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The Impact of Social Culture Environment for Modern Science Development: Based on the Understanding of Merton's Dissertation

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Abstract

In the ages of Big Science and under the situation of advocating an innovative society, it's very significant to re-read the Merton's Dissertation named *"Science, Technology and Society in the 17th Century England"* and explore fascination of thought and modern value in the classics which was recognized as a work of sociology of science. Along the thinking logic of Merton's text, we make the history of reduction and in-depth analysis of the England social culture environment in 17th century from three aspects of politics, economy and culture. And with this a base point, some important influences of Social Culture Environment to the rise and development of Modern Science are fully discussed from three perspectives which are the driving force of modern science, the turn of scientific research fields and its interaction mechanism.

Key words: Social culture environment; Puritan ethics; Transformation of job interest; Merton

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INTRODUCTION

Robert King Merton (1910-2003) is a famous American sociologist, the founder of the sociology of science, and structural functionalism school representative (Liu & Liu, 2011, p.267). He always adhered to such idea that an excellent scholar ought to be meticulous with knowledge and hold teaching philosophy in his ceaseless writing life, so he achieved great triumph in sociology of which the most important theoretical contributions were structural functionalism theory, middle theory and thought of Sociology of Science. And he has cultivated a batch of the world recognized leading sociologist during the thirty years of teaching at Columbia University, like J. Coleman, P. Blau, & L. Coser. Merton was honored as "the father of Sociology of Science" because of his great influence, then Merton's doctoral thesis *"Science, Technology and Society in the 17th Century England"* published in Journal *Isis* for the History of Science (1938) was generally accepted as the foundational work. Deeply influenced by these academic thought and method from sociologist Sorokin, Parsons and Mannheim, as well as guided by the historian of science George, Merton accomplished his paper with a great deal of historical data analysis and quantities methods (quantitative content analysis, collective biography etc.), and thought science as a kind of social system. He explored the mutual restriction and influence of science and politics, economy, military, social and cultural factors, as well as the interdependent relationship with other social system in the British background of seventeenth Century (Merton, 2000, p.5). As a representative of Merton's early thought, his paper was still neither perfect nor mature, but as Cohen said, "the majority of doctoral dissertation valuable things is in between the lines and notes, and STS is no exception." Rereading Merton's doctoral thesis is important to discovery the impact of social and cultural environment to the emergence and development of the modern science, and the implications that contemporary Chinese science should be more emphasis on social cultural environment construction.

1. THE SEVENTEENTH CENTURY ENGLAND SOCIAL CULTURE ENVIRONMENT

Social culture environment refers to the specific cultural atmosphere formed in the human life of the community, and is in contrast to the concept of natural geographical environment including cultural tradition, ethics, values, social ideological trend, etc. Social and cultural environment is the most important factor that affects the people's desire and behavior, so the different countries or nationalities have different custom and style owing to their different culture background. In this sense, social and cultural environment is the historical concept which inherently covers time and space, and its essence lies in analysis to the specific geographical and social culture factor along with the constantly evolution of human civilization. In Merton's context, science is not only considered as a system of knowledge, but also is a kind of idea and the social and cultural system, moreover, Merton inspected the relationship among scientific research system and other social systems were interdependent and interaction. In the early period of the modern science's development, the establishment of scientific system was deeply influenced by these social and cultural factors, such as economy, military, religion.

