

Cultural Logics for the Regime of Useful Knowledge during the Ming and Early Qing China c. 1400-1700

Jerry C. Y. Liu

Abstract

Few would dispute that Europe had triumphed over China materially, scientifically and technologically in modern world history, although historians are still debating about the precise date, causes and courses. Global economic historians today ascribe China's "failure" of achieving an equal level of scientific and technological progress to its inability in creating, innovating, accumulating, transferring, and diffusing sufficient useful and reliable knowledge, and to convert such knowledge into substantial material growth. A cultural historian who chooses to engage with the problem seriously, however, tries to avoid and neutralize the European triumphalism by contextualising the outer cultural ambiances and identifying the inner cultural logics for the Ming and early Qing China's "non-doings" in systematically institutionalizing "useful and reliable" knowledge.

Taking a cultural approach, the paper provides first a broad sketch of the regime of knowledge as a whole, and draws from it the regime of "useful knowledge" during the Ming and early Qing China. Through the historical mapping of the well developed network of sites of knowledge production and reproduction (interconnected official, independent schools and libraries and intellectual circles), as well as the storage, diffusion, and categorization of knowledge in c.1400-1700, it suggests that factors of imperial polity, sites of knowledge production and reproduction, scientific and technological institutions alone cannot explain the Ming and early Qing China's "failure" in adopting effectively useful knowledge. Rather, by deriving the cultural logics of the regime of useful knowledge, the paper illustrates how cultural motives, collective mentality, cosmological assumption, and style of thought may play a significant role in defining the "usefulness" and "uselessness" of a certain genre of knowledge. The paper identifies the cultural logics through studies of the Ming and Qing Chinese scholars' prefaces and postscripts to works of useful knowledge on medicine, agriculture, astronomy, calendar, commerce, mathematics, geometry, art of war, statecraft, weather forecast, botany, zoology, ethnology, topography and craft skill etc. Our analyses suggest the potent influence of China's pro-humanistic way of thinking upon internal and external encounters of useful knowledge during the Ming and early Qing era.

Introduction

Agreeably China had once led Europe in science, technology and material growth after the fall of the Romans to as late as the 13th or 14th century. Yet, few would argue otherwise that Europe had triumphed over China at least after the 19th century with the direct testimony of encounters of the two great civilizations. In the 1840s, China could hardly stand on its feet defending against the European invasions, be the causes western opium or cannons. Global economic historians today ascribe China's "failure" of achieving an equal level of scientific and technological progress to its inability in creating, innovating, accumulating, transferring, and diffusing sufficient useful and reliable knowledge, and to convert such knowledge into substantial material growth. Only the precise period, causes and courses for the Euro-Chinese divergence in material progress seem still under debate.

Many (Sinocentric) historians however "regard such a program for research in comparative history as contaminated by a potential (and possibly by an agenda) for the construction of yet another metanarrative of Western triumphalism". Some consider the question malposed since "China's economy, policy and culture had developed along its own path dependant trajectories", which had been very different from or even contradictory to the scientific or material centred (Eurocentric) one.¹ A cultural historian who chooses to engage with the problem seriously, however, tries to avoid and neutralize the European triumphalism by providing the Chinese regime of knowledge a specific cultural-historical context. Such an engagement is significant in two senses. Firstly, it is important to look into the established regime of knowledge in the Ming and early Qing China, to depict the well-developed intellectual networks of

¹ Patrick Karl O'Brien, 2004, "Regimes for the Production and Diffusion of Useful and Reliable Knowledge in Western Europe and the Chinese Empire from the Accession of the Ming Dynasty to the First Opium War", Paper Delivered in The 4th Global Economic History Network Conference, Leiden, Netherlands, 16th-18th September, 24.

knowledge production, reproduction, storage, and diffusion. There is the un-negligible fact that the Chinese regime of knowledge had been vivid and energetic before the great encounters. The sites of knowledge production include an interconnected official and independent school and library system at the capital, prefecture and sub-prefecture levels during the Ming and Qing China. The diffusion of ideas was achieved through the communication of central and local official apparatus and publishing houses. As intellectuals travelled for the itinerant public lectures and civil exams, and the state mobilized local artisans for public constructions, useful knowledge also flowed. In other words, there existed an established order of knowledge control and a vast amount of knowledge that was considered as “useful” and important was produced, innovated, accumulated, and diffused through the regime of knowledge.

Secondly, given the well-established intellectual networks and abundant knowledge production in the Ming and early Qing China, but not so well achieved scientific and technological progress, it suggests that besides the educational institutions, libraries and intellectual networks, some links are missing in explicating China’s relative underdevelopment. Here, the economic and cultural historians may ask the same questions: What is the mechanism of selection and perception of “useful” knowledge? Why was A certain category of knowledge considered more useful and important than others, hence worth generating and diffusing? Why was scientific and technological knowledge not recognized as systematically useful and not adopted even for the ultimate socio-political aims of the leaders in China? And why was it not innovated to reach its high/wide level of usefulness? To us, there are certain logics underlying such regimes of knowledge production, accumulation and diffusion. The central task of a cultural historian thus is to contextualize the outer cultural ambiances and identify the inner cultural logics for China’s “non-doings” in systematically institutionalising the “useful and reliable” knowledge during the Ming and

early Qing era (c. 1400-1700). Through studies of the Ming and Qing Chinese scholars' prefaces and postscripts to works of useful knowledge on statecraft, art of war, medicine, agriculture, astronomy, calendar, mathematics, geometry, weather forecast, botany, zoology, ethnology, topography and craft skill etc the paper aims to identify how in reality Chinese scholars and intellectuals visualized their knowledge environment. Our analyses suggest the potent influence of China's pro-humanistic way of thinking upon internal and external encounters of useful knowledge during the Ming and early Qing era.

Regime of Knowledge in the Ming and Early Qing China

The Official and Independent Educational System

China had developed a matured education system by the Ming times. The Ming state divided its administrative system into 13 provinces and two municipal capitals (not including the ethnic minorities at the Chinese peripheries), which were subdivided into 393 prefectures (called *fu*府 or *zhou*州) and 1,171 counties by 1382. A county could have as many as twenty cantons (*xiang*鄉), although the average was about eight.² In order to train those young talents into loyal civil officers, the founding emperor of Ming, Zu Yuan-Zang, made a great effort in promoting the official schools and the civil examination system. At the central level, the Ming founded the state universities, or *guozijian*國子監, in the two capitals, while local official schools were also set up at the prefecture, county and even canton levels. In 1423, the *guozijian* in Nanjing alone had 9,900

² The thirteen provinces include Zhejiang, Jiangxi, Fujian, Shandong, Guangdong, Shanxi, Henan, Huguang, Shaanxi, Guangxi, Sichuan, Yunnan, Guizhou. And the two municipal capitals are South Zhili (Nanjing) and North Zhili (Beijing). Yang Kuo-Chen楊國楨 and Chen Chih-Ping陳支平, 1999, *The New Compiled History of the Ming*明史新編. Taipei, 昭明出版社, 44, 53; Timothy Brook, 2005, *The Chinese State in Ming Society*, London and New York, Routledge, 21, 34.

students. Students and teachers in the official schools received monthly stipends from the state, and were provided with staple food, fish, meat and high quality clothes. Apart from classic learning and history, the official schools also taught subjects like imperial laws and judicial procedures, statecraft, mathematics, and archery.³ The official schools were strictly supervised by the central and local governments both in content of teaching and in administrations.

The other important school system in China was the independent teaching institutes that were called *shuyuan* 書院, whose origin may be traced back to the Tang and Song dynasties. The Chinese *shuyuans* were founded either by private owners, local officials and retired scholar-gentries, or they were jointly invested in by local governments and private owners. Though during the Ming times more than 60% of *shuyuans* were established, owned or renovated by local officials and their disciples,⁴ they were however independent from the official school system in respect of teaching and administration. In most cases the Ming *shuyuans* were managed by private owners or school principals who were employed by, but not subjected to the instructions of local officials. They received both private and official donations of money, books and some times even tenure lands. During the Jiajin 嘉靖 period (1522-1566), there were up to 1,239 *shuyuans* in China. In Jiangsu province alone there were more than 18 of these independent teaching institutes, and in Anhui province 39 *shuyuans* were renovated in the Jiajin era. During the Qing China, the number of *shuyuan* rose to more than 1,900. One of the key differences between official schools and *shuyuans* was the spirit of free lectures. Only a few of the Chinese *shuyuans* taught subjects that were

³ Guo Qi-Jia 郭齊家, 1994, *Schools in Ancient China* 中國古代學校, Taipei, 台灣商務印行, 110, 118.

