and some countries more powerful than others in the development of some scientific fields. Bronislaw Malinowski (1944) held that cultural tradition must be transferred from one generation to another, and that the key to that was the organization or institution. This is the inheritance mechanism of scientific traditions. It decides which scientific traditions can be inherited and in what way, so it functions as a screening and eliminating mechanism for scientific traditions.

3.4 Scientific culture and scientific talents

Scientific culture based on traditions is the key to the growth and development of scientific talents. Scientific talents grow up under the influence of scientific culture, so it is crucial for them.

Just as Aristotle said, 'Every one of us is shaped by our repeated behaviours. Therefore, excellence does not mean behaviour, but a habit.' The acquisition of scientific methods is a practical rather than a theoretical issue (Wu, 2001). Traditions and customs are parts of a culture passed from one generation to another. They are formed naturally in people's long-term communications and are long-lasting. They include such factors as values and beliefs, ethics and morality, and habits and ideology, which are informal and not mandatory.

Scientific customs consist of the following aspects.

- A scientist's individual habitual behaviour develops into the practice of a group of scientists. That is, when a scientist engaged in scientific research and technological innovation repeats an action or a behaviour in his or her work and life, it becomes a habit; and when people's individual habits are so similar that they approach consistency, they become the tradition of the collective. Malinowski (1944) believed that humans live according to norms, customs, traditions and rules formed through the interaction between the scientific system and humans' control and reorganization of the environment. These traditions are ubiquitous within the scientific community.
- When a tradition is kept in the scientific community for a period of time, especially when its generational transmission is finished, it will seep further into people's minds, settle down in the psychology of the society, and develop into a social norm.
- People violating these social norms will be punished by the scientific community. In any society or community, as long as customs exist, there will be some people violating them (Takizawa, 2003). In this case, the mechanism of punishment by the collective will play a significant role in guiding and normalizing the development of scientific talents.

3.5 The influence of scientific culture on decision-makers

Scientific culture influences the conscious and unconscious thinking processes of decision-makers and the methods they use to make decisions when it is disseminated to and penetrates the public and society as a whole. Successful decision-making needs not only scientific procedures and scientific plans, but also scientific culture, which helps decision-makers to improve their comprehensive literacy and more reasonably choose the best plans from multiple alternatives. Therefore, UNESCO suggests establishing or designing a scientific policymaking and implementing

mechanism to avoid potential dangers and make people realize and utilize the positive aspects of scientific inventions and technological developments and applications (UNESCO, 1974).

4. Conclusion

To scientists, 'scientific culture' means a lifestyle that they live in and enjoy. For laypeople, it provides a refreshing breeze flowing into social culture, guiding them to seek truth, innovate, respect knowledge and talents, and support the healthy development of science. Good scientific traditions and customs enable us to climb onto the shoulders of the giants and enter the centre of the world scientific stage. Therefore, a world leader in science and technology should be built on the basis of excellent scientific culture.

We have entered an era of scientific prosperity. The development of science has never been so fast, the scope of science has never been so wide, and the task of cultivating and propagating scientific culture has never been so pressing and so weighty as today. China should make larger contributions to the increase in human knowledge. In our journey to become a science and technology power, we must advocate scientific culture as a lifestyle, taking it as the most significant component of advanced socialist culture and the foundation of a science and technology power. This is the only road to develop our scientific cause and is also our historic responsibility.

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