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Historiography of Chinese Astronomy in the Pre-war and War-time Chinese Republic (1911-1949) and in the Early People's Republic of China (1949-1966): Political, Social and Nationalist Influences

Historiografie čínské astronomie za předválečné a válečné Čínské republiky (1911-1949) a za rané Čínské lidové republiky (1949-1966): politické, sociální a nacionalistické vlivy

Disertační práce

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Abstract

The present PhD thesis studies political, social and nationalist influences on the historiography of traditional Chinese astronomy written in two different periods, in the pre-war and war-time Chinese Republic (1911-1949) and in the early People's Republic of China (1949-1966).

After closer examination of the works on history of Chinese astronomy written in these two periods it is apparent that in many of them Chinese historical astronomical achievements are amplified. It is a representation of encouragement of the nation's self-confidence. This phenomenon is a result of certain political and social influences that had certain development and will be researched by this thesis. For the first period, the works of Zhu Wenxin 朱文鑫 (1883-1939), the most prolific pre-war historian of Chinese astronomy, as well as the works of his several pre-war and war-time fellow astronomers are studied. For the second period, mainly the works of Xi Zezong 席泽宗 (1927-2008), the most significant post-war historian of Chinese astronomy, are focused.

For the first period, the questions that we aim at are the primary motivation of the establishment of the modern historiography of Chinese astronomy in 1920s after the establishment of Chinese Astronomical Society and the relation of the research principles and topics highlighted by the historians of astronomy to the 'reorganization of the national past' movement backed by many contemporary intellectuals. Logically following questions are the reasons of the deviation from these principles in 1930s, after the turn to the construction of Sino-centric cultural tradition that many intellectuals saw as the nation's self-defense against Japanese annexation of Manchuria. This led to the tendencies in historical writings that were manifested also in the works on the history of Chinese astronomy by more amplification of Chinese achievements aimed to encourage the nation's self-confidence.

In the early PRC period the motivation for professionalization of history of natural sciences including astronomy is shown to be visibly related to the encouragement of nation's self-confidence. However, it also changed the quality of research, which can be seen from a comparison of post-1949 research to the previous period. For instance, certain claims of Chinese achievements were abandoned for lack of factual basis. The influence of Marxism (historical materialism) also led to more attention to social and political context of the

development of astronomy, which – despite heavy ideological constraints – was also an improvement over the previous period.

Key words: Chinese astronomy, historiography, Chinese Republic, People's Republic of China, history, reorganization, ideology

Abstrakt

Předkládaná disertační práce se zabývá politickými, sociálními a nacionalistickými vlivy na historiografii tradiční čínské astronomie psané za dvou období, za předválečné a válečné Čínské republiky (1911-1949) a za rané Čínské lidové republiky (1949-1966).

Zkoumáme-li blíže díla o dějinách čínské astronomie vzniklá v těchto dvou obdobích, je zjevné, že v některých z nich jsou úspěchy, kterých Číňané dosáhli v astronomii, zveličovány. Jedná se o projevy povzbuzování národního sebevědomí, které jsou důsledkem určitých politických a sociálních vlivů, které se určitým způsobem vyvíjely a které jsou předmětem zkoumání této práce. V prvním období tyto jevy zkoumáme v dílech Zhu Wenxina 朱文鑫 (1883-1939), nejplodnějšího předválečného historika čínské astronomie, i v dílech dalších astronomů z tohoto období. Ve druhém období se zaměřujeme zejména na díla Xi Zezonga 席泽宗 (1927-2008), nejvýznamnějšího poválečného historika čínské astronomie.

V prvním období se zaměřujeme na prvotní motivaci pro vznik moderní historiografie čínské astronomie ve 20. letech 20. století krátce po založení Čínské astronomické společnosti a vztah principů pro výzkum a výzkumných témat, která tehdejší historici astronomie vymezili, ke hnutí za „reorganizaci národní historie", za něž se stavělo mnoho tehdejších intelektuálů. Otázkou, která logicky navazuje, jsou důvody, proč se historici včetně historiků astronomie od těchto principů ve 30. letech odchýlili. V té době mnoho intelektuálů podporovalo konstrukci sino-centrické kulturní tradice jako obranu národa proti napadení Mandžuska Japonskem. To vedlo k tendencím v historických spisech, které se zveličováním čínských historických úspěchů projevily rovněž i v dílech o historii čínské astronomie a které měly za cíl posílení národního sebevědomí.

V období rané ČLR ukazujeme, že motivace k profesionalizaci (a institucionalizaci) výzkumu dějin přírodních věd včetně astronomie měla viditelný vztah k povzbuzování národního sebevědomí. Nicméně profesionalizace se také projevila v kvalitě výzkumu, což je patrné ve srovnání výzkumu po roce 1949 s výzkumem během dřívějšího období. Například

některá čínská prvenství byla vyvrácena, neboť se neopírala o fakta. Pod vlivem marxismu (historického materialismu) se věnovalo více pozornosti sociálnímu a politickému pozadí vývoje astronomie, což i přes značná ideologická omezení znamenalo kvalitativní zlepšení oproti historiografii předchozího období.

Klíčová slova: čínská astronomie, historiografie, Číská republika, Čínská lidová republika, historie, reorganizace, ideologie

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1. Introduction

This PhD thesis examines political, social and nationalist influences on the historiography of traditional Chinese astronomy written in two different periods, in the pre-war and wartime Chinese Republic (1911-1949) and in the early People's Republic of China (1949-1966).

When one examines the Chinese monographs and articles on the history of Chinese astronomy written in the 20th century, it is evident that in many of them China's achievements were significantly exaggerated. This is how the efforts to encourage a national self-confidence were represented in the works on the history of Chinese astronomy. This presentation of history had a particular development and was caused by certain political and social events. These political, social and nationalist influences on the historiography of Chinese astronomy are the topic of this thesis. The manifestation of such influences will be examined in the works of Zhu Wenxin 朱文鑫 (1883-1939), the most prolific pre-war historian of Chinese astronomy and in the works of other authors active in the first period in question. In the second period, attention will mainly focus on the early works of Xi Zezong 席泽宗 (1927-2008), the leading figure of the post-war historiography of Chinese astronomy.

China, as one of the world's ancient civilisations, has had its own long astronomical tradition. The opinions of experts on the date of its earliest beginnings vary from 8th to 6th century BCE,[1] although interest in heavenly events was already apparent in the area of today's China in the 13th century BCE when the earliest records of novae and other stars on oracle bones have been dated from.[2]

Astronomy in ancient China for most of its history, especially during the imperial period from 221 BCE to 1911, represented knowledge reserved for a very narrow group of people that worked in the imperial astronomical bureau. What we now call astronomy and astrology existed in synergy at the imperial court. The emperor was considered a proxy and a

1 Needham 1959: 176-177.

2 Needham 1959: 244, 424.

go between for the people between heaven and earth, and he made his daily political decisions according to the astrological interpretation of celestial events.

Traditional Chinese astronomy consisted of two components, *tianwen* 天文 and *lifa* 曆法. The term *Tianwen* (literally the 'Patterns of Heavens') referred to political astrology as a system of interpreting heavenly *omens* for the political needs of the emperor. The term also included astronomy in the sense of astronomical nomenclature consisting of stellar and constellation names, names of planets and other celestial objects. Many scholars now translate the term *tianwen* as 'astral sciences' but in this PhD thesis, the term 'astronomy' or where more appropriate 'astrology' is used instead, for practical reasons.[3]

The term *lifa* (literally the 'methods of calendar') referred to the models of calculations and constants for the periodic apparent movements of the sun, moon and planets. These calculations were crucial for setting up a calendar. In the last 100 years, there have been many scholars that translated the term *li* 曆 simply as 'calendar'. However, the term *li* has much broader meaning than 'calendar', as apart from solar and lunar cycles, it also includes the cycles of planets, precession and other cycles, therefore this author prefers to call it an 'astronomical system' or sometimes 'astronomical (calendrical) system'. In recent times, the term 'astronomical systems' has been used for the *li* by leading scholars in the field of history or Chinese astronomy, such as Nathan Sivin,[4] and this author also finds such use more suitable. Astronomical systems (*li*) have actually inspired more interest among the historians of astronomy than *tianwen*. The reason was that mathematical methods and the implicit models of the movements of heavenly bodies formulated in the *li* were closer to the research subjects of modern astronomy.

By the end of the preeminent period of astronomical development in China in the 13th and 14th centuries CE, Chinese astronomical instruments reached a higher level of sophistication than those in Europe. Nonetheless, traditional Chinese astronomy never left the stage of purely positional or spherical astronomy and never really entered the theoretical phase. Greek style geometry did not evolve in China. The observers used only their naked eye

3 The authors of the researched works predominantly used the modern term *tianwenxue* 天文學 [astronomy]. Some of them, for instance Zhu Wenxin, also used the term *tianxue* 天學 which could be considered closer in its meaning to 'astral sciences' but he did not use it systematically. It was used for instance, when Zhu referred to modern American astrophysics.

4 Sivin 2009: 19.

along with instruments designed for measuring. Copernican heliocentric theory, the first telescopes, Kepler's laws of planetary movement, Newton's universal gravity theory, spectrography and modern astrophysics integrated with physics and chemistry all had to be imported from the West one by one in the period of the 17th - 20th centuries CE.

The biggest contribution of Chinese astronomy to the world is undoubtedly the world's longest and continual records of celestial events. These records are actually a part of *tianwen*, as their primary purpose was to be interpreted as omens (or premonitions) in political astrology. The Chinese celestial records are for certain periods of history (5th century BCE to 10th century CE) almost the only ones available.[5] Chinese astronomy also had outstanding achievements in the field of astronomical instruments, mentioned above, in the evolution of astronomical calendrical systems (*li*) in ancient and medieval times, in the understanding of great cycles of the celestial sphere, in the mapping of the heavens and in the study of eclipses.[6]

As mentioned above, Chinese achievements were often amplified in the historiography of astronomy in both studied periods. One of the main ways this was done was by the tendency to try to prove the primacy of Chinese astronomy indirectly by asserting the alleged cultural superiority of China in particular historical periods. Another method was through the praise of China's brilliant ancient history which also included some self-reflection albeit sometimes as a basis for soul searching and then with an added comment that later in the course of history "something had gone wrong" and China had fallen behind. The next category of such exaggerations were the arguments which anachronistically explained certain concepts as foreshadowing modern astronomy. Similar to these arguments were the interpretations of certain records of events or interpretations of particular theories as being forerunners of Western ones by centuries or millennia where there was actually no significant understanding of the nature of the particular event or where it did not have a long term influence in the Chinese tradition. (All these categories of arguments are set out and exemplified in chapter 2.4.)

5 Needham 1959: 171.

6 Needham 1959: 176.

The start date of 1911 was chosen for the period to be researched in this PhD thesis because after the beginning of the Republic, the astronomers that had received a modern education and had some knowledge of western historiography gradually began their activities in China. In late Qing imperial China almost no astronomers showed interest in the work of their predecessors. Historical works written before 1911,[7] were considered out dated because their authors did not know much about Western astronomy and did not address comparative issues. The start of the second studied period (1949) is marked by the communist takeover of state power and their establishment of the People's Republic of China. While in initial period, the historians of astronomy worked on an amateur basis, in the period of the early PRC, the historiography of science including astronomy gradually became organised and professionalised by the state, therefore the nationalist character of historiography manifested in the works in a different way. 1966 was chosen as the natural end date for the period in focus since it was the beginning of the Cultural Revolution (1966-1976), which represented the beginning of a long term interruption to academic work and development.

Now the key problems and research questions of this PhD thesis will be presented. One of the key questions is the motivation of astronomers and why they turned their attention to the history of Chinese astronomy in 1920s. This problem will be analysed together with their relationship to the 'reorganisation of the national past' movement backed by contemporary intellectuals of the 1920s, also from the point of view of the research principles and topics which the historians of Chinese astronomy formulated. However, later in the 1930s these historians deviated from such principles and this thesis will argue that there was a strong connection with the rise of nationalism and with the resulting construction of a Sino-centric cultural tradition.

Relatively soon after the establishment of the PRC, the historiography of science including astronomy started to be professionalised and organised by the state. The motivation for the institutionalising the research on the history of the natural sciences in the early PRC will be examined, as well as how this professionalisation changed the quality of research on the history of astronomy.

7 For instance Ruan Yuan 阮元 (1810). *Chouren zhuan* 筹人传[Biographies of Astronomers and Mathematicians]. Lei Xueqi 雷學淇 (1900). *Gu jing tianxiang kao* 古經天象考[Investigation of Celestial Phenomena as Recorded in Classics]. There were also a couple of earlier historians listed by Needham (1959): 185.

The higher quality of research in the early PRC period can also be linked to historical materialism which was adopted as a writing method and which is therefore also worthy of a brief examination. Historical materialism caused some significant differences in the texts of both periods.

The interest in the historiography of science is relatively new, it appeared for instance, in the SAW Project led by Karine Chemla at the French National Centre for Scientific Research. As far as the modern historiography of Chinese astronomy is concerned, it has not yet been researched from the political and social viewpoint. There are only basic reviews of works on the history of Chinese astronomy, e.g. Ho Peng Yoke (1977) and Xi Zezong (1981) in English and Xi Zezong (1959) in Chinese.

This PhD thesis is based predominantly on the published writings of Zhu Wenxin, Chen Zungui 陳遵媯 (1901-1991), Gao Lu 高魯 (1877-1947), Gao Pingzi 高平子 (1888-1970), Zhang Yuzhe 張鈺哲 (1902-1986), Zhu Kezhen 竺可楨 (1890-1974), Li Yuan 李元 (born 1925) and Xi Zezong 席泽宗 (1927-2008). Other primary sources include the published Zhu Kezhen diaries[8] and also the oral interview that this author conducted in April 2014 in Beijing with Professor Chen Jiujin 陈久金 (born 1939), a historian of Chinese astronomy.

Additionally, documents from the archives of the University of Communications and Fudan University in Shanghai dealing with Zhu Wenxin together with a couple of materials from the archives of the Institute for History of Natural Sciences in Beijing were consulted. Moreover, reprinted archival materials were also used.

This thesis uses as its main methods an interpretation/close reading of the historical texts, especially the evaluations of particular events, combined with basic quantitative comparisons (how much space is devoted to a particular topic in different monographs). These basic quantitative comparisons reveal some fundamental patterns not fully captured just from a close reading of these texts.

The main body of this thesis is divided into three main chapters. Chapter two is dedicated to the historiography of Chinese astronomy written in the pre-war and wartime Chinese Republic (1911-1949). Its first section focuses on summarising the new approaches

8 Zhu Kezhen 竺可楨 (1890-1974), a significant meteorologist and geologist, from 1949 the vice-president of the Chinese Academy of Sciences.

to writing history in 1920s China, the 'reorganisation of the national past' movement and how these ideals were modified in the 1930s when there arose a need to construct a Sino-centric cultural tradition after the Japanese annexation of Manchuria. The next section deals with the establishment of the Chinese Astronomical Society and the role of its members in the formulation of research principles and research topics for the historiography of Chinese astronomy, also in relation to the goals of the 'reorganisation of the national past'. Another section is dedicated to Japanese research on the history of Chinese astronomy conducted in the pre-war period since it actually preceded and stimulated Chinese efforts in the historiography of their own astronomy. The next three sections focus on the life and work of Zhu Wenxin 朱文鑫 (1883-1939), the most prolific author of the historiography of Chinese astronomy active in the pre-war period, an analysis of his work *Short History of Astronomy,* as well as on other four significant historians of that period.

Chapter three concentrates on the historiography of Chinese astronomy written in the early PRC (1949-1966). Its first sections focus on how the ideology of the Chinese Communist Party influenced both current astronomical research and the historiography of Chinese astronomy. Institutionalisation and scientific planning were significant political measures applied to the historiography of science in this period, therefore the next sections examine the motivation and the role of both, especially the establishment of the *Cabinet for the Research on History of Natural Sciences*. A short section is also devoted to the life and work of Xi Zezong 席泽宗 (1927-2008), the most significant historian of Chinese astronomy in that period. Besides somewhat abstract ideological influences which are discussed in the beginning of this chapter, another section deals with the impact of the real policies of the regime and their mass political campaigns in the early PRC on the work of historians of astronomy. The aim is to explain and illustrate an important political factor that influenced, or rather blocked the work of historians of science, especially those working in the *Cabinet.* The last section of this chapter summarises the author's already mentioned interview with Chen Jiujin, a historian of Chinese astronomy from the *Cabinet* who was a younger colleague of Xi Zezong. This interview brings an insight into Professor Chen's perception of the work in the *Cabinet* and the political climate of that time as well as several details from Xi Zezong's life which have not been previously published.

Chapter four compares two significant works, each representing one studied period. For the period of the pre-war and wartime Chinese Republic this is Zhu Wenxin's *Short*

History of Astronomy (*Tianwenxue xiao shi* 天文學小史) published in 1935 and for the period of the early PRC it is the *History of Chinese Astronomy* (*Zhongguo tianwenxue shi* 中国天文学史) by Li et al., published in 1981. This second book was originally prepared for publication and handed to a publishing house in 1966 but the Cultural Revolution broke out later that year. It took ten years until the turmoil of the Cultural Revolution ended and another five years until a revised edition of the book could be published. The comparison focuses on those chapters of both books that give an account of the preeminent period in the history of Chinese astronomy from the Tang to the Ming dynasties (7th to 17th century CE). This chapter aims to analyse the main similarities and differences in the two different accounts of the same period and also aims to examine the political and social context of these point of similarity or difference.

The conclusion highlights nationalism as the thread linking the two periods. It also demonstrates the boundaries of reliability in the historiography of Chinese astronomy written during both periods in China which was caused by the desire to stimulate the nation's self-confidence, in some cases manifested by a strong compulsion to use historical writings to bolster that national self-confidence.

This PhD thesis is part of the project 'Deconstruction and Construction of the Traditions and the Science in China' (2013-2016) of the Faculty of Arts at Charles University in Prague which focused on the first half of the 20th century in China.

2. Pre-War Republican China: new ways of writing history, historiography of astronomy, Zhu Wenxin and others

2.1 New Ways of Writing History

As was outlined in the introduction, after the establishment of the *Chinese Astronomical Society* in 1922, its members who were interested in the history of Chinese astronomy developed principles and areas of focus for its research. The principles emphasised a systematic and scientific approach and need to use the results of such research for scientific purposes. In the choice of research themes selected by the members of the society, there is also evidence of attempts to pursue this new systematic approach. This was in line with the endeavours of Hu Shi and Gu Jiegang to 'reorganise the national past'. Moreover, by the end of the 1930s, the historians of Chinese astronomy directly declared themselves as following the principles of Gu Jiegang. These declarations in themselves serve to demonstrate the importance of Hu Shi and Gu Jiegang's new principles in the writing of Chinese historiography.

Now, in order to understand the needs of the early 20th century Chinese astronomers, which were to encourage the writing of historiography of Chinese traditional astronomy, as well as to understand the purpose this historiography was supposed to fulfil and the shape it eventually assumed, a detailed analysis must be given of the new attitudes which prevailed in intellectual circles of the pre-war Chinese Republic towards science and objectivity and see how these attitudes manifested themselves in the writing of national history in general.

As a result of Chinese inability to keep pace with the West in terms of modernization, and in the context of significant social and cultural movements such as the New Culture Movement (around 1915) and the May Fourth Movement in 1919, within early Republican China, science and scientism was invoked and modern scientific disciplines were created. [9] The study of history was thoroughly transformed by the way of adopting western methods and topics (according to common understanding, the science did not exist in China and it was necessary to create it, but history was scientific to a certain extent and it was enough just to modernize it).

If we look at a natural science such as astronomy, modern Western astronomical methods had been reaching China since the 17th century and were at least partly employed by the Imperial Astronomical Bureau. Some of these methods were also taught at naval

9 Kwok 1965.

academies. The establishment of the Republic brought astronomy's final "divorce" from the state-monopolized political astrology and later also led to the establishment of the first modern observatories in Chinese national possession, such as the Purple Mountain Observatory in Nanjing (1934). However, the modern astronomy came to China abruptly, upon returns of the first Western trained experts from their studies abroad and did not follow the partly modernised astronomical traditions before the Republic. The modernization of methodology in historiography started as late as in the 1910s and was also abrupt.

In the pre-war Republican period the two people who most represented the new way that history and especially Chinese national history was being written were Hu Shi 胡適 (1891-1962) and Gu Jiegang 顧頡剛 (1893-1980). Alongside these two individuals, there were of course many other historians at that time who also made significant contributions to their particular areas of focus and research.

Hu Shi was an influential philosopher, literary critic, essayist and later also a diplomat who studied at Cornell and Columbia universities in the United States. In 1917 he returned to China and became professor and later also dean and chancellor of Beijing University. Hu Shi's influence on Chinese culture was very significant. He contributed much to the dismantling of the authority of the classics both in the fields of literature and history.

Hu Shi's intentions in introducing Western scientific methods to Chinese studies of humanities were inspired by the older scholar, political reformer and journalist Liang Qichao 梁啟超 (1873-1929). Liang's publications in *New Citizen Journal* and his *New Historiography* 新史學 published in 1902 very much attracted Hu's interest, even in his youth.[10]

In China, Hu Shi promoted the ideas of his teacher from Columbia University, the American philosopher John Dewey (1859-1952) and considered his theories the essence of the scientific method, consisting of five steps or phases:

1. the process of thinking begins with a suspicion, which offers up the problem that needs a solution
2. determining where the problem lies

10 Wang 2001:54.

3. identifying possible methods to solve the problem
4. determining which method is the most effective
5. verification of the method.[11]

Hu Shi considered Deweyan pragmatism (which he translated as "experimentalism" *shiyanzhuyi* 實驗主義) as transnational and applicable to any culture. Hu advocated respect for facts and evidence, scepticism and the hypothesis-evidence structure of scientific research. His maxim was: "Boldness in setting up hypotheses and minuteness in seeking evidence. 大膽的假設 ，小心的求證" Hu Shi applied this scientific method in the Chinese literary tradition and also in his *History of Chinese Philosophy*. He also studied the evidential scholarships (*kaozhengxue* 考證學) of Qing scholars in order to trace scientific methods there. In his article *Intelectual Life, Past and Present* he argued that the scientific spirit of Chinese scholars did not produce results in the study of nature but did so quite remarkably in the study of words and texts. He concluded:

> Galileo, Kepler, Boyle, Harvey, and Newton worked with the objects of nature, with stars, balls, inclining planes, telescopes, microscopes, prisms, chemicals, numbers and astronomical tables. And their Chinese contemporaries worked with books, words, and documentary evidence. The latter created three hundred years of scientific book learning, the former created a new science and a new world.[12]

Gu Jiegang 顧頡剛 (1893-1980) was one Hu Shi's students from Beijing University with whom he closely collaborated and who he influenced to a large degree.However, it was Gu Jiegang, whose contribution to the new ways of writing national history was the most significant. Fu Sinian 傅斯年 (1896-1950), a famous educator and linguist, one of the leaders of the May Fourth Movement, an early friend of Gu Jiegang [13] and also of Hu Shi, once called Gu Jiegang "a king of Chinese historiography"[14] in "*A Letter to Gu Jiegang about Ancient Historical Books*" published in the Journal of Sun Yat-sen University in January 1928.

11 Wang 2001:55. For Dewey's own wording see Wang 2001:229, note eight. Between 1919 and 1920 Hu arranged Dewey's lectures in China that lead to broader dissemination of his philosophy.

12 Hu Shi. Intellectual Life, Past and Present. *Chinese Renaissance*, 66-71.

13 The friendship of Fu Sinian and Gu Jiegang finally ended in an argument.

14 Wang 2001:128.

Before the war against Japan, Gu Jiegang was mainly active at Beijing University, with short breaks in his hometown of Suzhou due to family or health reasons or when he briefly worked for Shanghai's Commercial Press.

His seven-volume work *Discussions on Ancient History* (*Gu shi bian*) 古史辨 (the title is also translated as *Critiques of Ancient Histories* or *A Symposium on Ancient Chinese History*), published between 1926 and 1941, initially caused much controversy among Chinese intellectuals for its critical assessment of the Chinese historiographical tradition. Within the *Discussions*, the texts of authors such as Hu Shi, Qian Xuantong and others were also published there, with Gu Jiegang acting as the main editor as well as author.

Gu Jiegang initially studied philosophy, but influenced by Hu Shi, he started to study history. He "felt at home" with the history of literature which was his main interest. Gu mentioned that geometry and other natural sciences in general were "vague and enigmatical" in Gu's mind and he confessed he wished he "had two or three years to devote to the review of all such scientific texts, because they contain much that is indispensable to modern research"[15]. In spite of his unfamiliarity with all the natural sciences, his ideals and methods for general history were so influential that even historians of astronomy, astrophysicists by education, made references to him (as was mentioned in the introduction of this chapter and as will be discussed in more detail in Section 2.2).

In 1926, Gu wrote a long, autobiographical preface (*zi xu*) 自序[16] to the *Discussions on Ancient History*. In 1931, this autobiographical preface was translated into English by Arthur W. Hummel (a total of 185 pages).[17] The preface offered a good overview of Gu Jiegang's ideas and the progression of his intellectual thought during roughly the first thirty years of the 20th century. The translator also added a comprehensive introduction that analysed the work's social context and background. Within the scope of this topic on the influence of that era's intellectual environment, including Gu's ideas on the historiography of astronomy, it is helpful to quote Hummel's general summary of trends brought by the New Culture Movement from the viewpoint of historical or classical criticism:

15 Hummel 1931:173.

16 Autobiographical prefaces (*zixu*) 自序 were a common way of writing forewords in China in the past. Authors provided readers with the accounts of their lives, upbringing and education written in quite a personal way, in order to explain to them their viewpoints and why they wrote as they did.

17 Hummel 1931.

1. A changed attitude towards the classics
2. Freedom from the domination of schools
3. The abandoned quest for absolutes
4. A new sceptical approach to the past[18]

` Gu Jiegang's name is much connected with the movement called "Reorganization of the National Past", known in Chinese as *Zhengli guo gu* 整理國故. Actually, it was an earlier adherent to the Ancient Text School, the conservative scholar Zhang Taiyan, 章太炎 (1869-1936) from whose writings this name of the movement was derived.[19] Here are the aims of this "Reorganization of the National Past" movement, also highlighted by Hummel:

1. The detection and elimination of forgeries
2. Recovery of lost and neglected works
3. Enhancing the intelligibility of old texts
4. The delineation of spheres
5. A new emphasis on (the) scientific method
6. Comparative study in other fields[20]

As shall be seen in a later section, these aims re-appear in a similar way but not in fully identical language in the materials of the early 1920s, when the historians of Chinese astronomy formulated their research principles and research plans.

Here, a brief explanation is needed of the trends in the New Culture Movement and the aims of the "Reorganization of the National Past" listed above.

A changed attitude towards the classics. Based on their new scientific methodology, Gu and others argued that "China's high antiquity, namely the 'Three Dynasties' (Xia, Shang and Zhou) prior to the eleventh century BCE only represented a legendary past; there was not

18 Hummel 1931:xviii-xxii.

19 Hummel 1931:xxx.

20 Hummel 1931:xxxi-xxxiv.

much credible evidence for their existence,"[21] and concluded that traditional accounts of China's high antiquity were a mere fabrication.

Chinese classics were exclusively venerated until the end of the Qing period, but then things radically changed. The historical value of some of the classics, such as *Shangshu* (The Classic of History) were to a large extent discredited and the authorship of Confucius was dissociated with most of them.

Freedom from the domination of schools. Scholars like Gu Jiegang wished to emancipate themselves from the influence of schools. In the past, those who studied with a renowned teacher were bound to him with an uncritical piety that was often a hindrance to independent thinking. To adhere to no school meant that one's opinions were not accepted or treated with respect. To contradict the opinion of a school meant that one should affiliate oneself with a different school which could have been equally as unscientific. Gu Jiegang stated, "There are men whose views I highly respect, but I respect them because they have outstanding qualities which serve to guide me – I have no intention of submitting my rational powers to their authority or dictation." Gu called this a "form of partiality", claiming that "with respect to different schools of thought, one can take an impartial and objective point of view; and even granting this to be impossible, one should at least strive to reduce one's partiality to a minimum."[22] Such emancipation from schools was gradually made possible in the new intellectual environment.

Gu also wrote about how he "developed an uncommon loathing" for a kind of partiality in history that could have occurred by applying the optics of the winners when writing. A person could be called "a bandit" but the other person not, even when the two did exactly the same thing, only the latter was sponsored by the camp that eventually won and, for instance, established a new dynasty. Here, Gu mentioned Jing Ke 荊軻 and Zhang Liang 張良 who both attempted to assassinate the First Emperor of Qin in the 3rd century BCE however Zhang Liang had been sponsored by Liu Bang, the founder of the Han Dynasty and was therefore viewed in a more favourable light.

The abandoned quest for absolutes. The doctrine that the sages laid down in the Classics - the essence of morality and that a scholar has a duty to spread it - was broadly

21 Wang 2001:64.

22 Hummel 1931:156.

accepted before the Republican Period. Gu Jiegang said that in the world of learning there would always be discussions and no rest, that he did not expect that the truth would at last be revealed to him and hereafter there would be "nothing left to do".[23] As Hummel pointed out in his foreword, historiographical works should not strive to become "immortal words" and with Gu Jiegang, "all writing partakes of the nature of hypothesis, and deserves only such immortality as it can manage to maintain in the face of the most searching criticism."[24]

A new skeptical approach to the past. Scepticism towards the past was not unknown in Chinese history. The New Culture Movement also aimed to reintroduce as many doubts as possible regarding antiquity, made by many bold thinkers such as Han Feizi 韓非子 (3rd century BC), Wang Chong 王充(27-100 AD), Zhu Xi 朱熹(1130-1200), Cui Shu 崔術(1740-1816) and many others in the course of history. This scepticism was considered a basis to build upon. In Gu Jiegang's words, "There had existed an unbroken line of critical scholars, who had attacked spurious elements in Chinese literature. But the credulity of former scholars toward ancient writings was so strong, that they not only ignored the critics but often employed forcible methods to suppress them…"But knowing now the importance of their insight, we can build on the inheritance which they left us."[25]

Now let's focus on the aims of the "Reorganisation of the National Past" movement (or *Zhengli guo gu*) mentioned above and make some comments and explanations/observations regarding it.

The detection and elimination of forgeries was one of the most important and also difficult tasks as it required scholarship and expertise. Forgeries are very plentiful in Chinese literature including in historiography, however until the end of the Qing period, the discovery of forgeries was often neglected or only scant attention was paid to them as the evidence presented did not satisfy the "mainstream" scholars. Gu Jiegang was especially active in this field, which he started to explore under the guidance of Hu Shi; Gu's methods can be seen in his *Series on the Detection of Forgeries* (*Bianwei congkan*) 辨偽叢刊.

The recovery of lost or neglected works included works that had been avoided during the Qing period, or had been long lost in China but were discovered in Japan or Korea, or

23 Hummel 1931:4.

24 Hummel 1931:xxii.

25 Hummel 1931: 75.

which resurfaced along with archaeological discoveries at the beginning of the 20th century, for instance in Dunhuang. Although 18th century scholars had already made significant contributions in this field, with the "Reorganisation of the National Past" these activities resumed with a higher intensity and were of better quality.

Enhancing of the intelligibility of old texts was necessary due to the long evolution of the language, whereby old texts often lost their intelligibility even to untrained Chinese people. In addition, it was also necessary due to frequent careless transcription, printing and amendments to the texts that had caused many errors.[26] Activities in this field were aimed at careful restoration of the original texts, including their re-punctuation, collation and annotation in the vernacular language, in order to make the texts more comprehensible. This endeavour to increase the intelligibility of old texts also brought with it a need for new dictionaries and grammar reference books which utilized modern methods. Ma Jianzhong's 馬建忠 *Mashi wentong* 馬氏文通, published in 1898, can be considered a forerunner of such grammar reference books. There was also a need for other reference materials such as the indexing of names, places, events and institutions and even a table of contents with the correct pagination.[27]

The delineation of spheres was, as Hummel put it,[28] the isolation of materials that could provide answers to certain questions, so that historians might be able to write specialized histories of all fields like ethics, philosophy, empirical science, folklore, art, religion and so on. Solving the problem of proper indexing mentioned above was considered an important prerequisite, as was the writing of specialized histories at the start of 1931, when this translation was first published.

A new emphasis on the scientific method. There was a clear trend to abandon old methods of scholarship. The early philosophers of Song (960-1279) and Ming (1368-1644) dynasties influenced by Taoism and Buddhism believed that highest knowledge had already been present in one's mind and that it manifested itself only by intuition and sudden enlightenment. Zhu Xi 朱熹(1130-1200) and his followers were very dedicated to scholarly research, but what they researched were rather abstract concepts of an individual's mind

26 Same as for the previous paragraph on recoveries of lost or neglected works, the eighteenth-century scholars had also made great contributions in this field.