⁴ Fan Ke-Zheng 樊克政, 1995, *History of Chinese Shuyuan* 中國書院史, Taipei, 文津, 171.

directly related to the state civil examination system. Many of them criticized the current affairs, educational policy of official schools, or even lectured against the doings of state officers.⁵ Such is the reason why the Ming state, though unsuccessfully, had made many attempts to destroy or even eliminate all the *shuyuans*. Thus the first picture we have for the Ming regime of knowledge is that there was an interconnected network of more than 2,700 official and independent schools (not counting the canton schools) within the Ming territory in the early 15th century.

Knowledge Production, Classification and Storage

As O'Brien rightly notes, the sheer volume of publications of Ming China looks impressive, although "it was dominated by editions, commentaries and elaborations on classical texts in moral philosophy (the analogue of theology and scripture in European publishing); followed by literature (plays, poetry, stories); as well as numerous gazettes, almanacs, manuals, concerned with statecraft (administrative and judicial procedures)."⁶ Between 1403 and 1408, the Ming court compiled the largest and the earliest encyclopaedia of the world. The *Encyclopaedia of Yong Le* collected some 8,000 pieces of work of different kind around the empire, and divided them into 22,937 volumes.⁷ The bibliography of the encyclopaedia contained "useful" knowledge on: geography, agronomy, hydrology, botany, zoology, natural history, medicines, optics, acoustics,

⁵ Ren Ji-Yu任繼愈 et al eds., 2001, *Chinese Libraries中國藏書樓*, Shenyang瀋陽, 遼寧人民出版社, Vol. I, ch. 1; Vol. II, 1157-1158, 1536; Zu Han-Ming朱漢民, 1993, *Shuyuan in China中國的書院*, 台灣商務印行, 118-119; Xue Hai Publisher學海出版社, 1985, *History of Chinese Shuyuan中國書院史話*, 學海, 5-6.

⁶ Patrick Karl O'Brien, op. cit. 2004, 32.

⁷ *Encyclopaedia of Yung-Lo永樂大典*, d. 1408, preface; Zhang Lian張璉, "The Publication under the Despotic Cultural Policy of the Ming明代專制文化政策下的圖書出版情形", *Sinology Research漢學研究*, 1992, Vol. 10 No. 2, 355-369.

pharmacology, silk, sugar, paper, printing, minerals, metals, chemicals, paints, glass, borax, dyes, alum, navigation, tides and winds, etc.

The Ming and Qing works on statecraft, which include a vast amount of useful knowledge, should not be overlooked. A brief survey of the headings in the works of statecraft would summarize on the key genres of “practical” knowledge of the Ming and Qing scholars: a) Sacred (or Confucian) teachings, rites and ancestral instruction: The ruling principles of an emperor, on masters and colleagues, sacred teachings, the ancestral instructions, self-cultivation, ritual ceremonies, courtesies to the subjects; b) Reclining luxuries, pleasures and tributes: Heresy and religious preferences, inspection tours, pleasures, tributary gifts, extra labours and exploitations; c) Judiciary, honouring decency and impeaching misconducts: Correcting infringement, assisting integrity, jail and criminal, discipline, honouring loyalty and merits, treacherous officials and powers, impeachment; d) Civil service and current affairs: Orders, state affairs, current policies, responding strategy, employment, accepting advises, selecting the able, assessment, civil service system; e) Finance and taxation: Financial expense, taxation, labours, horse trading policy, land cultivation, taxation on salt, currency; f) Infrastructure, welfare and social orders: Rivers and canals, water transportations, topography, famine and relief, good storage, astronomy and calendar, schools, customs, pacifying bandits, constructions and buildings; g) Military and security: Military preparation, frontier defence, art of war, punitive expedition, river defence, coastal guards, pacifying and administering the foreigners; h) Feudal awards and palace affairs: Crown prince, queens and concubines, suzerain and vassals, awarding noble titles, collateral relatives of the emperor, eunuch.⁸

⁸ Sun Xun孫旬ed., *Transcripts of the Royal Ming Memoranda* 皇明疏鈔, d. 1584.; Jia San-Jing賈三近et al eds., *Transcripts on the Royal Ming Memoranda in the Reigns of Jiajing and Longqing (1522-1572)* 皇明兩朝疏鈔, d. 1586, Zhang Han張瀚ed., *Selective*

As Fu rightly argues, unlike the classification of knowledge in the modern era, which systematically organizes knowledge according to the de-valued utilitarian logics of different academic disciplines, the ancient Chinese categorization of knowledge paid little attention to such academic utilitarianism. In contrast, the principles of knowledge categorization in traditional China had been that of meaning and function of certain knowledge, and that of conformity of knowledge to people's recognition of reality. In other words, the traditional categorization of knowledge in China focused firstly on the profoundness of values or implications that a given genre of knowledge might bring about to politics and the day-to-day life practices. Secondly, the arrangement for the order of knowledge had to conform to people's recognition of reality. The importance of historic figures and events needed to be reflected in their orders of appearance in an edited book. Thus, ancestral instructions and sacred teachings always precede statecrafts; thoughts of saints and sages go before knowledge of astronomy and topography; and accounts for lives of emperors headed those of civil officers and local merchants.⁹ Knowledge and even the classification of knowledge cannot be lifted above the existing structure of cultural values in ancient China.

As for publishers, according to the calculation of Tu Xin-Fu's 杜信孚 *General Records of the Ming Wood Block Carvings* 明代版刻綜錄, there were at least 4,993 wood block printing publishing houses in the Ming China. Counting five wood block carvers in each of the book publishers, it then amounted to 25,000 carvers during the Ming period who mainly scattered over Suzhou, Xinan, Beijing, Nanjing, Hangzhou, and Jianyang areas.¹⁰

Compilations of the Royal Ming Official Letters 皇明疏議輯略, d. 1551; He Chang-Ling 賀長齡 et al eds., *Imperial Collections on Works of Statecraft* 皇朝經世文編, d. 1826.

⁹ Fu Rong-Xian 傅榮賢, 1999, *A Study on the Classification of Books in Ancient China* 中國古代圖書分類學研究, Taipei, 台灣學生, 17.

¹⁰ Quoted from Cao Zhi 曹之, 1994, *Studies on Versions of Ancient Chinese Books* 中國

The Ming regime of knowledge certainly looks prosperous in knowledge production.

For book depositary in China, it was composed of four main systems, namely the official (central and local) school library collection, private owned library (*cangshulo*藏書樓) collection, monastic library collection and *shuyuan* library collection. Yung-Lo emperor seemed to value books far more than jewelleryes. In 1404, the emperor ordered the Minister of Rites Zheng Si鄭賜 to send those who know books well to search and purchase scattered books from the folk. He commanded,¹¹

Do not bargain with the civilian about the price of the book, just offer whatever they want and bring back those rare books... The folk people accumulate gold and jade for their sons and grandsons, I on the other hand collect these books for my offspring. The value of gold and jade is limited, yet is there a price for these books?

Brook has rightly pointed out that “[i]mperial distribution initiated the collections of books that most schools had, but commercial circulation enabled them to grow beyond the canonical core.” When Chen Feng-Wu (1475-1541), the Huguang Education Intendant, looked over the catalogue of books in the Wuchang prefectural school in 1505, “he was dismayed to find ‘only the editions of the classics issued by the court, but neither the writings of the philosophers nor the histories.’” So Chen sent someone to Nanjing to buy commercial presses of classics, histories, the writings of the philosophers, and literary collections to supplement the collections.¹² Book collections and storages in the independent *shuyuans* and private *cangshulos* libraries had almost become a vogue for the retired officials,

古籍版本學, Taipei, 洪葉, 532.

¹¹ Tung Lun董倫 and Hsieh Chin解縉 et al eds. *Veritable Records of the Ming*明實錄. *Veritable Records of Tai-Tsung*太宗實錄. r. 1402-1424. Taipei, 中央研究院歷史語言研究所, 1984 Reprints Vol. 53.

¹² Timothy Brook, op. cit. 2005, 109-110.

local gentries and riches to chase. Monastery too collected numerous amounts of sutras and contributed to the important site of knowledge storage. However, one should note that the book depositary system during the Ming and early Qing China had emphasized the storage, or in a passive sense of accumulation, of books far more than the real utilization and circulation of books (knowledge). In most cases, only civil officers, students in the official school or *shuyuan* and monks in the monastery were allowed to access to the books stored in these libraries.