In the times of great change during the whole 17th century, English society had transformed from "the private kingdom" ruled by the king completely into the constitutional monarchy whose parliament took precedence over the king, had changed the medieval Catholic concept into the implementation of radical protestant policies like religious freedom policy, and had expanded regional economy of rural and urban craftsmen to the highly commercial market economy and close business contacts with the world. The seventeenth Century of England social culture which connected with the dark fifteenth Century and rational eighteenth Century presented the following characteristics: **Firstly, England was under the rule of Stuart Dynasty in politics.** We could say the "Glorious Revolution" opened the channel for British continuous reforms, and this is the most important factor that the UK could eventually be able to lead the world trend. On the one hand, the Bill of Rights established the basic framework of the monarchy and parliament had gradually become the center of power; on the other hand, with the end of domestic long-term political conflicts, the colonial expansion had become the focus of national attention, and from then on, the British took active participation in the wars with other European countries for world hegemony during nearly a century. When the War between Britain and France was finished in 1973, England had built up the first empire centered in the North American colonies (Liu, 2008, pp.56-76.). The political culture of seventeenth Century England featured with the ideas of democracy and freedom, relatively relaxed political environment and the development mode smoothly. **Secondly, English economy was influenced by colonial ideology with mercantilist and the capitalist node of economic development.** In Elizabeth period, Britain encouraged the commercial activities and overseas trade, and begun to pursue mercantilist. The new aristocracy and bourgeoisie became the most powerful social class through the primitive accumulation of capital from domestic Enclosure Movement and overseas colonial expansion. Till 17th Century, England had become the higher development degree among the European capitalism countries, especially after defeating the Holland called "Sea Coachman" together with France. Thus preliminary established modern British colonial system and had strengths in striving for commercial maritime and colonial hegemony around the world, which laid the good foundation of the first British empire and the developing trace of the British Empire ever since (Huang, 2010, pp.72-77). **Thirdly, England's cultural life was characterized by empiricism and rationalism.** Under the combined effect of many factors including the relatively relaxed political environment, the rational Reformation and Puritanism, the leading scientific achievements and early onset of the bourgeois revolution, etc., the British became the birthplace of the Enlightenment throughout Europe. The mainstream value of British was characterized by the materialistic empiricism or British empiricism philosophy, which produced and developed on the basis of modern natural science progress and the bourgeoisie in the struggle against the scholastic philosophy (Chen, 2007, pp.55-65). Rationalism is mainly composed of the philosophy of Herbert and Cambridge Platonism, which emphasized knowledge, came from the innate ideas and human rationality. Generally the bourgeois ideology lay in the following aspects: there was Master Newton's classical physics in the natural sciences; there was the empiricism that has been initiated by Bacon, then systematized by Hobbes and completed by Locke in philosophy; there was the foundation of constitutional government thought including social contract, natural rights, doctrine of separation of powers, etc. which was clarified by Milton, Hobbes, Locke in politics.

Based on tracing back to the history of the seventeenth Century British, it's not difficult to find history is never the simple path from one point to another, but the uninterrupted flow which subjects to effects from all kinds of interactive factors. In the specific historical condition itself, time and space frame (the seventeenth Century England) provide unique social and cultural environment for the development of modern science, as the text conclusion said, "The seventeenth Century England cultural soil is very fertile for the growing and spreading of science."

2. PURITAN ETHIC: THE NEW DRIVING FORCE OF MODERN SCIENTIFIC DEVELOPMENT

Science and religion is two distinct cultural forms: the former seeks the truth whose core is intelligence; the latter pursues transcendence whose foundation is faith. But it is difficult to separate the two in history, so Einstein said, "Religion without science is blind, science without religion is lame." British Puritanism of the seventeenth century became the mainstream ideology, which inherently contained factors that support the development of science.

2.1 The Puritanism Ethos

"Puritanism" was derived from "the Puritans", which was known as the generalization of pilgrims' thought and behavior (Li, 2006). "Puritans" comes from the Latin word "Purus", and its original meaning is cleaning, washing and purification, then it refers to a Protestant denomination in Europe of the late reformation, whose thought is mainly originated from the French Calvin doctrine.