27 Hummel 1931:xxxiii.

28 Hummel 1931:xxxiv.

related to ethics and morale so consequently their teaching had a somewhat religious tone to it.

In the 17th and 18th centuries, there was a rise in evidential scholarship or *kaozheng* 考證, connected with the school of Han learning. These scholars were already setting up hypotheses and using evidence, but their research concentrated mostly on the fields of textual and historical criticism, geography and phonetics and was rather restricted to classical sources. However their research can be taken as a forerunner of later more rigorous scientific methods.

Gu Jiegang described this new scientific method in the following way:

> Modern science begins with the building of hypotheses – basing itself on these working postulates, it proceeds to gather more evidence and, on the basis of this evidence, revises the assumption. By evolving thus day to day truth is ultimately disclosed.

Gu then continued, more specifically on the new historical method:

> (…) When attending the lectures of Dr Hu Shih, I discovered that the historical method consists in the apprehension of a given event from every conceivable angle and in every possible relationship – no event being regarded as having sprung up independently of other considerations. To be perfectly honest, these are the only features of the scientific method that have impressed themselves upon me.[29]

From these excerpts, it can be assumed that the new scientific method was much more rigorous than evidential scholarship, since the specifics of it included "every conceivable angle" and "cross examination as in a court of law so that no untruth can escape without detection". [30]

Comparative study in other fields was supposed to enable the study of China's past not in isolation and in terms of itself or in terms of Chinese classical scholarship but in comparison with other neighbouring or distant cultures and from "every conceivable angle and in every possible relationship". That also included the method of comparison through the prism of multiple disciplines. For instance, archaeological discoveries discredited the theory that China had no stone age. Songs from the *Book of Odes* were to be studied in a parallel way

29 Hummel 1931:176.

30 Hummel 1931:77.

to the thousands of folk songs collected among the ordinary people in modern times. Gu Jiegang admitted that his biggest handicap here lay in the field of comparative study, for he "lacked the technique in philology, anthropology and archaeology"[31], though he was able to handle evidence from Chinese literary sources very well.

As will be seen in later sections, a comparative approach especially concerning China and the West to some extent also appears in the historiography of astronomy too, for instance in one of the important works of this period, Zhu Wenxin's *Short History of Astronomy*. In general, Hu Shi's, Gu Jiegang's, but also Liang Qichao's efforts brought a spirit of new thinking to historiography. This new spirit caused a shift in historiography towards objectivity, impartiality and scientific methods. These were regarded as the aims or principles that a modern historian should strive towards as closely as possible. It is of course reasonable to assume that how much a historian utilized these aims/approaches depended on many factors, including their education, their relationship to traditions and also their personality. The emphasis on objectivity, impartiality and scientific methods however, varied not only among specific individuals but also in time. The degree of this pursuit changed visibly in the early 1930s. After the Japanese invasion of Manchuria in 1931, a deviation from these principles occurred in the works of many historians. This phenomenon has already been studied by, for instance, Q. Edward Wang in his monograph *Inventing China Through History* and in Guannan Li's paper *Cultural Policy and Culture under the Guomindang: Huang Wenshan and "Culturology"*.[32] As will be argued in later sections, this deviation is particularly important to us since it also manifested itself in the historiography of astronomy.

The sudden loss of Manchuria frustrated, traumatised and shamed many intellectuals. It was considered a threat to the whole Chinese nation that had to be answered by a strengthening of national identity as well as the nation's fortifications. Subsequently, this threat became absolutely urgent since some years later in 1937, Japan began its invasion of other Chinese regions. Nonetheless, since the loss of Manchuria, intellectuals felt that the focus of China's cultural reform had to be reconsidered. This process naturally could not have left historiography unaffected.

31 Hummel 1931: xxxviii.

32 Dirlik, Li and Yen 2012.

Wang clearly marks the year 1931 as a turning point between the two different periods in historiography after the May Fourth Movement. He characterizes the historiographical approach of both periods in the following way:

> If in the 1920s the May Fourth historians evoked the past to reconcile tradition and modernity, negotiating between China and the West, now they were more interested in using the past to fortify and foreground the Chinese national identity. Consequently, foreign cultures whether from West or Japan, changed its role as the "other" in this process of identity construction; it was viewed more as an antagonistic "other" than as a comparable, supplementary "other."[33]

Many scholars changed their career orientations, the subjects of their research or their publication plans in order to comply with national needs and the nation's salvation. A not insignificant number among them, like Fu Sinian 傅斯年 (1896-1950), an educator and linguist, He Bingsong 何炳松 (1890-1946), an educator and historian and others found ways of backing the Guomindang government and tried to offer as much of their knowledge and skills as possible to the cause of saving the nation.

For instance, while working at Shanghai's *Commercial Press* as the head of the translation department and in reaction to the Japanese bombing of the publishing house in 1932, He Bingsong replaced plans for translations of Western historical books in their publication schedule with a series on "National Rejuvenation" *Minzu fuxing congshu* 民族復興叢書 to which he contributed his study of Chinese folklore.[34]

Wang highlights two phenomena that existed concurrently – *enlightenment,* meaning the earlier enthusiasm for science and free thinking as well as *nationalism,* meaning the nationalist reaction (to the loss of Manchuria) that "from time to time urged intellectuals to modify their goals in the former [the enlightenment]". These two he considers not always contradictory but rather complementary, meaning that historians employed elements both from Chinese and Western cultures and re-created history that suited national needs. According to Wang, this led historians to the development of a new approach that allowed them to address the need for a national salvation but on the other hand also allowed them to remain open to foreign influences.[35]

33 Wang 2001: 150.

34 Wang 2001: 152.

35 Wang 2001: 151.

As Wang admits, among those who studied Chinese intellectual history, many argued that *enlightenment* and *nationalism* in this period were antithetic. On the contrary, Wang argues that these two were not always contradictory but also complementary. This argument can be disputed and needs further clarification. Wang uses this statement to describe how these concepts worked in the case of some historians in China that were using methods that were both complementary and at the same time contradictory, as he further explains. For some historians, the relationship between *enlightenment* and *nationalism* in historiography was complementary and for some it was contradictory. In addition, it can be argued that the nationalist approach always brings limitations of objectivity. Of course, objective methods may serve the "national needs" but once facts are bent or manipulated, objectivity is lost. Therefore in general, *enlightenment* and *nationalism* should be taken as antithetic. Nonetheless, as a specific characteristic of Chinese historiography of that era, it is evident that a portion of Chinese historians took these two concepts to be less contradictory (antithetic) and more complementary.

Now let's turn to the Guomindang government's influence on historiography in the mid-1930s which in fact resulted in new trends within writing. As mentioned earlier, many intellectuals including historians decided to support the Guomindang government and its policies in this period of national crisis.

Firstly, let's mention a campaign that was not directly related to historiography but which could be regarded as a logical step towards the government's promotion of China-centric cultural constructs in 1935 that will be discussed later. In February 1934, Chiang Kai-shek launched the campaign called *The New Life Movement* (*Xin shenghuo yundong* 新生活運動). According to propaganda material from 1936, the *Information Bulletin of the Council of International Affairs*, the *The New Life Movement* was aimed at "rebuilding and rejuvenating the country from its very foundations" and based on the revival of four traditional Chinese virtues: *li* 禮, *yi* 義, *lian* 廉, *chi* 恥.[36] In this bulletin, *li* (etiquette, courtesy) was understood and translated as "courtesy"; *yi* (justice) as "service towards our fellow man and ourselves"; *lian* (honesty) represented "honesty and respect for the rights of others" and *chi* (shame, humiliation) was here interpreted as "high-mindedness and honour". In the words of the co-author of this bulletin's texts, Madam Song Meiling 宋美齡 (1897-2003), Chiang Kai-shek's wife, the *New Life Movement* was needed in order to fight

36 Chen 1936:189-191.

spiritlessness of the entire society which was manifested by there being no discrimination between good and the evil, dishonesty, ignorance, corruption and loss of discipline that resulted in the "disorganization of social order and national life" and an inability to face natural disasters and foreign invasions.[37] The movement had some real achievements in the fields of public hygiene and the suppression of gambling, prostitution and opium smoking, however, its goals went much further. Importantly, it aimed to fix social problems by means of returning to the roots of national tradition, Confucian values and the revival of traditional virtues that were given partly new meanings and thus were an object of cultural constructs. It is important to underline here that the Confucian values and the revival of traditional virtues were meant as traditions of a nation that was once great and strong.

In this light, it is only natural that the Guomindang strongly endorsed the manifesto of ten professors that was published in January 1935 in the journal *Cultural Construction* (*Wenhua jianshe* 文化建設) and reprinted by many others. This manifesto was called "*Declaration of the Construction of a China-based Culture*" (*Zhongguo benwei wenhua jianshe xuanyan* 中國本位文化建設宣言). This Declaration was also studied in detail by both Wang and Li. Wang concentrated more on its historiographical perspective and the active role of historian He Bingsong [38] while Li focused more on the role of culturologist Huang Wenshan 黃文山 (1898-1988) and of the Guomindang party.[39]

In the first section of the Declaration, the authors complain that China is losing "[the traditional] characteristics of her political system, social organization, and intellectual substance." Such politics, society and spirit is described as "characterless". Then the need for carrying on a China grounded cultural construction is stressed, in order to "make China raise her head in the cultural arena, to produce a politics, society and spirit with Chinese characteristics", to preserve its "Chineseness", like the glaringly vivid colours that are disliked by the Westerners but make a Japanese painting Japanese.[40]

In the third section, summarising what should be done in order to preserve the nation's character, the authors stressed that the past must be thoroughly investigated using "scientific

37 Chen 1936:224.

38 Wang 2001:152-160.

39 Dirlik, Li and Yen 2012: 109-138. Li also offers the partly English translation of the Declaration.

40 Dirlik, Li and Yen 2012: 125.

methods" and "the things that need to be preserved" must be preserved. By these, for instance, they had in mind the promotion of China's ancient "excellent institutions and great philosophy in order to make contributions to the whole world". However, vice versa, "abominable diseased institutions and evil philosophy" and everything invaluable and harmful should be eliminated. On the other hand, as the aim was to catch-up with the West, the authors stressed openness towards the West, but without blind imitation and concurrently without blindly praising ancient China.[41]

As Li puts it, these views were in close accordance with the views of Chen Lifu 陳立夫 (1900-2001), the Guomindang's ideologist and minister of education. In his work *Vitalism* (*Weishenglun* 唯生論) he advocated the idea that the world was unitary (*yiyuan* 一元) and that the origin (*benyuan* 本元) of the universe was the same. Chen demanded an examination of China's past, present and future as one entity and warned that failure to recognise the past would endanger the nation and would lead to problems. He also strongly criticised the iconoclastic approach of the May Fourth Movement towards the national heritage.[42]

Briefly summarizing the aims of this *Declaration*, these were: 1) the fulfilment of China's needs during this time and in its current situation ; 2) the preservation and study of anything within the Chinese tradition that can have some use and value but without blindly praising China's past; 3) studying from the West whatever is considered useful (science, etc.) but without any wholesale Westernisation; 4) the construction of a China-centric culture that spans the past, present and future.

The *Declaration* caused controversies among intellectuals and had its strong opponents. The most prominent of these was Hu Shi. Hu considered the Declaration's affiliation to the Guomindang government problematic, in spite of the fact that he himself was not Anti-Guomindang. He saw the *Declaration's* "China-based cultural construction" as more of an academic problem. He also regarded the *Declaration* as another version of the earlier *ti-yong* 体用 dichotomy discussed in the works of scholars of the late 19th century (Chinese culture as *ti* - body, or essence and Western culture as *yong* – utility). He showed his pragmatic view when he argued, for instance, that it was natural selection that should decide which part of tradition should survive, saying that no cultural tradition needs to be preserved

41 Dirlik, Li and Yen 2012: 126.

42 Dirlik, Li and Yen 2012: 122.

if it is still viable or that only competition with different cultures could show the value of that culture and if that culture could not survive competition, the need to preserve it would be very doubtful.[43]

Hu Shi's criticism was followed by defensive articles by He Bingsong and others who backed the *Declaration*, such as "Our General Response" (*Women de zongdafu* 我們的総答復) published in May 1935, where the authors highlighted the need for a China-based approach, for instance; "enrichment of people's cultural life, development of the country's economy and strive for the survival of the nation". According to Wang, around mid 1935, He Bingsong also claimed in his speeches that those behind the *Declaration* wanted to build a China-centric *modern* culture, not to return to the past, that they remained "committed to the enlightenment project of criticising traditional culture and introducing Western culture" but recommended criticism of both Chinese and Western cultures.[44]

As Wang points out, some publications, especially after 1935, confirmed Hu Shi's concerns regarding this China-centric construct, such as for instance, He Bingsong's long essay on China's cultural influence on the West. Here he intended to show that China was better than the West and the West should actually learn from China, arguing that many Western scholars, such as Leibniz and Voltaire strongly admired Chinese culture. That it inspired European designers and architects (for instance the art of Chinese gardens) and so on, pointing out that due to the fascination it offered to Westerners, Chinese culture should in no case be belittled, but should be observed and researched.[45]

In line with these views, the positioning of China's cultural and scientific traditions much more towards antiquity and on a higher level than in the West also appeared quite clearly in the historiography of astronomy, as will be examined in later chapters.

To end this section with a brief summary, in the second half of the 1910s and in the beginning of the 1920s, the New Culture Movement and the May Fourth Movement brought a new spirit of thinking to historiography which was based on objectivity, scientific methods and the dismantling of the authority of the Classics. This spirit was later around the mid-1930s modified in the works of a large proportion of historians, when it included a "China-

43 Wang 2001: 155.

44 Wang 2001: 156.

45 Wang 2001: 158.

based cultural construction" which was formulated at that time. This quite understandably stemmed from the "needs" of that time - China facing the loss of Manchuria and on-going Japanese aggression that made the demand for the nation's self-strengthening and self-fortification urgent. However these shifts were made at the expense of objectivity and scientific methods.

In the following chapters an analysis will be made of how the historiography of astronomy fit into this frame of new writing on history and how these phenomena manifested themselves in the field of historiography of astronomy.

2.2.1 Establishment of the Chinese Astronomical Society (CAS): Its Research Principles and Outlines for Historiography of Astronomy and Their Fit with the New Research Principles Advocated by Contemporary Scholars

2.2.1.1 The Establishment of CAS, its Environment and Context

The Chinese Astronomical Society (CAS) was an important organisation to which belonged the most important Chinese astronomers of the pre-war period. These included individuals such as Gao Lu 高魯 (1877-1947) and Gao Pingzi 高平子 (1888-1970). It was these two astronomers who were predominantly responsible for the efforts to establish a modern historiography of Chinese astronomy.

Before focusing on the Chinese Astronomical Society as well as the research principles and outlines for historiography of astronomy formulated by these two members of the society (and their role in the historiography of astronomy), a brief look at the environment and context in which the Society was established will be provided.

Shortly after the establishment of the Republic of China on January 1st, 1912, most of the imperial institutions were dismantled, including the Astronomical Bureau (or literally called *The Imperial Office for the Inspection of Heavens*, *Qin tian jian* 欽天監) of the Qing dynasty. The new state, the Republic of China, established its Central Observatory 中央觀象臺 in the location of the former Qing Astronomical Bureau, the Paozihe Observatory (*Paozihe guanxiangtai* 泡子河觀象臺), now known as the *Ancient Observatory* or *Gu guanxiangtai* 古觀象臺 (which is one of the famous sights of Beijing).

In their paper on the arrival of astrophysics to China, Sun Xiaochun and Ning Xiaoyu state that after the abolishment of the Qing Astronomical Bureau, all the imperial astronomers were dismissed.[46] Chen Zungui in his *History of Chinese Astronomy* mentioned that "this old institution was dissolved and *most* of the former workers were dismissed".[47] Its establishment marked a radical divorce with the traditional astral disciplines that included political astrology as a consulting tool for the ruler's daily political decisions and activities. These superstitious practices had no place in the new state that strived for modernity.

The first head of the Central Observatory, appointed by then minister of education Cai Yuanpei 蔡元培 (1868-1940) was Gao Lu 高魯 (1877-1947), who had obtained a doctorate in technical sciences in Belgium (1909), was politically active and connected with the *Tongmenghui* and later *Guomindang* and was deeply interested in astronomy, although he had not majored in this science. He held this position until he was appointed as the Chinese ambassador to France in 1919 and later again upon his return to China from 1922. Especially in the 1910s and 1920s, Gao was the main instigator and figurehead within Chinese astronomy, the Chinese Astronomical Society and also in the historiography of Chinese astronomy, as will be seen later.

Besides the historical astronomical instruments designed by the Jesuits in the late Ming and Qing eras which were inherited from the former imperial Astronomical Bureau, the Central Observatory did not have any modern observational instruments in the beginning. In the photos of its yard taken in the Central Observatory's early years, we can see only a couple of small-sized portable refractors.[48] In the entire Chinese territory (including the concessions), such large scale modern instruments were owned only by observatories in Shanghai and Qingdao which were run by foreigners at that time. The main task of the Central Observatory in its first years was the compilation of yearly almanacs which provided calendrical data and information on basic astronomical events. According to Chen Zungui, the observatory had four departments: calendrical (since its inception), meteorological (established in 1913 and moved to the Qingdao Observatory after the Chinese government recovered control of the territory from Germany in 1922), astronomical (established in 1921) and geomagnetic

46 Sun-Ning 2014.

47 Chen 1989: 1895.

48 Chen 1989: 1898.

(established in 1921 and also moved to Qingdao in 1922).[49] This set-up imitated the structure of modern observatories, including the ones in Shanghai and Qingdao.

2.2.1.2 The Lead up to the Establishment of the CAS: *The Observatory Reports* and Their Historiographical Content

In July 1915, the Central Observatory started publishing monthly its *Observatory Reports* (*Guanxiang congbao* 觀象叢報)[50]. The establishment of this kind of periodical with regular subscribers can be considered a direct step towards the establishment of the Society. In the publication *Chinese Astronomy on the March 1982* dedicated to the 60th anniversary of the Chinese Astronomical Society, edited by Wang Shouguan, the authors stated that the workers of the Central Observatory had already been preparing to set up the Society in 1915 and had published the *Observatory Reports* in its name, with the intention of spreading astronomical knowledge and recruiting members from its readers.[51] Chen Zungui added that work to establish the Society was made as a result of Gao Lu's proposal. Astronomy was not a popular science at that time and there were very few people interested in it. According to Chen, the publication of the *Observatory Reports* had as its aim to "broaden the influence" [of astronomical science].[52] On the basis of that, in the editorial which was written for the 1st number of the 3rd volume, the authors complained of the "a lack of the cream of Western scientific output in China" adding that "[its broadening] is [their] humble aim".[53] The editorial for the next volume made a similar complaint and wrote of the "lack of flourishing of science in spite its roots are deep [in China]", however it pointed out that "the origins of astronomy are the earliest in China", in the time of the legendary emperors.[54] It is evident that the authority of the legendary emperors in historiography had not yet been contested on a broader scale at that time.

49 Chen 1989: 1897.

50 Occasionally, when the English table of contents was provided, the journal's name was translated as "The Astronomical and Meteorological Magazine".

51 Wang 1982: 34.

52 Chen 1989: 2003.

53 安見歐美科學之菁華，不湧現於吾國哉？此則區區希望之微義也。GXCB Vol. 3, No. 1 (1918): 2,

54 安見無學術昌明之一日哉？且夫科學之為途至深邃也。(…) 中國天學發源最古。即如曆象一門。自大昊訖唐虞。岡不以觀象授時為務。Guanxiang congbao (1919) 4 (1) : 1.

Taking an overall look at the contents of the *Observatory Reports*, it is evident that it had regular authors among whom the most prolific were Gao Lu, his deputy Chang Fuyuan 常福元 (1874-1939) and Hu Wenyao 胡文耀 (1885-1966). The first issue of the journal had sections on theory, celestial events, calendrical astronomy, the literary world (文苑), containing biographies of scientists and annotations of new books and there was also a meteorological section.[55] Attached to the literary section, there was also a section devoted to "scientific novels" *kexue xiaoshuo* 科學小說 which serialised translations of foreign science-fiction novels. From the second issue onwards, the structure of the regular sections was simplified just to the *Pictures* (圖畫), *Writings and Translations* (著譯), *Reports* (報告) and *Supplements* (附刊), which continued on with publishing meteorological and literary content besides the astronomical.

The *Observatory Reports* did not have a regular historical section. However the publications of texts on the history of astronomy in this magazine were not rare and the topics were often serialised. The following table offers an overview of the main historiographical articles published in the *Observatory Reports*. Articles that present just fact sheets and data tables have been omitted.

Article Name	***Author***	***Article Name in Chinese***	***Vol./No.***	***Year***
On Heavenly Stems and Earthly Branches	Zhou Liangxi	說干支	1/11	1916
History of Encke's Comet Discovery	Gao Lu	因格彗星發現之歷史	2/2	1916
On the history of Western astronomy	Chang Fuyuan	*Taixi tianwenxue shi* (泰西天文學史)	2/3	1916
On Western Calendar	Chang Fuyuan	*Taixi lifa tongkao* 泰西曆法通考	2/4	1916
History of the Halley Comet	Gao Lu	哈雷彗星之歷史	2/6	1916
The Treatise on Twenty-eight Lunar	Gao Lu	二十八宿考	2/8 - 4/5	1917 -

55 The fact that there was a meteorological section reflected the fact that the meteorological department was integrated in the structure of the Observatory.

Mansions				1918
Lectures on Astronomy: History of Astronomy	Gao Lu	天文講演錄：天文學史	3/10	1918
Matteo Ricci in China	Gao Lu	利瑪竇來華始末記	4/11-12	1919
Fragmentary History of the Ancient Observatory in Beijing	Chang Fuyuan	北京古觀象臺殘缺記	4/11-12	1919
On Johann Adam Schall von Bell	Gao Lu	湯若望事略	5/1	1919
On Sundials	Gao Lu	日晷通考	5/2,3,4	1919
Winter Solstices in Chinese History	N/A	春秋以來冬至考	5/12	1920

From this table it is evident that among these 12 articles (or series), only three were purely on Western astronomy, only three were purely on Chinese astronomy and the remaining six were a combination of both, as they were about events concerning both Chinese and Western traditions. The article that is the most suitable for comparison with later writings on astronomy discussed in this thesis is the several pages long text called *Lectures on Astronomy: History of Astronomy* by Gao Lu published in 1918, which offers a perspective on general history including both Western and Chinese astronomy. The article integrates Chinese astronomy into the frame of world astronomy but does not devote a separate section to it per se, in spite of spending about 30% on it overall in the article. When discussing the beginnings of astronomy in China, the text refers to the legendary emperors and legendary astronomers Xi and He. It is obvious that the text was written before the May Fourth Movement and before Hu Shi's and Gu Jiegang's efforts on "reorganisation of the national past". The text claims that the "four thousand year Chinese astronomical tradition was the oldest in the world" (compared to a less than 3000 year history in the West according to the text) and that this fact "should not be forgotten by the historians of astronomy"[56]. Again, the text also stresses that prior to the invention of the telescope in Europe, Chinese astronomy had already reached a high level and it goes on to present a long list of significant Chinese astronomers and their

56 *Guanxiang congbao* (1918) 3 (10) : 29.

achievements. However, Gao Lu does not attempt any periodisation, neither in the history of Chinese nor Western astronomy. Although Gao Lu's text bears some nationalist overtones, it is not as strong as some articles that will be examined from the 1930s. Apart from the statement regarding the author's time placement of the beginnings of astronomy in the West in relation to China, the work does not look to significantly diminish the efforts of the West.

2.2.1.3 Establishment of the Chinese Astronomical Society

The Chinese Astronomical Society was established at its first preliminary meeting held in the Central Observatory on October 30th, 1922. In that year, it had just a few dozen members according to Chen Zungui.[57] Its spiritual leader and initiator was Gao Lu. Chen Zungui in his *History of Chinese Astronomy* reprinted an important document, written by Gao Lu, from which we can learn more about the motivations for the establishment of the Society, the author's attitude towards the national tradition, an evaluation of Chinese traditional astronomy and Western astronomy and where he saw their differences. This document was called *The Letter on Establishment of the Chinese Astronomical Society* 發起中國天文學會啓,[58] and was delivered as a speech (發) at the Society's first preliminary meeting in October 1922.

This document discussed the history of astronomy at length but it did not yet emphasise the need for its study. In this text, written in a relatively archaic and antiquated style, Gao Lu wrote about history because he wanted to stress that among the world's civilisations, astronomy had its earliest origins in China, even earlier than in Babylonia, as he believed, and that this could be proved by quoting the ancient legendary emperors' astronomical deeds.

> The sages appeared and their leadership benefitted from their power, they respected the Heavens' [natural] timing and scheduled human affairs, took the phenomena of the natural world as a basis and created all the civilisation and culture from it. This [in comparison with] the recent Western scientists who used the two things like experience and observation as the foundation and built a system of all the sciences and their branches is a different pathway but the same track. And the Yellow Emperor turned to the Sun and set out his plans, Yao set out the four seasons to become a year by means of intercalary months, Shun aligned the *Seven Governors* [Sun, Moon and five planets] by means of [using] the circumpolar constellation

57 Chen 1989: 2006.

58 Chen 1989: 2002.

template and *Yuheng,* star of the *Northern Dipper* and thus [the foundations] of the science of observation and assigning the seasons were basically present. Since [the time when] many astral theories of destiny had flourished, the truthful way of astronomy had been gradually [receding] into the background. However the theories did not cause any harm to the development of astronomy. When we read the histories of astronomy [written in the] West, there is so called Chinese astronomy, Egyptian astronomy, Babylonian astronomy and so on. If we examine their periods [of origin], one followed the other; and there is a bigger proportion of their ancient astronomers, such as Hipparchus and Ptolemy, that mostly gained [their knowledge] from the theories of the astrologers of the ancient Babylon. The development of astronomy was also the source of all the sciences based on it, there was nothing that was not based on [Babylon]; and astronomy was in particular a forerunner of all the sciences.[59]

Then Gao Lu emphasized the main achievements of Chinese astronomy in the period before the invention of the telescope in the West. He mentioned the specific characteristics of this state-monopolised discipline reserved for those bureaucrats authorised by the emperor which eventually stood in the way of its development. As a next step, Gao Lu turned to the practical applications of astronomy that flourished much more in the West and where Gao Lu saw the biggest difference between Chinese and Western astronomy.

(…) Liu Hong who knew that the speed of lunar motion was slowing down and accelerating, Zu Chongzhi who knew that there was the solar precession, Zhang Zixin who knew that five planets slow down and accelerate [their motion], make stops and move backwards and Guo Shoujing from the Yuan dynasty who innovated the calendar and built instruments and who particularly surpassed [his] predecessors. Only because the [type of] scholarship that was venerated in the past had studied other things and not this [astronomy] and as far as this field of research is concerned, there were only the officials that had responsibility to use it, [therefore] it could not spread among common people. Since the wisdom and efforts of everyone were not pooled in order to expound [the problems] with high concentration, therefore there was no tendency to come up with new things first and then follow up. This is what is [often] said that no [discoveries] were before, in spite of the fact that [the achievements] were nice but they were not made known, and nothing was afterwards, in spite of the fact that it was flourishing but there was nobody who would have handed it over [to the

59 Chen 1989: 2002. PhD thesis author's own translation. 有聖人出，因勢而利其導，奉天時以策人事，本自然界之現象而創一切制度文物，此與晚近歐西科學家以經驗觀察二者為基礎，而建設諸科學之統系及支派，實異途而同軌。及黃帝迦日推策，堯以閏月定四時成歲，舜以璇磯玉衡，以齊七政，現象授時之學，已稍稍備矣。自星命術數之說盛，而天文學真正之途徑，遂以不明。雖然其於天文學之進步，固未嘗有所損也。吾人讀泰西天文學史，其中有所謂中國天文學、埃及天文學、巴比倫天文學等，考其年代，後數者之發源均在前者之後;而彼古代天文學家，如依巴谷、都祿畝輩，大都得力於古巴比倫星命家之說為多。天文學之發達，即基於是各科學之起源，亦無不基於是;而天文學尤為各科學之先導焉。

> next generation], was it not a failure? This one science –astronomy, as far as its evolution is concerned, in how it differs significantly from the West, is its tendencies. When we arrive in modern times, the uses of this science have become even broader. For rail transport, the time must be precise to a second, for maritime navigation, the direction cannot differ in feet or inches, including civil engineering, setting out borders (…)[60]

"Pooling everyone's wisdom and efforts" was, as Gao Lu underlined in the following section, one of the reasons for the establishment of the Society which would bring more heads together, in contrast to the former, somewhat insulated imperial astronomers whose knowledge was sometimes even lost at the end of the dynasty because of their isolation. He wrote this because he hoped it would eventually result in the broader use of astronomy in the country's economy that would bring benefits for the modernisation of the state. Gao Lu further mentioned that many sciences had already established their societies in China and that astronomy should also have one.

Gao Lu then moved on to discussions at an international level, stating that "all civilised countries have already established their astronomical societies", and that the Society would bring benefits for international cooperation or integration into the international scientific community ("science is without borders"), mutual study and faster spread of knowledge, allowing everyone to have a chance to "become Newton or become Einstein", and in the spirit of Mencius stating "people all can become [the legendary emperors] Yao and Shun".[61]

2.2.1.4 The Four Research Principles, Seventeen General Research Outlines and Five Phases of Historiographical Work

In the field of historiography of astronomy before the 1920s, Chinese astronomers trained in the Western tradition showed very little interest in the work of their predecessors. It might even be stated that publications on this topic were rather scarce in the first decade of the

60 Chen 1989: 2002. PhD thesis author's own translation. 如劉洪知月行有遲速、祖沖之知大陽有歲差、張子信知五星有遲疾留逆，而元世郭守敬創法制器，尤突過前人，只以歷代所尊崇之學術，究在彼而不在此，關於斯學之研究，只有官守者有應用之職責耶職，而不能普及於齊民，既不合群策群力以潛心闡發，遂無前創後繼之趨勢，所謂莫為之前，雖美勿彰，莫為之後，雖盛勿傳者，非耶?此天文學一科，就進化方面而言，所以與歐西大異其趣也。泊乎晚近斯學之應用益廣，輪軌交通，時間必齊以秒忽之微;重洋航渡，方位不能有尺寸之差，以及土木之工， 經界之定 (…).

61 Chen 1989:2002. 人皆可以為堯舜。

Republic. The number of publications began to rise in the 1920s and especially after 1927, when the Guomindang established its capital in Nanjing. The volume of historiographical astronomical publications peaked in the 1930s.

In 1922 when the Chinese Astronomical Society was established, some of its members who showed an interest in the history of Chinese astronomy, namely Gao Lu and Gao Pingzi 高平子 (1888-1970) (also known as Gao Jun 高均), actually formed its small historical section. Gao Lu and Gao Pingzi exchanged letters on how the history of Chinese astronomy should be studied. From the start, they emphasised that they wanted to approach their subject "scientifically" and use the results of their research for scientific needs. Apart from the need to systemise this part of the nation's heritage and its potential utility for modern astronomy, another strong motivation for historiography of astronomy at that time, although almost never directly expressed, was to raise the nation's self-confidence, to show that the fruits of Chinese civilisation had once far exceeded those of the West, and that the Chinese people had once been capable of "doing science".

When Zhu Wenxin, the most prolific historian of astronomy active in this period died in 1939, in the obituary written in *Yuzhou* (in 1940) by his older contemporary Gao Lu, Gao recalled the process of method formulation in their scientific approach to the historiography of astronomy:

> When I remember Gongsan [Zhu Wenxin], I should especially recall [the time] before I met him, when we pursued the same goals without knowing each other. In the eleventh year of the Republic [1922] when Qingdao was returned, I corresponded with Mr. Gao Pingzi of Qingdao Observatory most intensively. As we were discussing the systemisation of ancient astronomy, Pingzi came up with a proposal. The original proposal had just three principles and twelve outlines, this proposal was [gradually] extended to four principles and seventeen outlines. The works of Zhu Wenxin are a part of this outline, although I did not even correspond with him at that time. […] Pingzi's proposal was called "The Study of Ancient Calendrical Astronomy"; and was formulated as set out below:[62]

62*Yuzhou* (1940) 10 (11) : 149-153. PhD thesis author's own translation. 余追憶貢三，余尤憶未識貢三前，默合之事跡。蓋在民國十一年，青島收回時，余與青島觀象臺高平子先生，通信最密，商量古天文學之整理，經檢討之下，平子先生，提出對安，原安僅三原則，十二大綱，對安擴為四原則，十七大綱。貢三著作，即大綱中之一部份，余斯時尚未與之通信為友焉。平子先生方案，實名為"古曆數之研究"；附記如下：

It is evident from this that the main authors of this proposal were Gao Pingzi and Gao Lu and that Gao Lu had not yet known Zhu Wenxin at the time that the principles and outlines were being formulated. It's also evident that through the agreement between Gao Lu and Gao Pingzi, one new principle and five more research outlines were added to Gao Pingzi's original proposal.