The Intellectuals Networks and Knowledge Diffusion

Apart from the civil examination that connected all the official schools, the independent teaching institutes *shuyuans* had developed among them a well-established “system of public lecture meeting 講會制度” in the middle of the Ming. With the promotion and participation of some famous Ming scholars like Zhan Ruo-Shui 湛若水, Wang Shuo-Ren 王守仁 and Zou Shuo-Yi 鄒守益, such a system of public lecture meetings flourished and was widely applied in the county and provincial levels during the Ming period. As the name of the public lecture meeting indicates, these meetings were systematically organized academic activities among the Ming intellectuals. They were held regularly in public, and the participants were not limited only to students of those *shuyuans*. Many scholars, local gentry and even common people would travel for hundreds of miles to attend the public lecture meetings. The lecture meetings might be held inside or outside the *shuyuans*, in many occasions they had attracted up to thousands of participants.¹³

The “Regulations of Lecture Meeting of Dong-Lin Shuyuan” of 1604 provide more detailed information about how the public lecture meetings

¹³ Fan Ke-Zheng 樊克政, op. cit. 1995, 194.

were organized. Key points of the regulations were extracted and translated as follows:¹⁴

The grand meeting is to be held once a year, either in the spring or autumn. The exact date should be decided when the time comes nearer. Only the announcement and invitations should be sent half a month in advance. The minor meeting is to be held every month except for January, June, July and December... Each meeting will last for three days. People may come voluntarily, and no individual invitations are needed... The grand meeting should elect one Chairperson every year to preside over it. And the minor meeting should elect one Chairperson every month to preside over it... In every meeting, one speaker is elected to lecture over one chapter taken from the *Four Books*. Apart from that, the lecture meeting takes questions when there are questions being raised, and discussions would be welcomed when the participants feel need to... During the meeting day, in order to wash away the inertia and to give more inspiration to the participants, it is proper to sing a poem or two after the long sitting... The registry should be set up in every meeting. It registers the frequency of attendance of the students and scholars on the one hand, so as to check their diligence and laziness; and it registers the personal information of the outside participants on the other hand, so as to trace the careers and whereabouts of the attendants, and take them as models or lessons in the future... Participants coming from different provinces and counties should be arranged into a table of four people for lunch. The meal includes two vegetable dishes and two meat dishes. For dinner, six dishes of vegetable and meat dishes with some wine should be served.

Apart from Dong-Lin Shuyuan, many other big *shuyuans* including Zi-Yang紫陽, Huan-Gu還古 and Yao-Jiang姚江 all held their regular lecture meetings monthly, seasonally and yearly at the county, provincial and inter-provincial levels. Famous speakers were invited for itinerant lectures, which had no doubt weaved among them an interconnected network of

¹⁴ Gao Ting-Zhen高廷珍 et al., d. 1733, *Records of Dong-Lin Shuyuan*東林書院志, quoted from Fan Ke-Zheng樊克政, op. cit. 1995, 197-198.

intellectual communication.¹⁵ Chinese *shuyuans* had sponsored actively for the travels of the Ming and Qing intellectuals. Taking Bai Lu Dong Shuyuan 白鹿洞書院 as an example, between 1644 and 1662, 100 out of its 800 taels budget was used to provide for the traveling costs of the renown scholars annually. Distinguished intellectuals from distant locations would be paid 12 taels more per year than the locals, if they were to study or research in Bai Lu Dong Shuyuan.¹⁶

In his *A Study on the Schools of Ming Scholars* 明儒學案 of 1676, Huang Zong-Xi's 黃宗羲 documented 17 different schools of Ming academics in the order of timeline. He listed more than 210 representative figures of the 17 academic schools of thinking and summarized the stream of thoughts and major works of them. The scholastic origins, founding masters and localities of the schools were evidently traced, and Huang even commented on individual schools of thinking to account for the intellectual trends and their inter-relations. Huang's study again provides a clear mapping of close intellectual networks among scholars in the provinces of Jiangxi, Zhejiang, Shanxi, Shaanxi, Huguang, Fujian, Guangdong, Guangxi, Henan, and Huguang at the Ming times.¹⁷

Although there was not an open diffusion of scientific knowledge and academies in China as such, a centralised bureaucracy together with local gentries did serve comparable function to the European scientific communities of that time. A frequent change of serving localities for civil officers was the common feature for Chinese governments of all dynasties. The statistical data for the movements of 53,270 civil bureaucrats at the county level in the Qing period provide a strong evidence for such high

¹⁵ Guo Qi-Jia 郭齊家, op. cit. 1994, 131-132.

¹⁶ Zu Han-Ming 朱漢民, op. cit. 1993, 122.

¹⁷ Huang Zong-Xi's 黃宗羲, d. 1676, *A Study on the Schools of Ming Scholars* 明儒學案, Taipei, 世界, 1962 Reprint.

degree mobility. Accordingly, 74.1% of provincial magistrates知府and 78.8% of county magistrates知縣in Qing local governments served a term of less than three years, and nearly half of them stayed less than one. Within such position changes, 50% were simply swaps of serving locales.¹⁸ As Wong pointed out, when officials moved to new posts, information about crops and agricultural techniques successful in the former jurisdictions were taken to their new ones, with the hopes of persuading peasants to adopt them. Irrigation projects specifically and water control works more generally were intimately enmeshed within particular ecologies. Handicraft technologies were also promoted. Chen Hongmou, for instance, promoted sericulture in the mid 18th century Shangxi by establishing “silkworm bureaus” in the provincial capital and a number of prefectures to demonstrate silk weaving techniques.¹⁹ However, it should be noted that unlike the European scientists and technologists, who gathered around in scientific societies from time to time and engaged in serious testing, debating, arguing and refining of useful knowledge, there seemed to be very limited scholastic interactions among Chinese academics of useful knowledge (see the section follows).

During the Ming period, the state registered around 300,000 hereditary artisans. Among them 20% were stationed artisans, who mainly served in the Capital city area for the production of weaponry and military necessities; and the other 80% were artisans in shifts who were called up from their residential areas to serve in the Beijing and Nanjing capitals for a term of 3 months every 3 years. In 1393, 62 different professions of artisans were categorized into five different shifting terms in order to meet

¹⁸ Jin Guantao金觀濤 and Liu Qingfeng劉青峰, *Transformation in Opening Up開放中的變遷*, Taipei, 風雲時代出版公司, 1994, 50-51.

¹⁹ R. Bin Wong, “The Chinese State and Useful Knowledge: Criteria, Intentions and Consequences”, paper presented in the Conference of Regimes for the Generation of Useful and Reliable Knowledge in Europe and Asia 1368-1815, Windsor Great Park, 14-16 April, 2000.

the demands of various official departments. For instances, carpenters and tailors were called up every 5 years to sever for a period of 3 months; tilers, bricklayers, painters, blacksmiths and carvers were called up every 4 years; house builders, coppersmiths, weavers, dyers and brush pen makers were called up every 3 years; stonemasons, shipbuilders, oar makers, saddle makers, fan makers, wooden bucket makers, silversmiths, goldsmiths, pearl stringers and locksmiths were called up every 2 years; and mounters, foundry workers, embroider makers, arrow makers, bow makers, lazurite makers, printers, earthenware kiln workers were called up every year. During the Jiajin period (1522-1566), the Ming state re-categorized the artisans into 188 different professions. For those whom were called up from a far distance, it usually took them 3 or 4 months to travel.²⁰ It logically follows that useful knowledge of manufacturing would flow with migrations of skilled artisans, though this was diffused in a radiating web format, which flowed among the two capitals and cantons. Based on such a powerful bureaucratic organization, China was able to overcome many difficulties with the process of knowledge diffusion and sustain a remarkable advanced level of science and technology in many areas (such as agriculture, manufacture and astronomy) before the 17th or even the 18th century.

Cultural Ambiances of the Ming and Early Qing Knowledge Regime

Cultural Logics of Chinese Intellectual Tradition

Social, economic and political changes have to be understood through values that were embedded in, or planted into everyday life. There are certain “deeper logics” beneath cultural practices. By “cultural logic”

²⁰ The Globe Publisher地球出版社, *History of Chinese Civilization: Ming Dynasty*中國文明史：明代, Vol. 8, No. 1, 1994, 143-145.

(or logics) here, we mean a stable pattern of value presentation, which at an individual level resembles what Confucius described as an attitude, manner or stance towards one's life that he could hold on to persistently to face the world.²¹ At a collective level, the logic of culture is the way of thinking and behaving of a people, which when it is accumulated over time may constitute the mean-system of a culture. We agree with Brook and Luong that culture or "meaning systems are of great importance in relation to the material and political circumstances of daily economic life, both in the microscopic analysis of human action and in the macroscopic examination of system transformation."²² Hence they must be brought back in to the theorizing of the interactive relations of culture and economy. With the cultural logics people then formulate among them a collective mentality or worldview, which when they were applied to the regime of knowledge play a significant role in defining the "usefulness" and "uselessness" of the specific genre of knowledge.