One is the utilitarian principle of "Praising God". Utilitarianism is the theory of utility perfection, which thinks all the behaviors guided by the function and interest as "the greatest happiness". Merton found that the British Puritans or natural philosophers who believed Puritanism generally held the utilitarianism as their values. Wether to convey the preaching of the Gospel activities or to carry out the practice of scientific exploration was to "praise god" better, even public education and welfare policy were for this purpose. Scientific activities and career choice thus became the process and means of religious practice. Two is the concept of rationalism and empiricism. As the mainstream of modern European philosophy, the both concepts were also reflected in the Puritan ethic, such as asceticism or abstinence, introspection and self-regulation, to praise highly to be the chosen ones. Therefore these ideas supported the empirical scientific development unconsciously which was based on the observation and thinking of the experience materials, thereupon temperament of Puritan spirit of speaking highly of reasoning power inevitably led to those activities of which always needed the sympathy attitude to use strict reasoning. But in contrast to medieval religious theology, the reason has been seen as subordinate to the empiricism. Three is the ethics of diligence. English Puritans in seventeenth Century was thought of being the most warmly, conscientious and keen on reform of the Protestant. They tried to look for the consistency of Protestant faith to realize unity of religious life in the national scope, so that they could "seek for the restriction of all disordered things", namely to put the disorder of religious and social moral in God's requirements. Most pilgrims have sense of mission and achievement with diligence, and they appeal to the religious significance of individual conscience, rationality and knowledge. For this reason, they always examined their own daily actions and advocated simple and frugal life, and by the means of Scripture, sermons and family prayers, could they "speak to God" to live reverentially. We could say the Puritanism not only made these believers to live within the half framework of the Christian belief, but also created the religious life with more rigid beliefs; and not only shaped the Puritans' daily life, but also often affected other people's religious life which was full of secular color. In the summary, puritanism means cultural and ethical value which always wears the colors of rationalism owing to moderation and self-control, shows the value of utilitarianism because of the way of the good and the goal of getting salvation, and reveals the tendency of secularism on account of the principle of asceticism, although on the surface this seems contradictory. The notions of Puritanism, Pietism, Protestant Ethics in Merton's context, are all based on the social background of seventeenth Century England, their core content are a kind of mainstream social value or culture represented by Calvinism. As a kind of culture, it has been beyond the religious meaning itself already, then has become dominant mental factors or ideology in the society (Wang, 2007, p.71). This culture is the consciousness exists of dispelling the unique nature, and is equally effective on the constant social awareness and cultural circumstances for Isaac Newton and Albert Einstein as the 17th-century England and the 20th-century America.

2.2 The Compatibility of Puritan Ethics and Modern Science Spirit

To discuss the inner link of Puritan ethic and science spirit actually stems from the well-known "Merton Proposition", namely "the traditional value system which was led by puritanism promoted modern science unconsciously (Merton, 2000, p.183)." When it comes to cultural value of the Puritan ethics or its spirit, religion and science are "selective affinity", that science as "the slavery of utility" has not got rid of the religious fetter yet under the unique background of 17th century England, which took refuge in religion but at the same time wanted to beak its control of which the latter was unexpected by Puritan. Scientific spirit refers to the sum of scientific norms and value pursuit what the scientific community should obey to, and the result of scientific practice which scientists have engaged in for a long time. The formation of the modern scientific spirit is the result of the confluence of two types of culture: one is the philosophical tradition of emphasis on experience and nature, the other is the rational or logical thinking tradition. The exclusivity between the Puritan Ethics and the spirit of science can't eliminate the "unexpected" compatibility after all, the new thinking of scientific development and Puritan values well forme cultural fit (Dai, 2010).

First, the "predestination" thought and epistemological position are consistent. The basic idea of Calvin's philosophy is predestination that means the God "has presupposed all the things that are about to happen", that is to say, the universe runs according to God's arrangement, the nature or the experience world reflects the God's omniscience and omnipotence. So the science is the first to recognize the object world which is certain and regular and not changeable randomness. This agreed with the scientific default position which hold the view of "the world is knowable". Thus formed a series of key assumptions, like "the world is organized and can be recognized through reason". Although there are non-empirical and transcendent hypotheses, this is sufficient to explain the religious belief's guiding role in scientific understanding, and "non-logical concept with the transcendental content can also have considerable influence in practical behaviors".

Second, the "engaged asceticism" is coordinated with the scientific rationality in experiments. Science and technology inherently contain the rational consideration of theory and practice. Therefore, scientific researches focus on rational thinking of the experience material and verify the hypothesis through empirical method or experimental means, and the combination of empiricism and rationalism. In the Puritan view, the rationality is not conflict with the religion, can people be rational only if they become the chosen who is different from the beasts and birds. And Puritan life with asceticism affected people's psychology and emotion by osmosis to use rational thinking, namely scientific experiments refrained from "indolence" and unreasonable desire so as to be closer to the God's wisdom and live an orderly moral life according to God's commandments. The this-worldly idea rather than the other-worldly idea suggests that puritanism is trying to combine transcendental religion with secular world, which is conducive to the integration of religion and science to some extent. These are coincide with the rational spirit revealed in science, or a historical "encounter" caters to the needs of the society and supply scientific activity supplement to methodology and epistemology, so as to promote the development of modern science.