Here are the four research principles for the study of the history of astronomy as well as the seventeen general outlines as Gao Pingzi and Gao Lu formulated them, as quoted in Gao Lu's article:[63]

Table of the Four Research Principles (*Yuanze si xiang* 原則四項):

1	以科学方式，整理历代系统	Systematise historical calendrical systems using scientific methods.
2	以科学方法，疏解并证明古法原理	Using the methods of science to interpret and prove principles of ancient methods.
3	以科学公式，推算古法疏密程度	Using modern scientific formulae, calculate the degree of precision of ancient methods.
4	以科学需要，应用古测天象	Apply ancient records of celestial phenomena according to scientific needs.

17 General Outlines (17 Topics to Be Researched, *Dagang shiqi tiao* 大綱十七條):[64]

1	各家術語名義異同	Terminology of different authors
2	觀測法之變遷沿革	Evolution of observational methods
3	儀器之制度沿革	Evolution of the system of instruments
4	干支及歲月日時諸名稱之起源沿革	Origin and evolution of all names of [heavenly] stems, [earthly] branches and years, months, days and hours
5	中星列宿之起源及沿革	Origin and evolution of [the measurements of] culminating stars and the (slices of) lunar mansions

63 *Yuzhou* (1940) 10 (11) : 151-152.

64 The table's content is PhD thesis author's own translation.

6	有史以來之紀年之整理	Systemisation of the numbering of years since the beginning of history	
7	中曆制度之共同原則及其歷次之因革（歲首、置閏、進朔、超辰等事屬之）	Common principles of Chinese calendars and all their previous changes (beginning of the year, inserting intercalary months, inserting new moons, Jupiter trespassing constellation etc.)	*
8	改曆演撰法之素隱（章、節、曆元、調日法，等屬之	Elements of compilation of calendrical reforms (*zhang*, *jie*, beginning of the calendar, setting of days, etc.	
9	諸曆用數之變遷	Changes of parameters used in different calendars	*
10	諸曆推步法之概要	Outline of calculating steps in different calendars	
11	古法推算得數，與現代天學公式推算得數，之課校	Comparison of values gained by ancient computing methods with those gained by modern astronomical formulae	
12	觀測記錄之攷求，及用現代公式校核	Analysis of observational records and their comparison with predictions of modern formulae	
13	歷代數理上發明	Historical inventions in mathematical sciences	
14	歷代觀測法之發明	Historical inventions in the field of observational methods	
15	推算結果，與實測結果之分別	Distinguishing computed results and results of actual observations	
16	後人偽撰之攷核	Discovery of later forgeries	
17	傳寫脫誤之訂正	Correction of omissions and errors of transmission	

From the tables listed above, it is evident that there were efforts to develop a scientific approach towards the historiography of astronomy. The word “science” or “scientific” appears in each of the four research principles. Three times the term means the scientific approach to systematisation of ancient calendars, the interpretation and validation of ancient methods and calculating the degree of their precision. In the last instance it represented the use of ancient observational records according to scientific needs. The calls for a scientific

approach to systemisation, interpretation and validation were in accordance with the principles of objectivity in history advocated by Gu Jiegang and Hu Shi, as was discussed in the previous section.

As far as the Seventeen General Outlines are concerned, most of them are intrinsic to astronomy. We can divide them into overlapping groups according to their focus: calendars, observational methods and records, instruments, inventions, terminology. The items marked with an asterisk are those researched by Zhu Wenxin, who will be discussed later. The last two items, 16 and 17, could be included in a 'general group' as they, as far as their methods are concerned, could be applied to any other science or scholarship, including general history. These two perfectly fit into what Gu Jiegang did and advocated. Identifying forgeries, omissions and transcription errors were among the important tasks of the "reorganisation of the national past". However, the other outlines also corresponded with the aim for objectivity of this "reorganisation", especially their efforts for systemisation, comparison and analysis.

There was another important framework which offered guidelines for the work of historians including the historians of astronomy. In his obituary of Zhu Wenxin, Gao Lu highlighted and summarised the "five phases of systemising history" which resulted from the work of contemporary scholars (Gu Jiegang and his colleagues) and Gao Lu made it the basis for evaluating Zhu's scientific approach in the following way:

> The works published by Gongsan [Zhu Wenxin] in the past are mostly an examination of national astronomical heritage. Recently, scholars have been seeking methods for systemisation of ancient history, these methods can be roughly divided into five phases; Qian Xuantong, Gu Jiegang, Cao Juren and others all propose them roughly in the same way. Among the mentioned five phases the first is identification of forgeries, the second is exploration [of variant sources and their collation], the third is annotation [linguistic and historical], the fourth is systemisation, the fifth is exploration of the principal meaning. Among Gongsan's already published works, the Archeoastronomical Records belong to annotation, the Treatise on Historical Solar Eclipses belongs to systemisation and Calendrical Annals belong to exploration of the principal meaning. I have heard that there are several others not yet published. Future colleagues with the ambition to systemise the national heritage should not forget Gongsan's example.[65]

65 *Yuzhou* (1940) 10 (11) : 150. PhD thesis author's own translation. 貢三歷次發表之著作，大抵為天文國故之檢討。最近學術界，探求整理古史方法；約分五個階段；錢氏玄同，顧氏頡剛，曹氏聚仁諸家，主張大略相同。所謂五階段者，一辯僞，二探勘，三詁釋，四整理，五探究。貢三著作之已發表者，天文攷古錄當屬於詁釋，歷代日食攷當屬於整理，曆法通誌當屬於探究；其未曾發表者，聞尚有多種。今後

However, it is obvious that the 'Five Phases' could have been appropriated by the historians of astronomy at least four or five years after the *Four Principles and Seventeen Outlines*, as the main body of Gu Jiegang's works started to be published as late as in 1926. It is evident that this is concerned with the evolution of simple principles at the beginning of the 1920s and a conscious acceptance of Gu Jiegang's plans and thoughts at the end of the 1930s. It is unclear whether the principles were actually announced at the beginning of the 1920s by the astronomers on the basis of the fact that they knew Gu Jiegang or Hu Shi. Their principles could have been influenced by Western historiography and only as an afterthought they may have attached these principles to Gu Jiegang's ideas.

These phases represented different levels which the author should pass in the course of writing his historiographical work and supposedly the authors of the most valuable works were expected to pass through all of them. This excerpt can also be understood as a direct admission to the principles of Gu Jiegang and his colleagues. However, an evaluation of Zhu's work will be made later. Gao Lu also characterised the "Five Phases of Systemising History" as the 'warp' (*jing* 經) and "Four Principles" and "Seventeen Outlines" as the 'weft' (*wei* 緯) of future historiography of astronomy.[66] *Warp* means the set of lengthwise threads attached to a loom, while *weft* means the transverse threads drawn through and inserted over-and-under the warp. This statement therefore stressed the importance of both sides, one represented by "Five Phases" and the other by "Four Principles" and "Seventeen Outlines" and actually stated that should good historiography of astronomy be written, then one "side of the loom" is unable to exist without the other.

It is evident that the historians of Chinese astronomy in 1920s adopted the new methods of writing historiography that resulted from the efforts of contemporary scholars. The Chinese Astronomical Society played an important role, as it simplified the spreading of new ideas among them and promoted their contacts. The principles and outlines that the historians of astronomy recorded in the written materials, did not explicitly speak on objectivity or impartiality but rather on re-organisation, systemisation or exploration. Nonetheless, in addition it can be assumed that the quest for objectivity and impartiality was also adopted, as the historians of astronomy announced that they should follow the "Five

同志，整理國政，其勿忘貢三之前驅。

66依整理古史之五階段為經，合四原則十七大綱為緯

Phases of Systemisation of History" proposed in a similar manner by contemporary scholars such as Gu Jiegang, Qian Xuantong and Cao Juren and follow their other methods or principles. However, it is evident that objectivity and impartiality were frequently put to one side in their works. Many historians of astronomy continued to write in a manner close to the style of the *evidential scholarship* that they had mastered in earlier times. In spite of proclaimed adherence to the methods and principles of contemporary progressive historiographers, they often continued to use for instance the time of legendary emperors as the evidence of Chinese astronomical traditions being the oldest in the world. When this practice began to cease, it was gradually replaced by the strong nationalist flavour of the 1930s. It can be assumed that this nationalist flavour had already been present in the publications even back in the 1910s, but in the 1930s it obviously significantly intensified, as will be seen later.

2.2.2 Japanese Historiography of Chinese Astronomy and its Reflection in Pre-war and Wartime China

2.2.2.1 The School of Historians and the School of Astronomers

When dealing with historiography of Chinese astronomy written in the period of pre-war and wartime Republic of China, it is impossible to bypass Japanese historiography of Chinese astronomy. There was an obvious influence of the latter on the former. Like in the case of many other sciences (including astronomy) whose modernisation was inspired by the Japanese model, including borrowing its vocabulary, Japanese historiography of Chinese astronomy was also studied and discussed in China quite intensively.

The first large scale monograph on Far-Eastern astronomy, the *Studies in the History of Far Eastern Astronomy* (*Dongyang tianwenxue shi yanjiu*, 東洋天文學史研究 or *Tōyō tenmongakushi kenkyū* in Japanese original) by Shinjō Shinzō was published in 1928 in Tokyo and in 1933 it was published in Shanghai in a Chinese translation. The largest part of this book was concerned with Chinese astronomy. It is impossible to overlook the fact that such a large monograph appeared much earlier than any of its comparable counterparts written by Chinese authors. Japanese studies into the history of Chinese astronomy (including

the one mentioned above) also provoked reactions from some Chinese authors who either wished to defend the antiquity of Chinese astronomy by rational and scientific arguments or who wanted to express their emotions and disappointment. In addition, after the Japanese annexation of Manchuria in 1931 and after the Marco Polo Bridge Incident in 1937, the substance of the articles by Chinese authors even stepped up in this respect.

There are several English language papers that offer a brief but comprehensive overview of the Japanese historiography of Chinese astronomy with bibliographies. One is *Modern Scholarship on the History of Chinese Astronomy* by Ho Peng Yoke 何丙郁 (1926-2014), published in 1977,[67] as well as another paper by Shigeru Nakayama 中山茂 (1928-2014), *Japanese Studies in the History of Astronomy*, published in 1962.[68]

The following summary is primarily based on the description of Japanese historiography of Chinese astronomy in the above two reviews. We will notice the reaction of Chinese historians to Japanese historiography that will be documented on a Chinese paper from the late 1920s that criticised one of the key publications of a representative of one of the Japanese schools of astronomical historiography and we will evaluate how these Chinese reactions corresponded to Gu Jiegang's and Hu Shi's efforts of "reorganisation of the national past". Finally, attention will turn to several direct Chinese references of Japanese presence in the historiography of Chinese astronomy and its influence in this field in China in general.

The two schools of Japanese historiography of Chinese astronomy were called the *Historians' School* and the *Astronomers' School*. The basis of their debate was the origin of Chinese astronomy. While the 'historians' claimed that the origin was quite late, not earlier than the 4th century BCE, the 'astronomers' supported the idea of much earlier development. The adherents of the *Historians' School* were mostly historians by training. They claimed that Chinese astronomy was predominantly of Western origin and they aimed to use traditional Chinese astronomy and also modern astronomy as a tool for understanding Chinese antiquity and the exact dating of its historical events as well as dating of the creation of Chinese classics and other historical sources. In their work, they relied mostly on celestial events

67 Ho Peng Yoke. *Modern Scholarship on the History of Chinese Astronomy.* Occasional paper 16, Faculty of Asian Studies, The Australian National University. Canberra 1977.

68 Nakayama, Shigeru. Japanese Studies in the History of Astronomy. *Japanese Studies in the History of Science* No. 1. The History of Science Society of Japan. Tokyo 1962.

recorded in these historical sources in combination with modern astronomical methods. Simply put, they researched history through astronomy.

On the other hand, the members of their opposing and antagonistic school, the *Astronomers' School,* were all astronomers by training. They supported the theory that Chinese astronomy had developed independently of Western influence. The focus of their interest was Chinese astronomy as a whole, the evolution of the system of Chinese astronomy and its components and in the words of Ho Peng Yoke, "their aim was to study Chinese astronomy from fragments of the Chinese classics."[69] History was more of an auxiliary science to them and unlike the adherents of the *Historians' School* they preferred to study ancient astronomy with the help of history. However, they also made contributions to the dating of early Chinese history, as Nakayama remarked, stating that they applied their modern methods of astronomical chronology "after the manner of Otto von V. Neugebauer (1899-1990) and Theodor von Oppolzer (1841-1886), to ancient Chinese sources, for the determination of dating as well as the evaluation of ancient Chinese astronomy."[70]

The main representatives of the *Historians' School* were Iijima Tadao 飯島忠夫 (1875-1954), who along with others wrote the monograph *A Treatise on Ancient Chinese History* 支那古代史論 (1925) which provoked a Chinese reaction by Liu Chaoyang to this work discussed below. Another representative of the school was Hashimoto Masukichi 橋木增吉 (1880-1956), a historian who doubted the authenticity of the Book of Documents (*Shujing*) and "brought the date of the astronomical observations in the *Shujing* down to the 8th century BC."[71]

The *Astronomers' School* was represented by Shinjō Shinzō 新城新藏 (1873-1938), the author of the book *Researches in the History of Astronomy in the Far East* mentioned above, which gained considerable influence in China after its Shanghai publication in 1933. According to Ho Peng Yoke, the *Astronomers' School* gained much influence later on and played an important role in world historiography of Chinese astronomy in the 20th century since after the war, some of the arguments of their opponents were no longer valid in the light of modern scholarship (for instance, the research on the oracle bones must have destroyed

69 Ho 1977: 6.

70 Nakayama 1962: 14.

71 Ho 1977: 6.

some of Hashimoto's conclusions).[72] Later, this school was represented by Shinjō's younger disciples Noda Chūryō 能田忠亮 and especially Yabuuti Kiyosi 薮内清 (1906-2000) who later became probably the most prolific Japanese historian of Chinese astronomy.

The *Historians' School* and the *Astronomers' School* often had contradictory conclusions based on different evidence. In the 1920s and 1930s, these opposing views and the competition between the schools was the catalyst for the production of monographs and papers by both sides, and caused reactions also within China.

2.2.2.2 Liu Chaoyang on Tadao Iijima's *Treatise on Ancient Chinese History*

The most significant reaction to the Japanese historiography was the paper by Liu Chaoyang called *Comments on Tadao Iijima's 'Treatise on Ancient Chinese History'* published in 1929. It was a clear example of the author's modern scientific approach that was, for instance, demonstrated in the critical discussion of Iijima's conclusions and logically structured argumentation. Moreover, it explicitly confirmed the author's affinity with Gu Jiegang's and Hu Shi's thought and their efforts in the "reorganisation of the national past". It also showed in a fairly illustrative manner the types of evidence, opinions and conclusions of the Japanese *Historians' School* and how these differed to the *Astronomers' School*.

Liu Chaoyang 劉朝陽 (1901-1975) was a significant educator, physicist and astronomer. In the period before the Communists took power, he first taught at Sunjatsen University in Guangzhou, then between 1931 and 1937 he worked as a researcher at the Qingdao Observatory and during the war he taught once again at the universities in Guangzhou, Guiyang and Chengdu. His three main fields of research all focused on ancient China, on the Zhou, Qin and Han periods. His first field of research was the systemisation and dating of the oracle bones and inscriptions on bronzes and astronomical research related to them. The second field was the dating of ancient texts with references to astronomy and the third was calendrical records and the records of the heavenly phenomena. However, we can nonetheless mention at this point that Liu was considered one of the most important historians of Chinese astronomy in this period, both by his later Chinese followers, such as the contemporary historian of Chinese astronomy, Chen Jiujin 陈久金(*1939) as well as by Westerners such as Joseph Needham and Wang Ling. In his postface to the collection of Liu's

72 Ho 1977: 6.

eighteen papers on the history of Chinese astronomy[73], Chen Jiujin placed him beside Zhu Wenxin 朱文鑫 (1883-1939) and Dong Zuobin 董作宾 (1895-1963), making these three personalities the most significant representatives of that era's "wave of research in the history of science [in China]" and "[Chinese] pioneers in using the modern and the newest scientific knowledge in the research of the history of science".[74]

In the paper *Comments on Tadao Iijima's 'Treatise on Ancient Chinese History'*,[75] Liu Chaoyang first summarised the conclusions of Iijima's monograph. He divided the conclusions related to the three areas of Iijima's interest: (1) the system of ancient Chinese astronomy and calendar, (2) the relationship between Chinese and Western astronomy and calendars in ancient times and (3) the dating of Chinese historical sources.

Iijima based his evidence on astronomical data. This data included positions of certain stars, for instance the Cowherd star (α Aql or Altair) or β Cap in relation to the winter solstice point whose apparent movement is caused by the Earth's precession. His evidence was also based on data on stars and asterisms near the celestial pole that also change their relative position to the pole in accordance with the Earth's precession, like all other stars. Another source of Iijima's evidence were the records of the Jovian (Jupiter) cycle which must have been set down in a particular period and which was believed to last for 12 years, each year corresponding to one of the 12 Earthly Branches. In fact, the Jovian cycle lasts only 11.86 years, therefore once in roughly 85 years, Jupiter falls one step behind the cycle. According to the estimates of when the cycle was set down, Iijima tried to find differences that would help him in dating it.

Last but not least source of Iijima's evidence were the records of solar eclipses. Iijima argued that some of the recorded eclipses could not be visible either in the state of Lu nor in the entire area of today's China and therefore there must have been knowledge transfer of the Babylonian *Saros* period of eclipses (223 months, slightly more than 18 years). According to all this evidence, Liu quoted Iijima as concluding that the system of Chinese astronomy,

73 Before Liu Chaoyang turned his interest to theoretical physics and concentrated more on teaching in 1946, he wrote more than thirty works related to the history of Chinese astronomy.

74 Li and Chen, eds. 1999: 497.

75 Original publication in the Institute of the Language and History of the Sunjatsen University Weekly Journal's "Special Issue on the History of Astronomy" (中山大學語言歷史研究所周刊：《天文學史專號》), 1929. Reprinted in Li and Chen, eds. 1999: 474-495. Original paper title: 飯島忠夫《支那古代史論》評述.

including *yin* and *yang* and the system of *Five Phases* was established around the year 300 BCE or later.

Iijima found so many similarities and time coincidences between Western and Chinese astronomy and calendar that he concluded that many of its components came from the West. For instance, Liu quoted that Iijima found similarities between Greek and Chinese theories on the origin of the universe, five heavenly emperors vs. five main gods in Greece, found that Eudoxus (408-355 BCE) also determined the year as 365 ¼ days, that the same cycle of 76 years was determined by Callipus[76] around the year 330 BCE, that the 28 Chinese lunar mansions *xiu* and Babylonian and Indian 28 or 27 lunar lodges apparently came from the same source in Iijima's view, as well as the way years were counted according to the Jovian cycle. In addition to this, Iijima pointed out the similarities between the connections of music theory and astronomy both in Greece and in China, the similarities between Western and Chinese astronomical instruments and also the similarities between Babylonian and Assyrian astrology and the astrology contained in Sima Qian's *Book on the Organisation of the Heavens* (*Tianguan shu*). According to Liu, all this evidence led Iijima to conclude that Chinese astronomy, astrology and its calendar were imported from the West, again around the year 300 BCE. He connected this theory with Alexander the Great's military expedition to Persia in the year 330 BCE and additionally supported the theory with the findings of Greek style and Chinese style bronze vessels side by side in a tomb by the Russian river Yenisei which dated back to 7th century BCE and which provided evidence of early contacts between China and the West at that time.

As far as the last area of Iijima's interest, the dating of selected Chinese canonical texts is concerned Iijima claimed that the canonical texts, "such as the *Book of Documents* (*Shujing*), the *Book of Odes* (*Shijing*), the *Spring and Autumn Annals* (*Chunqiu*), *Discourses of the States* (*Guoyu*) and the *Commentary of Zuo* (*Zuozhuan*) were all works from around the year 300 BCE or a later period."[77] Iijima's evidence also came from the positions of important stars or asterisms in relation to the celestial pole or the winter solstice point that is affected by the Earth's precession. For instance, on the *Book of Documents,* he stated that its 28 chapters must have been created after the year 300 BCE, after the determination of the winter solstice point. In another example, according to him, the Canon of Yao (*Yaodian*) also could not have

76 Callipus cycle is 76 years (4 x 19 years) after which the solstice falls on the same time of the day and on the same phase of the Moon.

77 Li and Chen, eds. 1999: 480.

been written during the time of the emperor Yao as the relative positions of constellations mentioned there again corresponded to the same time period as above, around the year 300 BCE. However, Iijima's evidence was not based solely on the astronomical data in this specific area. He was said to have had a deep knowledge of Chinese canonical texts, therefore he also employed historical methods and methods of determining the authorship.

How did Liu Chaoyang evaluate Iijima's evidence and conclusions? He divided Iijima's conclusions into two groups of i) relevant and ii) doubtful. The relevant conclusions, summarised in the section *Precise textual research* (精切之考證), included the ones that Liu agreed with fully or partly. Initially, Liu found that the relative positions of the Cowherd star to the winter solstice point, the Polar star, the establishment of the Jovian cycle, the direction of Northern Dipper's handle, the solstices according to the calendar and so on, all corresponded to the period of 400-300 years BCE. However, whether the beginnings of Chinese astronomy and calendar really fall into this period, Liu considered questionable.

Furthermore, Liu agreed fully with Iijima's conclusions on the *Spring and Autumn Annals* (*Chunqiu*) and partially with his conclusions on the *Commentary of Zuo* (*Zuozhuan*). In the case of *Chunqiu*, Iijima's argument was that its foreword was a later forgery. This argument was based on discrepancies when counting the years in the *Zhuanxu li* (Zhuanxu's [Astronomical] System) - it actually used a method of counting which revealed that a later system had been used instead. Another strong piece of Iijima's evidence was the name used for the hypothetical planet anti-Jupiter, that was used for the determination the planet's position in the form of *sui zai* 歲在 or *taisui zai* 太歲在 as late as in the Eastern Han period (25-225 CE). This underlines the argument that the foreword must have been written much later.

For the *Chunqiu* itself, Liu agreed with Iijima's opinion that it must have been written around the year 300 BCE or later and agreed in refuting the authorship of Confucius. This view was supported by arguments such as the special astrological attention devoted to the Northern Dipper constellation and star *Dachen* 大辰 (Antares, α Sco, also known as *Dahuo* 大火) which concerned meteors entering or approaching them. According to Liu, these interpretations, together with "astronomical lore" which said that the Northern Dipper showed the seasons, while the *Dachen* showed the time, all appeared in the middle period of the Warring States. Liu considered the irregular insertion of intercalary months as denying the existence of a precise astronomical system and the method of designating the first month of

the year to be another reliable piece of evidence. However, Liu disputed Iijima's conclusion that several solar eclipses in *Chunqiu*, invisible in the state of Lu must have been added based on the knowledge of the *Saros* period which had transferred from the West. He found it impossible to explain that the eclipse period later employed by the Western Han *Grand Inception System* (*Taichu li*), also mentioned in the Western Han period's *Book on the Organisation of Heavens* (*Tianguan shu*) should last only 135 months, while the knowledge of *Saros* being 223 months would have meanwhile been lost.

What is interesting from the viewpoint of the research questions posed in this thesis is that Liu mentioned at the end of this section Gu Jiegang and Hu Shi and their discussion of the work of the Swedish sinologist Bernhard Karlgren (1889-1978) on the dating of *Zuozhuan.* Gu Jiegang and Hu Shi agreed with Karlgren's conclusions and on the basis of that all the three had the same opinion, Liu considered it another reason for accepting Iijima's conclusions in this field. This is one of the two paragraphs of the paper where Liu Chaoyang mentioned the "reorganisation of the national past", however from his these statements we can not definitely assume that he accepted the principles of this movement.

Let us now turn to what Liu Chaoyang considered very doubtful in Iijima's book. Liu argued that scholarship of the Han era was very conservative and both *Huainanzi* and *Tianguan shu,* where Iijima found origins of Chinese astronomy, describe much earlier situation of the heavens. Liu believed that *Tianguan shu* described the sky of around the year 400 BCE, as the group of stars mentioned there was at that time really near the pole.

Liu also strongly disagreed with Iijima's argument that the *Heavenly Stems* and *Earthly Branches* must have appeared concurrently with the *Five Phases* and *Yin-yang* theories. Iijima argued that the *Stems* and *Branches* had a clear connection with the Jupiter cycle (in the case of the *Branches*) and the basic rules of the five planets' movement that were, according to him, discovered and written down after the year 400 BCE.

The *Heavenly Stems* and *Earthly Branches* are closely connected with another area where Liu strongly disagreed with Iijima. This concerns the dating of the ancient relics with inscriptions using the *Stems* and *Branches*. Iijima stated that the earliest canonical texts containing the *Stems* and *Branches* were not evidence that these had existed as early as that and he even discredited the oracle bone inscriptions (*jiaguwen*) and bronze inscriptions (*jinwen*) along with the *Stems* and *Branches* as later forgeries. The research of oracle bones and bronzes was one of the main fields of Liu's interest. Liu disproved these arguments

convincingly, calling them "inadequate" and "unacceptable" adding that these relics were found at so many different and mutually distant localities from different periods, thus discrediting Iijima's conclusion.[78] However, Liu admitted that the problem of authenticating the oracle bones and bronzes would require further research and detailed study.

As Liu stressed, this book was a part of Iijima's ongoing discussion with Shinjō. After some time, in 1926, Shinjō wrote an article[79] in which he reacted to Iijima and formulated the three key problems concerning the possibility of later alteration of certain astronomical and also historical events in the *Chunqiu* and *Zuozhuan*.[80] While Shinjō supported the idea that none of these key sections were later altered, Iijima insisted on the opposite view. Likewise, in another of his later papers, Iijima formulated his additional three basic questions concerning the connection between Western and Chinese astronomy and also the connection of the *Stems* and *Branches* with the system of *Yin-yang* and *Five Phases*.[81] Here once again, Iijima's answer to all these questions was affirmative while Shinjō's was completely negative. This underlines again the antagonistic positions of the *Historians'* and *Astronomers' Schools*.

In the conclusion of his paper, Liu Chaoyang evaluated Iijima as a rather superficial researcher. According to Liu, he did not pay too much attention to the evolutionary stages of Chinese astronomy and its advent seemed too sudden to him, therefore he attributed to it a Western origin. Moreover, Liu stressed that he concentrated too much on the similarities of Chinese and Western astronomy, and almost neglected the point that all of the cultures observed basically the same sky. Therefore, many particular features of their astronomical systems that were first and foremost necessary for the right timing of agricultural work produced similar or the same results by the sheer fact of nature and no contact would have been necessary for coming up with, for instance, the twenty-eight lunar mansions, the Jovian

78 Li and Chen, eds. 1999: 493.

79 Li and Chen, eds. 1999: 494. The article's original title was *The Ancient Chinese Culture Viewed through Astronomy* 由天文學上所見中國古代之文化, published in Shisō 思想 No. 55, 1926.

80 These problems were concerning (1) whether the solar eclipse of 525 BCE was inserted later into the *Chunqiu* on the basis of the knowledge of the Babylonian *Saros* period, (2) whether the record of Jupiter's position in the 8th year of Qin was later altered and (3) whether the year of Chen's death (陳亡之年) in *Zuozhuan* was later altered.

81 Li and Chen, eds. 1999: 494. Here, only the Chinese title of Iijima's study is given: *A Study on the Establishment of Chinese Ancient Astronomy* 中國古代天文學成立之研究. Iijima's key questions: (1) Is there a relationship between the most ancient Chinese calendar and the Greek calendar? (2) Is there any relationship between counting the years according to the Jovian cycle and worshipping Jupiter in China, India and Babylonia? (3) Is there a fundamental qualitative relationship between the *Ten Stems* and *Twelve Branches* and the theories of *Yin-yang* and *Five Phases*?

cycle or the year being 365 ¼ days. The only thing that deserves attention is the fact that the systems appeared at roughly the same time periods.

On the other hand, Shinjō was praised for the demarcation of the evolutionary steps of Chinese astronomy, for looking for their characteristics and relationships between the different periods in its history. Moreover, Shinjō had always backed the autonomous evolution of ancient Chinese astronomy and he even supported the idea that the system of twenty-eight lunar mansions might have spread from China to India. This also explains why Shinjō's work was much more broadly and warmly accepted in China, as will also be seen later.

However, Liu Chaoyang underlined that at the very least, Iijima's dating of Chinese canonical writings "was a strong help to Gu Jiegang".[82]

This Liu Chaoyang's paper shows that chronology based on astronomy was considered as important by Gu Jiegang and Hu Shi. Gu Jiegang's scepticism towards ancient Chinese history might have influenced such people as Liu Chaoyang. Instead of the direct rejection of the Japanese attempts to contest the antiquity and originality of Chinese civilization, Liu felt the need for the detailed polemic with the Japanese and in some cases, he even acknowledged that their hypotheses might have been grounded. Liu not only explicitly mentioned Gu Jiegang twice and Hu Shi once. He also stressed that this scientific method based on astronomical records contributed to supporting their arguments. (However, in modern times, the method is no longer employed as part of mainstream methods of dating the Classics due to its low precision.) Although it is not expressed directly anywhere in the paper, the reader can discern that Liu valued Gu's and Hu's attitude towards the interpretation of ancient history highly and probably showed his affinity with their efforts. This argument can also be supported by Liu's obvious modern scientific attitude, the logical structure and polemical nature of his paper.

2.2.2.3 Other Chinese references to the Japanese Historiography of Chinese Astronomy and its General Influence in China

In the period of pre-war and wartime Republican China, we can find probably the most frequent references to Japanese historiography of Chinese astronomy once again in Liu Chaoyang's articles. These included the study analysed above and the papers that he

82 Li and Chen, eds. 1999: 495.

published later. He mostly referred to the two main authors discussed above, Shinjō Shinzō and Iijima Tadao, and predominantly to their works which have already been discussed. In his study *Calculating the Period of Compilation of the 'Yaodian' from Astrology and Astronomy* (*Cong tianwen lifa tuisuan 'Yaodian' zhi biancheng niandai* 從天文曆法推算《堯典》之編成年代),[83] he, besides Shinjō and Iijima, also referred to other Japanese historians, such as Naka Michiyo 那珂通世 (1851-1908), a historian of East Asia, and Hayashi Taisuke 林泰輔 (1854-1922) who were interested in ancient Chinese oracle bone inscriptions *jiaguwen*, pointing out that they also relied on the astronomical dating of the *Yaodian*.

Liu also referred to Shinjō and Iijima and their works discussed above in his paper *Treatise on Early Zhou Astronomical System* (*Zhou chu lifa kao* 周初曆法考),[84] published in 1944.

Japanese historiography of Chinese astronomy was also known to Zhu Wenxin. Zhu 's work *A Short History of Astronomy* (*Tianwenxue xiao shi* 天文學小史) from 1935 contained several scarce mentions of Japanese historiography of Chinese astronomy. Shinjō's monograph *Researches in the History of the Far Eastern Astronomy* was referred to only once in the section devoted to Indian astronomy. Zhu referred to Shinjō's work in order to support his view that Indian astronomy was strongly influenced by the Chinese and wrote that "Shinjō Shinzō says most clearly" that the twenty-eight lunar mansions had originated in China and later had spread to India. He quoted Shinjō as pointing out that even their Indian names were similar to the constellations of the Chinese sky, that they could be traced on their way to India and that only some non-substantial changes occurred within their system en route, including a change to their starting and ending points.[85]

Chen Zungui mentioned Japanese historiography of Chinese astronomy in many of his works written both before and after the Communists took power in 1949. The Japanese efforts in this field represented for Chen a driving force for writing the historiography of Chinese astronomy from the pen of the Chinese. As he admitted explicitly, for him personally it was also a significant motivation. He felt very disappointed that Yamamoto Issei 山本一清

83 The Journal of Yanjing University No. 7, June 1930 燕京大學學報第七期，1930 年 6 月. Reprinted in Li and Chen, eds. 1999: 10-38.

84 "Special Publication of the Institute of Chinese Culture" of the West China Union University, Volume 2B, 1944 華西協和大學《中國文化研究所專刊》，乙种第 2 冊（1944 年）.