There exist disparate cultural logics in both Chinese and European regime of knowledge. In China a "pro-humanistic" cultural logic was deeply embedded in the intellectual tradition by the Ming times. Such a moral, ethical and commonsensical oriented way of thinking and behaving founded itself on the Confucian tradition, whilst it absorbed the Buddhist way of self-cultivation, Taoist mystic philosophy, and a nomadic or peasant spirit of common sense at the same time. The Song scholars associated the Confucian concept of "benevolence" with the Taoist metaphysic concept of "Tao" and "universe", which connected the nature of human reason with the law of natural phenomena, and injected moral and ethic

²¹ Confucius said confidently that "my life philosophy (or Tao) is simply that all pervading consistency 吾道一以貫之." See *The Analects* 論語, Section 4, Taipei, 啟明書局, Reprints.

²² Timothy Brook and Hy V. Luong, 1999, "Introduction: Culture and Economy in the Postcolonial World", in Timothy Brook and Hy V. Luong eds., *Culture and Economy: The Shaping of Capitalism in Eastern Asia*, Michigan, The University of Michigan Press, 1-21, quote page 14.

meanings into the natural law. The “rationalistic school” advocated the principle of “unity of the natural and humanity”, which affirmed the union of natural order and life philosophy in Chinese worldview, and provided the basis for all interpersonal relations. Neo-Confucian scholars in the middle and late Ming period extended this moralized natural law even further. Wang Yang-Ming (1472-1528) asserted that human emotions, consciousness and common feelings of people should be taken as the basis of ethic system, for “goodness” and “sincerity” in fact came from the inner heart of every human being. In this sense, virtuous sages or holy man rather than God, spiritual ideology, or supernatural powers, became the model for people to follow.

The Song and Ming intellectual traditions provided solid philosophical ground for three analytical levels of the so-called “common-sense”, which in turn became the basic resources of Chinese cultural logics. Such a repository includes a) the common or intuitive knowledge and obvious natural laws within the universe; b) the common feelings of people or human emotions; and c) the inner consciousness or sense of morality within a moralized world.²³ Thus it is important to note that, “natural laws” or “natural science” in China differed hugely from that of the European tradition, for morality, ethic and human feelings or “nature” under the principle of “unity of the natural world and humanity” was indivisible from the “ethic-freed or -neutralized natural world” at the very first instance. Chinese intellectual traditions up to late Ming period had been highly “rationalized”.²⁴ Such pro-humanistic way of reasoning operated in a very different “natural context”, which saw the wholeness of natural world, ethic and humanity, not a burden of knowledge but an

²³ Jin Guantao金觀濤 and Liu Qingfeng劉青峰, op. cit. 2000 (Vol. I), chapter 3.

²⁴ Tu Feng-Xian杜奉賢, 1997, *The Developmental Theory of Chinese History: A Comparison between Marx and Weber's Theory on China*中國歷史發展理論: 比較馬克思與偉伯的中國論, Taipei, 正中書局, 133-134.

inborn and requisite integrity. As a bench mark of human reason, the pro-humanistic cultural logic stresses less on the objective goal, profit orientations, or the scientific logic of a human behaviour. Rather, the case of the Neo-Confucianism in China during the Sui and Tang eras and later the Song and Ming periods deliberately emphasized the spirit of commonness, the self-generating moral senses, and the spontaneous flow of human emotions. Differing from the dominant instrumental view in Europe²⁵, such a process prioritises not the calculative, scientific or logical articulation of interest for an individual or a specific group, but a general and sympathetic understanding of human desires, minds and feelings as a whole. This humanistic course of rationalisation consciously denied the “intellectual escape” of pure reason from its integral moral-ethical traits. It emphasized the fusion of the nature, inborn human morality and pragmatic profit calculation.

Cultural Ambiances of the Ming and Early Qing Regime of Useful knowledge

The existing inner cultural logics of Chinese intellectual traditions had potent influences upon the regime of useful knowledge during the Ming and early Qing China. Such logics permeate the outer cultural

²⁵ O'Brien summarized it well that in Europe, “from its very inception everything in the world could be represented as having been purposefully fashioned and rationally organized in ways that could: (a) be systematically investigated, validated by observation and controlled experiments and, (b) (and this powerful and productive notion emanated from Graeco-Roman-Christian traditions of intellectual representation) expressed in the logical and universally comprehensible and comprehensible language of mathematics. The gradual consolidation of a ‘belief’ in natural laws provided an increasing minority of educated Europeans inclined to conduct systematic investigations into natural phenomena with the confidence required to recognize that success must crown their efforts... Furthermore, by deploying a rhetorically powerful mathematical logic together with experimental methods, they gradually convinced political, economic and ecclesiastical elites in Europe that traditional understandings of the celestial, terrestrial and biological domains of nature (based either on scripture or upon established classical texts of Ptolemy, Aristotle and Galen, let alone Aquinas) had run into diminishing returns and provided an inadequate basis for the accumulation of more useful and reliable knowledge.” Patrick Karl O'Brien, op. cit. 2004, 38-40.

ambiances of the regime, and generate certain conditions to the production and diffusion of useful knowledge. To have a more detailed portrait of the cultural ambiances of the knowledge regime, it is conducive that we conduct a broad survey OF the prefaces and postscripts of works on useful knowledge of statecraft, art of war, medicine, astronomy, agriculture and gardening, calendar, mathematics, geometry, climate, botany, zoology, ethnology, topography, and craft skill. Since the preface and postscript of a book usually extracts the essence of its content, explains the author's motives of writing, elaborates the main arguments and narratives of the book, and provides the background information of such narratives and the author's personal history; the investigation may contribute to a better understanding of the specific cultural context in which the Ming and early Qing scholars were situated.²⁶ The textual analyses may provide a critical mapping on the motives and mindset of the authors or readers of these works, and reveal the underlying cultural logics of the regime of useful knowledge.

The cultural ambiances of the Ming and early Qing regime of useful knowledge can be contextualized in the following five analytical logics:

1. *To be Useful and Pragmatic in Knowledge Production*

Perhaps, the best terms to convey the character of the knowledge project in which the Ming and early Qing Chinese intellectuals were engaged are “*jingshi zhiyong*經世致用”, which means to manage the world or the age through classic learning so as to elaborate its pragmatic efficacy. The standard term for a school library in the Ming is *Zunjing Ge* (*Pavilion for Revering the Classics*), which together with *Cangjing Ge* (*Pavilion for Storing Classics*) showed the attitude of the Ming scholars towards

²⁶ The National Central Library國立中央圖書館ed., 1993, *The Collected Prefaces and Postscripts to The National Central Library's Collections of Ancient Books*國立中央圖書館善本序跋集錄, Taipei, National Central Library, Preface.

Confucian classics and Buddhist sutras. During the late Ming, there was a great shift of the study of Confucian from the conventional exploration of human mind and human nature to that of the pragmatic utility of the classics. Prefacing to his *Collected Royal Ming Documents on Statecraft* 皇明經世文編, Chen Zi-Long 陳子龍 lamented that the intellectuals at his times learned no pragmatic knowledge, but produced an immense number of works on the verifications and explanations of ancient texts. “The scholars cared little about state policies concerning current affairs and the daily needs of people, but spent most of their time refining the glossary and polishing the sentences of literary works to make them look elegant and beautiful.” To Chen these works carried no practical efficacy but hollow literary grace. Thus he compiled the book of statecraft by referring to the models of ancient sages and investigating the present experiences.²⁷

The emphases on the notion of *jingshi zhiyong* is reflected on the emergence of a vast amount of works concerning statecraft during that period. The influential ones include Huang Xun’s 黃訓 *Collected Royal Ming Memorials of Famous Officials on Statecraft* 皇明名臣經濟錄 of 1551, Wan Biao’s 萬表 *Royal Ming Collections of Works on Statecraft* 皇明經濟文錄 of 1554, Feng Ying-Jing’s 馮應京 *Royal Ming Compilation of Documents on Statecraft and Pragmatics* 皇明經世實用編 of 1603, Wan Ting-Yan’s 萬廷言 *A Brief Outline on Statecraft* 經世要略 of 1610, Chen Qi-Su’s 陳其慤 *Royal Ming Selected Writings on Statecraft* 皇明經濟文輯 of 1627, Chen Ren-Xi’s 陳仁錫 *Royal Ming Exemplary Records on State Affairs* 皇明世法錄 of 1630, Chen Zi-Long et al edited *Collected Royal Ming Documents on Statecraft* of 1639. The purpose for these enormous collections was to enhance the

²⁷ Chen Han-Ming 陳寒鳴, “The Confucian Studies of Statecraft and its Implications 儒家經世之學及其意義”, Online Paper of the Website of Guoxue 國學, <http://www.guoxue.com/newbook/gx/002.htm>, retrieved in March 2006.

understanding of civil officers and Confucian scholars about the operation of real politics, in a sense that the classics can be very “useful” in their practical application to state affairs.