Third, human easy and comfortable of utilitarian tendency agrees with the practical value of science. "Praising God" and "for the good of people" are the puritanical leading belief, and to praise "nature as the great creator" is the purpose of existence and everything, but as long as you can "make human life sweeter" and improve the material life of human, this will be good in God's eyes (Merton, 2000, p.103). Science and technology precisely at this time acted as the means or tools of obtaining "human's comfort" at this time, and to understand and change the natural world in turn were the effective way to confirming people's worship of God. As a result, the approval of science accelerated the scientific socialization, and puritanism provided the value basis. However, with the integration of scientific reason and humanistic spirit in the era of big science, scientific research is no longer purely for the truth but more for the sake of the common good. So the function of scientific practicability and purpose is more outstanding, and scientific activities also prove practical value is indispensable with the guidance of social need. But today's utility is a general concept including the factors of the social, cultural and psychological. Besides the modern British science with Puritan Ethics has become the value judgment which extensively affected the occupational choices and people's ideas, so as to make science "legitimacy" eventually.

However, due to the departure of science and religion in nature and the need of social development, science eventually breaks the shackles of religion. So we should dialectically treat their relationship, learn to make them complement each other, and attach importance to the cultural power of scientific development. Contemporary science no longer needs to foster the religious culture, but the scientific and cultural environment is very important. The prosperity and development of science cannot be separated from the cultural context with "vitality".

3. ECONOMY, MILITARY AND SOCIAL SUPPORT: TO PROMOTE TRANSITION ON SCIENTIFIC RESEARCH

The common social phenomena in the assembling and transformation of scientific interest in different times are regarded as the start point to analyze its deep reason that is the research interest or focus has changed with the social development, especially the economy and military. Economic, military and technical issues are important reasons for the scientific revolution of the seventeenth century England. Meanwhile, the social development also provides material condition and system criterion for scientific activities, eventually which forms the shared progress of scientific development and social economic stage.

3.1 The Influence of Social Environment to Scientific Interest Transfer Theory

The track of historical development shows that the scientific center of different times is not identical: the Perikles of ancient Greek is philosophy and art, the Middle Ages is theology and religion, the Renaissance is literature, ethics and art, the modern times is science and technology. Why the British became the world science center in the 17th century? We normally think that "philosophy begins in wonder" and "science starts with problem", and maybe this question has opened the gate of the Sociology of Science.

3.1.1 The Connotation of Vocational Interest Transfer Theory

The theory of assembling and transformation of job interest refers that people with occupation activity is relatively stable or lasting psychological change tendency, and this kind of phenomenon is at the heart of social attitude and social demand. The transformation of occupation interest affects people's evaluation of job, the internal attitude, emotion and other psychological state by some external factors which include economic development, values, and social needs and so on. "Transfer" originally meant change and move, and then it suggested the dynamic process from one state or field to another, and one side's "sacrifice" return to others "victory" to achieve some unknown balance. And when a particular field or profession has become "hot", it is bound to bring the transfer of intellectual resources, so as to play a promoting or block role in.

3.1.2 The Social Environment Analysis of Vocational Interest Transfer

Knowledge accumulation and keen academic smell made Merton realize "the civilization of seventeenth Century British has provided particularly rich materials for the research on interest transfer in science and technology or the study of interest center (Merton, 2000, p.33)." Through a great deal of quantitative analysis on statistical collection and uncertain analysis on historical record, Merton found that: No.1 During the latter half of the 17th century, science transformed from the "wild" occupation to the organized social activity in England, which indicated that science changed from amateur interest of the upper class to the popular occupation interest; No.2 The scientific production of the latter half of this century was three times than the first half, and this suggested that the entire 17th century in England was keen on science and gave birth to many achievements; No.3 Scientific interest was affected by the thought of the Renaissance, so early attention was from material science (astronomy, physics, chemistry) and formal science (mathematics, logic and methodology) to life science (natural history, botany, zoology and medicine) and culture science (archaeology, linguistics, economy), which showed that scientists usually chose problems closely related to the dominant value and interest as their research subjects (Shang, 2008, p.75).