85 Zhu 1935: 100.

(1889-1959), a Japanese astronomer, was named the head of the International Astronomical Union's (IAU) commission for the research into the history of Chinese astronomy in 1939. In his obituary of Zhu Wenxin in 1940, he wrote the following:

> [As far as] the IAU's last year's survey of the ancient Chinese astronomy [is concerned], it was delegated to Yamamoto Issei from Japan, I deeply felt the utmost sorrow. Because of this event I even more mourn the master's [Zhu Wenxin's] passing , if he was alive this job would be done by him. [However], now he has passed away and even if the IAU asked [a person from] our country to do [the job], I am afraid that it would be without response.[86]

In the autumn of 1937, Chen even received a letter (mentioned earlier) from Yamamoto, where he was asked to hand over any related valuable historical materials to him and to "give assistance". Chen declined. In his later writings, he expressed his displeasure at that time about foreigners writing the historiography of Chinese astronomy instead of the Chinese. Given the wartime situation, he felt especially ashamed that in Japan, the history of Chinese astronomy was studied in much more depth and volume than in China. In his *Brief History of Ancient Chinese Astronomy* (*Zhongguo gudai tianwenxue jian shi* 中國古代天文學簡史) that was already being prepared before the war but was published as late as 1955, Chen stressed that in the first place, these materials should be studied by the Chinese and their study used to raise the patriotic self-consciousness of his fellow countrymen. They should not end up in the hands of the enemy.[87] We will return to this monograph again in the section on the historiography of Chinese astronomy of the early PRC. However, this Japanese story appeared in a similar format in Chen's obituary for Zhu Wenxin in *The Universe* (*Yuzhou*) from 1940, in another of his articles in *Yuzhou* called *The PreliminaryExploration of the History of Chinese Astronomy* (*Zhongguo tianwenxue shi chu lun* 中國天文學史初論) from 1945[88], in his book *Brief History of Ancient Chinese Astronomy* (1955) already mentioned above and even in his large-scale multi-volume *History of Chinese Astronomy* published in the 1980s. In this last work, Chen added more details to this story.[89] As Professor Jiang

86 *Yuzhou* (1940) 10 (11) : 153. 去年國際天文協會關於中國古代天文學之調查，托由日人山本一清擔任，誠堪痛心之至。因此一舉，余更追憶先生，先生若尚健在，此种工作，當由先生為之；今先生已逝，縱使國際天文協會吾國擔任，恐亦將無以應命焉。

87 Chen 1955: 1.

88 Yuzhou Vol. 15 No. 1-3 (1945): 9-14.

89 Chen 1989: 2239. Chen says here that the letter was originally addressed to Yu Qingsong and he opened it because it was a letter of duty.

Xiaoyuan of the University of Communications advised the author of this thesis in an interview conducted in March, 2015 in Shanghai, there must also have been quite a personal reason for Chen's anti-Japanese sentiment: one of Chen's relatives was murdered by the Japanese.

In the introduction to Chen's article *The Primary Exploration of the History of Chinese Astronomy* mentioned above, there is about half a page on Shinjō's *Researches in the History of the Far Eastern Astronomy*. He did not present there any direct evaluation of the book, but he wrote that he had been repeatedly encouraged by the fellow astronomer Zhang Yuzhe 張鈺哲 to make a new translation of it in order to replace the first translation (1933) done by Shen Xuan 沈璿 (1899-1983), a mathematician. He also mentioned that he had already finished the translation and was encouraged by Zhang to conduct further research into the history of Chinese astronomy, which was summarised in the article.[90] Considering that it did not contain any criticism of Shinjō's book and Chen's efforts on its new translation were mentioned, it can be assumed that Chen regarded it as a valuable book, as Zhu Wenxin and Liu Chaoyang also did.

Moreover, from a passage in the fourth volume of Chen Zungui's *History of Chinese Astronomy,* it can be assumed that the translation of Shinjō's book together with notes from his reading of other historical materials was the basis for Chen's *Brief History of Ancient Chinese Astronomy* (1955) which was published later.[91]

As far as Chen's motivation for researching the history of Chinese astronomy is concerned, it is also interesting that he mentioned as factors the "situation" (wartime occupation) and the "lack of material resources" in his article *The Primary Exploration of the History of Chinese Astronomy*, as the factors that barred him from observational work and modern astrophysical research and caused that he turned his attention more towards the historiography of astronomy.

From these few examples it is evident that the Japanese historiography of Chinese astronomy influenced the Chinese quite deeply. Since the beginning of the 20th century, Japan had been regarded as the model of modernisation in many sciences. The study of Japanese materials on this specific field of research not only complied with the spirit of modern

90 Yuzhou Vol. 15 No. 1-3 (1945): 9.

91 Chen 1989: 2240.

approaches to history, but it also fuelled polemics and heightened the need for emancipation of the Chinese. The Japanese scholarship in this field used scientific methods based predominantly on modern astronomical knowledge and also modernised historical methods in order to approximately date not only the history of Chinese astronomy alone, but also Chinese classics and ancient history in general. This is in fact an example of the use of astronomical historical sources for modern scientific needs, which Gao Pingzi and Gao Lu included in their *Four Research Principles*.

The polemics which it incited as well as the rising need for emancipation in China can be attributed to both Japanese schools - the *Historians'* and the *Astronomers' School*. However, it was the latter that gained support in China and became a welcome source of reference for the assertions that the astronomical traditions, such as the twenty-eight lunar mansions, originated in China and therefore Chinese astronomical traditions might be the oldest in the world. Especially after the annexation of Manchuria, it might have brought some satisfaction to the historians of astronomy in China that even some of the despised Japanese, represented here by Shinjō's school, acknowledged the domestic origin of the Chinese astronomical traditions and their antiquity. For the Chinese historians of astronomy, Shinjō's school was closer to their conclusions and also to their hearts, especially in this period that called intellectuals to contribute to national self-preservation. Japan was a model example of modernisation and the modern scientific approach, but the conclusions of this specific school, Shinjō's school, were used as one of the starting points for writing with that nationalist flavour that eventually fuelled the deviation of Chinese historiography of astronomy from objectivity and impartiality, as was advocated by the "re-organisation of the national past" by Gu Jiegang and Hu Shi.

2.3 Zhu Wenxin's Life and Work

This section will focus on the life of Zhu Wenxin 朱文鑫 (1883-1939), who is considered the most prolific author of the historiography of Chinese astronomy in Pre-war Republican China and also the first such author to write a comprehensive monograph on the history of Chinese astronomy which covered all historical periods and employed a modern scientific approach.

Concurrently with his biography, an attempt will be made to focus on his possible sources of motivation and the sociological and political influences on him. This will be done in order to evaluate how much these influences may have caused his affinity or rejection of the contemporary modern ideals of writing historiography, as they were set out by Hu Shi and Gu Jiegang, as well as any influence on how these ideals were modified in the 1930s, following the Japanese annexation of Manchuria.

The most valuable primary sources in Zhu Wenxin's life include the obituaries about him and a structured biography, published in *The Universe* (*Yuzhou*, 宇宙) journal in 1940.[92] Added to these are also the proceedings from a 2003 conference commemorating the 120th anniversary of his birth which were published in 2008.[93] There was another commemorative publication for the 130th anniversary published in 2013.[94] Both of the published works from these commemorative proceedings were full of short papers and articles on his life and work, including reprints of some relevant and important archival materials and photos. They also included reprints of some of his works with the first commemorative edition from the 2003 conference being much more plentiful in this regard.

For the author of this thesis, the personal visit in 2015 to Zhu's home town of Jinxi 錦溪, near Kunshan in Jiangsu Province was also of significant importance, as it was an opportunity to visit and interview Zhu Wenxin's possibly greatest biographer, Lu Yitai, who took this author to Zhu's former residence and showed him all the statues and institutions named after Zhu around town. Lu Yitai also took this author to Zhu's grave and provided

92 *Yuzhou* (1940) 10 (11) : 149-158.

93 Chen Meidong and Chen Kaige, eds. *Zhu Wenxin – jinian Zhongguo xiandai tianwenxuejia Zhu Wenxin dansheng 120 zhounian* [Zhu Wenxin: commemorating the 130th anniversary of the birth of a Chinese modern astronomer]. Beijing: Qunyan Press, 2008.

94 Lu Yitai, ed. *Jinxi jianchu renwu jinian zhuanji (4): Zhu Wenxin, Zhu Wenxiong jinian zhuanji* [Commemorative Collection on the Outstanding People of Jinxi]. Kunshan, 2013.

much valuable material. It is apparent that with support from the local government, Mr Lu has been taking special care of the memory of Zhu Wenxin along with the memory of other local compatriots such as Zhu Wenxin's cousin, Zhu Wenxiong.[95]

It is interesting that the intense attention paid to Zhu Wenxin appeared as late as on the occasion of the 120th anniversary of his birth and not earlier, for his centenary for instance, as in the case of his cousin Zhu Wenxiong. This growing interest is also visible when the name changes of the institutions mentioned above are followed[96]. The interest may also be the result of the government's recent more intensive focus on patriotism and outstanding patriotic figures of the past, specifically of the pre-war Republican period.

Some scarce but valuable information on Zhu Wenxin's life can be found in the archives of the Chinese universities where he once taught. For this reason, this author visited the archives of Shanghai University of Communications *Shanghai Jiaotong daxue* 上海交通大學 and Fudan University *Fudan daxue* 復旦大學 in April 2015. However, the material found in the archives had already been partly reprinted in the commemorative proceedings for the 120th anniversary and especially the 130th anniversary, along with photos from Zhu's albums as well as the material from university archives in the United States where he studied which had also been published already.

In Zhu Wenxin's works, indeed even in the forewords to his publications which were written by other authors, very little information on his life can be found.

2.3.1 Early Life and Family

Zhu Wenxin was born on October 9, 1883[97], in Chenmu town 陳墓鎮 near Kunshan 昆山, in Jiangsu Province. This town is now called Jinxi township 錦溪鎮 and belongs to the Kunshan municipality, some sixty kilometres to the West of the Shanghai city area. His courtesy name (*zi* 字) was *Gongsan* 貢三 and his *hao* 號 name was *Panting* 槃亭. When he studied in the United States, he used the Latinised form of his name *Tsu Wen Shion* under

95 Zhu Wenxiong 朱文熊(1883-1961) was a linguist, one of the pioneers of the Romanisation of the Chinese language.

96 Only the local high school bore his *hao* name, *Panting,* which was used for a certain period after the war.

97 On the ninth day of the ninth month of the lunisolar calendar.

which he has been known outside of China since then and under which it is possible to find a his English-language articles.

Zhu Wenxin was born into a scholarly family. According to Lu Yitai,[98] Zhu Wenxin's father Zhu Zufang 朱祖方 (1864-1925) was an excellent mathematician and the co-founder of a local school.[99] Wenxin was the eldest son in the family and he had two younger brothers, Wentao 朱文騊 (1895-1919) and Wensu 朱文騶 (1898-1967).[100]

Zhu's life can be roughly divided into four main periods:

1) early life (1883-1908)
2) the period of his studies in the United States (1908-1912)
3) his teaching activity after his return to his homeland (1912-1927)
4) the period of his participation in politics (1927-1939)

2.3.2 Early Life (1883-1908)

Zhu Zufang paid much attention to the education of his eldest son. The basis of young Wenxin's education was a classical one and he got excellent grades. In 1901, he came first out of all the candidates in the entrance examination at the Kunshan County School and subsequently obtained the degree of *shengyuan* 生員.[101]

The information on his further higher studies in China in different *nianbiao* information sheets and biographies vary.

If the highest possible validity is attached to the following archival document the "*Certificate of the capability of studying in the US*", issued by his Chinese 'alma mater',[102] then it is evident that in 1903, at the age of 20, he was admitted to a school that offered a combination of classical and modern education, a school that was more progressive than the

98 Lu 2013:38.

99 The school was called 'The Primary Study Hall of the Second Grade'"兩等小學堂".

100 For their *zi* names, descendants and other genealogical data, Lu 2013:29 may be referred to.

101 Also known as *xiucai* 秀才 or 'bachelor degree'.

102 Reprinted in Lu 2013:5.

standard ones. The school was located in Suzhou and it was called the *Jiangsu Higher Academy* 江蘇高等學堂. It existed between the years of 1900 and 1912, originally under the name *Suzhou Chinese-Western School* 苏州中西学堂.[103] The education system at the school was divided into two stages, *preparatory courses* 预科 and *bachelor courses* 本科. This document further outlined that in the 11th month of the 31st year of the Guangxu Era (1905), he graduated from the *preparatory course* in the top three of all students. The following year he was promoted to a general and physical science class *zhengke like ban* 正科理科班 as part of his bachelor studies. At this point he was praised for his good exam results and was told that he was "capable of studying in the United States". According to the list of subjects set out in this document, Zhu excelled in Chinese language and literature, higher algebra, differential calculus, analytical geometry and English.[104] The document, dated on 11th month of the 34th year of Guangxu (1908) also states that Zhu spent 11 semesters at the school. He apparently did not finish the bachelor course but received a recommendation for his future studies abroad.

There was also another important matter connected with this school that influenced Zhu Wenxin's future career. This was the fact that during his studies he was a classmate with his younger uncle Ye Chucang 葉楚傖 (1887-1946), a later politician and important personality of the *Tongmenghui*, *Xinhai* Republican Revolution of 1911 and one of the founding members of the Nationalist Party (*Guomindang*). This individual would later prove to be crucial for Zhu at several key moments in his life, usually when a new period of Zhu's career was about to start and he needed recommendations.[105] Ye was also his closest connection to the world of politics.

As far as the dating of the anti-imperial revolutionary activities of Zhu Wenxin in support of his young uncle Ye Chucang is concerned, discrepancies are found even in the articles of a single author. In his article "*The First Chinese Who Wrote the Comprehensive History of Astronomy*",[106] Lu Yitai wrote that in 1902, Ye together with Zhu took part in anti-

103 Chen and Chen 2008:12.

104 According to Zhu's recommendation letter for studies in the U. S., reprinted in Lu 2013:5, the curriculum also included physics, anorganic chemistry, organic chemistry, mechanics, mineralogy and physical geography.

105 E.g. after arriving from his studies abroad or after the Donghua university where Zhu later taught financially collapsed.

106 Lu 2013:30.

imperial student protests and for a period of time they fled to Shanghai where they studied at the Patriotic Society 愛國學社. There, they followed the anti-imperial activities of Cai Yuanpei 蔡元培 (1868-1940), Zhang Binglin 章炳麟 (1868-1936) also known as Zhang Taiyan 章太炎, Zou Rong 鄒容 (1885-1905) and other revolutionaries.[107] According to this account, Zhu was admitted to the Jiangsu Higher Academy in 1903, after the Patriotic Society was dissolved. The same text states that in 1907, Zhu and Ye were both expelled from the Jiangsu Higher Academy, because the headmaster "could not stand patriotic students" and they continued their studies at Nanyang Middle School 南洋中學.[108]

However, the 'recommendation certificate' quoted above does not mention any interruption to his studies.

In 1905, Zhu Wenxin married his first wife, Wang Zhiyi 王織儀 (died 1910) who gave birth to their eldest son Zhu Zhanggan 朱章淦 (1906-1985) the following year. In 1905 and 1906, Zhu taught at Suzhou Teacher Training Institute 蘇州師範傳習所 and became the director of the Suzhou Girls' School 蘇州女學校.

In 1907, Zhu Wenxin successfully passed the provincial governor's examination for a government scholarship abroad. On this occasion, a commemorative photo with his classmates and an American teacher named William Huggins was taken and has been preserved until today.

Zhu left for America as late as November 1908. As this author was told by Lu Yitai in an interview in March 2015, the year of Zhu's departure was incorrectly stated as 1907 in the older publication for the 120th anniversary.[109] In that same year, in 1908 his second son Zhu Zhangqi 朱章棨 was born, and was adopted by Zhu Wenxin's younger brother Wentao.

2.3.3 Studies in America (1908-1912)

107 Lu 2013:30, 38-39.

108 However, in Zhu's biographical information sheet (*nianbiao*) from 2013, the same author writes that Zhu was admitted to the Academy in 1903 and that Zhu's revolutionary activities occurred afterwards, in 1904 and were just an interlude, after which in 1905, he successfully graduated from the preparatory course at the Academy. In the older *nianbiao* information sheet, published in 2008, Lu Yitai wrote that Zhu left the school before he was able to graduate in 1904 and devoted himself to revolutionary activities in Shanghai, without further mentioning his studies at the Jiangsu Higher Academy.

109 Chen and Chen 2008:22.

Getting to study in America was not easy, however, Chinese students were supported by the "Boxer Indemnity Fund", as Chen Zhaohong stated in his article.[110] Zhu Wenxin also needed the help of William Huggins, an American living in Suzhou, whom Zhu called his teacher in the description below the group photo mentioned above.

Zhu Wenxin was accepted into the University of Wisconsin in Madison and studied astronomy, mathematics and physics. This choice was motivated by his own interests and also by the interests of his father. Furthermore, this choice also conformed to the requirements of the Imperial Court. Chen Zhaohong referred to an imperial edict that restricted the majors of the *four fifths* of publicly funded students abroad under the Boxer Indemnity Fund to "physical, industrial, agricultural and commercial" subjects.[111]

While studying in the US, two of Zhu Wenxin's teachers became his main mentors. The first of these, George Cary Comstock (1855-1934) was an American astronomer and educator, a co-founder of the American Astronomical Society (1897) and the author of many articles published in scientific journals as well as several textbooks on astronomy such as *A Text-book of Astronomy* (1901) or *Studies in Spherical and Practical Astronomy* (1895).[112] Unlike the other mentor, Professor Comstock's name has appeared in all biographies on Zhu Wenxin.

The second mentor was Edward Burr Van Vleck (1863-1943), an American mathematician whose name has appeared only in the newer anthology from 2013 written for the 130th anniversary of Zhu Wenxin's birth, after new archival materials were discovered.[113] According to online sources, Van Vleck later became president of the American Mathematical Society (in 1913) and was the author of *Theory of Divergent Series and Algebraic Continued Fractions* published in 1903. His son John Hasbrouck Van Vleck was an outstanding physicist who won the Nobel Prize in 1977.

110 Chen and Chen 2008:11. Boxer Indemnity Fund was a result of negotiations between the Qing imperial government and the American government that made possible the use of war compensation for the studies of Chinese students in America.

111 Chen and Chen 2008:14.

112 For more details on Professor Comstock, refer to Stebbins, Joel. *Biographical Memoir of George Cary Comstock*. National Academy of Sciences of the USA, Biographical Memoirs Vol. 20 No. 5., 1938.

113 These include photos and other materials mainly from the US that were not available to the editors of the previous anthology for the 120th anniversary in 2008. Among these, there is a portrait photo of E. B. Van Vleck with Zhu Wenxin's hand writing and Van Vleck's handwritten best wishes..

Among archive materials newly reprinted in 2013, there is also a program of a student colloquium event which included "Tsu Wen Shion from Soochow, China" (Zhu Wenxin) and the presentation of his thesis *On the systems of Tangent Circles: Mathematics is a science of necessary conclusion.* In it was also his English nickname "*Sametze*" which however does not seem to appear anywhere else.

In 1910, during his studies in America, Zhu Wenxin became chairman of the US Chinese Students' Association, according to mentions in several papers which were included in both anthologies from 2008 and 2013. However the reprinted archival documents prove only his membership of the *Chinese Students' Club* at his university.[114] The newly found newspaper article from March 8th, 1910 stated that on the previous day Zhu was elected treasurer of *The Chinese Students' Club at the University of Wisconsin*. No mention of him being the chairman and no explicit mention that the Club covered the whole of the US.[115]

During that time, Zhu Wenxin also joined the American Mathematical Society and the American Astronomical Society, as stated in the secondary sources, the anthologies.

While in America, Zhu also started his publication activities. Unfortunately to date, it has not been possible to confirm the exact wording of the English titles of his two works published in the US at that time. In spite of the fact that these two works were written in English, both anthologies provided only the Chinese versions of the titles and the publisher information. The first was the *History of Education in China* (?) 中國教育史 published by the University of Wisconsin Press, the second was *A Key to the Solution of Pappus Tangent Circles Problem* (?) 攀巴斯奇題解, published by the American Mathematical Society. Pappus of Alexandria (c. 290 - c. 350) was one of the great Greek mathematicians of antiquity. However, a colleague that helped this author with his inquiries at the archives of the University of Wisconsin and its publishing house was not able to find anything and neither were the American Astronomical nor the Mathematical Societies able to locate either of these works.

Zhu Wenxin's graduation ceremony was held on June 19, 1912. Zhu spent the last year of his study at the University of Wisconsin as a teaching assistant all the while preparing

114 Lu 2013:8.

115 The article mentioned Chinese students from different U S universities as members of the Club, however it is obvious that they were students of the University of Wisconsin at the time of publication, as they switched from other universities to University of Winsconsin - Madison.

his astronomical work *Resurvey of the Charles Messier Objects Catalogue*, which featured 103 brightest deep-sky objects (stellar clusters, nebulae and galaxies) now widely known by amateur astronomers. He was probably not able to finish this work in America, so the work was published in China many years later in two editions, *Resurvey of the Messier Catalogue* 梅氏表之腹測 (1930, Jiangsu Land Office) and *Records of the Observations of Stellar Clusters and Nebulae* 星團星雲實測錄 (1934, Commercial Press). The access to the nearby Yerkes Observatory, founded in 1897 by astronomer George E. Hale and financed by businessman Charles T. Yerkes and later operated by the University of Chicago enabled Zhu Wenxin to conduct this research. Yerkes Observatory was equipped with one of the largest telescopes in the world at that time, the 40-inch (100 cm) refractor allowing observers to make world class research with a very high degree of precision.

Zhu Wenxin moved back to China in 1912. Several papers in both anthologies from 2008 and 2013 all emphasise that it was because of his patriotic feelings. The last imperial dynasty, the Qing dynasty had been overthrown and the Republic had been established, so many Chinese students abroad felt that they should use their skills and knowledge to help in the development of their motherland and also returned home.

Can the traces of Zhu's interest in the history of Chinese astronomy be found already in the research he conducted during his studies in America? His work *Records of the Observations of Stellar Clusters and Nebulae* 星團星雲實測錄 (1934) is based on what he had started and was able to work out to a large extent while in America (under the title *Resurvey of the Messier Catalogue*). Although basically intended as a summary of modern astrophysical knowledge concerning the 103 Messier objects (stellar clusters, nebulae and galaxies)[116], the work also includes a lot of historical data related especially to Western astronomy. The Messier catalogue itself was first published in 1771. Later in 1781 it was extended from the original 45 objects to 103 objects, with further amendments made in the early 1920s. Besides the history of Western astronomy, the work also contains some links to the history of Chinese astronomy. If a couple of well-known objects visible to the naked eye are checked, for instance M31 (Andromeda Galaxy) and M45 (Pleiades), quotations from the *Tianguan shu* (Book on Heavenly Officials by Sima Qian 135-86 BC) and *Han shu* (The History of the Han Dynasty, 205 BC- 9 AD) can be read respectively, as giving an account of

116 The original purpose of the Messier Catalogue was to provide a tool for observers to distinguish between quickly moving comets and 'non-comets' or comet-like fixed objects.

how these objects were viewed in China, what they were called, etc. However, it is questionable whether this historical content related to China had already been written by Zhu in America or was added later. Zhu's interest in the history of Chinese astronomy might have already been present, but not as strongly as in the 1920s and 1930s.

2.3.4 Teaching Activity in China (1912-1927)

When exactly Zhu Wenxin returned to China is not clear, but it must have been after his graduation ceremony in June 1912 and before August of the same year[117], when he is thought to have started teaching at the Hunan Public Industrial Specialised School in Changsha. Lu Yitai mentions that upon his arrival in Shanghai,[118] his younger uncle Ye Chucang recommended him for membership of the *Tongmenghui* (translated as The United League or [Chinese] Revolutionary Alliance) that had once been a secret resistance and revolutionary organisation with which both Zhu and Ye had been in contact with earlier and which was a forerunner of the Nationalist Party (*Guomindang*) into which it transformed itself later that year. Lu also states that Zhu worked for a short time as the editor of *Taipingyang bao* 太平洋報 (The Pacific Times) before moving to Changsha.

However after six months, in February 1913, Zhu was entrusted by Lin Zhaoxi 林兆禧 (an overseas Chinese, further details on him are unfortunately unavailable) to administer the Nanyang School of Communications and Mining *Nanyang lukuang xuexiao* 南洋路礦學校 in Shanghai. He was named headmaster of this school. The first civil engineers graduated at the school in 1915. At the time, as an expression of praise for the school's achievements, the founder of the Chinese republic Dr. Sun Yat-sen gave the school an inscription "Build roads [in order to] save the country" 造路救國 in his own calligraphy. This was the elites' symbolic way of expressing their endeavour for China's modernisation. The list of schools where Zhu taught during this period will be given in a table at the end of this sub section.

In 1913, Zhu married his second wife Cheng Lingyi 程令彝 (1894-1969). His first wife Wang Zhiyi had died in 1910 of an incurable illness. Cheng gave birth to their three daughters Zhangsheng 朱章聖 (1915-2003), Meilian 朱美漣 (1922-?) and Meiyi 朱美漪

117 Ye et al. 2014:77 stated that Zhu had already returned to China in February 1912. This is in disagreement with other secondary sources and given the time sequence of other events such as his graduation ceremony, rather improbable.

118 Lu 2013:39.

(1923-2013) and sons Zhangheng 朱章亨 (1918-1941), Zhangjing 朱章京 (who died very young) and Zhangliang 朱章亮 (1924-?). Altogether Zhu had eight children, which included his son from his first marriage and the second son from his first marriage who was adopted by his younger brother's family after his birth and after his mother, Zhu's first wife died while Zhu was still abroad.

In 1915, Zhu Wenxin's publication activity continued, concentrating however more on mathematics than astronomy and predominantly in the form of textbooks. He published *Differential Equations* 微分方程式 (Commercial Press 1915, Shanghai in English) and *Graphic Algebra* 圖解代數 (Nanyang School of Communications and Mining 1915, Shanghai).

Attention will now turn to Zhu Wenxin's social activities connected with the endeavour of modernising and strengthening the role of science during this period.

In October 1915, an event happened that influenced many intellectuals who were striving for China's modernisation, including Zhu Wenxin. Ren Hongjun 任鴻雋 (1886-1961), Zhao Yuanren 趙元任 (1892-1982), Hu Mingfu 胡明復 (1891-1927), Hu Shi 胡适 (1891-1962) and other intellectuals established The Science Society of China (*Zhongguo Kexue she*, or just *Kexue she* 中國科學社 at Cornell University in the United States. The Science Society originally functioned in the form of a stock company whose members made investments based on their financial circumstances and who earned income from its publications.[119] The Society was the first Chinese scientific society and played the role of a platform for the scientists (all of them had initially studied abroad), in order to popularise scientific research and to increase the influence of science in China. Its main activity was publishing the journal called *Science* (or *Kexue* 科學, also known under another transcription as *K'o Hsüeh*).

After this society set up its headquarters in Shanghai (in 1918 the headquarters moved to Nanjing), Zhu Wenxin joined it on February 26, 1919. He was both an active contributor of the *Kexue* journal and a regular member.[120] He wrote the article *An Argument on the*

119 Zhang 2005:48-51.

120 Kexue 4 (2): 204.

Secondary Education of Mathematics 中等教育算学通论 for the second number of the fifth volume (1920).[121]

Zhang Jian mentioned four significant astronomers who were members of the *Science Society* in 1920s, Zhu Wenxin being among them, alongside Gao Lu 高鲁 (1877-1947), Zhang Yun 張云 (1896-1958) and Yu Qingsong 余青松 (1897-1978), adding that all of them were among its most enthusiastic members. Even though it has to be borne in mind that at that time, there were only a few professional astronomers by training in China, maybe only around three dozen individuals in the 1930s and 1940s,[122] and in the 1920s even less than that, this statement reveals that he was considered important.

Between the years 1919 and 1921, Zhu Wenxin also acted as general secretary of the National American and European Students Association 全國歐美同學會 which was for Chinese students who had studied in these countries[123]. Dr. Sun Yat-sen paid a lot of attention to this organisation and personally supported its activities as we can see from a group photo from a hotel in Shanghai, where Dr. Sun Yat-sen and Cai Yuanpei chaired a large table under the 'banner' of Cornell University with several dozen Association members seated around, including Zhu Wenxin sitting in the corner.[124]

In 1923, Ye Chucang also recommended his elder nephew Zhu Wenxin to another progressive organisation called the New South Society *Xin nan she* 新南社.[125] This society was founded on the remnants of the South Society 南社 which had been a literary society established in 1909, was closely connected with the *Tongmenghui* and which had participated in anti-Qing activities. That society was eventually dissolved in 1923 and then re-established with the modified name of New South Society.

Zhu's membership in all these societies and associations illustrates that besides his teaching duties he was socially very active and he kept close to the intellectual circles that strove for China's modernisation, for the scientific approach, and which aimed at broadening

121 Kexue 5 (2).

122 Zhang 2005: 298.

123 According to a reprinted archival document in Lu 2013:14 from 1920, the chairman of the Association was Cai Yuanpei. Zhu Wenxin is listed after the chairman and two vice-chairmen as the fourth highest functionary.

124 Lu 2013: 13

125 Chen and Chen 2008: 15.

the impact of science on Chinese society. He was also politically close to the *Tongmenghui* and its successor *Guomindang*, respectively, and promoted their policies, which can be characterised and shortly summarised by Dr. Sun Yat-sen's Three Principles of the People: nationalism, democracy and people's livelihood.

Among the important activities from Zhu Wenxin's life during this period, mention should also be made of his parallel teaching at Shanghai Industrial Technical School of the Ministry of Communications 交通部上海工業專門學校 (or Nanyang Polytechnic),[126] a predecessor to today's University of Communications (*Jiaotong daxue* 交通大學).

According to the archive materials from the University of Communications that this author accessed in March 2015, Zhu started to teach there in September 1915 (4th year of the Republic) and left the school in December 1921 (10th year of the Republic). He was called professor of mathematics in this document which listed teachers that had already left the school.[127] The more concrete archive document from 1922 stated explicitly that he taught trigonometry and higher algebra.[128] The other documents provide several of his residential addresses as well as phone number details. Two documents- the registers of alumni - state that a long time after leaving the school, at the end of 1930 and start of 1931, he was either working at Jiangsu Province Land Office or as the director of the Land Office, respectively.[129]

In the anthologies to both of Zhu's birth anniversaries, the 120th and 130th, Zhu's special activity connected with this school was mentioned. In 1916, on the occasion of the 20th anniversary of the establishment of this school, he designed a memorial pavilion at its campus inspired by the *Book of Changes* and by western labyrinths. The university president Tang Wenzhi 唐文治 (1865-1954) named the pavilion *Panting* 槃亭. Five years later, Zhu Wenxin asked him to write the *Notes from Panting* 槃亭記 and according to Lu Yitai, Zhu Wenxin used the *hao* name *Panting* since then.[130]

126 This school was established in 1896 and was originally called Nanyang Polytechnic Public School *Nanyang gongxue* 南洋公學. Later it changed its name to Shanghai Industrial Technical School of the Ministry of Communications 交通部上海工業專門學校.

127 LS2-035, May 1st 1936.

128 LS2-050, March 1st 1922.

129 LS3-449, December 1st 1930, February 1st 1931.

130 Lu 2013: 32.

Another of Zhu Wenxin's parallel teaching duties was at the Fudan University in Shanghai 復旦大學, where he taught from 1917. From two Fudan University archive documents from the years 1918 and 1919 that this author was able to access in April 2015, it is revealed that Zhu taught infinitesimal calculus and higher algebra there.[131]

There was also another school in Shanghai connected with Zhu Wenxin's name. Zhu transformed the *Nanyang School of Communications and Mining* mentioned above into a larger institution in 1924, with an attached secondary school. The school was called the *Donghua University* 東華大學. The degree of the school's transformation is not fully evident from the sources. It seems that it was just renamed, some new curricula were added and the secondary school was established and attached. While Chen Zhaohong[132] wrote briefly that Zhu "established the Donghua University on the basis of Nanyang School of Communications and Mining", Lu Yitai simply wrote in the later anthology only that the school "was renamed, its civil engineering and business studies departments were established (商科) and the lower and higher secondary school were newly attached."[133] Zhu continued to be the head of this institution. However, the Donghua University was short-lived and as Lu Yitai stated, it ceased its activities in June 1927 "due to the difficulties with funding"[134]. Chen Zhaohong also mentioned that during this period Zhu's job was the chancellor of Donghua University and his intensive work on the history of Chinese astronomy started. Chen mentioned his unpublished work *Panting ping xiao ju ke qian Hanshu* 槃亭評校局刻前漢書 which contained Zhu's detailed comments on the astronomical chapters of the *History of the Former Han* (205 BC – 9 AD), adding that at the beginning of the 1920s, Zhu had already started to examine, reorganise and study the astronomical materials in the ancient historical literature. According to Chen, this can be proved by the stamp of the Donghua University President on the manuscript.[135] This seems to be proof that Zhu's activity in writing those works on Chinese traditional astronomy started at the latest in the mid 1920s, even before the political changes of 1927. This timeframe coincided with the efforts of Gu Jiegang and Hu Shi to "reorganise

131 Two archive documents dated December of the seventh (1918) and eighth (1919) year of the Republic. The 1919 document lists both infinitesimal calculus and higher algebra. The 1918 document was reprinted in Lu 2013: 15.