Explaining the relationship between classic learning, statecraft and the pragmatics of knowledge Wang Guo-Nan's 汪國楠 wrote:²⁸

One should manage the world with Tao and protect Tao with classics. Classics are like the laws of natural phenomena and the warp of a loom in human society. Both are essential to the real world and they reflect its pragmatic functions. Such basic laws of the real world can be summarized as *qian* 乾 [the first divined token in the *Book of Changes*], which includes the four virtues of *yuen* 元 [beginning or sprouting in spring], *heng* 亨 [vigor and growth in summer], *li* 利 [collection or harvest in autumn] and *zhen* 貞 [storage or consolidating the foundation in winter]. The pragmatic functions help to nurture, to grow, to harvest, and to preserve the natural world. This is the so-called management.

Chen Ren-Xi 陳仁錫 made it explicit that his *Exemplary Records on State Affairs* meant to erect models for the later generations. By compiling scholastic works from self-cultivation to coastal guard system, military preparation, judicial regulation and pacifying barbarians, Chen aimed to extend the practical functions of the classical text to its very extreme. As he stated:²⁹

It [the book] promotes rites and music so as to reconcile the ties between the natural world and men; it rectifies the calendar and differentiate the seasons so as to provide references and guidance for self-cultivation; it shows the state's sympathy to people so as to consolidate its foundation; it accumulates the resources so as to enrich the country; it emphasizes the punishments and judicial

²⁸ Wang Guo-Nan's 汪國楠, d. 1603, “Preface to *Royal Ming Compilation of Statecrafts and Pragmatics* 皇明經世實用編”, Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. of History, No. 4, 31.

²⁹ Chen Ren-Xi's 陳仁錫, “Preface to *Royal Ming Exemplary Records on State Affairs* 皇明世法錄”, d. 1630, Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. of History, No. 4, 43.

regulations so as to correct the custom; it keeps details of the canal and coastal guard system so as to enhance water communication; it takes records of the behaving of prime ministers and famous officials so as to set examples; it investigates into warfare so as to strengthen military preparation; and it surveys the four barbarians so as to show the state's efforts of making conciliation.

Evidently the Ming scholars had perceived the need to associate classic learning to practical knowledge. As Feng Ying-Jing馮應京declared “all in all, talking is empty, and behaving is substantial. Ideals are hollow, and doings are practical. Without substance and practice, what would the emptiness attach to?”³⁰ Such powerful cultural logics of academic pragmatism and efforts in the production of useful knowledge during the Ming and early Qing China cannot be overlooked.

2. *Accumulative Innovation, Sharing and Diffusion of Useful Knowledge*

The second characteristic feature that can be extracted from the Ming scholars' writing of useful knowledge is that there had been definite individual creativity, serious attempts of accumulative innovation, and a strong intention concerning the sharing of useful knowledge. The Ming intellectuals had been working in diligence and made their efforts to borrow the teaching from their predecessors and apply it to the current situation. In the preface to the *Records of the Unified Great Ming*大明一統志, the Ming Emperor Ying-Zong英宗expressed his will of widely diffusing the knowledge of topography that the work “not only would impart to my offspring and later generations the great accomplishment of their ancestors and knowing to preserve it with caution, but it would also help

³⁰ Feng Ying-Jing馮應京, d. 1603, “Preface to *Royal Ming Compilation of Documents on Statecrafts and Pragmatics*皇明經世實用編”, Collected in The National Central Library 國立中央圖書館ed., op. cit. 1993, Sec. of History, No. 4, 32.

the country's scholars with their investigation in verifying the facts of the past and present.”³¹

Qi Ji-Guang 戚繼光 on the other hand recorded his efforts on accumulative innovation of useful knowledge. As he wrote in *A Renovating Book of Effective Practice* 紀效新書 that “it selects only those useful and effective strategies [from previous works] to train the soldiers in respects of personnel selection, placement of orders, military strategies, mobility and camping, martial arts, post guarding and water battling.” The book is “effective”, as it records no empty words but only real practices. And it is “renovating” because it bases itself on the previous military codes but is not constrained by them.³² Feng Shi-Ke 馮時可 documented in the *Records of the Extensive Territory* 廣輿記 that on seeing the over complexity or incompleteness of earlier works on topography, his friend Lu Ying-Yang 陸應陽 spent more than ten years traveling around the country, collecting all possible information from other books and his own experiences. Lu “took up every detail of the *Records of the Unified Great Ming*; he researched and refined the work and eliminated all confusing information. Lu discarded the old records and brought in the new intelligence.”³³ Apart from those, Ku Yen-Wu 顧炎武 went through more than one thousand provincial and county gazetteers and completed his *Records on the*

³¹ Ming Emperor Ying-Zong 英宗, d. 1461, “Preface to *Records of the Unified Great Ming* 大明一統志”, Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. of History, No. 3, 84.

³² Qi Ji-Guang 戚繼光, d. 1522-1566, “Preface to *A Renovating Book of Effective Practice* 紀效新書”, Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. Zi, No. 1, 260.

³³ Feng Shi-Ke 馮時可, “Preface to *Records of the Extensive Territory* 廣輿記”, Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. of History, No. 3, 91.

Exploitation of Territories 肇域志 in twenty years.³⁴ Yang Shen 楊慎 recorded in his *General Collections on the Studies on Lead* 丹鉛總錄 that he had transcript more than one thousand volumes since he started writing. “I only selected the essential one hundredth of his works, which I feel inspiring and innovative, and compiled them into the four volumes of studies on lead,” stated Yang.³⁵

Li Tai 李泰 in his *Collective Explications of Climates in the Four Seasons* 四時氣候集解 claimed that “I scrutinized a vast amount of books in my spare time... and compiled this collection accumulatively. Although it does not reveal all the profundity, it is certainly much more comprehensive than the previous versions. I dare not to hide it in private; and I wish to share it with friends and colleagues. If there is anything that I had missed, or had not explained clear enough, it is hoped that other learned scholars would contribute to improve it later on.”³⁶ All these clearly show the efforts at accumulative innovation and a strong will of sharing of useful knowledge during the Ming and early Qing China.

3. *The Permeation of Moral-ethical Teachings with Useful Knowledge*

The third analytical logic for the cultural ambiances of the Ming and early Qing China’s regime of useful knowledge is the permeation of moral-ethical guidance with practical knowledge. Extending from the

³⁴ Ku Yen-Wu 顧炎武, d. 1659, “Preface to *Records on Commencing Territories* 肇域志”, Collected in *The National Central Library* 國立中央圖書館 ed., op. cit. 1993, Sec. of History, No. 3, 91.

³⁵ Yang Shen 楊慎, d. 1542, “Preface to *General Collections of Studies on Lead* 丹鉛總錄”, Collected in *The National Central Library* 國立中央圖書館 ed., op. cit. 1993, Sec. Zi, No. 2, 466, 467.

³⁶ Li Tai 李泰, d. 1425, “Preface to *Collective Explications of Climates in the Four Seasons* 四時氣候集解”, Collected in *The National Central Library* 國立中央圖書館 ed., op. cit. 1993, Sec. of History, No. 3, 53.

pro-humanistic cultural logics in the intellectual tradition, ethic and morality served as the ultimate benchmark of the Chinese knowledge regime. It left the pure pursuit of useful knowledge and its application to material progress not much ground for ethical justification, let alone breaking away from all moral burdens. In other words, all knowledge and professions were subordinated to the ethical order and should find their own position. The terms *jishi zhiyong* express the Confucian commitment to applying practical solutions for improving the world, while carried “simultaneously a moral orientation, a repertoire of practical activity, and a category of knowledge.”³⁷ Cultural logic in the sense of reasoning from ethics, benevolence, hard working, social justice, loyalty to the emperor, and responsibility to the state and public, performed as underlying motives of Chinese scholars’ acquisition of useful knowledge. Knowledge production, if to be “useful”, had to carry certain moral functions. Explaining the concepts of statecraft and the pragmatics of knowledge, Feng Ying-Jing argued there could be a direct analogy between self-cultivation with virtue and state managing:³⁸

To employ the talents beneath the heaven and maintain the order of the world, that is what we mean by managing the age [or the world]. People usually consider that only a seven feet tall human body is the physical body, but they did not know that the entire world can be taken as a human body too. If they understand that the entire world can be taken as a body, then managing the world is just like cultivating one's own body. A person needs to train the body to become healthy; to behave in the principle of benevolence so as to fulfill oneself and become a good governor. He needs to refine the inter-personal relations so as to meet the principles of rites; to make good use of the material world so as to conform to the principle of righteousness; and to foster capable people so that they would gain

³⁷ Timothy Brook, “The Milieux of Scientific Activity in Ming China”, paper presented in the Conference of Regimes for the Generation of Useful and Reliable Knowledge in Europe and Asia 1368-1815, Windsor Great Park, 14-16 April, 2000.