The transfer of vocational or scientific interest was not free, chaotic and disorder in England, at least we could conclude that there was a positive relationship between the development of science and technology and scientific interest, and various scientific interests partly were caused by the social, non-scientific factors without the specific historical events. Of course, the transfer of modern scientific interest is independent and autonomous because the scientific orientation primarily is decided by the inner development of various sciences once it's perfect. However, it should be clear that modern science is still in the "early childhood" period of scientific development and has a high dependence on the external environment so as to need the society to confirm the its legitimacy, therefore, the scientific interest is mainly led by social demand and featured with centralization and decentralization. External factors as motivation of scientific interest transfer contains the deep cultural mainstream and superficial physical environment, like economy and military. The former has been discussed from the perspective of cultural factors above, so the following will pay attention to clearing the role of the latter to scientific field turning.

3.2 Science Needs Social Support and Orientation

The development of modern science and technology is not isolated but intimately involved with other social systems. When science and technology is put in "the social ocean", the greater role it has played and the more extensive it has infiltrated in every field. While the interaction between science and technology and the other systems are more obvious, the more we will rely on the social support. The so-called "social support" was originally a psychological term that referred a person could feel, perceive or receive the care or assistance from others. In the social science context, it refers to the tendency and assistance of politics, economy and the public opinion, emphasizing the support of "great culture" both inside and outside science. From the rise of modern science to the prosperity, support and orientation of society is an indispensable factor, but may not be the decisive role.

3.2.1 Stable Social Environment Is the Necessary Premise of Scientific Activity

According to Maslow's hierarchy of needs; the demands of human beings are ranked by physiological, safety, love and belongingness, esteem and self-actualization from lowest to highest. It is not difficult to see that human started to seek for development after survival. Whether bad or good natural conditions in fact, the human's living needs favorable natural environment as the premise objectively, because material basis is necessary for survival and development. While scientific experiment as the specific scientific activity is to promote social progress and for the benefit of humanity to achieve the greatest goodness, scientific activity also needs a stable social environment as its necessary premise, just like the way of existence needs superior natural environment as the prerequisite. Only if the society is stable and order, constant the scientific interest will be, the possibility of science practice it can be offered to, and helpful it is to the combination of social support and scientific activities. For example, because the English civil war and glorious revolution resulted in the decrease of scientific productivity, intellectual interests in these two periods temporarily left the field of science and technology and keened on the social and political affairs. Imagine a society in the chaos at home and abroad, how to guarantee

the continuance of scientific activities? How to practice the theories or ideas? How to maintain the enthusiasm of scientific interest? Generally speaking, a stable social environment is more conducive to keep scientific interest, accumulate scientific knowledge and carry out research activities smoothly.