132 Chen and Chen 2008:15.

133 Lu 2013:32.

134 Lu 2013:40.

135 Chen and Chen 2008:15,19.

the national past" and Zhu must have been influenced by these efforts and decided to bring the spirit of systematic and scientific attitude also to the historiography of astronomy. However, it can be assumed that this activity can be considered a primary manifestation of Zhu's interest and the influence of the intellectual environment was secondary.

The year 1927 was another turning point in Zhu Wenxin's career. He left his remaining teaching posts and relied again on the help of his younger uncle Ye Chucang.

Table: Zhu Wenxin's Teaching Positions (1912-1927)

Institution	**Position, subjects taught**	**Time period**
Hunan Public Industrial Specialised School in Changsha (長沙湖南公立工業專門學校)	Teacher of mathematics	Aug 1912 – Jan 1913
Nanyang School of Communications and Mining (南洋路礦學校), later Donghua University	Headmaster, teacher of mathematics	Feb 1913 - 1924
Shanghai Industrial Technical School of the Ministry of Communications (交通部上海工業專門學校), earlier called Nanyang Polytechnic (南洋公學), now University of Communications	Teacher of trigonometry, higher algebra	Sep 1915 – Dec 1921 (archive document LS2-035, 1936) Jul 1916 – Dec 1924 (according to Lu 2013: 39.)
Fudan University 復旦大學	Teacher of infinitesimal calculus, higher algebra	Aug 1917 – Jul 1920
Kaiming Girls' School 開明	Teacher of mathematics	Aug 1913 – Jun 1925

女學 (according to Lu Yitai in Chen and Chen 2008: 22.)

2.3.5 The Period of Participation in Politics (1927-1939)

In 1927, after the *Guomindang* government established its capital in Nanjing, Zhu Wenxin abandoned his teaching duties and entered the world of political administration. He served in several politically nominated official posts, the most important of which were the Head of Jiangsu Province Land Office 江蘇省土地局局長 (1930-1933) and the *Special* Secretary of the Central Political Committee (of the *Guomindang*) 中央政治會議特務秘書 (1933-1935). The list of Zhu's official posts is outlined below.

Position	**Period (if available)**
Jiangsu Construction Bureau Secretary and Section Chief of the 1st Department 江蘇省建設厤秘書兼第一科科長	Jun 1927 – 1928 (or 1930?)
Member of the Investigation Committee under the Central Executive Committee of GMD, Shanghai Interim Political Conference and Shanghai Internal Local Institutions 國民黨中央執行委員會上海臨時政治會議上海市內地方機關調查委員會會員	1927 – 1928 (or 1930?)
Member of the Technological Committee of the Yangtze River 揚子江技術委員會委員	1927 – 1928 (or 1930?)
Compiler and Project Director of the	Dec 1928 – Dec 1931

Compilation Committee of Jiangsu Annals 江蘇通志編纂委員會編纂兼總務主任	
Director of Jiangsu Province Land Office 江蘇省土地局局長	Jun 1930 – Aug 1933
Member of the Board of Trustees of the Suzhou Specialized Fine Arts School 蘇州美術專科學校校董	Aug 1932 - ?
Special Secretary of the Central Political Conference 中央政治會議特務秘書	Dec 1933 – Dec 1935
Member and Secretary of the Transportation Special Sub-committee of the Central Political Committee 中央政治委員會交通專門委員會委員兼秘書	Dec 1933 – Dec 1935

According to Chen Zhaohong, Zhu's participation in the world of political administration was connected with his joining the New South Society (*Xin nan she,* mentioned above), but of course, the most important element which made it happen was the recommendations of his younger uncle Ye Chucang, since Ye was repeatedly promoted in the GMD hierarchy at that time.[136]

These official positions were due to their often technical nature suitable to a specialist such as Zhu Wenxin. Chen mentioned that when serving as the head of the Land Office, Zhu brought up many geodesists and improved their methods of land surveys employing modern technologies based on astronomical measurements.[137] In 1930, the Jiangsu Land Office also published his *Resurvey of Charles Messier Catalogue Objects*.

Zhu's biographers have also devoted special attention to his role in the compilation of Jiangsu local annals. In 1928, the Suzhou Library initiated their third compilation of these annals and formed a group of sixteen compilers with Zhu named as their head. Zhu also

136 Chen and Chen 2008:15, 19. In 1926 Ye Chucang was promoted to the post of the GMD Central Executive Committee Secretary, in 1928 he became the leading member of the Party matters in Jiangsu Province, in 1930 he became the Chairman of the Jiangsu Provincial Government (Governor?).

137 Chen and Chen 2008:15.

compiled the astronomical component of the annals, but it was unfortunately lost, the whole chapter concerning astronomy was not published, only its original preface appeared in his *Archeoastronomical Annals* 天文考古錄 (1931) and turned into the book's appendix.[138]

He was also very active in the Chinese Astronomical Society (CAS) in this period and held important posts there too. He was elected member of the Society Board and secretary and held these two positions from CAS's sixth annual meeting in 1928 until the 13th annual meeting in 1935. He became member of the committee for the creation and translation of astronomical nomenclature and terminology at the time of the eighth annual meeting in 1930. This committee had 13 members[139] and their efforts resulted in a publication of which he was co-editor called *Astronomical Terminology* 天文學名詞, published by the Ministry of Education in 1933.

World astrophysics at this time was developing very fast. Original terminology of traditional astronomy already existed, however due to the traditional and purely positional character of this science in China which was without any elements of modern astrophysics (no physics or physical chemistry) included in it, a huge portion of new Chinese terminology was urgently needed. This was similar to the case of other sciences, as the Chinese scientific elite hoped that their country could catch up with the West one day.

Zhu was active in the Astronomical Society until his death and he acted as member of the editorial committee of the CAS from May 1936, besides his work in the committee for astronomical terminology. The CAS elected him "permanent board member" 永久委員 in 1939, shortly before his death.

In 1938 Zhu had a stroke but continued his work as the symptoms of the disease tended to come and go. His illness worsened severely in May of the following year and on May 15, 1939 Zhu Wenxin died in Shanghai.

2.3.6 Zhu Wenxin's Works from this Period (1927-1939) and his Scientific Approach

The period of Zhu's official and political activities (1927-1939) was at the same time the period of his highest publication activity and also the period when the majority of his

138 Lu 2013:41. Chen and Chen 2008:16.

139 According to Lu 2013:41, among the other members there were astronomers such as Gao Lu and Yu Qingsong.

significant works on the history of Chinese astronomy were published. He abandoned his teaching activities and his new official posts provided him with more temporal and local flexibility that allowed him to devote more time to writing. For instance, Lu Yitai has stated that in the year 1927 he moved to Suzhou, because "there were too many social duties in Shanghai that prevented him from doing his research".[140] He must have frequently travelled between Suzhou, Shanghai and Nanjing where the central and provincial official institutions were seated.

Actually, his interest in the history of Chinese astronomy might have already appeared during his studies in America. His *Resurvey of Charles Messier Catalogue Objects*, the larger part of which he probably wrote in Wisconsin, already contained some references to the Chinese astronomical tradition as has been mentioned above. However, it cannot be proven whether or not this content was added later, when Zhu eventually published this work in 1930 and 1934.

Another activity proving of interest prior to this period was his unpublished research on the astronomical chapters of the Han dynasty history, where Chen Zhaohong, as also discussed above found the stamp of the Chancellor of the Donghua University which did not exist after June 1927. In addition, his first two larger historical publications, the *Textual and Map Research of the Fixed Stars in the Book on Celestial Officials of the Records of the Grand Historian* 史記天官書恆星圖考 and *Archeoastronomical Records* 天文考古錄 were prepared and published shortly prior to this period, in 1927.[141]

Both publications used modern scientific methods for the analysis of historical material. The *Textual and Map Research (...)* concentrated on one concrete historical work, the 2000 year old *Book on Celestial Officials* (*Tianguan shu*) by Sima Qian and a part of his *Records of the Grand Historian*. Dealing with the identification of its stars and plotting their maps, the book also concentrated on explaining, identifying and depicting other celestial objects which were visible with the naked eye and which were included in the *Tianguan shu*, such as the *Pleiades* open cluster or other bright nebulae (and galaxies). This book as well as the one that followed next represented a new systematic scientific approach.

140 Lu 2013:41.

141 One of the prefaces of the *Textual and Map Research…* was dated as being written in winter of the previous year 1926.

The *Archeoastronomical Records* presented the history of Chinese and Western astronomy in separate chapters with large fact sheets after each section. The large fact sheets are organised into rows dedicated to individuals, the development of the *tianwen* and *lifa* (astrology and astronomy), instruments and theories as well as columns for various periods. The textual parts offer a periodisation of both astronomical traditions of China and the West based on different criteria. This is a manifestation of the systematic and scientific approach. However, the same cannot be said of its pursuit of objectivity. In the work Zhu repeatedly wrote that the history of Western astronomy started practically in the 16th century, underlining that this was the dividing period, before which Chinese astronomy was more developed and after which Western astronomy prevailed.[142] However, just a couple of sentences later he started writing about Hipparchus and Ptolemy. Nonetheless, the text was written this way in a re-edition from 1980 printed in Taiwan - the 1927 edition was marked as a *preliminary collection* 初集 by Chen Zhaohong.[143] It cannot be determined whether the text was modified significantly in the 1933 edition that followed. His two texts, *The Observations of Halley's Comet in Chinese History* (which will be discussed later) and *The Statistics of the Historical Solar Eclipses* that were both published separately later in the journal *Popular Astronomy* in America in 1934 in English and in the *Journal of the Chinese Astronomical Society* in 1929 and 1930 in Chinese, were also included in this monograph as chapters.

This seems to be in accordance with the premise of this thesis that nationalist overtones caused a deviation in historiographical works from the principles of objectivity in this period, although the deviation was still not as significant as after 1935 when the biggest wave of constructing a sino-centric cultural theory occurred, in reaction to the Japanese annexation of Manchuria and other Japanese military actions, as was discussed in Chapter 2.2.1. Zhu Wenxin experienced the Japanese military campaigns himself in the beginning of the year 1932 when the *January 28th Incident* (also known as *Shanghai Incident* or 一•二八事變) broke out. During bombing, Zhu's manuscript of *A Resurvey of Charles Messier Catalogue Objects* that he had already handed to the *Commercial Press* 商務印書館 in Shanghai was burnt and he had to prepare the work for publication again.[144]

142 綜觀西洋天文史。自十六世紀起。Zhu 1980:21.

143 Chen and Chen 2008:25.

144 Lu 2013: 41.

In 1934, Zhu published an 11 page English language paper in *Popular Astronomy*, titled *The Observations of Halley's Comet in Chinese History*.[145] The Chinese version on the basis of which Zhu translated and modified the English edition (as can be seen from the same structure but slightly different contents) was published in the *Journal of the Chinese Astronomical Society* 中國天文學會會報 in 1929.[146] This paper summarised all the records on the returns of Halley's Comet recorded in Chinese historical annals from 240 BC until the year 1910. The note from that year was extended to include Zhu's own observational experience from Washburn Observatory which belonged to the University of Wisconsin.[147]

Another important Zhu work is *A Study of Historical Solar Eclipses* 歷代日食考, published in 1934 by Shanghai's Commercial Press. This book is divided into chapters corresponding to Chinese historical dynastic periods. Each was given a short overview and a table. The general study at the beginning of the work prior to these chapters deals with the problems of calculating and recording solar eclipses in general and also more specifically in the Chinese tradition, where it examined the ability of the Chinese to predict these phenomena throughout history and mentioned also their astrological importance to the court. It referred to influential Western works in this field, such as Oppolzer's *Canon der Finsternisse*.[148] It did not make any comparison with the Western tradition, it simply stated that by the end of the Ming dynasty, Western computing methods started to be employed for prediction. The work surveyed the solar eclipses recorded in Chinese history and proved its use, in Zhu's own

145 *Popular Astronomy* (1929) 42: 191-201

146 *Zhongguo tianwen xuehui huibao* (1929) 6: 1-14,

147 Popular Astronomy, Aug. 1934, Vol. 42, p. 201. The full text of Zhu's record of 1910's is quite interesting, hence here is its full version: "The latest return of Halley's Comet in 1910 was the shortest period being about seventy-four and a half years from 1835. It was fortunately witnessed by the writer, when he was a student in the University of Wisconsin and took a general course in astronomy under Professor Comstock who was the director of Washburn Observatory and the Dean of the Graduate School of the University. In the evening of May 13 we saw a comet with a tail about 50 degrees. It was interesting to find the planet Venus shining by the side, and the comet was as bright as Venus. On May 17 it became a morning star its tail extending like the Milky Way across the heaven. On May 21, the Earth passed through the tail, there was no indication of it at all on our Earth. It is very interesting to find a statement in the Chronicle of Tan Yang, the city along the Shanghai Nanking Railway about 100 miles from Nanking, recording as follows: 'In the 4th month of the year (May 1910), a comet was seen and the meteors appeared like a weaving on the same night.' Though the author of the Chronicle did not care for the astronomical theories at all and the statement was very simple only to record the actual occurrence taking place at that time, but it was a strong evidence that Halley's Comet has a close relation to the Aquarids."

148 Theodor Egon Ritter von Oppolzer (1841 – 1886) was of Bohemian-German origin and was a professor of astronomy at the Vienna University. His Canon der Finsternisse was published by the Academy of Sciences in Vienna in 1887.

words, for historical and modern calendrical science, for astronomers examining irregularities in lunar motion and for historians' dating of events in the remote past.[149] This work was subsequently praised by Zhu's contemporaries and by his successors for its systematic nature, as will be discussed later in this chapter.

Even more important was Zhu Wenxin's work *Annals of Astronomical Systems* 曆法通志, published in 1934 also by the Commercial Press. It has already been discussed that it is perhaps more suitable to translate *li* (or *lifa*) as an '(astronomical) system' rather than a 'calendar'. These systems were much broader and worked with much more parameters, such as anomalistic and draconic months, cycles of planetary conjunctions, etc., which should prevent them from merely being called 'calendars'. Zhu's work provides quite a long account of the history of these systems (which is not free from references to mythical figures, at least at the beginning) which numbered over 100 in Chinese history. Zhu presented 102 systems in total. In a chapter called *History of the Systems' Evolution*, Zhu offered analysis of all the important events in their history, the individuals, their relationships and foreign influences. According to him, China did not catch up with the rapid development of astronomy in the West in the 19th century, as China's elite "buried their heads with eight-legged essays and poems" and "textual criticism has overcome previous generations, but astronomy has become lost knowledge".[150] The rest of the monograph is divided according to dynastic periods, and it contains many tables comparing parameters of the particular astronomical systems such as the values of anomalistic and draconic months or planetary cycles, the authors of the systems, etc. The work also includes tables on the width of lunar mansions in particular systems as well as a comparison of Chinese and Western methods of eclipse calculations and Chinese and Western division of the sky into twelve sectors (*ci* 次 in China and zodiacal signs in the West).

Three of Zhu Wenxin's works, the *Archeoastronomical Records*, *A Study of the Historical Solar Eclipses* and *Annals of Astronomical Systems* were his most highly rated works among his contemporaries and even among his successors for their modern scientific and systematic approach. Refer to the subsection 2.2.1.4, where the exact wording of what

149 Zhu 1934a: 114.

150 Zhu 1934b: 30. 十九世紀正西洋天學猛進之時。而我國學子。方埋頭於八股詩賦。(…) 考據之學。超越前代。而天文曆法。遂成絕學。

Gao Lu wrote in Zhu's obituary from 1940 is quoted.[151] He wrote in it that the methods of the systemisation of history as proposed by Gu Jiegang and other scholars could be roughly divided into five phases: *identification of forgeries*, *exploration* [of variant sources and their collation], the third being *annotation* [linguistic and historical], *systemisation*, and *exploration of the principal meaning*. According to Gao, the *Archeoastronomical Records* presented an annotation, *A Study of the Historical Solar Eclipses* was an example of systemisation while the *Annals of Astronomical Systems* represented an exploration of the principal meaning. In other words, Gao Lu stated that these three works of Zhu's fit best into the aims of the efforts of "reorganisation of national past".

Subsequent modern historians of traditional Chinese astronomy such as Xi Zezong 席泽宗 (1927-2008)[152] who will be discussed in more detail later in one of the following chapters and Ho Peng Yoke 何丙郁 (1926-2014)[153] both identically highlighted these three monographs as the best among all of the works Zhu had written, adding to them only the *Textual and Map Research of the Fixed Stars in the Book on Celestial Officials of the Records of the Grand Historian* (also mentioned above) as the fourth significant work.

In 1935, Zhu Wenxin published his two volume work *Short History of Astronomy* 天文学小史 in Shanghai's Commercial Press. This comprehensive, 200 page book will be discussed in much more detail in one of the next sections. A comparison will be made between its account of history in the most flourishing period of Chinese astronomy and another important work on the historiography of Chinese astronomy published in the period of the People's Republic of China, after the Cultural Revolution. In Zhu's *Short History of Astronomy* the most obvious influence of Sino-centric cultural construction can be seen among all his works. The time of its publication corresponded with the issue of the *Manifesto* by the *Guomindang* backed intellectuals in the beginning of the year 1935.[154] This book has a less analytical nature to it than the previous three or four main works and has quite a few tables, as it was aimed at the broader public. It is a fairly voluminous and significant Zhu work, but what is of note, neither Gao Lu in the obituary, nor Xi Zezong or Ho Peng Yoke in

151 YZ Vol. 10 No. 11 (1940): 151-152.

152 Wang et al. 1982: 10

153 Ho 1977: 23.

154 Discussed in more detail in section 2.1.

their short summaries of pre-war historiography of astronomy neither made any mention of this book at all or if given more space[155] ranked the book as secondary in their assessments when comparing it to the previously mentioned three or four works of Zhu. On the contrary, the biographic encyclopaedia of Chinese scientists called the *Overview of Academic Achievements of the 20th Century Famous Chinese Scientists: Astronomical Volume* 《20 世纪中国知名科学家学术成就概览》天文学卷 from 2014 rates Zhu's *Short History of Astronomy* as first among his works and gives it the most space.[156] This may be a sign of the re-evaluation of Sino-centric cultural construction in that period.

The last significant work of Zhu's published during his life was the translation of an edition of eight lectures by H. C. Macpherson on cosmology from the years 1928 and 1929 that he had given at the Royal Technical College in Glasgow (now the University of Strathclyde).[157] Hector C. Macpherson (1888-1956) was a Scottish astronomer and a minister of the Church of Scotland.[158] His original book was titled *Modern Cosmologies: A Historical Sketch of Researches and Theories Concerning the Structure of the Universe*.[159] Zhu's translation was abbreviated to just *Modern Cosmologies* 近世宇宙论 and was first published in 1935 by the Commercial Press in Shanghai. This work can be regarded as a short history of cosmology, as it discusses geocentrism, heliocentrism, the structure of the Galaxy and the theories of the finite Universe, chronologically.

A final brief mention should be made of one of Zhu's works which was published posthumously, in the *Science Publishing House* (科学出版社) in 1965. It was *A Study of Complete Astronomical Annals of the Seventeen Dynastic Histories* 十七史天文諸志之研究. The book is divided in two volumes. The first volume presented chronologically the characteristics of the Astronomical Annals of all the seventeen dynasties, described how they were organised and what of importance was to be found in them. The second volume is chronological again, but it focused more on specific interesting problems of most of the

155 Xi Zezong's article on Zhu Wenxin in Chen and Chen 2008: 157-160.

156 Ye et al. 2014:76-86.

157 In 1956 it switched its name to the Royal College of the Science and Technology, in 1964 it gained the university status and renamed to the University of Strathclyde.

158 Macpherson studied theology, first became a minister for the United Free Church of Scotland that merged with the Church of Scotland in 1929.

159 London: Oxford University Press 1929.

periods, for instance the context and the problem of non-dissemination of the *Xuanye* theory 宣夜說 (the intuitive progressive theory advocating the vast and empty space and motion of the celestial bodies powered by *qi*) in the Period of Disunion (3rd to 6th century CE). As well as on mistaking lunar and solar eclipses during the Five Dynasties (10th century CE) or on Su Song's work *Xin yixiang fayao* 新儀象法要 (On the New Components of the Armillary Sphere and Globe) concerning his astronomical tower from the 10th century.

All of Zhu Wenxin's works, both published and unpublished are listed in a table in the Appendix.

Zhu Wenxin was a strong and very important personality of the historiography of Chinese astronomy and its most prolific author in the period before the war. His successors called him "an important astronomer of the formation stage of modern Chinese astronomy" and "a pioneer of research of the history of Chinese astronomy in the modern meaning".[160]At the same time, he was also a significant figure in the educational, social and political life of pre-war Republic of China. Of course, he was to some extent influenced by the old ways of writing history, employed by the pre republican scholars accustomed to the methods of *evidential scholarship.* However generally even though he also mentioned mythical emperors in some of his works, he strove for a modern scientific approach to the research of the history of astronomy. Xi Zezong characterised Zhu's key contribution as "the use of modern astronomical knowledge for the research of ancient Chinese astronomy".[161] This can be clearly seen, for instance, in Zhu's reconstructions of the parameters of ancient Chinese astronomical systems in his *Annals(...)* or the use of modern methods and terminology in the identification of heavenly objects in the *Book on Celestial Officials* in his *Textual and Map Research(...)*.

It is not known to this author whether Zhu explicitly mentioned anywhere in his works that his methods should conform to Gu Jiegang's and other scholars' efforts for "reorganisation of the national past". However, his contemporaries like Gao Lu praised him for doing so, at least in particular parts of Zhu's works. If Zhu's personal history and social contacts are considered, it must be assumed that Zhu was not isolated and that this revolutionary and later nationalist environment must have had an influence on him. Given his

160 The first assessment was given by Wang Shouguan 王绶琯 (born 1923), a pioneer of Chinese radio astronomy, the second by Xi Zezong 席泽宗 (1927-2008), the most significant historian of Chinese astronomy in the People's Republic of China in the 20th century. Chen and Chen 2008:161.

161 Chen and Chen 2008:157.

close ties with the *Guomindang* through his younger uncle Ye Chucang, manifested by his numerous official posts in the later period of his life, it is clear that he must have followed the *Guomindang* party's cultural policy and personally participated in the construction of the Sino-centric cultural tradition which had been stimulated by the preceding Japanese aggression.

2.4 Zhu Wenxin's "Short History of Astronomy"

A large chapter of this monograph from 1935 will be compared to the corresponding chapters in the *History of Chinese Astronomy* (*Zhongguo tianwenxue shi*) by Li et al. (1981) in another part of this thesis. That chapter is devoted to the most significant and flourishing period in Chinese astronomy which lasted more than a thousand years (the Tang, Song, Yuan and Ming dynasties, spanning from the beginning of 7th century to the mid-17th century CE). Therefore, Zhu's monograph as a whole also deserves a short specialised section devoted to it. This monograph was published in 1935, after he had already published some of his more extensive works on particular topics of focus (see Chapter 2.3). These works provided a foundation for this monograph and this could also be the reason why the monograph acted as a quasi overall 'summary' of his research up to that point. In this monograph, one can find many examples of that Sino-centric style of writing which was designed to stimulate a national self-confidence and which was outlined in the introduction as one of the central themes.

Its structure, resources, scientific approach, how and why this monograph deviated from the new principles of writing historiography as well as how its popularising character related to its target audience (the public) will be discussed here.

Given the complexity of its topic - the history of astronomy, the book is not long, it has only 262 pages. The word *xiao shi* 小史 in the title even means a *short* or *little* history, therefore the book was not meant as very comprehensive overview. It does not contain any pictures or diagrams and only a few tables unlike Zhu Wenxin's other works. It does not include in-depth analysis, its apparent aim is to popularise the subject of the history of astronomy and to encourage national awareness. However, this does not diminish the significance of Zhu Wenxin's *Short History of Astronomy* as the first book of such a scope written by a Chinese person on the history of astronomy in line with contemporary Western scholarship.

2.4.1 Structure and Resources

The book was published in 1935 in two volumes by the Commercial Press (Shangwu yinshuguan 商務印書館) in Shanghai under the title *A Short History of Astronomy* (*Tianwenxue xiao shi* 天文學小史). The first volume is called *The History of Ancient Astronomy* (*Gu tianwenxue shi* 古天文學史) and the second *The History of New Astronomy*

(*Xin tianwenxue shi* 新天文學史). Zhu understood the 16th century as the transitional period between 'ancient' and 'new' astronomy, as he wrote in his foreword. What was before the 16th century belonged to 'ancient astronomy' and what came afterwards was 'new astronomy'.[162] In the 16th century, the process of a gradual radical change in the perception and understanding of the Universe started in the West. Zhu stressed that this new period in the history of astronomy was marked by the beginning of the era of *theoretical astronomy* that was represented by the formulation of the laws of planetary motion by Johannes Kepler (1571-1630) and later also by the universal gravity law of Isaac Newton (1642-1726). According to Zhu, the advent of theoretical astronomy was made possible by the appearance of the *heliocentric theories* of Nicolaus Copernicus (1473-1543) that were followed by the invention of the telescope by Johann Lippershey (1570-1619) and its first astronomical use by Galileo Galilei (1564-1642) which introduced the era of telescopic astronomy.

As the table of contents is quite short and it illustrates the structure of the book very well, it is listed here in its entirety:

Volume 1: The History of Ancient Astronomy

Foreword: The Origin and Development of Astronomy (10 pages)

History of Chinese Astronomy (48 pages)

1. From Tangyu to Zhou and Qin
2. Two [Periods of] Han
3. Wei, Jin and Southern and Northern Dynasties
4. Tang, Song, Yuan and Ming

History of Western Astronomy (62 pages)

1. Babylon
2. Egypt
3. Greece
4. Rome

162 Zhu 1935:9.

5. India
6. Arabia
7. Western Territories
8. Western Europe

Volume 2: The History of New Astronomy

1. The History of Astronomy in the 16th Century (19 pages)
2. The History of Astronomy in the 17th Century (32 pages)
3. The History of Astronomy in the 18th Century (33 pages)
4. The History of Astronomy in the 19th Century (22 pages)
5. The History of Astronomy in the 20th Century (11 pages)

Transcribed Table of Foreign Personal Names

Transcribed Table of Foreign Local Names

The book is 262 pages long. The history is retold chronologically in the first large section devoted to Chinese astronomy, while in the section devoted to ancient Western astronomy, various civilisations were covered one by one. Traditional Chinese astronomy was given about one quarter of the space of the whole monograph (a total of 46 pages in the original). In the second volume which was devoted to the 'new' astronomy, history was once again outlined chronologically and was divided only into chapters representing particular centuries with no subheadings highlighting particular areas or nations.

The monograph was written in simplified *wenyan* 文言, in a literary style of language based on the written idioms of the late Qing period with some added innovations in vocabulary and a more regular sentence structure. The frequent use of parallelisms is also typical of this style. However, this language differs in its regularity and vocabulary from the language of frequent quotes of astronomical chapters of the dynastic histories and the quotes from the Classics that also sometimes appear in Zhu's text. Zhu's typical writing style is rather descriptive and factual.

As far as the large section on the history of Chinese astronomy is concerned, Zhu Wenxin's sources included mainly quotations from the dynastic histories, specifically their astronomical chapters. These chapters that were a part of almost every dynastic history were called either *Annals on Tones and Astronomical Systems* (*lüli zhi* 律曆志), or just *Books on Astronomical Systems* (*li shu* 曆書) or *Annals on Astronomical Systems* (*li zhi* 曆志). Zhu also used the Annals on Astrology (*tianwen zhi* 天文志) that many dynastic histories also contained and that listed heavenly events combined with their astrological interpretations (*omina*). To a lesser extent, especially in the introductory chapters, Zhu used earlier writings that had appeared prior to dynastic histories and their astronomical chapters, such as *The Treatise on Heavenly Offices* (*Tianguan shu* 天官書) and even the Classics from the pre-imperial period, such as *Master Lü's Spring and Autumn Annals* (*Lüshi chunqiu* 呂氏春秋), the *Book of Rites* (*Li ji* 禮記), *Book of Documents* (*Shang shu* 尚書) and also *The Commentary of Zuo* (*Zuozhuan* 左傳). Zhu's narration often followed the structure of these sources, especially in the case of the astronomical chapters in dynastic histories. Zhu's research on the history of astronomy was a long-term project during which he wrote many other books on specific aspects of Chinese astronomy that have already been discussed in section 2.3. He built on these foundations (*A Short History of Astronomy* was practically his last bigger historiographical work, in fact it was the second last one) and as can be seen from frequent references to his older publications, he also drew extensively on his previous works.

The sections on Western astronomy, regardless of whether ancient or modern (the whole of the second volume) were largely based on Western secondary sources written in English. For Zhu, the most significant source was *A Short History of Astronomy* by Arthur Berry (1862-1929) published in 1898. In the footnote at the end of the first volume,[163] he wrote that from Greek astronomy onwards, the section on ancient Western astronomy was written based on this book. Only the sections on Babylonian and Egyptian astronomy were based on other Western works.[164]

Even in the 2nd volume, it is evident that he was inspired by Berry's *Short History of Astronomy,* although the book's name does not appear as a reference anymore. Zhu wrote it

163 Zhu 1935:120.

164 For instance the sections Eclipses of Babylon and Egyptian Astronomy from Mitchell, S. A. *Eclipses of the Sun*. New York: Columbia University Press, 1923. Breasted, James Henry. *Development of Religion and Thought in Ancient Egypt*. New York: Charles Scribner's Sons, 1912.

on similar topics and the division of the structure in the volume based on particular centuries is also reminiscent of Berry's approach. Here, however, many other secondary sources were quoted. To highlight at least three other most significant ones, Agnes Mary Clerke's *Popular History of Astronomy During the Nineteenth Century* (1885, reprinted 1902), Harlow Shapley's *A Source Book on Astronomy* (1929) and George Ellery Hale's *New Heavens* (1922) deserve a mention.[165]

2.4.2 The Scientific Approach and Deviation from the New Ways of Writing Historiography

In the introduction, Zhu Wenxin wrote that we cannot divide astronomy into categories of ancient and new or foreign and Chinese and that astronomy represents only the laws that are laid down by nature such as:

> Why the Moon sometimes looks like a mirror and sometimes like a hook? Why the Sun is sometimes more to the north and sometimes more to the south?[166]

This belief in the universality of astronomy was a direct consequence of the adoption of modern scientific thinking.

In the following passage, he wrote on the mutual assistance between general history and the history of astronomy and about the significance of the history of astronomy in understanding the stages of evolution of mankind.

> Therefore we may confirm historical records using astronomy and [at the same time] we can turn to history to discover and understand astronomical observations. History of astronomy can be used to clarify the stages of human progress and the course of development of the celestial sciences.[167]

Below are two periodisations by Zhu of the history of astronomy based on different criteria which also represent a good example of a systematic approach to the classification of historical periods, though such classifications were likely directly inspired by modern western historiographic models:

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165 Other works include: Chauvenet, William. *A Manual of Spherical and Practical Astronomy.* Philadelphia: J. B. Lippincott & Company, 1891. Buchanan, Roberdeau. *The Mathematical Theory of Eclipses.* Philadelphia: J. B. Lippincott & Company, 1907.

166 Zhu 1935:1. PhD thesis author's translation. 天文之學，無分乎古今中外，而其間有一定之律也。月何以有時如鏡，有時如鈎。日何以有時極南，有時極北。

167 Zhu 1935:3. PhD thesis author's translation. 故歷史之紀載，得天文以證明之，而天文之觀測又藉歷史以闡發之。天文學歷史者，所以明人類進化之次第，天學發達之源流也。

1) Zhu Wenxin's periodisation based on observational methods

   - period of observing with the naked eye
   - period of telescopic astronomy (from 1609)
   - period of spectroscopic astronomy (from 19th century)

2) according to its history (based on calculated / theoretical methods)

   - the period of observational or practical astronomy
   - the period of gravitational or theoretical astronomy (from the 17th century – Kepler, Newton)
   - physical or natural science related astronomy (from 19th century onwards, incorporating physics, chemistry, etc.)

Although there are less stages in Zhu Wenxin's than in Gao Pingzi's periodization, (discussed in section 2.2.1.5), their concepts do not differ that much. However, Zhu Wenxin did not explicitly argue that Chinese astronomy did not enter the second stage (the third stage in Gao Pingzi's periodisation).

The following excerpt shows that he objected to superstition while at the same time he asserted that many ancient astronomical records were preserved because they formed a part of divination texts.