³⁸ Feng Ying-Jing 馮應京, op. cit. 1603.

enough wisdom to undertake state affairs. And by achieving all these, the world would then function subtly.

Even the art of war had to conform to the moral principles. In Li Jin-Xhin's 李進行 preface to the *General Principle to the Art of War* 武經總要, He wrote that "the art of war is often full of villainous strategies, constant changes and deceptions, which are certainly denounced by the Sages. Only this work tends to constrain itself with benevolence and righteousness that are just like the rules and yardsticks of a great artisan."³⁹ Similarly, Wang Cheng 王禕 prefaced to his own *An Essential Outline of the Art of War* 綱目兵法 in 1500 that⁴⁰

While writing this book I would extract the main principle by the end of each section, or summarize the key points after several sections by my own judgments, sometimes to comment on the ancestors' merits and demerits, and sometimes to express my own views on it. All these are nothing but to help grow the enduring moral principles and to embed the established ethical rules; to value the Chinese and devalue the barbarians; and to respect the virtuous people and despise the villains.

Ethnological works could not have escaped from the moral-ethical spectacles of Ming intellectuals either. After Yan Cong-Jian's 嚴從簡 had completed his famous book of *Comprehensive Records on Foreign Territories* 殊域周咨錄 in 1574, he asked his uncle Yan Qing 嚴清 to preface it. Yan Qing described that the book collected the diaries of travellers and gathered extensive information from envoys that were sent to other

³⁹ Li Jin-Shin 李進行, d. 1439, "Preface to the *General Principle to the Art of War* 武經總要", Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. Zi, No. 1, 249.

⁴⁰ Wang Cheng 王禕, d. 1500, "Preface to *An Essential Outline of the Art of War* 綱目兵法", Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. Zi, No. 1, 251.

countries. However, what were valued most were not the detailed descriptions about the great expeditions of Zheng Ho, the exotic experiences, foreign customs and ethnographical knowledge. As Yan Qing put it, "I read it in my spare time... Since it sets the model for conciliating the peoples and vassals in peripheral areas with generosity and tenderness, would this not be classified as one of the nine classics beneath the Heaven? I am pleased with that this book conforms to my principle [of virtue] thus I wrote the preface to it."⁴¹ It seems evident that Chinese scholars had to work within a cultural framework, which preferred to praise moral reciprocity over pure pursuit of useful knowledge. For most of Chinese intellectuals, there was something far more important than practical knowledge and material progress. Even if it meant to adjust oneself to the world rather than to master the world, it was certainly necessary under such pro-humanistic logics.

4. *Knowledge of Low Esteem: Unrelated to Great Career in Civil Service*

The fourth analytical point to be made about the outer cultural ambiances of the Ming's knowledge regime is the low esteem of the useful knowledge producers. Describing the progress of knowledge during the late Ming China, Matteo Ricci (1552-1610) stated that Chinese "have not only made considerable progress in moral philosophy but in astronomy and in many branches of mathematics as well. At one time they were quite proficient in arithmetic and geometry, but in the study and teaching of these branches of learning they labored with more or less confusion." However, Ricci concluded in his report: "The study of mathematics and that of medicine are held in low esteem, because they are not fostered by

⁴¹ Yan Qing 嚴清, d. 1583, "Preface to *Comprehensive Records on Foreign Territories* 殊域周咨錄", Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. of History, No. 3, 534.

honors as is the study of philosophy, to which students are attracted by the hope of the glory and the rewards attached to it.”⁴² Ricci is probably right. Even the great Ming general Qi Ji-Guang had to justify his efforts on producing a military work. Qi wrote,⁴³

The world often considers archery and horse riding as trivial skills, and the military arrays as a means to fool people. Do these people know the fundamentals of the world? The Yellow Emperor’s code was rooted in the pettiness; the warfare of the Emperor Tang and Wu was based on benevolence and righteousness. However, the rise of the pettiness and the emergence of benevolence and righteousness are originated from my mind.

When Zhao Shi-Zhen趙士禎presented his *The Manual of Celestial Weaponry*神器譜with all the military weapons he produced to the Ming court, he was “mocked by some officials for being chasing after secular names,” as the work contained no elaborations of classical text and moral philosophy.⁴⁴ And after transcribing more than one thousand volumes of earlier works, Yang Shen expressed his anxiety in the *Studies on Lead*. “Maybe it will be laughed at by great scholars, and be considered as a petty route to learning. But am I not aware of that?”⁴⁵ Spending thirty years to work on his *The Travels of Xu Xia-Ke*徐霞客遊記, Xu Hong-Zu’s徐宏祖 received his commentary from Yang Ming-Shi楊名時that⁴⁶

⁴² Benjamin A. Elman, “Jesuit *Scientia* and Natural Studies in Late Imperial China, 1600-1800”, *JEMH* 6,3, 209-232, quoted page 210.

⁴³ Qi Ji-Guang戚繼光, op. cit. d. 1522-1566.

⁴⁴ Wang Yan-Shi王延世, d. 1598, “Preface to *The Manual of Celestial Weaponry*神器譜”, Collected in The National Central Library國立中央圖書館ed., op. cit. 1993, Sec. Zi, No. 1, 262-263.

⁴⁵ Yang Shen楊慎, op. cit. 1542.

⁴⁶ Yang Ming-Shi楊名時, d. 1709, “Preface to *The Travels of Xu Xia-Ke*徐霞客遊記”, Collected in The National Central Library國立中央圖書館ed., op. cit. 1993, Sec. of History, No. 3, 484.

Those ancient scholars, who were famous of their dedications to astronomy and geography, had collected abundant secreties and contemplated their profound subtlety. They visited the spacious landmass and probed into distant hidden places... If not that one had the extraordinary inquisitive disposition, who would be willing to step into the extreme dangers and go to areas in distant barren only to exhaust his vigor. Given this said, if their findings are somehow verified by scholars and become helpful in broadening the eyesight of people, they would still serve some auxiliary functions.

To the Ming intellectuals, a brilliant scholar's "extraordinary inquisitive disposition" and decades of hard-working on "useful" knowledge could only become valuable when it served some supplementary functions to classical learning. It is not difficult to perceive traditional Chinese literati's frustration towards the unaccommodating mainstream intellectual atmosphere for the pursuit of a pure (value-free) technological knowledge. As the Ming technologist Song Ying-Xing宋應星 remarked sarcastically that "I would advise those brilliant literati, who are longing for their great careers, to throw this book away from their desks, because this book is not going to have any tiny little relevance to the achieving of their scholarly honour, or the pursuit of their official ranks."⁴⁷ Knowledge that was not helpful to pass the official civil exam was held as trivial and of low esteem. Many academics only took on research after they were relieved from official posts.

Retiring from his position, Wang Xiang王象 wrote in his *Records on Fragrant Flowers of Er Ru Pavilion*二如亭羣芳譜 that "Confucius said he was a lesser person than an old farmer and an old gardener. The secular people were astonished and stated that farming and gardening were but petty things for trivial people, a great man should reconcile the spirit of Ying and Yang and put all the beings of the world in order. What is the use

⁴⁷ Song Ying-Xing宋應星, d. 1637, *The Exploitation of the Work of Nature*天工開物, Taipei, 金楓出版, Vol. I, 1986 Reprints, preface, 13.

of such a trivial thing?” Wang argued enthusiastically that he wrote the botanical book not only to contribute to the living of people, and remind the importance of the forgotten gardeners. And he had to defend himself by asking those so-called great men if they consider the farming and gardening trivial things to do, and if the ancient sages had ever sentimentally attached to official positions and fame.⁴⁸

Likewise, Li Shih-Ying 李時英 prefaced to the *Studies on the Rare Flowers, Plants, Birds and Animals in China and Barbarian Countries* 華夷花木鳥獸珍玩考 that the learned people usually contributed their knowledge to the world when they were in high positions, and they tried to release their depression and angers through their articles when they were poor or unsuccessful. “I recall that when I travelled to my official post that was ten thousand miles away from the capital, there were so many rare flowers, plants, and unusual birds and animals that I cannot even name them. I realized the profoundness of the world’s wild species and felt it a great pity that I did know them before. Now that I have read this book and would applaud for it.”⁴⁹ Obviously many officials had produced works on useful knowledge to preoccupy themselves in order to get away from the depression and experiences of the unsuccessful career. They then tried to justify their own efforts on the studies of those “petty” things or trivial knowledge.

⁴⁸ Wang Xiang 王象, d. 1621, “Prefaced to *Records on Fragrant Flowers of Er Ru Pavilion* 二如亭羣芳譜”; and “Postscript to *Records on Fragrant Flowers of Er Ru Pavilion* 二如亭羣芳譜”, Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. Zi, No. 2, 332, 336.