3.2.2 Economy and Military Have an Important Impact on the Social Orientation of Scientific Development

Engels pointed out, "After the darkness of the Middle Ages, science re-emerged with the unexpected power and developed in an amazing speed, so we should attribute the miracle to production once again." From the perspective of social history of science, it was the modern capitalism as the important social motivation that promoted the birth of modern science (Li, 2009, p.91). The rise of modern capitalism marked the prosperity and development of a new economy which was closely linked with the market, namely, the development of modern science was connected with the complex of capitalist intervention which was composed of interest, desire and activity, and this was a profound process of rationality, also the science and experimental technology were applied in the industrial production (Merton, 2000, p.185). The objective world is a reflection of human essential strength, and the scientific activity acts as a tool of making man's will engraved into nature. From another aspect, human will always presented in the activities of commerce's and wars which man was engaged in. The early scientific activities were more dedicated to the study of "useful things" which based on the experience, for example as the Royal Society "experimental supervisor", Hooke was asked to invent and create within the fields of smelting, lifting mines and other industries with high economic value. The enormous economic benefits brought about the development of new field (such as mining, transportation) would make the social resources or technical issues gathered in this, and enlarge its social influence owing to the special halo effect so as to cause much more concerns and increase the value of problems, thus the research results to solve the relevant technical problems were increasing. At least this shows scientific activity is not isolated completely in accordance with the logic of its own development, but has certain relevance with social demands. Also it can be so expressed like this: the main way of which economy had impact on scientific development, highlighted the directional role in scholars' interests of some specific problems in certain time and space. Tendency behaviors of the scientific research priorities and subjects are significantly affected by the local economic development, whether purposefully or blindly. So as the military activities, for the victory of war to put forward higher requirements of technology, and directly or indirectly promoted the related scientific theory and technology. In other words, the military needs make science focus on this as hot social factors then. Indeed, the social demand can promote the birth of a new invention and have an important impact on the social orientation of scientific development, but demand does not necessarily create inventions whose role is conditional and restricted by social and cultural environment.

The focus of normal social science differs from the transfer of occupation interest, which economic, military and technological factors play important roles in the social orientation of science. In today's risk society, even if the autonomy of science is growing, the turn of science research cannot do without the analysis of change about social economic and military issues, and the both run in parallel.

4. THE SOCIAL INTERACTION OF SCIENTIFIC COMMUNITY: THE FOUNDATION OF SCIENTIFIC DEVELOPMENT MECHANISM

The scientific community is seen as an integrated and holistic science system, which is not only constituted by the norms and punishments, but also a social organization in the composition of individual role and interactions with each other (Sztompka, 2009, p.58). As an open communication system, science is the interaction mechanism of science, technology and society, which emphasis on the interactive relationship between social and cultural institution and science.

4.1 The Main Form Of Scientific Interaction

The social interaction of scientific community is the mutual effect and actions between the community of science as the main and other social system or inner community. One thing with another need the specific media, and it is obvious that the reason why social interaction of scientific community produced is just based on this.

Because of the requirement of scientific development and the restriction of social conditions, travel and communication became the important way to scientific exchange in early British. So we could say the leading scientists then passed their own ideas and new discoveries by writing letter, and such universal communication manner to keep the accessibility of academic information was so common. The private letter became the main publishing form of some innovative thoughts, so this could be used to confirm the time of the new scientific discoveries. The small-scale private communication exchanges formed an "invisible college" (Yan & Yao, 2001, pp.9-11), and it became the potential form of academic journals. As for cross-border travel, it is one of the ways to expand scientists' understanding, because the encounter with different regional customs might be the collision of wisdom, and the face-to-face communication would stimulate the inspiration of scientific discovery.

With the need of social change and the development of scientific autonomy, scientists have strong aspirations for publishing personal research achievements and to be recognized, so they self-organized small groups to study the issue and mutual evaluation together. Scientific communication is an important form of scientific interaction, and the visible carrier or basic unit of science exchange is the scientific community. Flag formation of modern scientific community is to establish the Royal Society. In the early 17th century, people began to realize it's so important to carry out academic exchange and cooperation between scientists after Francis Bacon conceived "Solomon's Temple" as the workplace of gathering scientists to do research whole-heartedly in his work *New Atlantis.* The English famous Sam Gray Institute was the first practice of the Bacon's "Solomon's Temple", the Royal Society was founded on this basis by mid-century which was the prototype of the scientific community in a sense. The majority of scientific discoveries and technological inventions was found and created by the natural scientists form the Royal Society, thus it can be seen the community had a profound impact on the development of modern science. The Society subsequently founded his own official publication in 1665, namely the first scientific journal "*Philosophical Transactions of the Royal Society*", and it was the longest continuous academic journal all the world. Its main content includes the article and abstract presented by members, the observed strange phenomenon from parties of report, the communication and controversy with foreign academic researchers, and the introduction of the latest published scientific books (Chen, 2005, p.17). During the same period, elsewhere in Europe had also established the scientific community, like Academy of Sciences in Paris, Berlin Academy in Germany? In a word, the early scientific interaction was mainly in a small range between scientists by letters and tourism in England, then the range was expanded owing to the emerge of the scientific community represented by the Royal Society in the mid-to-late 17th century, and gradually developed towards the trend of scientific knowledge dissemination to the public. At the same time, this predicts the interactive possibility of science and other disciplines or social systems.