> In the 16th year of Duke Xi, in the first month and on the new moon, on *wushen* day, five meteorites fell in Song state; [as far as the ability to record a location and number of meteorites is concerned, it also begins in the Annals;] although people like Zi Shen, Pi Zao, the scribe Shi and the fortune-teller Zhao were only strong at judging auspicious signs and weak at predicting celestial phenomena, the progress of astronomical observations relied on [their activity], and the records in ancient histories are preserved [thanks to them], it is not possible to neglect them because they were followers of divination theories.[168]

However, Zhu's Short History of Astronomy quite heavily supported the Sino-centric view of the origins of astronomy. The following quote represents a certain category of historical arguments that have a tendency to prove the priority of Chinese astronomy

168 Zhu 1935:18-19. PhD thesis author's translation. 僖公十六年，正月戊申朔，隕石于宋五，則隕石之能書其而記其數者，亦自《春秋》始，當時梓慎、裨竈、史趙卜偃之徒，雖長於禨祥，短與推步，而天文之觀測，賴以促進，古史之紀載藉以保存，亦未可因佔驗之說而忽之。

indirectly by way of asserting the alleged cultural superiority of China in particular periods. This argumentation is concentrated mostly in Zhu Wenxin's foreword:

> By what was spread by fame and learning, the distant countries were honoured, therefore the West in Antiquity called China the Heavenly Court, as the Greek Ktesias mentioned in his work 400 years BCE, it roughly corresponds to the boundary between the Chunqiu and Warring States Periods. It is enough to prove that calendar makers at the end of Zhou Period had spread Chinese astronomy to those other countries, [that is how] they came to know the high [Chinese] civilisation and happened to revere it as the Heavenly Court.[169]

The following excerpt, also from the foreword, is of the same style:

> What was exported from China to the West in that time were rods [made of] mountain bamboo, cloth from Western Shu [now Sichuan Province] and a bit less brocade and silk, all of those belonged to skilful products manufactured by the people. Whereas Western contribution to China were Roman treasures, horses from Ferghana, tortoise shells, gold and silver, all of those belonged to natural products. The difference between the cultured [civilisation] and barbarians is clearly visible. (…) For instance, what was later called Roman science and art, would not be worth attention for China at the turn of Sui and Tang dynasties [6th to 10th century]. The technology of papermaking before the Tang and the methods of printing reached Western Europe through the Arabs and initiated the medieval civilization on the European continent.[170]

The argumentation presented in these passages ran in the following manner: China exported advanced products while it imported raw material from the West, therefore China was more culturally developed at that time (around 4th century BCE). China was more culturally developed and therefore it must have had more advanced astronomy that may have (but did not necessarily have to have) been exported to the West.

This argument is questionable.

However, which astronomical tradition influenced who first and whether any influence occurred in that period at all was the subject of many contemporary debates (for the debate among the Japanese historians of Chinese astronomy in the pre-war period see section 2.2.2). Modern scholars, such as David W. Pankenier support the idea that Chinese astronomy

169 Zhu 1935:4. PhD thesis author's translation. 聲教所播，遠國懷柔，故西方古時，稱中國為天朝，語載希臘人提細亞斯之著述，時在西元前四百年間，約值春秋戰國之際，足證周末疇人，有以中國天學，傳入彼邦，始知上國文明，致尊為天朝也。

170 Zhu 1935:5. PhD thesis author's translation. 況當時中國之輸入西方者，邛竹之仗，西蜀之布，以及錦繡絲絹，皆屬人造藝術之品；而西方之貢獻於中國者，大秦之寶，大宛之馬，以及玳瑁金銀，盡是天然生産之物，文野之分，顯然可見。(…)即如後世羅馬之所謂科學藝術，在隋唐之際，尚不值中國之一顧，唐以前中國造紙之術，印刷之法，由阿拉伯傳入歐西，始開中古歐陸之文明。

developed independently from any foreign traditions (including the Babylonian) in this early formative period, and vice versa, that China did not influence the Babylonian tradition.[171]

Another category was through the praise of China's brilliant ancient history which also included some self-reflection albeit sometimes as a basis for soul searching and then with an added comment that later in the course of history 'something had gone wrong' and China had fallen behind. This excerpt is from the first chapter:

> No country in the world has had such a complete long history of more than two thousand years. Moreover, astronomy developed [here] before the West. [Only because we] had become lax in the middle of the way, [we] fell behind the others and became backward. Later generations praised highly the Western teaching and detested and rejected the former knowledge, did not know [that they should] get to the root of the matter. [Eventually] it got to the stage that they [became] ignorant of the history of their own country.[172]

In this passage, the primacy of China in world astronomy was even underlined explicitly. Moreover, the need to turn to the national tradition and to the knowledge of the history of one's own country was stressed.

Zhu Wenxin also often anachronistically explained certain concepts as foreshadowing modern astronomy. For these explanations, another category of arguments to encourage the national consciousness could be established. The arguments set out in this category will be illustrated through the following two cases: the ancient Chinese concept of *space-time* as well as one of the three cosmological theories, *Xuan ye* 宣夜 (from the turn of 2nd and 1st centuries BCE), which described the universe as infinite and the motion of celestial bodies as freely floating in space powered by the energy *qi*.

Turning now to the ancient Chinese concept of *space-time* that was already mentioned by Zhu in the foreword.

> Where is the area for these laws [that astronomy represents]? This is called space. What is space? This is the place that astronomy occupies [or where astronomy happens]. Where are these laws used then? This is called time. What is time? This is the time period in which

171 Pankenier, David. W. (2014) Did Babylonian Astrology influence Chinese Astral Prognostication Xing Zhan Shu 星佔術? *Early China* (37):1-13.

172 Zhu 1935:12. This thesis author's own translation. 此二千餘年完整之歷史，為世界各國所無，天學之發達，亦西方之前，徒以中途廢弛，反落人后，後世推崇西學，厭棄前聞，不知探本而窮源，遂致數典而忘祖。

> astronomy occupies its place. Zhang Heng from the Later Han period wrote in his "Spiritual constitution" that "what is upward, below and in the four directions was called *yu*, the ancient times, the past, present and future were called *zhou*." *Yu* occupies the space, [while] *zhou* occupies the time. The concept of space-time has developed along with historical evolution. The boundaries of space-time have grown along with the progress of astronomy. Time and space are the main elements of astronomical observation and have a tight relationship. Zhang Heng's concept of *yu* and *zhou* and Einstein's theory of four dimensions are two thousand years from each other and their principles are tightly bound to each other, therefore the history of astronomy is [so] valuable![173]

Yuzhou 宇宙, the combination of both *yu* and *zhou*, is the modern Chinese word for "the Universe". In modern dictionaries of classical Chinese, the particular meanings of both correspond to what was written above.[174] The linking of this ancient concept of space-time with Einstein's modern theories may underline the intuitive approach of the Chinese scholars, however given the theoretical, mathematical and physical background needed for Einstein's theories, the claim is exaggerated.

The situation with the *Xuan ye* 宣夜 theory from the first chapter is similar:

> From that time [when the theory appeared], nobody concerned oneself with it [the *Xuanye* theory]. Eventually [they] were not able to study the cause of the movements and stops of heavenly bodies by the means of the mystical and omnipotent [energy] *qi*. [The task] was waiting for Newton who came after two thousand years and discovered the principles of gravitation and became the person who has rendered outstanding service to celestial mechanics, isn't it a pity?[175]

Here once again, the intuitive approach of Chinese scholars may have some value , but it must be taken into account that even this concept did not have any computational or

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173 Zhu 1935:1-2. This thesis author's own translation. 其範圍此定律者何在？曰空間。何謂空間？即天文學所佔地位之處。其應用此定律者又何在？曰時間。何謂時間？即天文學所佔地位之時。後漢張衡《靈憲》云"上下四方謂之宇，古往今來謂之宙"，宇佔空間，宙佔時間。時空之觀念，隨歷史之演進而發展，宇宙之界限，由天學之進步而擴張。時間與空間，為天文觀測之主要元素，有密切之關係。張衡之宇宙觀，與哀斯坦之四元論，上下二千年，有息息相關之理，於是天文學史尚矣。

174 According to *Gu Hanyu changyongzi zidian*: 宇: 1. the plaid (屋檐 wuyan), the part of roof exceeding the walls; 2. upward, below and four directions; 3. manners, appearance. 宙: from ancient times till today, relates to all the time.

175 Zhu 1935:23. PhD thesis author's translation. 從此無人過問，致不能以玄妙萬能之氣，推究其衆星行止之故，直待二千年后之牛頓，方發明引力之理，而為天體力學之功臣，豈不惜哉。

theoretical background and the *Xuanye* theory did not have any followers except for its creator Qie Meng 郄萌 (2nd – 1st century BCE).

Zhu Wenxin stressed how revolutionary these concepts were and regretted that similar concepts were fully developed only in the West. This kind of rhetoric supports the argument of this author mentioned in the introduction that it was the nationalist overtones which caused a deviation from new ways of writing history based on objectivity. Moreover, the rhetoric hinted at the fact that encouraging the national consciousness might very probably have been his main motivation for writing this monograph.

Similar arguments can be found on China's cultural superiority, the exaggerated explanations or claims of certain concepts as foreshadowing modern astronomy such as space-time and the *Xuanye* theory also in the works of Chen Zungui (discussed in section 2.5)

As far as the chapters devoted to Western astronomy (both ancient and modern) are concerned, these also refer to the Chinese astronomical tradition, though in fact not too frequently. Essentially Zhu chronicled the history of Western astronomy on its own and based on his Western secondary sources. From time to time, a reference to the history of Chinese astronomy appeared, commenting on whether the particular historical feature was or was not similar to China. Sometimes a short commentary appeared and highlighted the real or alleged primacy of Chinese astronomy in a particular field.

For instance, when Zhu was explaining ancient Greek Metonic (19 year) and Callipus (76 year) cycles, he found parallels with ancient Chinese *zhang* 章 and *bu* 蔀 cycles.

We can find more references to China in the section devoted to Indian astronomy. Zhu was consistent with what he had written in the foreword on Chinese cultural superiority and argued that much of the Chinese astronomical concepts, including the 28 lunar lodges had originated in China and were later transferred to India. As we have already mentioned in section 2.2.2, he underlined this argument with the authority of Shinjō's monograph *Researches in the History of the Far Eastern Astronomy*.[176]

Zhu also wrote a short section on Arab achievements in astronomy. According to him, mentions of Arabian achievements disappeared from the history of astronomy as early as in the 13th century. In his view, Arabs had not brought much innovation, but their instruments

176 Zhu 1935:100.

had been more precise than those in Greece and many astronomical terms, mathematical functions and star names had originated in Arabic. In the conclusion of this section, Zhu wrote: "Therefore Qing scholars, such as Mei Wending,[177] Qian Daxin[178] and others, all believed [that the] Arabs took over the [Chinese solution of higher equations with four roots] *si yuan shu*[179] and [their knowledge] degenerated. Communication between China and the West, serving as a link between past and future and opening the source of European science - all of these were the achievements of the Arabs."[180]

In the last section of the first volume devoted to the ancient astronomy of Western Europe, there are also two references to China. When Zhu wrote about Regiomontanus,[181] whom he called "the last great astronomer of ancient astronomy" and his first scientific observation of the comet of 1472, he did not forget to add that Chinese records on the positions and apparent orbits of comets were two thousand years older (with reference to his article on Chinese historical observations of Halley's comet, published in his *Archeoastronomical Records* in 1933).

Another reference to China appears when Zhu Wenxin commented on the discovery by Girolamo Fracastoro[182](1483-1543) and Peter Apian (1495-1552) that comets' tails always pointed away from the Sun. Here Zhu referred to the *Astronomical Annals of Jin* (*Jinshu tianwenzhi* 金書•天文志) and dated the same discovery in China to about one thousand years earlier. This would appear to be a valid assessment by Zhu of the historical facts.

Even fewer references to China are found in the second volume devoted to modern astronomy from the 16th century onwards. The explanation for this is once again centred on the fact that the history of astronomy as outlined here was based on Western secondary sources with occasional references to China.

177 Mei Wending 梅文鼎 (1633-1721), astronomer and mathematician of the early Qing period.

178 Qian Daxin 錢大昕 (1728-1804), historian and philologist of the middle Qing period.

179 *Si yuan shu* 四元術 was a Chinese solution of higher equations with four roots, developed in the early 14th century.

180 Zhu 1935:111. PhD thesis author's translation. 故清代學者如梅文鼎、錢大昕等，皆以爲阿拉伯得中國四元術而蛻化者也。溝通中西，承前啓後開歐洲科學之源，皆阿拉伯之功也。

181 Regiomontanus was the latinized name of Johannes Müller (1436-1476), a German astronomer.

182 Zhu Wenxin uses anglicized transcription Jeremy Fracaster.

At this point for instance, Zhu Wenxin mentioned Chinese records on the observation of sunspots from the Western Han period (205 BCE-9 AD) when he discussed the first observations of sunspots in Europe shortly after the invention of the telescope in early 17th century.

A little bit of space was devoted to the Jesuits who started coming to China at the end of 16th century. In the chapter on the 19th century, when the beginnings of meteoritic astronomy in the West were discussed, much more space was given to Chinese historical records of comets and meteors. Zhu Wenxin highlighted the interest of the Westerners in Chinese astronomical records, for instance, the interest of French physicist, astronomer and mathematician Jean-Baptiste Biot (1764-1862) who wrote a paper on Chinese records of meteors, as Zhu Wenxin stressed, "the precision of which the West could not reach by far"[183]. Meteoric showers were identified along with the orbits of comets and therefore their [the Chinese] records could be used in verifying the theories. As acknowledged by many scholars, the rich records of celestial phenomena have truly been the biggest contribution of Chinese astronomy. [184]

Several references to China which appear in the second volume belong to alleged discoveries prior to the West which have since been discredited by later Chinese research in the field of history of astronomy. For instance, Yixing's discovery of the proper stellar motion and Wang Xichan's calculations of the Venus transit in 1631 that Zhu Wenxin highlighted as China's primacies were both convincingly discredited by Xi Zezong in his papers *On the Observation of Star Positions by Monk Yixing* from 1956[185] and *A Study on the Astronomical Works of Wang Xichan (1628-1682)* from 1963,[186] respectively. The section where Zhu discussed Yixing and his "discovery" of the proper stellar motion will be analysed in the Chapter 4.

2.4.3 Public readership and the Popular Character of Zhu Wenxin's *Short History of Astronomy*

183 Zhu 1935:225.

184 Needham 1959: 171.

185 Xi Zezong. Seng Yixing guance hengxing weizhi de gongzuo 僧一行观测恒星位置的工作. *Tianwen xuebao* (1956) 4 (2).

186 Xi Zezong. Shilun Wang Xichan de tianwen gongzuo 试论王锡阐的天文工作. *Kexueshi jikan* (1963) 6.

In 1936, around a year after its publication, Zhu Wenxin's *Short History of Astronomy* was briefly promoted in *The Universe* journal (*Yuzhou* 宇宙) in an article named *On the Astronomical Works published in Chinese in the 24th year of the Republic* (1935).[187] The annotation was actually very brief:

> [The book] is divided into the first and second volume. The first volume describes the history of ancient astronomy and is divided into two sections on China and the West. The second volume describes the history of new astronomy from the 16th century to the 20th century. The account is divided into [chapters on particular] centuries.[188]

From the table listing the publications at the beginning of the article, one can also learn the exact month of publication, September 1935, as well as the publishing house, the *Commercial Press*, and the number of pages, which was 262. There is a notice *fei mai pin (*非賣品) in the price column which could be understood that the article was not to be sold or perhaps that it was a gift for subscribers.

It can be assumed from this notice that the book was not sold on a commercial basis but was distributed through certain organisations. One can only guess the channels through which it could reach readers, quite probably it was through the educational system and through libraries. This only serves to underline the view that the book was aimed at the general public.

If Zhu Wenxin's account of the origins of world astronomy and Chinese astronomy in his *Short History of Astronomy* is taken as an example, one can clearly see that it was written in a Sino-centric way. From Zhu's point of view, in antiquity, the other cultures learned from China and were far less developed, so astronomy among other knowledge spread from China to them. Actually, the origins of Chinese astronomy was still being debated in Zhu's time, but Zhu asserted only this one Sino-centric view.

187 Minguo ershisi nian Zhongwen tianwenxue shuji jieshao [On the Astronomical Works published in Chinese in the 24th year of the Republic] (1936). *Yuzhou* (7) 6-11:229-232.

188 Ibid: p. 232. PhD thesis author's translation.

2.5 Other Significant Historians of Chinese Astronomy in this Period (Besides Zhu Wenxin and Gao Lu)

Zhu Wenxin's life and work will be given much space in this thesis and Gao Lu has already been discussed extensively here, therefore the discussion will now focus briefly on the other historians of Chinese astronomy active in this period, Ye Qisun, Gao Pingzi, Chen Zungui and Zhang Yuzhe.

Ye Qisun 葉企孫 (1898-1977) was a physicist and one of the founders of modern physics in China. He is included in the list because at the young age of 18 and 19, while studying at Tsinghua (Qinghua) University, he published a twenty-page series of articles in Chinese covering the history of Western astronomy called *The Summarization of Astronomy*[189] 天學述略 as well as a twenty-page series of articles in English titled *The History of Astronomy in China*[190] published in the Qinghua University Journal. Both of the articles show modern scientific approach. The latter analysed various foreign influences on Chinese astronomy, "the merits and defects" of the Chinese astronomical tradition, however it still quite extensively referred to the mythical emperors on the first couple of pages. This work, together with Gao Lu's articles in the *Observatory Reports*, can be used to prove interest in the history of Chinese astronomy in China as early as at the end of the 1910s, but it is evident that no-one preceded Zhu Wenxin with a large, originally written (rather than translated) monograph on this topic.

Ye Qisun later studied physics at the University of Chicago and Harvard University in the United States. Upon his return to China, he taught at several universities including Nanjing University, Qinghua University, National Southwestern Associated University and Beijing University. He was elected member of the Chinese Academy of Sciences in 1955. Xi Zezong in his oral autobiography mentions Ye Qisun's close cooperation, as one of the elder specialists, with the newly established Cabinet for the Research of the History of Natural Sciences in 1957.[191]

Gao Pingzi 高平子 (1888-1970), also known under his original name Gao Jun 高均, was an astronomer with a strong interest in the history of Chinese astronomy, especially in the

189 Tsing Hua Journal Weekly 《清華周刊》 (1916-17) No 84-103.

190 Tsing Hua Journal (1917) Vol. 2. No. 3, pp. 41-45, No. 5, pp. 72-77, No. 7, pp. 182-186.

191 Guo 2011:XX.

history of astronomical systems (*li* 曆). He can even be regarded as one of the founders of the modern historiography of Chinese astronomy and a pioneer of its scientific methods. As was discussed earlier in this chapter, Gao Pingzi along with Gao Lu formulated the four research principles and seventeen key research outlines in 1922, shortly after the foundation of the Chinese Astronomical Society. All these principles and outlines were based on the new scientific approach.

Gao Pingzi was also a significant researcher in the field of modern astrophysics. He studied geometry, physics, philosophy but also Latin and French at the private *Zhendan College* 震旦學院 (also known as *Aurora College*) in Shanghai between 1903 and 1912. In 1924, after the former German concession Qingdao was returned to China, Gao Lu, who was at that time the head of the Central Observatory sent Gao Pingzi to Qingdao to take part in the handing back of the *Qingdao Observatory*, which had been built by the Germans in 1898. Gao Pingzi, who had already had earlier practical experience from the *Sheshan Observatory* in Shanghai operated by the French missionaries (also known under the name *Zo-Sé Observatory*) led the Qingdao Observatory's Department of Astronomy and Geomagnetism and had important achievements in the organization of the observation of sunspots and in building the foundations of China's time service based on the measurements made by using the meridian telescope left over by the Germans. As his biography in the *Overview of Academic Achievements of the 20th Century Famous Chinese Scientists: Astronomical Volume* 《20 世纪中国知名科学家学术成就概览》天文学卷 mentions, the Qingdao Observatory under Gao Pingzi also took part in the *International Campaign of Longitude Determination* in 1926 and Gao was also very active in the process of building China's first national modern astronomical observatory, the Purple Mountain Observatory 紫金山天文臺 which opened in 1934 in Nanjing.[192] He was also the editor-in-chief of *The Universe* 宇宙 journal for several years from its establishment in 1930.

Ye et al. mention his work in the field of historiography of Chinese astronomy in connection with the expedition sent to the historical *Zhou Gong Observatory for Measuring Sun's Shadow* 周公測景臺 near Dengfeng in Henan Province. This is an ancient gnomon that is believed to have been first erected apparently in the 11th century BCE, later replaced by a stone gnomon in the 8th century CE, which neighboured with a larger gnomon combined with

192 Ye et al. 2014: 87-98

an observational tower built in the 13th century by Yuan Dynasty astronomer Guo Shoujing 郭守敬 (1231-1316). Gao Pingzi took part in this expedition and contributed valuable measurements and calculations of the functionality of the ancient instruments.

However, Gao's most intensive publication activity in the field of historiography of Chinese astronomy started after he moved to Taiwan in 1948. Ye et al. state that it was because he was no longer associated with any observational institution. He held a researcher's post in the *Academia Sinica* (Zhongyang yanjiuyuan) 中央研究院 from 1949. He published several dozen studies on the history of ancient Chinese astronomy among which the papers on historical astronomical systems *li* 曆 stood out. Many of these studies were also re-published in two main collections in Taiwan, *Pingzi's Writings and Drafts* 平子著述餘稿 (1967)[193] and *The Selected Works of Gao Pingzi on Astronomy and Astronomical Systems* 高平子天文曆學論著選 (published posthumously in 1987)[194]. Ho Peng Yoke[195] highlighted his *A New Study on the Reformation of the Han Astronomical Systems* 漢曆因革異同及其完成時期的新研究,[196] *General Questions on the Identification of Chinese Asterisms* 中國星座對照之一斑[197] and the chapter *Astronomy* 天文學 in the *Scientific Annals of the Republic of China*.[198] His biographers in Ye at al.,,[199] in addition the collections mentioned above, further highlighted his *Contemporary Notes on the Book on Celestial Officials* 史記天官今注,[200] and *A Study of the North Pole in Zhoubi suanjing* 周髀北極濬璣考.[201]

193 Gao Jun. *Pingzi zhushu yugao* 平子著述餘稿 [Pingzi's Writings and Drafts]. Jinshan lü Tai tongxianghui [The Natives Association from Jinshan in Taiwan]. Taipei 1967.

194 Gao Jun. *Gao Pingzi tianwen lixue lunzhu xuan* 高平子天文曆學論著選 [The Selected Works of Gao Pingzi on Astronomy and Astronomical Systems]. The Institute of Mathematics, Academia Sinica. Taipei 1987.

195 Ho 1977: 38-39.

196 Dalu zazhi, 7 (No. 4., 1953).

197 Zhongguo kexueshi lunwenji. Taipei 1958.

198 Zhonghua minguo kexuezhi 中華民國科學志. Taipei 1955.

199 Ye et al. 2014: 95.

200 Gao Jun. Shiji tianguanshu jin zhu [Contemporary Notes on the Book on Celestial Officials]. In: Gao Pingzi tianwen lixue lunzhu xuan [The Selected Works of Gao Pingzi on Astronomy and Astronomical Systems]. The Institute of Mathematics, Academia Sinica. Taipei 1987.

201 *Zhongguo tianwenxuehui huibao* [Journal of the Chinese Astronomical Society] No. 4, 1923.

A brief discussion of a short Gao Pingzi study called *A Bird-eye View of Ancient Chinese Astronomy* 中國古代天文學鳥瞰, originally published in 1949 in Taiwan and reprinted in Gao's posthumous collection will now follow.[202] This short study provides an interesting contrast to other historical works analysed in this thesis due to its sceptical assessment of Chinese astronomical achievements. Unlike the works of Gao Lu that were discussed in this chapter, the works of Zhu Wenxin and other historians active in pre-war China and even some in the early People's Republic that are yet to be discussed, this short study is entirely free of any nationalist overtones and presents a critical, sober and scientific approach. At the end of the study for example, Gao Pingzi compared the periodisation of Western and Chinese astronomy.

According to Gao's periodisation, Western astronomy has undergone the following six stages:

1. primeval astronomy
2. spherical astronomy
3. theoretical astronomy
4. celestial mechanics
5. photographic astronomy
6. astrophysics

According to Gao, although China "might be the area where astronomy first appeared," Chinese traditional astronomy has undergone only the first two stages of *primeval astronomy* and *spherical astronomy*. By that he understood as not only identification of basic heavenly objects and their nomenclature but also knowledge of the relationship of the movements of heavenly objects on human life and agriculture, knowledge of the periods of the objects' apparent movements and calculation of their cycles. Chinese astronomy was unable to enter the third stage of *theoretical astronomy*, as it failed to find the natural relationship of the objects and find the laws of their movements based on real situations (this is what Copernicus, Galilei and Kepler had done). It did not even have enough theoretical constructs such as Ptolemaic epicycles and deferents which had already been used in Western

202 Gao 1987:237-248.

Antiquity to describe the geocentric movements of planets, which turned out to be completely erroneous concepts in the Renaissance. Gao underlined here, that "Chinese astronomy had gone the wrong way already since the third development stage."[203]

This study was published in 1949 in Taiwan. Its quest for objectivity and lack of a nationalist tone are more apparent than in similar studies that were published in China before the war or shortly afterwards, during the first years of the People's Republic. Almost no one would dare to be so straightforward in their critical comparison of the Western tradition. One assumes that Gao Pingzi was a very talented historian of Chinese astronomy who was also courageous. The possibility that there wasn't yet any strong ideological pressure in Taiwan just after Chiang Kai-shek's *Guomindang* seized power on the island should also be considered. Another reason for this anomaly might be the increased self-confidence of Chinese scientists during this period. They were now integrated in modern astronomy and were acutely aware of the shortcomings of the Chinese astronomical tradition.

Chen Zungui 陳遵媯 (1901-1991) was an astronomer, educator, populariser and historian of ancient and even modern Chinese astronomy. He studied in Tokyo, Japan, at the department of mathematics of the Higher Teachers' School in the years 1920-1926. His life was tightly bound with astronomy from 1926 until his death in 1991. He was recommended to Gao Lu by Chen's father and following his return from Japan he started to work at the Central Observatory in Beijing where he compiled astronomical almanacs. Then in 1928, he became a researcher at the astronomical institute of the Academia Sinica. He was also secretary of the Chinese Astronomical Society and an editor-in-chief of *The Universe* 宇宙 journal for the majority of its existence (1935-1949). In the 1930s, he took part in building and opening the Purple Mountain Observatory 紫金山天文臺, the first national, Chinese-built observatory in Nanjing (opened in 1934) and in 1937, he co-organised the move of the observatory's valuable instruments to safety in Kunming in response to escalating Japanese aggression. The Phoenix Hill Observatory 鳳凰山天文臺 (later Yunnan Observatory) was established in Kunming in 1940.

As Chen Zungui mentioned in many of his works, in autumn 1937[204], while waiting for a boat to Chongqing which was the first stop of that wartime shipment of astronomical

203 Gao 1987:246-247.

204 Chen 1989:2239.

instruments from Nanjing, Chen opened a letter from Japanese astronomer Issei Yamamoto 山本一清 (1889-1959), the director of the Kwasan Observatory in Kyoto 京都華山天文臺, addressed to the Observatory's director Yu Qingsong. Yamamoto asked for materials related to the history of Chinese astronomy to be handed over to Japanese astronomers and for assistance to be provided, adding that the Japanese astronomers were acting on behalf of the International Astronomical Union which had requested research into Chinese astronomical sources. Chen Zungui explicitly stated in this section and also in several other places in his works that this was his primary motivation for doing intensive research into the history of Chinese astronomy, as he simply was not willing to allow foreigners and what is more, China's enemies, to conduct this research before his fellow countrymen. Chen Zungui's further interaction with Japanese studies of the history of Chinese astronomy will be discussed in more detail in section 2.2.2 on Japanese research in this field.

One of the first fruits of Chen's efforts, based on what he started doing at the beginning of the war was his article in *The Universe* 宇宙 journal from the year 1945 called *First Analysis of the History of Chinese Astronomy* 中國天文學史初論.[205] He stressed in it again the patriotic (and anti-Japanese) sentiment mentioned above as his motivation for writing and what is interesting, he presented in it his periodisation of the history of Chinese astronomy with these stages:

1. using lunar calendars
2. using a solar or lunisolar calendar to determine the settlement of seasons
3. the evolution of astrology, establishment of the 12 *ci* 次 (*Jupiter mansions*, similar to Western zodiacal signs)[206]
4. the formation of cosmological theories and observations of planetary movements
5. astro-navigation and stellar astronomy
6. the modern era of astrophysics and solar physics[207]

205 YZ Vol. 15 No. 1-3 (1945) :9-15.

206 He commented on this as being „non-scientific but an important factor of the development of astronomy."

207 According to his comments, the last two stages occurred in China only as a result of foreign influences.

Chen also offered another periodisation specifically for the evolution of calendrical astronomical systems (*li* 曆):

1. the period when the lunar calendar was used ("from Yao and Shun" until 2nd millennium BCE)
2. the time when the Sun's shadow length was determined (2nd millennium – 6th century BCE)
3. the period when the calendar (astronomical system) was studied(6th century – 360 BCE)
4. the period when the calendar was formed and stabilized (3rd century – 104 BCE)
5. the calendrical period (from 104 BCE)

We can compare these time period classifications to the previous one by Gao Pingzi mentioned above and we can see that they seem to be far more "on the side" of Chinese astronomy, nothing is mentioned about "going the wrong way", such as in Gao's classification (?) periodisation. Moreover, the reference to "Yao and Shun" does not evoke the spirit of scientific approach. He appeared objective in his argument however he used legendary (mythical) emperors as the basis for how he classified those historical timeframes.

Chen Zungui's first historiographical monograph titled 中國古代天文學簡史 *A Brief History of Ancient Chinese Astronomy*, also based on his wartime research and published as late as 1955 was a much more important work. It was the only monograph on the history of Chinese astronomy written in the modern language (*baihua*) for a long time after its publication. In the introduction, Chen repeated again his patriotic motivation for writing the history of astronomy and the story about Yamamoto's letter. Here he explicitly wrote that the aim of this work was to "encourage the readers' research and attention to the history of the homeland's astronomy and from there, encourage the readers' love for the motherland."[208] In the introduction, Chen wrote that astronomy was developed in China first out of the whole world and that it developed there independently. However, later on in the text he no longer asserted China's primacy, but still claimed its independent development from the West, based on a reportedly higher stage of cultural development in China at the time of its first contacts with the West. Chen underlined some of China's primacies, for instance the concept of *space-*

208 Chen 1955:2.

time (or *continuum*) that had been formed in China and which combined the concepts of *yu* 宇 (space) and *zhou* 宙(time), in Chen's words, more than two thousand years prior to Einstein. These characters are still used in the modern Chinese word to mean "the Universe" (*yuzhou* 宇宙). Chen's mention of this primacy is a clear anachronism and was designed to elevate the level of Chinese astronomy.

The monograph is organized thematically rather than chronologically, its chapters focus on various themes that are grouped together, such as the independent origin of Chinese astronomy, astronomical (calendrical) systems (*li* 曆), abundant records of heavenly events, inventions and discoveries, astronomical instruments, etc.

His conclusion again stressed the independent evolution of ancient Chinese astronomy and stated that its biggest achievements for astronomy as a whole were their astronomical systems (*li* 曆) and records of heavenly phenomena. Among the Chinese discoveries prior to the West or independent from it, Chen mentioned for instance the 19 year cycle according to which intercalary months were inserted, which he claimed happened prior to the western *Metonic cycle*.[209] As well as this 19 year cycle, he also highlighted the practice of calculating with quarter-day remainders (which he saw as being used earlier than that of Callipus)[210], precession, astronomical refraction (these two independent discoveries actually occurred after the West) and proper stellar motion, (the discovery of which was later discredited, as will be discussed in another section) as all being Chinese discoveries made earlier than in the West. The work concludes in an 'optimistic manner', stating that after the foundation of the People's Republic, observatories and instruments were retaken from the Japanese and other Imperialists and that under the leadership of the Communist Party, "in the near future, Chinese astronomy will be reborn and will have contributions to the world astronomy."[211]

In 1955, Chen Zungui was named the head of *Beijing Planetarium* 北京天文館, which was opened shortly afterwards in 1957. This was the climax of his activities to popularise astronomy. In addition, Chen's contributions to ephemeris astronomy (compiling almanacs) have also been highlighted in secondary sources. According to Wang et al., China's

209 Metonic cycle of 19 years corresponds approximately to 235 synodic months, the Moon is in the same phase on the same day of tropical year – usually referred to winter solstice.

210 Callipus cycle of 76 years corresponds to four Metonic cycles of 19 years, the Moon is in the same phase on the winter solstice, moreover the solstice occurs roughly in the same time of the day.