⁴⁹ Li Shih-Ying 李時英, d. 1581, “Prefaced to *Studies on the Rare Flowers, Plants, Birds and Animals in China and Barbarian Countries* 華夷花木鳥獸珍玩考”, Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. Zi, No. 2, 346.

5. *Unusual Knowledge: Lack of Private Resources and Scholastic Interactions*

The fifth point is that the Ming and early Qing scholars who worked on useful knowledge such as weaponry, mathematics, astronomy, technological instrument, craft skill etc were considered as “rare”, “extraordinary”, “unusual” or even “abnormal”. For many, this rare knowledge should not bother the minds of brilliant scholars at all; some even argued that it would be sufficient for the unusual people or foreigners to research it. Prefacing to the *Compendium of Astronomic Inquiries* 天問略, Ko Zhen-Shi 孔貞時 wrote that when seeing something rare, the ancient Chinese scholars used to exclaim in praise. But they argue that “for knowledge that fell outside the field of classical learning, there will be foreigners rather than Chinese officials or scholars to study them.” It is not necessary for the Chinese scholars or classics to record all those. Ko went on to explain that⁵⁰

Indeed I have met some unusual people who gave me books from the great West, and I was surprised by the remarkable articles and subtle principles that were beyond our knowledge. I first learned these unusual things with curiosity. But when I pursued further, I realized that there are natural laws that exist between the heaven and the earth. The western scholars discovered them, and the eastern scholars read about them. However, it is not because the western scholars were more capable of mastering the rare knowledge, but that the eastern scholars had never made real efforts in researching it. This book is one of the particular cases.

Wu Wei-Zhong 武位中 was not happy at all about the Ming scholars’ reluctance in engaging the studies of western scientific and technological instruments. Timidity and shallowness of the Ming mandarins was his

⁵⁰ Ko Zhen-Shi 孔貞時, d. 1615, “Preface to the *Compendium of Astronomic Inquiries* 天問略”, Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. Zi, No. 2, 3.

verdict. In the postscript of the *Selected Illustrations of Rare Instruments from the Far West* 遠西奇器圖說錄最, Wu stated that⁵¹

The very unusual things of the world are achieved by very unusual persons. The unusual persons wonder about them, but the petty mandarin scholars are timid and shallow and they try to cover up their ignorance with the *Doctrine of The Golden Mean*. By stating that if even the *Doctrine of the Golden Mean* cannot explicate them, wouldn't they be abnormal? However, if one can accept marvelous articles in the literary circle; ingenious military moves on the battlefield, unusual methods in geomancy, exceptional persons in human society, rare animals in the mountain and the ocean, and inexplicable phenomena of ghosts and gods, why can he not accept rare things in instruments?

Apart from being classified as rare and abnormal people, the Ming researchers of useful knowledge, though creative and diligent, had been working very much alone; and they had little private resources and patronage for research. After completing his famous piece, Song Ying-Xing wrote: "Recently I have written a book named *The Exploitation of the Work of Nature*. It is a pity that I am so poor that I do not have money to buy some rare books and rare crafts to validate my writings. I would love to invite people who share the same interest with me to discuss and verify the correct ones from the mistaken ones, but I do not even have a place to think about all these."⁵² Contrasting to the European case, it seems that private sites for the production of useful knowledge had been rare and relatively distant from one another, while private patronages for intellectuals who were engaged in technological innovation had been limited and scarce during the Ming times. The scarcity of site and

⁵¹ Wu Wei-Zhong 武位中, "Postscript to *Selected Illustrations of Rare Instruments from the Far West* 遠西奇器圖說錄最", d. 1627, Collected in The National Central Library 國立中央圖書館 ed., op. cit. 1993, Sec. Zi, No. 2, 375.

⁵² Song Ying-Xing 宋應星, op. cit. 1637, preface, 12.

patronage for the innovation of useful knowledge is a fact, yet the root for such a shortage was not the institution's inability to mobilize sufficient resources and assets, but the society's underlying logic of the "uselessness" of such knowledge.

The writings of the Ming technologists revealed that the ambiance for the research of useful knowledge was certainly not warm at all. Unlike the case of vigorous debates of classical teachings that occurred during the public lecture meetings of the Ming *shuyuans*, there lacked intimate interactions among scholars of useful technical knowledge. And there is no real evidence for the existence of any regular "scientific societies" in the Ming China. Liu Shi-Xue劉世學 lamented the efforts of Zhao Shi-Zhen for his *The Manual of Celestial Weaponry* that⁵³

He has been pondering about the usages of linen and handling the works of military instruments in the capital for decades, and no one seems to show any interest about them. Chang-Ji 常吉 [Zhao] has been contemplating so seriously and working so diligently, yet for decades he has got no one to share his expertise. When he met some learnt persons by accident, he would try to test the essence of his findings by all means.

Similarly, Liang Zuo梁佐, although he admired the profound work of his teacher Yang Shen (on *the Study of Lead*), grieved that "the book was published, and was treasured in the artistic and literary circle. The pity is that it is difficult for people to find it."⁵⁴ Chen Jin-Mo陳璽謨 also wrote in his *Angle Measurement*度測 that "the diagrams and explanations in the western works are very clear and detailed. However, the minds of Chinese

⁵³ Liu Shi-Xue劉世學, d. 1599, "Preface to *The Manual of Celestial Weaponry*神器譜", Collected in The National Central Library國立中央圖書館ed., op. cit. 1993, Sec. Zi, No. 1, 263.

⁵⁴ Liang Zuo梁佐, d. 1554, "Preface to *General Collections of Studies on Lead*丹鉛總錄", Collected in The National Central Library國立中央圖書館ed., op. cit. 1993, Sec. Zi, No. 2, 467.

readers are perplexed because their eyes are blinded. They simply cover the book up and put them away in the cabinets, therefore, only very few scholars have thorough understandings about it.”⁵⁵ After 30 years of hard working, Li Shi-Zhen李時珍 completed his *Systematic Pharmacopoeia*本草綱目 in 1578, which was published later in 1593. In 1596, *Systematic Pharmacopoeia* was presented to the Ming court by Li’s son, who however received only seven words remark from the emperor that the court should “[k]eep the book for reference, and notice the Ministry of Rites.”⁵⁶ Useful knowledge, although creatively produced, after all was not systematically researched and collaboratively innovated during the Ming and early Qing China as IT was in Europe.

Why didn’t China Change?

So why was scientific and technological knowledge not recognized as systematically useful for and by Chinese elites? And why didn’t Chinese leaders adopt the “useful knowledge” from Europe? Here, answers to the questions can be addressed in four different respects. Firstly, most will agree that the successful story of European material progress via the production, innovation, accumulation and diffusion of useful knowledge and its later application in scientific and industrial revolution was by no means a teleological process (i.e. some brilliant intellectuals or one small group of social, political elites in the 15th or 16th century had actually foreseen the dynamic consequence of the mid-19th century), neither was the underdeveloped China. The European story was accidental in the sense that it was an unexpected, if not unintended,

⁵⁵ Chen Jin-Mo陳璣謨, “Preface to *Angle Measurement*度測”, c. 1628, Collected in The National Central Library國立中央圖書館ed., op. cit. 1993, Sec. Zi, No. 2, 40.

⁵⁶ Li Jian-Yuan李建元, d. 1596, “Memorial on Presenting the *Systematic Pharmacopoeia*本草綱目”, Collected in Li Shi-Zhen, d. 1593,本草綱目, 中國檔案出版社, 1999 Reprint.

consequence that was achieved in collaborations of hundred and thousands of mutually unknown or even unrelated socio-political elites, scientists, merchants, artisans, and experts of different professions. What they shared together was never a clear portrait of a future scenario in the 19th century, but the diffused *scientific institutions* and a consequent routinization of European *scientific culture*. As Inkster argues, the built up of mental capital, or effective transfer and diffusion of knowledge and information through scientific communities and academies, had generated within Europe a particular cultural milieu that was conducive to scientific and technological inventions and innovations in the 18th and 19th century.⁵⁷ That scientific cultural milieu was not found in contemporary China (although other forms of academic institutions were).

Secondly, it should be remembered that there had been a well established ethic-centric regime of knowledge (with a network of sites of knowledge production, reproduction, storage, diffusion, and classification) in China by the Ming times. The implication of the well established regime of knowledge is that in strictly institutional terms, China was more than ready to adopt and diffuse the (European) useful and reliable knowledge (science and technology) quickly, systematically, and creatively through the existing intellectual networks. What was lacking, however, was the collective cognition or motive to do so. Why should things be changed if all seems to function well? The diffusion institutions and sites need more than assets, they need motivation. The pro-humanist based Confucian cultural logic in China unlike a religious derived moral system in Europe had never been challenged: not any artistic renaissance, not any sort of religious reforms, not the scientific disproof of the Earth as the centre of the Universe, and not even the doubt of God's existence. Indeed there had been innovative works of useful knowledge in the Ming and early Qing

⁵⁷ Ian Inkster, 1991, *Science and Technology in History: An Approach to Industrial Development*. Hampshire and London, Macmillan, chapter 2 and 4.