As the prototype of today's scientific community, the secular scientific community played an active role in gathering the talent, the exchange of ideas, information transmission and the knowledge spread at that time. Contemporary society featured with knowledge and information is in the process of rapid development, meanwhile technological progress and the rate of replacement is changing, so modern science should be inspired new vitality in social interaction from a wider vision, especially the combination of the Internet and science and technology activities.

4.2 The Significance of the Scientific Community's Social Interaction

The scientific community of different times has the different social interaction in a particular way, as Merton said, "The high degree of social interaction involves many processes, which is generally conducive to cultural change, particularly the development of science." The contradictions and conflicts, that is precisely what the high level of interaction produced, lay the important system for scientific development.

4.2.1 The Social Interaction Is Helpful to Form the Mechanism of Scientific and Technological Innovation

The innovation needs inspiration and insight, so George Bernard Shaw said, "After the apples being exchanged, each of the two persons still has one apple, however, after the ideas being exchanged, each of the two persons will has two ideas." So the thought communication and collision may come out confrontation and may also arose resonance, and this process is the "1 +1> 2" course, which can broaden horizons, identify problems, inspire talent, and public personal knowledge. In the certain cultural history condition, the contact between thoughts is easy to stimulate cultural change and is bound to have a positive effect on the observation or creation. In the 17th century England, Puritan culture was the subversion of the traditional Catholic ethics, and social interaction played a significant role because of the favorable conditions for increasing population mobility, which promoted the ideological and cultural exchanges and widely spread. Whether the change of regime or the creation of technology both are different forms of innovation. The innovative mechanism in scientific activities is not just recognition of new theories and technologies, but also it is the guaranteed power source for the new scientific discovery and technological inventions. High degree of social interaction is the key to solve the problem of innovation and sustainable development. Interaction means open mind, the flowing information, and collision of wisdom, therefore, social interaction means a steady stream of fresh "blood" injection, the iconoclastic creativity and critical spirit. In brief, interaction is very important for the promotion of science and innovation system. As for this, England of 17th century and America of 20th century are the best examples. The groups who lived in the same area but had different faiths and different ethnic, would exchange their thoughts in different manner, especially the United States as a British colony once. Government could provide the favorable cultural environment to promote the scientific interaction and innovative thinking for scientists on economy, talents and policy.

4.2.2 The Interaction Inside the Scientific Community Is Conducive to the Formation of Peer Review Mechanism

Actually, the Royal Society of the early scientific community for the embryonic form was inherently

includes construction of evaluation system. Because scientific activities have the particularity compared with other activities, as stated in Pryce's image description, "Artists have strong individual characteristics, while scientists need to be recognized by colleagues. Artists' ivory tower can be a small room for one person alone, while scientists' must be the building which can accommodate others and their counterparts" (Shen, 2008, p.106.). The scientific community as the scientist's ivory tower is bound to go on some so internal interactions at least, which is based on scientific autonomy. Then, the interaction between subjects itself may have different judgment standards and value tendency so that it will lead to academic disputes and risk the unfair judgment. Thus scientific community benefits the academic exchange and the scientific results of the evaluation and appraisal which is in the common language or paradigm, and the code of conduct, namely, the formation of peer review or supervisory mechanism. Evaluation of the scientific community is to judge, predict or select in terms of its value and significance of the meet of knowledge increase and human interests, which can guide the development of science. And its essence is that scientific community evaluates a particular scientific achievement, a scientist or a scientific organization in the contribution to scientific development (Shang, 2008, p.141). This kind of evaluation and supervision has deindividualized feature, which is the authoritative evaluation and appraisal about the academic achievements and scientific groups, and more focus on qualitative evaluation. If there was no peer evaluation of scientific community, we might never see the science image as it were. Modern scientific evaluation system has gradually changed from uncertainty analysis to quantitative analysis, and the citation analysis layed the important method of the latter.