211 Chen 1955:180-181.

dependence on foreign almanacs ended in the 1960s and "important contribution was made in this field by Prof. Chen Zungui when he was in charge of the ephemeris compiling work in early post-liberation days."[212]

In 1957, Chen was labelled as a "rightist" and his books could not get published. He resumed his job within the leadership of the *Beijing Planetarium* in his old age, many years later, and only after the Cultural Revolution ended. As he mentioned in his work, this ban paradoxically provided him with more time to research further into the history of Chinese astronomy. At the end of the 1970s and start of 1980s, publishing houses revived their interest in re-editing and republishing his *Brief History of Ancient Chinese Astronomy*, however he published his monumental work *The History of Chinese Astronomy* 中国天文学史 in four volumes quite late, in 1989 - only two years before his death. To date, this is the most comprehensive historical monograph on this subject, covering mostly ancient but also modern Chinese astronomy in the 20th century (in its last volume). Analysis of this large monograph shows a generally high level of precision and is beyond the scope of this PhD thesis, but it is of note that for instance in order to prove the antiquity of Chinese astronomy and its independent origin and development, the same arguments were used as are found in Chen's works from the 1940s and 1950s and even Zhu Wenxin's *Short History of Astronomy* (1935). According to these arguments, when early contacts with the West occurred at the time of Aristiea (7th century BCE)[213] and Nearchus (4th century BCE)[214], China imported raw materials from India but exported quite sophisticated products, such as silk. Based on this argument of the goods traded, the argument was made that Chinese astronomy must have also been more developed than in the West and must have spread along the trade route. These arguments are rather questionable, however in general, this four-volume monograph proved to be quite precise and useful in the course of writing this thesis.

Zhang Yuzhe 張鈺哲 (1902-1986) is the last astronomer to be discussed in this section. He was one of the most significant Chinese astronomers of the 20th century, however among around a hundred works of his, only a handful are historiographical.

212 Wang et al. 1982:47.

213 According to Herodotus.

214 A general of Alexander the Great of Macedonia.

Zhang Yuzhe was a versatile astrophysicist, organiser of scientific research, populariser and educator. He conducted research in celestial mechanics, asteroids, solar and stellar physics, calendrical and practical astronomy, orbits of artificial satellites, history of astronomy and he was even a skilful designer and builder of astronomical instruments. From 1923 to 1929 he studied in the United States, firstly mechanical engineering and construction at Purdue and Cornell Universities and from 1925 until 1929, he studied astronomy at the Chicago University where he gained a PhD. In 1928, at the near-by Yerkes Observatory, he became the first Chinese person to discover an asteroid. As the discoverer has the right to name it, the asteroid was named "*China*" (*Zhonghua* 中華) according to his wish.

Zhang returned to China in 1929 and started teaching astronomy, astrophysics and celestial mechanics at the Nanjing Central University. During the war, he initially moved with his family to Chongqing and later directed the Astronomical Institute in Kunming. In 1941, he organized the expedition to Gansu Province to observe the total solar eclipse (in which Chen Zungui also took part).

Zhang Yuzhe's pre-war and wartime popular scientific articles appeared in The Science (*Kexue* 科學) Journal. For instance, in it he published the long article *The False Heavens* 假天 in 1932[215] and advocated for the establishment of planetaria in the capital and other large cities for the purpose of public education and popularisation of science.

Zhang also published in *The Universe* (*Yuzhou* 宇宙) journal. Focusing more on the historiography of astronomy, his popular article on the history of Chinese astronomy can be found in that journal's issue from 1946 (YZ Vol. 16 No. 4-6 p. 17-25) called *A Bird-eye View of Chinese Ancient Astronomy* 中国古代天文鸟瞰[216]. The title is the same as Gao Pingzi's article that was discussed above, its structure as an overview and its comparative approach is also similar. According to the subheading in brackets, it was originally a transcript of Zhang's lecture which he had delivered to a youth assembly in Kunming in the summer of 1945. That is the likely reason why it is written in the vernacular (*baihua* 白話) unlike most other articles from this period which were written in the language close to the literary classical style of writing (*wenyan* 文言). Its narrative style does not flood the reader with facts, indeed, the text has the style of a lecture. In it, he discussed the system and evolution of the *zhang* 章, *bu* 蔀 *ji*

215 Kexue 17 (11):1585-1595.

216 YZ 16 (4-6):17-25.

紀 and *yuan* 元 periods,[217] Jupiter mansions *ci* 次, astronomical terminology and nomenclature and pointed out what was similar in China and in the West. Zhang did not assert the Sino-centric line of the development of astronomy, for example when discussing the origin of the twenty-eight lunar mansions' (*xiu* 宿) system, he stated that there were multiple theories on this. However, when speaking of the western criticism of Chinese astronomy due to its lack of theoretical foundations, he defended the Chinese tradition with ancient *Gai tian* 蓋天, *Hun tian* 渾天 and *Xuan ye* 宣夜 theories.[218] These could be called theories, however, they were based more on intuition rather than on exact foundations and far from describing the real state of affairs. When comparing the astronomical instruments of China and the West, he stated "Although the Chinese have not invented the telescope, nonetheless we started to use instruments for observation of the Heavens quite early." It can be stated that Zhang's article is written in a less patriotic or nationalistic manner than many others, but nonetheless it is not critical of the Chinese tradition at all and this is the main difference between this article and the article of the same name written by Gao Pingzi that was discussed above and that was published just three years later in Taiwan.

As Ye et al. mentions, Zhang Yuzhe was an outstanding organiser of scientific research. We can find the traces of his research ideas and organizational efforts on most Chinese astronomical institutions, including the Beijing, Nanjing, Shanghai, Yunnan and Shaanxi Observatories and also the Nanjing Astronomical Instruments Factory. He was a long-time director (1950-1984) of Nanjing's Purple Mountain Observatory 紫金山天文臺 serving without interruption during political campaigns and the Cultural Revolution, apparently because of his importance for national astronomical research and his participation in the artificial satellites' program.[219] He was active in calculating and monitoring their orbits, and as Wang et al. mentioned, he had published articles on satellite dynamics even shortly

217 *Zhang* 章 was a period between two winter solstices with a new moon, it lasted 19 years or 235 months or 6939.75 days; *bu* 蔀 was a period between two winter solstices with a new moon at midnight, it lasted four *zhang* or 76 years or 27759 days (the number of days had to be an integer); *ji* 紀 was a period of 20 *bu* or 1520 years, in addition the event of *bu* should occur on the same cyclic day (the number of days should be divisible by 60); *yuan* 元 was a period of three *ji* or 4560 years, in addition the event of *ji* should be on the same cyclic year, the concept of *yuan* was abolished in the 13th century as redundant.

218 Simply explained, *Gai tian* 蓋天 it represents a round, flat or hemispherical heaven and square Earth, *Hun tian* 渾天 represents a spherical heaven and flat or hemispherical earth and *Xuan ye* 宣夜 represents heavenly objects in an empty space supported by the "breath" of *qi*.

219 Ye et al. 2014:141.

before the Soviet Sputnik 1 was launched. He proposed the establishment of the satellite monitoring station in Urumqi. The Purple Mountain Observatory directed by him as well as other astronomical institutions have been engaged in work related to China's own artificial satellite program that started at the end of the 1960s and start of the 1970s.[220]

Zhang Yuzhe also participated in the formation of the *Twelve-years' Plan* for science and technology in 1956 (this plan will be discussed in a later chapter). As far as his other activities in scientific planning are concerned, he also headed the astronomical group of the National Committee for Science and Technology (国家科委天文学科组, now the Ministry of Science and Technology). Zhang Yuzhe also served as the member of the National People's Congress 全国人民代表大会 from 1964 to 1983.

When it comes to his other historical works, he also published a couple of studies on the historical changes in the orbit of Halley's Comet and its historical returns (published in 1978[221] and 1980[222]), but due to the time of their publication, these works are beyond the time scope of this thesis.

The four astronomers discussed in this section were contemporaries of Zhu Wenxin and also made a significant contribution to the historiography of Chinese astronomy in this period as well as in the period of the early PRC because they were lucky enough to outlive him by several decades. Three of them were quite similar to Zhu in their style and approach while Gao Pingzi differed quite a lot, perhaps due to the fact that he spent a significant part of his later life in Taiwan.

220 Wang et al. 1982:47.

221 Zhang Yuzhe (1978). Halei huixing de guidao yanbian qushi he ta de gudai lishi 哈雷彗星的轨道演变趋势和它的古代历史 [Trend of the Evolution of the Halley Comet's Orbit and its Ancient History]. *Tianwen xuebao* 19 (1).

222Zhang Yuzhe (1982). *Halei huixing jinxi* 哈雷彗星今昔 [The Present and the Past of the Halley Comet]. Beijing: Zhishi chubanshe.

3. The historiography of astronomy in the Early People's Republic of China (1949-1966)

This chapter aims to research the historiography of astronomy in the period from the establishment of the People's Republic in 1949 until the outbreak of the Cultural Revolution in 1966 which was another important milestone in the history of modern China. It will also examine the influence of communist ideology, including its nationalist elements on it. Finally, the chapter will also focus on the process of the institutionalisation of studies in the history of science (and the history of astronomy in particular) and the role of 'scientific planning' in the case of the historiography of astronomy.

This period that started immediately after the Communists gained and centralised their power in October 1949 can be characterised as the period when the Chinese communist state was built. In historical literature it is usually divided into two or three shorter periods – the birth of the People's Republic (1949 – 1953, until the end of the Korean War), the consolidation of the new regime and the period of political unity (or also the period of socialist construction; 1953 – 1958) and the period of 'deepening the revolution' (or the 'period of policy oscillations'; 1958 – 1966) after the Great Leap Forward (*da yue jin* 大跃进) was launched. In some monographs, the first two shorter periods are merged into one and only the start of the *Great Leap Forward* is considered as a dividing point. [223]

In this period, the rapid modernisation, gradual establishment of cooperatives, the adoption of Soviet models (that ended at the latest alongside the withdrawal of Soviet specialists and advisers in 1960) and more or less frequent political campaigns were typical. Soviet models were adopted not only for the country's economy, culture, education, but partly also for its political system and also for such sciences that were regarded as an indispensable tool for modernisation.

3.1 The Communist Ideology, Modern Chinese Astronomy and Popular Astronomical Articles

All the historians of Chinese astronomy active in this period were recruited from individuals with an educational background in astrophysics. The history of astronomy was regarded to a large extent as subordinate to astronomy.[224] Therefore it is useful to first focus

223 Cf. Spence 1991; MacFarquhar 1994; MacFarquhar, Fairbank 1987 (The Cambridge History of China Vol. 14).

224 As we can see, for instance, from almanacs, such as Wang et al. 1982.

briefly on modern Chinese astronomy as a whole, the popularising activities around it and the ideological influences in these fields.

Ideological influences were first of all reflected in passages of historical works dealing with politics, social development or national questions. Such content might make use of the results of scientific research for political, social or nationalist purposes. The ideology might even attempt to deform the perception of the science itself, when it was stated in advance what the scientists were supposed to believe. Another kind of ideology was more hidden, implicit in a specific kind of narrative, for example the concept of the class struggle or explanations of how astronomy is useful to the 'working classes'.

Modern astronomy in China was able to build on traditions from the period of the pre-war and the wartime Chinese Republic (1911 – 1949). However, the level of instrumental equipment was far behind the world's top astronomical observatories. This can be seen when comparing the largest reflector telescope in China of that time, located at the Purple Mountain Observatory, which had only 60 centimetres in diameter, with the five-meter telescope on Mount Palomar in the US built in 1928 that had for a long time been the largest telescope in the world.

At the beginning of the 1950s, only three 'national' observatories were in use, the Purple Mountain Observatory 紫金山天文台 in Nanjing that had opened in 1934, the Kunming Observatory (which had opened in 1941), and the Qingdao Observatory, which had actually officially been taken over by the Chinese government from the Germans in 1924. Another two observatories, Xujiahui 徐家汇 (also known as Zi-ka-wei) and Sheshan 佘山 (Zô-sè) observatories near Shanghai, both established by French missionaries, were operated by foreigners until 1950, when they came under the jurisdiction of the People's Republic. Newly built institutions included the Beijing Planetarium (opened in 1957), the Beijing Observatory (1958), the Nanjing Astronomical Instruments Factory 南京天文仪器厂 (1958), the Wuchang Time Station 武昌时辰站 (1962) and the Shaanxi observatory 陕西天文台 (1966). Radioastronomy was introduced to China in 1958.[225]

There were several dozen and later more than a hundred professional astronomers in China at that time (of these the historians of astronomy represented less than one tenth).[226] All the important elder astronomers active in this period had studied abroad before 1949, in the

225 Wang et al. 1982.

US, Britain, Japan or France. Two of those historians have already been discussed in detail in chapter 2.2.1.5. They were Zhang Yuzhe 张钰哲(1902 – 1986), the discoverer of the first 'Chinese asteroid' called Zhonghua (1928) who was also the long term director of the Purple Mountain Observatory and who had studied in the US in the 1920s, and Chen Zungui 陈遵妫 (1901 – 1991), the director of the Beijing Planetarium who studied in Japan. Another important astronomers were Dai Wensai 戴文赛 (1911 – 1979), who had studied in the UK and became the head of the department of astronomy at Nanjing University, Li Heng 李珩 (1898 – 1989) the director of Shanghai Observatory who had studied in France and Wang Shouguan 王绶琯 (*1923) who had studied in the UK and worked subsequently at Nanjing, Shanghai and Beijing observatories and made significant contributions to China's radio astronomy.

In 1950s China, Soviet models were meant to also be adopted within astronomy, as well as in all the other scientific disciplines. Like in other socialist countries, the communists regarded the popularisation of astronomy under this model as a very suitable tool to spread the Marxist-Leninist scientific worldview among the masses. Friedrich Engels' work *Dialectics of Nature* was sometimes quoted in popular books, such as Xi Zezong's *Hengxing* [The Stars][227], stating that when one wanted to study the development of natural sciences, it was necessary to study astronomy first.

In general, as can be seen from the reports on scientific conferences in the Soviet Union published in China[228] (and in a similar way in other 'fraternal countries' of the socialist bloc such as Czechoslovakia[229]), astronomers as well as other scientists, were supposed to reject *scientific individualism* ('science for science's sake'), *selfishness in science* and *objectivism* (understood as false objectivity, the unwillingness of scientists to take a stand, eg. when their knowledge was to be used to build weapons, etc.).

The role of science was changing - it had become not only a tool for modernisation, self-strengthening and securing the wellbeing of the society but also a propaganda tool for the

226 From this author's personal communication with Li Geng (National Astronomical Observatory of China), April 2014.

227 Xi Zezong, *Hengxing*, Shangwu yinshuguan, Shanghai 1952. Chapter Tianwen yu rensheng.

228 Zhu Kezhen, Canjia Sulian tianti yanhua lun di si ci huiyi de baogao [A Report from the 4th Conference on Cosmogony in the Soviet Union]. In: *Kexue tongbao 1955 No. 1.*

229 Milde, L., Z brněnské konference. [From the Brno Conference] In: *Říše hvězd* 33 (3): 76–79. Prague 1952.

spread of ’the only correct’ Marxist-Leninist scientific worldview as well as a tool for the fight against superstition and religion.

For example, in articles published in 1953 in the journal *Kexue dazhong* [Popular Science], Li Yuan 李元[230] wrote on the achievements of Soviet astronomical work and the popularisation of astronomy at the Moscow Planetarium. These articles stressed that the Chinese should learn from the Soviets and were full of praise for the new conditions in science created by the new social order.[231] In another article[232] on the role of astronomy in the new China, Li Yuan presented the concept of ’bourgeois’ and ’socialist’ astronomers. The ’socialist’ astronomers were supposed to believe in the infinity of the universe, in multiple civilisations, in the possibility of understanding the universe and were supposed to adhere to the theory of dialectical materialism. On the contrary, he saw ’bourgeois’ or ’capitalist’ astronomers as stuck in their idealist theories, in the belief of a finite universe, in the uniqueness of our civilisation and the impossibility of gaining a full understanding of the universe.

However, in his recently published oral memories[233] Li Yuan has stated that he had written those articles in 1953 with the aim of getting the support of the relevant government bodies for the idea of building a planetarium and purposely did not write on any western planetaria even though he had a lot of information on them. One may assume that the abundant use of ideological content in such articles might have had certain aims, in this case to make specific procedures run ’smoother’. The other possibility is that Li Yuan may have wanted to apologise for his earlier behaviour in the more recent oral memories.

In the contrast with the period before 1949, from a certain point of view, it can be even said that astronomy was ’lucky’ since it had started to receive unprecedented material support from the central government in the ’New China’, as can be seen from the list of newly established institutions in the 1950s and 1960s above. The Beijing Planetarium, built for some

230 Li Yuan 李元 (*1925), famous popularizer of astronomy, used to work at the Purple Mountain Observatory and later on for a long time at Beijing Planetarium.

231 Li Yuan, Sulian tianwenxue de kuanguang daolu. In: *Kexue dazhong 1953 No. 11.*

232 Li Yuan, Xin Zhongguo de tianwen gongzuo. [Astronomical labour in new China]. In: *Kexue dazhong 1953 No. 10.*

233 Li-Chen 2010.

3 million RMB and opened on October 1st, 1957[234], was probably the most important institution which popularised astronomy among the masses. Its director Chen Zungui in his article in *Kexue dazhong* [Popular Science] wrote:

> With the help of the planetarium projector, we can understand the structure of the universe visually and thus get rid of superstitious thinking and theories of destiny, which is helpful for building the materialist worldview.

He concluded his article with praise for the Communist Party:

> Beijing Planetarium is the only planetarium in continental Asia. Its establishment lets us feel how our government cares about science and considers it important. This iron reality confronts head-on the rightists' slanders to the big achievements of the people under the direction of the Communist Party after the Liberation.[235]

Such conclusions in popular astronomical articles were quite common, they contained quite frequent praise for the generous support of the new social order and especially the Communist Party's support for science, even if the rest of the article was neutral. It was apparently an obligatory content of the articles. For instance, among the astronomical articles in *Kexue dazhong* [Popular Science] from the year 1957, most articles seemed to be neutral to a larger extent, even the ones written by those same authors mentioned above (Chen Zungui, Li Yuan). Some of them contained ideological language similar to above in their introductions and conclusions. Another feature that appeared quite frequently in astronomical articles was references to the Soviet Union. These were descriptions of its scientific organisation system, endorsements of particular observation facilities or achievements, or recommendations or reviews of books recently translated from Russian.

The year 1957 and the first half of the year 1958 were proclaimed as the *International Geophysical Year*. This was also a time of fierce competition between the Soviet Union and the United States in the race to launch the first man-made satellite. The related articles in *Kexue Dazhong* [Popular Science] stressed the superiority of Soviet science and technology, the failure of the United States and the superiority of the new social order. Just reading the title of the article on the second Soviet satellite Sputnik 2 which carried the dog Laika, "The

234 The Zeiss planetarium projector had even been bought earlier from the German Democratic Republic for about 600 hundred thousand RMB in 1954.

235 Chen (1957). *Kexue dazhong* (10):455–458.

Second ‚Red Moon' Has Ascended the Heavens" (*Di'er ge 'hongse yueliang' shengshang tian* 第二个"红色月亮"升上天)[236] gives an idea of the kind of language that was used.

3.2 The Path to the Institutionalisation of the Historiography of Astronomy and its Patriotic Context

The historiography of Chinese astronomy had a tradition from the period of pre-war and wartime Chinese Republic (1911 – 1949), mainly represented by Zhu Wenxin (1883 – 1939). Studies of Zhu and other historians on the history of Chinese astronomy published in the earlier republican period are discussed in detail in chapter 2. During the war against Japanese aggression, historical studies on astronomy were almost interrupted.

3.2.1 Zhu Kezhen's Efforts

Xi Zezong mentioned that already in the year 1951, Zhu Kezhen 竺可桢 (1890 – 1974), the vice-president of the Chinese Academy of Sciences and a significant meteorologist and geologist, had the intention to establish a research committee dedicated to the history of natural sciences, including astronomy and to transform it later into a research department (known as a Cabinet). [237]

This *Research Committee for the History of Natural Sciences in China* (*Zhongguo ziran kexue shi yanjiu weiyuanhui* 中国自然科学史研究委员会) was eventually established by the Chinese Academy of Sciences in August 1954. It had 17 members who came not only from the Academy of Sciences and universities, but also from the ministries of railways, water resources, culture and so on. As the complete list of members presented by Guo Jinhai showed, the only person responsible for research on the history of Chinese astronomy was Zhu Kezhen, who was at the same time the chairman of the Committee.[238]

Zhu Kezhen was deeply interested in the history of science and in particular in the history of Chinese astronomy as he had already demonstrated through the publication of several articles on the topic in the pre-war and wartime Republican period.[239] He also published in this field at the beginning of the 1950s, for instance his article *The Great*

236 *Kexue dazhong* (12):533 (1957). Of course, there is no mention of Laika's unlucky fate.

237 Guo 2011:110.

238 Ibid.

Contributions of Ancient China in Astronomy[240] written in a patriotic style was published by the central mouthpiece of the Communist Party, the *People's Daily* (*Renmin ribao*)[241] and then reprinted in the *Science Bulletin* (*Kexue tongbao*). Due to his academic background however, Zhu Kezhen often labelled himself as an outsider (*waihang* 外行) in these articles on the history of astronomy. The task of conducting deeper research in this field was apparently waiting for someone else.

As can be read in Zhu Kezhen's published diaries, on January 3rd 1954, just six months after he had visited an international conference in the Soviet Union in June 1953, Zhu obtained a letter from the Soviet academic Kulikovsky, who was at that time chairman of the *Committee for the Study of the History of Astronomy by the Academy of Sciences of the USSR*. In the letter, the Soviet Academy of Sciences requested the Chinese side to carry out research into novae and supernovae in Chinese historical records.[242] This research was crucial for a project by the Soviet academic I. S. Shklovsky concerning his research on supernovae, their radio emissions and thematically closely connected planetary nebulae.[243]

The young astrophysicist Xi Zezong was recommended and appointed for this task and carried out the research in the years 1954 – 1955. After the research was finished in 1955, he published it as *Gu xinxing xin biao* 古新星新表 [New Catalogue of Ancient Novae], which was regarded as a ground breaking work. He later extended this work with research on the connection of novae and supernovae with radio sources in the sky. In the 1960s, he extended this research again and also included Japanese and Korean sources.[244] Xi's work was very warmly accepted abroad and it was translated and re-published in both the USSR and the US.

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239 For instance: 1) Zhu Kezhen (1926). Lun yi suicha ding Shangshu Yaodian si zhong zhongxing zhi niandai 論以歲差定尚書堯典四仲中星之年代 [*Calculation of the Date of the Yaodian Chapter of the Book of History from the Four Quadrantal Lunar Mansions and the Precession of Equinoxes*]. *Kexue 11*:1637. 2) Zhu Kezhen (1944). Ershiba xiu qiyuan zhi didian yu shijian 二十八宿起源之地點與時間 [On the Place and Time of Origin of the Twenty-eight Lunar Mansions]. *Qixiang xuebao* 18(1).

240 Zhu Kezhen (1951). Zhongguo gudai zai tianwenxue shang de weida gongxian 中國古代在天文學上的偉大貢獻 [The Great Contributions of Ancient China in Astronomy]. *Kexue tongbao* 2:215.

241 On Feb 25th and 26th, 1951, in two parts.

242 Zhu Kezhen, *Zhu Kezhen quan ji* [The Complete Works of Coching Chu]. Shanghai keji jiaoyu chubanshe, Shanghai 2004 – 2007. Vol. 13:362.

243 One of the outputs of this research was the English-language monograph I. S. Shklovsky, *Supernovae*, Wiley, New York 1968, or the Russian language monograph I. S. Šklovskij, *Sverchnovyje zvezdy i svjazannyje s nimi problemy*, Moscow 1976.

Prior to this, Lundmark's survey of Chinese records had been used extensively, but it contained many errors.[245] In 1921 Lundmark published a work on historical supernovae based among other things on his research into the compilation of observations in Ma Duanlin's 馬端臨 (1245-1322) *Wenxian tongkao* 文献通考, which had been translated by missionaries.[246] Lundmark later also worked with Dutch sinologist J. L. L. Duyvendak (1889 – 1954) in this field.

In July 1956, the first conference on the history of natural sciences took place in Beijing. Among its 24 papers, there were four dedicated to the history of astronomy, written by Xi Zezong, Liu Chaoyang, Zhu Kezhen and Qian Baocong 钱宝琮 (1892 – 1974). The latter two were not astronomers by profession, Zhu was a meteorologist and Qian was a historian of mathematics. Xi's paper was on the measurements of stellar positions by Yixing, the imperial astronomer from the time of the Tang dynasty. Qian wrote on the astronomical system *Shoushi li* 授時曆 from the Yuan period, Liu on the astronomical systems of the pre-Qin period while Zhu's paper with rather general topic on the astronomical scientific heritage was reprinted in the Party's newspaper, the *People's Daily* (*Renmin Ribao*). [247] This shows the significance which was given to this conference by the central press authorities.[248]

3.2.2 Establishment of the Cabinet for Research on the History of Natural Sciences

At the beginning of 1957, as a result of a political decision that was made, the *Cabinet for Research on the History of Natural Sciences* (*Ziran kexue shi yanjiushi* 自然科学史研究室) was established. Zhu Kezhen played an important role when this administrative move was being planned, but we have no information which particular governmental body made the

244Xi Zezong (1965). Zhong, Chao, Ri san guo gudai de xinxing jilu ji qi zai shedian tianwenxue zhong de yiyi [Ancient Novae and Supernovae Recorded in the Annals of China, Korea and Japan and Their Significance in Radioastronomy]. *Tianwen xuebao* 13 (1). English translation: *Science* 154 (3749), November 1966.

245 Knut Lundmark (1889 – 1958), a Swedish astrophysicist.

246 Lundmark, Knut (1921). Suspected New Stars Recorded in Old Chronicles and among Recent Meridian Observations. *Publications of the Astronomical Society of the Pacific* 33: 225–238.

247 Zhu Kezhen, Bai jia zheng ming he fajue wo guo gudai kexue yichan 百家争鸣和发掘我国古代科学遗产 [Contention of Hundred Schools of Thought and Exploration of Ancient Scientific Heritage of Our Homeland], *Renmin Ribao* July 15th, 1956.

248 Guo 2011:127.

decision. The *Cabinet* was subsequently subordinated to several different institutes of the Academy of Sciences, first to the *Second Historical Institute*.[249] In the beginning, the *Cabinet* had only eight researchers. Two of them, Xi Zezong 席泽宗 (1927-2008) and Bo Shuren 薄树人, were historians of astronomy and represented a small section there. The director of the *Cabinet* was Li Yan 李俨 (1892-1963), a historian of mathematics.

In Xi Zezong's own words (from his oral autobiography) and with partial reference to Zhu Kezhen's diaries,[250] the establishment of the *Committee for the Research on the History of Natural Sciences in China* (*Zhongguo ziran kexue shi yanjiu weiyuanhui* 中國自然科學史委員會) in 1954 (which can be viewed as the forerunner of the *Cabinet for the Research on History of Natural Sciences)* was motivated by the following three factors:

1. Foreign influences, especially those of the Academy of Sciences of the Soviet Union.

2. Additionally, there arose a need for patriotic articles on the history of ancient and modern Chinese science in the Party's newspapers, the People's Daily (*Renmin Ribao*), Guangming Daily (*Guangming Ribao*) and others.

3. As the last significant motivating impulse, Xi Zezong mentioned the need to delineate from and compete with Joseph Needham's large multi volume project *Science and Civilization in China*. *The Chinese Aca*demy of Sciences was well aware of the preparations and progress of this work, as Needham and his collaborators sent their outlines to them regularly.

It can be clearly seen that one of the most significant motivations for the establishment of a specialized institution for the research on the history of natural sciences in China was the need to summarise the national heritage' Apart from the publishing of scientific papers, the fruits of this research were intended to be turned into patriotic texts, especially popular articles in newspapers and journals aimed at a broader audience.

249 历史研究所二所.

250 Guo 2011:111.

The specialized research institutions for the history of science were modelled on the Soviet Union, where research on the history of the natural sciences had been institutionalised earlier. Zhu Kezhen mentions frequent meetings with Soviet advisers in his diaries. The desire to delineate from and/or to compete with Joseph Needham's project *Science and Civilization in China* was also a strong motivation. This is mentioned quite frequently in various sources. For instance, Xi Zezong's oral autobiography quotes an excerpt of a 1956 speech by Guo Moruo 郭沫若 (1892-1978), a famous writer and the first president of the Chinese Academy of Sciences. Guo highlighted that through research into the history of Chinese science and technology, it was possible to "conduct patriotic education and encourage national pride"[251] and added that it was also necessary to "compete" (*zheng yi zheng* 争一争) with Needham.[252]

3.2.3 The Twelve Year Plan and the Historiography of Astronomy

The *Twelve Year Long Term Plan* (*Shi'er nian yuanjing jihua* 十二年远景计划 1956-1967) was an ambitious plan to bring the selected areas of Chinese science and technology as close to the 'international level' as possible. The Plan was a tool that subordinated the research to the needs of the state and the planned economy, in contrast with the previous research according to personal interest. The Plan was launched by Premier Zhou Enlai 周恩来 (1898-1976) at the *Conference on the Problems of Intelligentsia* organised in Beijing in mid January 1956 by the Central Committee of the Party. Premier Zhou Enlai delivered a speech *Report on the Problems of Intelligentsia* (*Guanyu zhishifenzi wenti de baogao* 关于知识分子问题的报告) dedicated partly to scientific work, where he mentioned the necessity to create the Twelve Year Plan. At the same conference, academician Wu Heng 武衡[253] highlighted in his speech the need to „summarise the scientific heritage of the homeland (*zongjie zuguo kexue yichan* 总结祖国科学遗产)"[254] as the last of the four main tasks of scientists in the coming Twelve Year Plan. The other three tasks were; 1) to catch up with the world's newest and fastest developing scientific disciplines, 2) to conduct a basic survey and research into the natural conditions and natural resources of China and 3) by using the achievements of modern

251 进行爱国主义教育，提高民族自尊心。

252 Guo 2011:130.

253 Wu Heng 武衡 (1914 – 1999), a geologist, then a deputy-secretary of the Chinese Academy of Science (from 1954).

254 Guo 2011:116.

science to study scientific and technological problems which the socialist structure of China needed to solve.

The plans included the recruitment of 10,000 graduate students or researchers (*yanjiusheng*) and 1000 doctoral students in the next 12 or 15 years.[255]

The plan was created through a complex process of almost daily meetings with leaders of the Chinese Academy of Sciences and Soviet advisors. The Soviet advisors played a crucial role - Zhu often mentioned the general advisor Lazarenko and specialised advisor Sinitsyn in the diaries. Most of the meetings were held in the hotels where the advisors stayed.[256] Most of the communication was done with the assistance of interpreters, often recorded in Zhu Kezhen's notes from the meetings.

The plan philosophy was captured in the slogan "tasks driving disciplines" (*renwu daidong xueke*), i.e. focus on problems regardless of established disciplinary boundaries, and, conversely, deliberate neglect of parts of disciplines not directly relevant to designated tasks. The core of the plan were the 'fifty-four central problems' (*zhongxin wenti* 中心问题), the priorities for particular disciplines; in practice, these core problems were broad enough to allow all disciplines finding research topics which could be pursued in relation to the central problems, as will be illustrated on the example of the history of natural sciences.

Under Zhu Kezhen's directives given at a meeting at the end of February 1956, historians of science worked out their own twelve year plan, named the *Draft of the Twelve Year Long Term Plan for the Research on History of Natural Sciences and Technology in China* (*Zhongguo ziran kexue yu jishu shi yanjiu gongzuo shi'er nian yuanjing guihua cao'an* 中国自然科学与技术史研究工作十二年远景规划草案), further referred to simply as *Draft*.[257] This draft was written by several historians of natural sciences. Apart from himself, Xi Zezong mentioned Ye Qisun, a historian of physics, and Tan Qixiang 谭其骧 (1911-1992) a historian of Chinese geography as co-workers.[258]

255 Zhu 2004-2007 Vol. 14:273.

256 Xijiao Hotel 西郊宾馆 or Xi Yuan Grand Hotel 西苑大旅社 are often mentioned.

257 Guo 2011:119-124.

258 Guo 2011:117. They worked together on the plan at the Xi Yuan Grand Hotel 西苑大旅社.

The *Draft's* first part on general conditions stressed the usefulness of research on the history of natural sciences giving as an example the studies of the records of historical earthquakes that could be useful for planning infrastructure. It further mentioned that research on the history of natural sciences had lacked sufficient support in the previous period before 1949. The authors continued by stating that the committee for this research was established in 1954, outlining the difficulties of such study (difficulties of collecting the material that was disseminated in many sources, mastering a particular science but also the necessity to master the classical language, knowledge of the "social environment and the situation in production" in particular periods as well as the knowledge of the history of science and technology in the world). The first part further highlighted that this research was supported in the Soviet Union and 'new people's democracies'. As far as research in the 'capitalist countries' was concerned, the authors added that the research into the history of Chinese science and technology also existed there but its "viewpoints were not fully accurate".