China. Yet under such ethic-centric cultural milieu, it is difficult to alter or surpass the ultimate principle of value and moral judgment in the hierarchical Chinese regime of knowledge. Science and technology in China was not an end of its own, but a means to contribute to the ethic moral based social order. Despite sporadic intellectual creativities of useful knowledge, China simply didn't accumulate enough internal momentum to transform its knowledge regime fundamentally. It can be argued that culture had been influencing the practice of socio-political elites by saturating into their way of thinking and by containing them within certain value systems, within which a decision-making process is set into cultural debates. To ask China to change would require an extensive conversion of the collective psychology, what Reinert and Daastøl labelled as the "gestalt-switch," or a fundamental change of Man's worldview or mindset, as a necessary condition.⁵⁸ This only came later in the 19th century.

Thirdly, major external encounters of China with Europe in the 16th and 17th centuries did not seem to have posed enough threat for China to consider a fundamental reform of its pro-humanistic cultural logics either. The Portuguese did not have the chance to meet Zheng Ho's fleets, yet, they did meet his successors in the 16th century. The Portuguese first arrived at a small islet outside Guangdong in 1514, and then 1516 and 1517 under Fernão Perez d'Andrade and Tomé Pires in the name of tribute, while applying at the same time for trading permission. The first European embassy to China was not a success. The Ming government demanded the evacuation of Malacca, which was then a tribute state to China. On Pires' refusal to discuss the question, he was imprisoned later in Guangdong (until he died in 1524), and Portuguese were expelled by Ming navies in 1522. It was by informal agreement, paying bribery and full

⁵⁸ Erik S. Reinert and Arno Mong Daastøl, 1997, "Exploring the Genesis of Economic Innovations: The Religious Gestalt-switch and the Duty to Invent as Preconditions for Economic Growth", *The European Journal of Law and Economics*, Vol. 4, No. 3/4, 233-283.

customs dues (20,000 taels per year) to local government that Portuguese ships were allowed to dry their cargoes in Macao.⁵⁹ On similar grounds, the Dutch were refused to trade with China in 1601. However, they soon came with navies in 1607, and were quickly driven back. In 1622-1624, the Ming imperial navy twice defeated the invading Dutch fleets (with the help of Portuguese, Spanish and the Jesuits) off China's south coast at Macao and Amoy, and off the Pescadore Islands near Taiwan.⁶⁰ The Hollanders reluctantly turned to Taiwan, who nonetheless were ousted again by Zheng Cheng-Gong in 1662 after naval battles. It was until 1729 that they were finally allowed to trade inside Guangzhou by paying tribute every five years, which were deemed as a reward of helping Qing government "recover" Taiwan. In other words, before the 18th century, in military or technological terms, the Europeans could hardly cast any serious doubts to Chinese bureaucracy that there was need to change its existing regime of useful knowledge. Despite the Renaissance, Reformation and Scientific Revolution, the Europeans were not powerful enough yet, or at least unable to prove themselves superior enough for Chinese to instigate a fundamental change for the persisting cultural form. China before 1800 was very little influenced by European political economy, by science and technology, and by Christianity. It held itself pretty well until early 19th century.⁶¹

Lastly, it is probably an understatement there was never a pure transfer of useful knowledge from Europe to China during the Ming and

⁵⁹ Guo Ting-Yi 郭廷以, 1994, *The Guideline History of Modern China* 近代中國史綱, Taipei, 曉園出版社, Vol. I, 17-18; and S.A.M. Adshead, 2000, *China in World History*, London and New York, Macmillan Press LTD, Third Edition (First Published in 1988), 204-205.

⁶⁰ Patrick K. O'Brien et al. eds., 1999, *Philip's Atlas of World History*, London, George Philip Limited, 139; Kang Zih-Jie 康志杰, "明清之際在華耶穌會士抵制荷蘭的原因 Reasons Why the Jesuits in Ming and Qing China Defied the Dutch", *歷史月刊* *History Monthly*, May 1999, 103-110.

⁶¹ Qien Mu 錢穆, *An Introduction to Chinese Cultural History* 中國文化史導論, Taipei, 台灣商務印行, 1993, 211-214.

early Qing times. The Jesuit activities in China may serve as an important indicator here. Chinese intellectuals, though they did not consider science and technology as a major component in the cultural system, were after all not indifferent to it. Michael Ruggiero arrived at Macao in 1579 with clocks, and Matteo Ricci arrived at China in 1582, introducing astronomy, mathematics, physics, and geography to the Ming court. The Ming officials Xu Guang-Qi and Li Zhi-Zao, who worked intensively with the Jesuits not only improved the Chinese calendars, but also translated many of the European scientific works (such as Euclides's geometry and Archimedes's physics) into Chinese. Qing emperor Kang-Xi learnt mathematics from the Jesuits, and even asked T. Pereyra and J. Bouvet to give him lectures in person.⁶² Nonetheless, nothing was ever simply a matter of diffusion of knowledge. The Catholic priests who brought them these machines and knowledge were salesmen of a special kind. "They sought to convert the Chinese to the one true Trinitarian God of the Roman Church, and the clocks served a twofold purpose: entry ticket and argument for Christian superiority."⁶³ Against the Christian doctrines, Nicolas Longogardi, Emmanuel Diaz Junior, and Jean Adam Schall von Bell helped the Ming court build fire weapons and cannons in Beijing, and directly involved in the wars with the Dutch.⁶⁴ During the early Qing period, the Jesuits even engaged heavily in the palace politics. Despite the early success, the effectiveness of Jesuits missions was suddenly paralysed from home for their acceptance of Chinese family rites and beliefs for honouring ancestors, and their sinicizing of Christian teaching since Matteo Ricci. It prompted the papal condemnation in 1704 (by Pope Clement XI), and later in 1715 and 1742 of "improper flexibility in 'accommodating' Christian

⁶² See Li Guo-Qi 李國祁, *Chinese History* 中國歷史, Taipei, 三民書局, 1986, 304.

⁶³ David Landes, 1998, *The Wealth and Poverty of Nations*. London, Abacus, 337.

⁶⁴ Kang Zih-Jie 康志杰, op. cit. (1999), 103-110.

teaching to Chinese custom.”⁶⁵ Cultural and moral supremacy was then as an unquestioned part of the mental world of the educated Chinese. The contradiction with such fundamental Chinese cultural logic could only result in the emperor Kang-Xi’s decree (in 1710) that “all missionaries must accept the Jesuit view or leave the country.” Following his father, and unsatisfied with the Jesuit’s interferences for his succession, the emperor Yong-Zheng’s banned Christianity strictly in 1723. All priests and missionaries were expelled from China.⁶⁶ Ostensibly, it was not the Chinese intellectuals or even emperors had no curiosity for European science and technology, but the European missionaries and colonists in China had never kept power, warlikeness, and their superior religion out of the pure diffusion of knowledge. Whilst Europeans were asking why the moral-ethical-commonsensical based cultural logics and regime of knowledge in China could not have developed by itself, or adopted from the West modern science and technology to reach its high level of usefulness; the Ming and Qing Chinese on the other hand were asking why the Christian moral and ethical system could not have mastered their own science and technology; and why the European regime of useful knowledge could not have formulated a “useful” moral-ethical system to constrain their aggressive expansionism and imperialist behaviours. In the Chinese cultural context, the inability in providing an adequate moral protocol only demonstrated the uselessness of European scientific and technological knowledge.

True that with the 19th century everything changed. The hundred years of closure from 1710 had secluded China from a systematic diffusion of European knowledge. The Opium War of 1840 to 1842 and the following two British and French military coalitions of 1857 to 1860

⁶⁵ J. M. Roberts, 1985, *The Triumph of the West*, London, Guild Publishing, 289.

⁶⁶ Chen Jia-Yen 陳嘉言 and Yang Jing-Xien 楊靜賢, *Chinese Modern History 中國近代史*, Taipei, 大中國圖書, 1988, 7-8.

relentlessly taught the Chinese a lesson. The misfortune of China is clear: it was that the European culture of science and technology especially was *diffused* (if it is still an appropriate term) to the Qing China in such a coercive and forceful way. Surely humanistic reason had to play a significant role in China: anger, fear, panic, humiliation, abhorrence, and unwillingness spilled over from the innermost mind to their pragmatic rationality. "Resistance" there had been, yet, it was only because the historical circumstances had left Chinese no ground and no time to receive European knowledge in any reflective manner. Would the outcome have been any different if those European who had come to China had been real scientists like Copernicus, Galileo or Newton rather than missionaries and colonists?