4.2.3 The Interaction Between the scientific Communities Is Beneficial to Eliminate the Originally Isolated Community Consciousness

The interaction between the scientific community more emphasizes the otherness among the groups. The more distinctive characteristic or the more different identity, the much more different research field with different value system which the scientific community will have. Once they have intersection, the relationship of every part is either assimilation or adaption. But in any case, the dynamic interaction will facilitate scientific exchange and break the original research boundary so that this can form the perspective of integration and the rise of interdisciplinary, such as life science, environmental science, and behavioral science. At the same time, this effect also prompts the knowledge flow and communicates in different areas, which scientists can take to expand their knowledge background and enhance academic rigor and discipline integrity. Of course, science and technology as "the first productivity" accelerate the social advancement, while the society supplies sustained motivation for scientific development mechanism as well. With the globalization of the economy, from the national to the personal, the aspects of politics, economy, culture, science and technology and the other are more and more to break through the boundaries of countries and bear the mark of globalization. So the globalization of science and technology has become unstoppable trend, which is precisely rooted in social interaction between the modern scientific communities. This scientific exchanges and cooperations beyond regions and fields indicate the development trend of the globalization of science and technology today, also show that science is no longer confined to the internal or specific narrow field so as to become a close contact with society and open system.

Interaction has experienced from letter contacts to the establishment of the scientific community, and then from the published academic journals to the contemporary science interaction, which presents the globalized and large-scale features. Whether the modern society or the contemporary society, the interaction of scientific community has laid the foundation of scientific development mechanism, moreover, the frequent interactions have important influences in science innovation, evaluation mechanism and the formation of open scientific system. Therefore, we should pay attention to scientific interaction and create a favorable social/cultural environment to increase the frequency of interaction, so as to meet the need of the era of big science and social development.

CONCLUSION

Optimize the social cultural environment & promote the development of Chinese science.

When the chairman Xi jinping visited the Chinese Academy of Sciences, he said, "Science and technology are with conspicuous characteristic of universalization and times, so the development must have a global vision and grasp the pulse of the times. Nowadays, some important scientific problems and key technology have presented a foreboding of the revolutionary breakthrough. We must establish the ambition to catch up and promote the development of China's science and technology." The importance is self-evident for the rise of china to develop science and technology, while China is faced with a series of problems, such as how to adapt to the scientific system integration, socialization and internationalization of scientific activity. Therefore, we should learn from each other and continue to shorten the gap with western countries, so that finally we can realize the prosperity and development of Chinese science.

Reread Merton's doctoral thesis, based on the seventeenth Century England's surroundings, a comprehensive study was given to analyze the effects of science development and show the main assumption that was "the significant and continuous development

of science can only happen in a certain type of society, the society provide two aspects of material and culture for the development condition." from the perspective of sociology. As Merton said, "the works of every classic writers in each academic field are worth using sufficient time to read over and over again, because you will get some inspiration and ideas every time (Merton, 1965, p.45)." So we can acquire a lot of wisdom inadvertently in conversation with Merton likewise, and we are more clearly known that the future road of current scientific development need to optimize the social culture environment as its external motivation. In fact, Chinese culture soil is quite fertile owing to the five thousand-year-old civilization, so we should attach it importance and make full use of this first advantage to create a favorable social environment in order to achieve the traditional humanistic spirit's return. In addition, China's scientific development needs social support, because the strong economic background is the material basis for its development, the standard of scientific competition mechanism and evaluation system is a long-term mechanism of scientific operation, and the open social interaction is the motivity of its development. However, the above emphasis of external factors does not mean that the autonomy of science and technology development is not important. It's just because Chinese science has paid much more attention to its autonomy and independence for a long time but ignored the external motivation, precisely, the social and cultural environment plays a potential role in promoting the science and technology development, and even it plays a decisive role in the certain history condition. Scientific development is the result of internal and external factors acting together, the two cannot paranoid one of them, and it's the inevitable path of scientific investigation to place it into a broader community and cultural background. The optimization of social cultural environment is bound to make Chinese "cultural soil for the growth and spread of science is especially rich".

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