The second section dealt with 'core problems'. It stressed that the struggle of mankind with the natural world should be studied, as should the clash between materialism and idealism and "how idealism in connection with feudal organisations had always caused obstacles for the evolution of science and technology". Then the authors turned their attention to specific tasks. The research was supposed to focus on histories of particular sciences. Priority was given to the history of agriculture and traditional Chinese medicine. The histories of mathematics, astronomy, chemistry and so on were noted there as secondary but with the phrase that they "should be emphasised too".

The following table illustrates the concrete twelve year publication plan for the history of astronomy and mathematics:

Item	**History of astronomy**	**History of mathematics**
Specialised monographs	History of Chinese astronomy	History of Chinese mathematics
Textbooks	none	none
Sources and reference books	Edition of the Chinese records of heavenly phenomena, anthology of Chinese historical	Summaries of ancient works on Chinese mathematics

	astronomical materials	
Translations of foreign books	Ptolemy: *Almagest*; Copernicus: *De revolutionibus orbium coelestium* [*On the Revolutions of the Celestial Spheres*]; Kepler: *Astronomia Nova*; works of Galilei	M. Cantor: *Vorlesungen über Geschichte der Mathematik* [*Lectures on the History of Mathematics*] ; H. G. Zeuthen: *Geschichte der Mathematik im Altertum und im Mittelalter* [*History of Ancient and Medieval Mathematics*]; G. R. Kaye: Indian Mathematics; Algebra of Al-Khwarizmi
Commented re-editions of famous domestic works	*Zhoubi suan jing* 周髀算經 [Arithmetical Classic of Zhou Sundial]	Around twenty famous works of Chinese ancient mathematics

In the end, only a small fraction of this ambitious plan had actually been finished by 1967, the original end of the planning period. The reasons for this were political and will be discussed in more detail in one of the next sections.

In the section on the "training of cadres", the authors wrote that the Academy of Sciences was supposed to recruit a growing number of graduate students (*yanjiusheng*) specialising in the history of Chinese science and technology every year, starting with five in 1956 and rising to ten in 1967. The expected number of such researchers by 1967 was supposed to be 100.

The authors of the *Draft* further mentioned the planned establishment of the *Cabinet for the Research on History of Natural Sciences* in 1957 as well as other institutional plans. Among them there were plans to establish a working group of historians of geography in the Geographical Institute and proposals to establish institutions for historical research on behalf of the ministry of health (for traditional medicine), the ministry of agriculture (for the history of agriculture) and so on.

Eventually, according to the *Draft*, the *Cabinet for the Research on History of Natural Sciences* was supposed to transform into an independent research institute of the Academy of Sciences. This actually happened many years later in 1975.

Science planning was an important factor that contributed to the formation of modern studies on the history of natural sciences in China. It was closely connected with Soviet models and the planned economy that operated in the Soviet Union and in other socialist countries. The political hindrances which caused the research and publication activities to proceed at a significantly slower rate than estimated will be discussed in one of the next sections. First, we will turn our attention to the most significant researcher active in the field of history of astronomy, working in the *Cabinet* from its very beginning.

3.2.4 Xi Zezong, the Most Significant Historian of Chinese Astronomy in the Early PRC Period

Xi Zezong 席泽宗 (1927-2008) was the most important and most prolific historian of Chinese astronomy active in this period. Moreover, he became an even more significant and influential figure in this field later in his life, after the Cultural Revolution.

Xi was born on June 9, 1927 in Yuanqu County 垣曲县[259] in Shanxi Province. He was the only child born to the family of a rich merchant and landlord.

Young Xi lost his father quite early in 1941 and was soon in charge of the family business, however Yuanqu County was shortly thereafter invaded by the Japanese, so the family had to flee to Xi'an. Xi's lower secondary school was the 7th secondary school in Yang County 洋县 (some 250 km from Baoji 宝鸡 in Shaanxi Province). Later on, he attended the higher secondary school attached to the Xi'an Northwestern Pedagogical Institute which had already moved to Lanzhou in 1941. He enrolled in this school in 1944. This school was where

259 From 1959 Gucheng cun 古城村 , in the same year the county's administrative centre moved to Liuzhang cun) 刘张村

his interest in astronomy first appeared in earnest after he read Zhang Yuzhe's book on the universe.[260]

Between the years 1947 and 1951 he studied astrophysics at the Sun Yat-sen University in Guangzhou. It was a time of economic difficulties for him, as his astrophysical studies were not the wish of his family. He earned some money through writing popular astronomical articles for Hong Kong newspapers and by giving private lessons.

After graduating in 1951 he was assigned a job in the *Editorial and Translation Office* (*bianyi ju* 编译局) of the Academy of Sciences in Beijing. The next year he was sent to Harbin to study Russian for two years. Later on, he translated several astrophysical works from Russian jointly with an older astronomer Dai Wensai 戴文赛,[261] who persuaded him to study the history of astronomy. However, while Xi's knowledge of the Russian language was enough for the translation of scientific monographs it was not enough for active use.[262]

In 1954, Xi Zezong accepted an offer made by the vice president of the Academy of Sciences, Zhu Kezhen, to work on the Chinese historical records of novae and supernovae at the request of the Soviet Academy of Sciences (discussed in section 3.2.1). This work, published in 1955 as *Gu xinxing xin biao* 古新星新表 [New Catalogue of Ancient Novae] gained him much fame, even abroad.

It was one of the older important astronomers, Zhang Yuzhe, who later persuaded him once again to concentrate on research into the history of Chinese astronomy. After this, Xi accepted his assignment to the *Second Historical Institute*. From the end of 1954 until the end of 1956 he worked part time at both institutions, in the *Editorial and Translation Office* and the *Second Historical Institute*, where a group for the study of the history of natural sciences was formed.[263]

260 Guo 2011:52.

261 For instance Амбарцумян, В. А. Теоретическая астрофизика. Москва 1952. [Ambartsumyan, V. A. et al. Theoretical Astrophysics. Moscow 1952.] Together with Dai Wensai 戴文赛.

262 One of his younger colleagues, Chen Jiujin 陈久金 (born 1939), also a historian of Chinese astronomy told the author of this thesis that he actually never heard Xi Zezong speak Russian. From this author's interview with Chen Jiujin on April 1st 2014.

263 Guo 2011:113.

At the beginning of 1957, Xi Zezong was assigned to the newly established *Cabinet for the Research on History of Natural Sciences* that was subordinated at that time to the *Second Historical Institute*. He was affiliated with this institution for the next 50 years of his life. He worked there continuously except for enforced breaks during the political campaigns of the late 1950s and early 1960s and during the Cultural Revolution. Shortly before the end of the Cultural Revolution, in 1975, the *Cabinet* became an independent research institute of the Chinese Academy of Sciences (*Institute for the History of Natural Sciences, Ziran kexue shi yanjiusuo* 自然科学史研究所) and in the 1980s, Xi Zezong served five years as its director (in the years 1983-1988).

An anthology of Xi Zezong's self-selected works *A New Catalogue of Ancient Novae and Explorations in the History of Science*[264] shows the topics which he studied in the decade from 1955 when he began publishing on the history of astronomy until the beginning of the Cultural Revolution in 1966:

1) Scholary studies of Chinese astronomy

    a. *A New Catalogue of Ancient Novae and Supernovae* (1954)[265]

    b. *On the Observation of Star Positions By Monk Yixing* (1956)[266]

    c. *Gaitian and Huntian Theories* (1960)[267]

    d. *A Summary and Explanation of the Astronomical Chapter in the Huainanzi* (1962)[268]

    e. *A Study on the Astronomical Works of Wang Xichan (1628-1682)* (1963)[269]

264 Xi Zezong (2002). *Gu xinxing xin biao yu kexue shi tansuo* [*A New Catalogue of Ancient Novae and Explorations in the History of Science*]. Xi'an: Shaanxi shifan daxue chubanshe.

265 Xi Zezong (1955). Gu xinxing xin biao 古新星新表 [A New Catalogue of Ancient Novae and Supernovae]. *Tianwen xuebao* 3 (2). In English: *Smithsonian Contributions to Astrophysics* 2 (6). Washington D. C. 1958.

266 Xi Zezong (1956). Seng Yixing guance hengxing weizhi de gongzuo 僧一行观测恒星位置的工作 [On the Observation of Star Positions By Monk Yixing]. *Tianwen xuebao* 4 (2).

267 Xi Zezong (1960). Gaitian shuo he huntian shuo 盖天说和浑天说 [Gaitian and Huntian Theories]. *Tianwen xuebao* 4 (2):80-88.

268 Xi Zezong (1962). "Huainanzi tianwenxun" shulüe 《淮南子天文训》述略 [A Summary and Explanation of the Astronomical Chapter in the Huainanzi]. *Kexue tongbao* 1962 (6).

f. *Ancient Novae and Supernovae Recorded in the Annals of China, Korea and Japan and Their Significance in Radioastronomy* (1965)[270]

g. *The Dunhuang Star Map* (1966)[271]

h. *1949-1959: Studies of the History of Chinese Astronomy* (1959)[272]

2) Scholarly studies on world astronomy

a. *In Honour of the 400th Birth Anniversary of Galileo Galilei* (1964)[273]

b. *Astronomical Thought of Korean Bak Yiwon's Jehol Diary* (1965)[274]

3) History of astronautics

a. *In Honour of the Birth Centenary of Tsiolkovsky* (1958)[275]

4) History of astrophysics

a. *Selenography* (1961)[276]

b. *Some Problems Concerning Venus* (1961)[277]

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269 Xi Zezong (1963). Lun Wang Xichan de tianwen gongzuo 论王锡阐的天文工作 [A Study on the Astronomical Works of Wang Xichan]. *Kexue shi jikan* 1963 (6).

270 Xi Zezong (1965). Zhong, Chao, Ri san guo gudai de xinxing jilu ji qi zai shedian tianwenxue zhong de yiyi 中、朝、日三国古代的新星记录及其在射电天文学中的意义 [Ancient Novae and Supernovae Recorded in the Annals of China, Korea and Japan and Their Significance in Radioastronomy]. *Tianwen xuebao* 13 (1). In English: Science 154 (3749,4) November 1966.

271 Xi Zezong (1966). Dunhuang xingtu 敦煌星图[The Dunhuang Star Map]. *Wenwu* 1966 (3).

272 Xi Zezong (1959). 1949-1959 Zhongguo tianwenxue shi de yanjiu 1949-1959 中国天文学史的研究[1949-1959 Studies of the History of Chinese Astronomy]. *Shi nian lai de Zhongguo kexue – tianwenxue.* Beijing: Kexue chubanshe.

273 Xi Zezong (1964). Jinian Jialilüe danchen 400 zhounian 纪念伽利略诞辰 400 周年 [In Honour of the 400th Birth Anniversary of Galileo Galilei]. Kexue shi jikan 1964 (7).

274 Xi Zezong (1965). Chaoxian Piao Yanyan "Rehe riji" zhong de tianwenxue sixiang 朝鲜朴燕岩《热河日记》中的天文学思想 [Astronomical Thought of Korean Bak Yiwon's Jehol Diary]. *Kexue shi jikan* 1965 (8).

275 Xi Zezong (1958). Jinian Qi'ao'er'kefusiji danchen 100 zhounian 纪念齐奥尔科夫斯基诞辰 100 周年[In Honour of the Birth Centenary of Tsiolkovsky]. *Kexue shi jikan* 1958 (1).

276 Xi Zezong (1961). Yuemianxue 月面学 [Selenography]. *Kexue tongbao* 1961 (2).

277 Xi Zezong (1961). Guanyu Jinxing de jige wenti 关于金星的几个问题 [Some Problems Concerning the Venus]. *Kexue tongbao* 1961 (4).

5) Popular articles on the history of Chinese and Western astronomy, on astrophysics and astronautics in newspapers and popular magazines

   a. *Artificial Satellite Will Appear Within 1-2 Years* (1957)[278]

   b. *How the Law of Universal Gravitation Was Discovered* (1961)[279]

   c. *Astronomy and the Modern Science* (1962)[280]

   d. *Cosmological Thought of Zhu Xi* (1963)[281]

   e. *Sketches of the Universe* (1965-1966)[282]

One can see that Xi Zezong's thematic scope was broad. The list of his scholarly publications on the history of astronomy illustrates that the dominant topics were the historical records of novae and supernovae, but he also studied the historical astronomers Yixing and Wang Xichan.

Xi Zezong was praised for strict adherence to facts (*shi shi qiu shi* 实事求是 'seek the truth from facts').[283] Especially his two works, *On the Observation of Star Positions By Monk Yixing* from 1956 and *A Study on the Astronomical Works of Wang Xichan* from 1963 are cases in point. In these two papers, Xi Zezong refuted and convincingly discredited two alleged astronomical primacies of China, the 'discovery' of proper stellar motion by the monk Yixing (683-727 CE), and Wang Xichan's (1628-1682) alleged prediction of the Venus transit in 1631. Xi's first argument was that Wang would be only three years of age when he was supposed to make those calculations, however Xi provided even more additional arguments

278 Xi Zezong (1957). Renzao weixing yi liang nian nei jijiang chuxian 人造卫星一两年内即将出现 [Artificial Satellite Will Appear Within 1-2 Years]. *Kexue xiaobao* Feb 16th 1957 (Beijing).

279 Xi Zezong (1961). Wan you yinli dinglü shi zenyang faxian de 万有引力定律是怎样发现的 [How the Law of Universal Gravitation Was Discovered]. *Wenhui bao* Oct 8th 1961.

280 Xi Zezong (1962). Tianwenxue he xiandai kexue 天文学和现代科学 [Astronomy and the Modern Science]. *Kexue dazhong* 1962 (5).

281 Xi Zezong (1963). Zhu Xi de tianti yanhua sixiang 朱熹的天体演化思想 [Cosmological Thought of Zhu Xi]. *Guangming ribao* Aug 9th 1963.

282 Xi Zezong (1965-1966). Yuzhou jianying 1-7 宇宙剪影[Sketches of the Universe]. Published under the pseudonym Zhou Fen 周芬. *Renmin Ribao* Oct 16th, 28th, Nov 4th, 11th, 22nd, Dec 13th 1965, Mar 22nd, Apr 2nd 1966.

283 Guo 2011: 16.

that contradicted this idea fully and convincingly. Both of these 'primacies' appeared in the works of earlier historians, Zhu Wenxin and Chen Zungui, and have already been discussed in chapter 2. The case of Yixing's alleged discovery of proper stellar motion will be analysed in more detail in chapter 4. This example clearly shows that professionalization of the history of science led to a higher precision and the 'seeking [of] the truth from the facts'. The competition with foreign publications could also have been another factor, as these kinds of issues could have easily soon become an easy target for foreign researchers if not refuted.

Later on, especially after the Cultural Revolution, Xi Zezong resumed his publication activity in full. He also broadened his research scope to studies of the Mawangdui tomb comet drawings (Western Han dynasty 205 BCE-9 CE) which was published in 1978,[284] Gan De's discovery of Jupiter's moon Ganymede (published in 1981), to the Xia-Shang-Zhou chronology project, and finally the history of scientific thought, among many other smaller projects.[285] Xi Zezong's early work was gravely impacted by the political campaigns of the 1950s and 1960s. As will now be shown, this was however not simply a hindrance of his research, it also transformed the way he approached history of Chinese astronomy.

3.3 Ideological Influences on Papers Written About the History of Chinese Astronomy (1949 – 1966) and the Essence of Historical Materialism

What was said in chapter 3.1 on astronomy and communist ideology and its appearance in popular astronomical articles is also valid here, at least for the historiography of astronomy as a discipline and its popular articles. Although the historiography of natural sciences had for a long time been institutionally subordinated to the *Second Historical Institute*, the relationship between astronomy, astrophysics and the history of astronomy was quite close as historians of astronomy were all recruited from the ranks of astrophysicists in this period.

In this section, the focus will mainly be on the articles of Xi Zezong as they represent a larger proportion of all the relevant articles written in this period. In a book summarising events in Chinese astronomy in the years 1949 – 1959, in a special chapter devoted to historiography, Xi Zezong wrote:

284 Xi Zezong (1978). Yi fen guanyu huixing xingtai de zhengui ziliao – Mawangdui Han mu bo shu zhong de huixing tu 一份关于彗星形态的珍贵资料—马王堆汉墓帛书中的彗星图 [*Valuable Material on the Types of Comets – Comet Drawings on the Silk Manuscript from Mawangdui Han Period Tomb*]. *Wenwu* 1978 (2):5-9.

285 As Xi Zezong's work after the Cultural Revolution is beyond the scope of this PhD thesis, the reader is referred to Guo (2011) and Xi (2002) for comprehensive bibliographies of Xi Zezong's works.

> After the liberation of the whole country, the workers of historical sciences assumed a new important duty, that is to take the stand of the working people and to research and write the history of the homeland from the viewpoint of historical materialism. [286]

However it needs to be pointed out that in Xi Zezong's articles on the history of Chinese astronomy published in scientific journals, such direct manifestations of communist ideology (and/or its nationalist aspect) were very rare. Ideological proclamations were rare and adherence to historical materialism did not enter the matter-of –fact-presentation (*shi shi qiu shi* 实事求是, literally 'seek the truth from facts') especially in his main research field which was the history of Chinese astronomy as well as in these kinds of articles.

On the contrary, in Xi Zezong's historical articles which did not deal with Chinese astronomy, communist ideology appeared more prominently. These were for instance his articles on Galileo Galilei and K. E. Tsiolkovsky.[287] In the article on Galileo[288] Xi compared the Italian scientist to the Bulgarian Communist Georgi Dimitrov (1882 – 1949) who had defended himself in a 1933 trial in Nazi Germany for setting the German *Reichstag* on fire. In the article on Tsiolkovsky,[289] Xi emphasised the contribution of the Great October Revolution (1917) to Tsiolkovsky's later scientific career, when he finally gained good conditions for his research, and quoted Tsiolkovsky's personal letter to Stalin saying that only Stalin's regime allowed him to carry out his plans and elevate mankind.

There is the possibility that these ideological 'insertions' might have been enforced by the editors of a particular journal. And of course, these statements might have already been present in the secondary sources that Xi Zezong used for writing.

It must be said that political and nationalist content occurred much more in popular articles (sometimes only partly) dedicated to the history of Chinese astronomy which were written by other authors apart from Xi Zezong and which were published in newspapers or popular scientific journals. Mostly, the authors of these were not historians of astronomy and

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286 Xi Zezong (1959). 1949 – 1959：Zhongguo tianwenxue shi yanjiu 中国天文学史的研究, *Shi nian lai de Zhongguo kexue – tianwenxue (1949 – 1959)*.

287 Konstantin Eduardovich Tsiolkovsky (1857 – 1935) was a Russian and Soviet rocket scientist and a pioneer of the astronautics theory.

288 Xi Zezong, Jinian Jialilüe danchen 400 zhounian [Commemorating the 400th Aniversary of the Birth of Galileo], IN: *Kexue shi jikan*, No. 7, Beijing 1964.

289 Xi Zezong (1958). Jinian Qi'ao'er'kefusiji danchen 100 zhounian 纪念齐奥尔科夫斯基诞辰 100 周年[In Honour of the Birth Centenary of Tsiolkovsky]. *Kexue shi jikan* 1958 (1).

sometimes even not astronomers by profession. For instance, this might have been the case of the already mentioned article by Li Yuan on astronomical work in New China[290] which also had a section on the history of astronomy, with a paragraph written in a rather boastful and exaggerated narrative style (which was a manifestation of the nationalist aspects of communist ideology) where it listed China's (alleged) primacies in world astronomy. It was clearly aimed at astonishing readers and raising their national pride. Zhu Kezhen's articles on the Chinese astronomical heritage in *Renmin Ribao* (the *People's Daily*) in the early 1950's were a similar case. One of the articles referred to below praised Chinese ancient astronomers highly and especially Zhang Heng 张衡 (78 – 139 CE), who was re-evaluated after 1949 as one of the first sceptics in China, stating that he was a person "with feather of phoenix and a horn of *qilin* (凤毛麟角的人物)", ie. a very rare person. The article concluded in a rather typical manner:

> If we see the huge work of Guo Shoujing, before him Zhang Heng, Yu Xi, Liu Chao, Yixing, Shen Kuo and others, and the results of active and tireless work of a myriad of astronomical workers, we gain the self-confidence that under the leadership of the new cultural and educational policy of the People's Government that defends patriotism, love for the people, love for labour, love for science, love for public-owned cultural education, then if the necessary time is given, our astronomy, in the same way as the other sciences accompanying her can acquire even brighter and glorious achievements. [291]

Historical materialism was mentioned in Xi Zezong's quote at the beginning of this section. This term refers to the Marxist methodology of historiography, first formulated by Karl Marx (1818-1883) himself. The key idea of *historical materialism* is that history occurs in accordance with observable inclinations that are based on material and production conditions of a population and production relationships within the society. The combined material and technological conditions together with the relationships of production in the society determine the society's development. *Historical materialism* always traces the causes of social shifts to the changes of how the people collectively made their livelihood. The social classes and the relationships between them are supposed to be a reflection of economic activity of human society in any given particular period. This methodological approach was

290 Li Yuan, Xin Zhongguo de tianwen gongzuo 新中国的天文工作 [Astronomical Labour in New China]. *Kexue dazhong* 1953 (10).

291 Zhu Kezhen (1951). Zhongguo gudai zai tianwenxue shang de weida gongxian 中国古代在天文学上的伟大贡献 [The Great Contributions of Ancient China in Astronomy]. *Renmin ribao* Feb 26th 1951.

adopted by socialist countries in the second half of the 20th century as their scientific method for historiography.

As far as the historiography of Chinese astronomy of the early PRC is concerned, one can see the methods of historical materialism to be rather more present in larger monographs (or longer narrative articles) focused on the general history of Chinese astronomy or its particular period than in shorter scientific or popular articles, perhaps due to their narrower topics and the amount of space allocated. The *History of Chinese Astronomy* by Li et al. (1981) was published several years after the Cultural Revolution but had already been intensively worked on before its outbreak in 1966. Under the influence of *historical materialism*, this work analysed broader social and political context of events in the history of Chinese astronomy and its structure contained more argumentation and analysis and was more structured than earlier works from the pre-war republican period such as Zhu Wenxin's *Short History of Astronomy* (1935) and Chen Zungui's *Brief History of Ancient Chinese* Astronomy (published in 1955 but written during wartime, see chapter 2.) In Li et al. (1981), material and technological conditions together with relations of production (for instance the prevailing conditions in agriculture) were analysed for each historical period and laid out as the background for the evolution of astronomy. The relationships between social classes were also examined in each period and terms such as 'class struggle' (*jieji douzheng* 阶级斗争) and 'exploitation' (*boxue* 剥削) of one class by another were often used. The influence of *historical materialism* will also be further discussed in chapter 4 which compares works from both periods.

It should be stressed that content related to communist ideology and/or its nationalist aspects is almost not present in the articles on the history of Chinese astronomy published in scientific journals. In the articles on the history of Western astronomy or astronautics, it can be found to some extent. In popular historical articles, this content is at its most plentiful. What can be observed is that the wider the intended audience of the article, the more ideological content can be found in it. The methodology of *historical materialism* was apparently used rather more in monographs or longer narrative articles on the general history of Chinese astronomy or of a particular period within it. Under the influence of *historical materialism*, the social and political context outlined was more focused on, the histories are more structured and they contain more analysis and argumentation than in earlier works.

3.4 Historians of Chinese Astronomy and the Political Campaigns of the Late 1950s and Early 1960s

This section aims to focus on how the politics of the Chinese Communist Party and especially its campaigns affected intellectuals and scientists mainly during the period from the establishment of the People's Republic of China in 1949 until the year 1958. Only the campaigns that affected the historians of Chinese astronomy are discussed.

3.4.1 The Campaign Against Hu Feng

This campaign wascalled 'Fan Hu Feng' 反胡风 in Chinese. Hu Feng 胡风 (1902 – 1985) was a writer and a literary and art theorist and his real name behind the pseudonym was Zhang Guangren 张光人. He came from the circle of writers around Lu Xun. He was also active in the *League of Left Wing Writers*, being one of its most prominent members. In 1942, when the *Zheng feng* campaign broke out in Yan'an, he was in Chongqing. At that time, he and his disciples were very active in criticising the Party's line regarding literary creation. They felt that what was going on in the literary realm following the publication of Mao's "Yan'an Talks on Art and Literature" (*Zai Yan'an wenyi zuotanhui shang de jianghua* 在延安文艺座谈会上的讲话) was against the spirit of the revolution, especially that literature would lose its function of being a mirror of society and would become a propaganda tool praising revolutionary heroes and idealising the future.

At the beginning of 1955, more and more meetings criticising Hu Feng were organised, where most of his fellow writers took part. All of his three self-criticisms, where he nonetheless denied being anti-Marxist and against the party, were rejected as insufficient or false. In May of that year, the Chinese Writers' Union expelled Hu Feng and the campaign to eradicate all Hu Feng elements in the whole society was expanded to the entire country. A month later, the *People's Daily* (*Renmin ribao*) talked of him no longer as just an ideological deviationist, but as the "leader of the imperialist and GMD secret service and commander of an anti-Communist, anti-masses underground" and the Xinhua Agency wrote that there was enough evidence from his secret letters that showed his group plotted to "overthrow the people's state and restore imperialism and GMD rule in China."[292] To prove his counter-revolutionary activities, his private letters were used as evidence and his references to literary affairs were often interpreted as references to political affairs. These letters together with party materials were distributed to individual study groups.

292 Goldman 1967:150.

In July 1955, Hu Feng was arrested and with one short break, spent over twenty years in prison. The campaign against him however, continued until the end of 1955 with even more noise generated in order to spread the 'facts' to ordinary people in the remotest areas. The party aimed to build up a pure political consciousness and to destroy all unorthodox thinking.

In the summer of 1955, this campaign reached scientists, including the *Second Historical Institute*, where Xi Zezong worked at the time. He mentioned that the campaign paralysed their work and they had to spend around six months studying critical materials on Hu Feng. Xi's older colleague Ye Qisun stated: "Of course we should criticise him too, but using half a year is unnecessary, this matter does not have so much importance for us."[293] This attitude conformed with the general indifference of natural scientists towards Hu Feng's case and proved that "their vigilance in the revolutionary case was low," according to Goldman.[294]

3.4.2 Campaign Against the Rightists

The Campaig Against the Rightists followed the Hundred Flowers Campaign in July 1957, as Mao Zedong's counter attack to the intellectuals that had previously criticized him.. Mao Zedong's speech from February was published but in an altered version, highlighting the allowed and forbidden kinds of criticism and calling for a fight against the counter-revolutionaries. Thus the second phase of the 'Movement of Rectification of Workstyle' started, better known as the 'Anti Rightist Campaign' (*fan you yundong* 反右运动). The daring intellectuals became a target of the 'class struggle' declared against them by Mao. There are three most widespread theories on why Mao acted this way. The first says it was simply a trap for those who dissented. The second, supported for instance by McFarquhar, stated that Mao's decision was strongly opposed by many other party leaders and so he was forced to "beat a hasty retreat after criticism of him got out of hand." According to the third theory proposed by Goldman, this was a common cycle of relaxing and seizing power in which "the party first relaxed control over intellectuals in order to encourage their creative participation in solving problems it faced, and then repressed dissidence in order to re-impose political control."[295]

293 Guo 2011:133.

294 Goldman 1967:151.

295 Andreas 2009:40.

The campaign targeted the intellectuals who had expressed criticism as well as some members of the party. At that time, the rectification campaign ran within the party and some party members were suspected of getting ideologically close to the intellectuals, so the stigma of 'being marked as a rightist' (*hua cheng youpai* 划成右派) was given to both the 'rightist' intellectuals and some of the party members. According to Fairbank, between 300,000 and 700,000 qualified people were removed from their positions and marked as 'rightists', ie. enemies of the people.[296] The campaign reached every corner of urban society and many 'rightists' were sent to the countryside for 're-education' and 'remoulding' for the rest of their lives. In reality, the time that they spent in the countryside often even exceeded 20 years or until the 'rehabilitations' of the late 1970s.

Mao Zedong in this way 'beheaded' Chinese society. He dismissed a huge portion of the Chinese intellectual elite and replaced it with 'fundamentalists'. From 1957, Mao began to persecute intellectuals much more intensely and vindictively and many attacks against them also appeared in his speeches. In reality, this also displayed his fears and his inability to control them.

This campaign also affected astronomers and historians of astronomy, however for the most part, simply by significantly slowing their work and strengthening the censorship of their articles. The academics rarely mentioned people in their circles as being labelled 'rightists'. Xi Zezong said that at their institute, the campaigns were organised by deputy director Zhang Yizhi who was the leader of the local party group. Political meetings were held every day. Zhang had serious disputes with Qian Baocong 钱宝琮 (1892 – 1974), a historian of mathematics who did not recognise his expertise. Zhang was eventually replaced by Wu Pinsan, who reportedly held the party line very strictly. No publication or articles could pass without Wu's approval. [297] Li Yuan mentioned only a couple of examples of academics who were targeted by the regime. The case of Chen Zungui 陈遵妫 (1901 – 1991), an important foreign educated astronomer who was labelled a 'rightist' when he was the director of the Beijing Planetarium, and also the case of Wang Tianyi, a co-founder of the Journal Popular Science (*Kexue dazhong* 科学大众) who was sent to Xinjiang during the *Anti-Rightist Campaign*. He had to stay there for 20 years, working as a cook.[298]

296 Fairbank 1998:407.

297 Guo 2011:163.

298 Li, Chen: 2010.

Pretexts needed for attacks on individuals during the campaigns became more and more trivial as time passed. As Strauss outlined, "by 1957 one only needed to have ever said something that could be construed as counter revolutionary to be so targeted, and by the end of the 1950s a simple accusation of having thought the wrong kinds of thoughts sufficed." [299]

For scientists, the campaign of 1958 for 'red expertise' (also called *hong zhuan jiaoyu* 红专教育) was important. This campaign is mentioned here in spite of the fact that it was a campaign of a different type than the ones described above which had featured 'struggle meetings' and punishments where this one did not. The leadership wanted to re-educate scientists who would be both 'red' as well as 'experts', meaning to breed 'new' scientists who were absolutely loyal to the regime. Everyone, including Xi Zezong, had to come up with their own plan for how they would become 'red and expert'.

3.5 A Summary of this Author's Interview with Chen Jiujin 陈久金, a Colleague of Xi Zezong and a Professionally Trained Historian of Astronomy

The following text is based on an interview that this author conducted with Prof. Chen Jiujin on April 1st, 2014. Chen Jiujin was born in 1939 and comes from Changzhou 常州 near Nanjing, Jiangsu Province. Between the years 1959 and 1964 he studied astrophysics at Nanjing University. Since his graduation in 1964 until his retirement, he worked at the *Cabinet for History of Natural Sciences* (a separate institute from 1975). His main field of research focused on astronomical historical figures. In the 1980s, he turned his attention to the astronomy of national minorities in China and in the new millennium, he began publishing works on traditional Chinese constellations, astrology and myths about the heavens.

Not too many new facts were gleamed from this interview however it allowed this author to refute or refine some hypotheses and to clarify certain information..

Following a brief introduction of this research project to Professor Chen, the first area of questioning which the interview started with concerned the professor's family, his youth and the time before he began university. Unfortunately he spoke very little on this topic. His father and grandfather had some background in geomancy. His two brothers and one sister did not have anything to do with astronomy. His own interest in astronomy was inspired by the books that he read in his youth and he became a historian of astronomy immediately after his graduation from astrophysics at Nanjing University in 1964. He also considered working at an

299 Strauss 2006:910.

observatory or staying at the faculty. Through the university he received this job offer for the *Cabinet*. This was a different situation to that of his older colleague Xi Zezong who was appointed to the same job of historian several years after graduating.

Regarding the political campaigns of the 1950s and early 1960s and their influence on his life and work, he stated that they were only temporary and not so frequent and that he encountered them only after secondary school, at university. He mentioned the campaigns *Against the Rightists* 反右 (1957) and *Socialist Education* (1963–1966 also known as the *Four Clean Ups* 四清). They presented an obstacle to scientific work and study, but when the campaigns were not running there was space for 'free research' in the framework of the *Twelve Year Plan*.[300] As Chen put it in the interview, the basic way to survive during the campaigns was to "be able to speak well and not to act against the Communist Party". This account differs significantly from Xi Zezong's account of this period in his oral autobiography, Xi criticised the campaigns a lot for being a hindrance to research, for not allowing the employees of the *Cabinet* to dedicate more than around 20% of their time to research. The rest had to be allocated to political meetings whilst the campaigns were running. As the editor of Xi's oral autobiography, Guo Jinhai, mentioned in a footnote that from the beginning of the *Great Leap Forward* (1957) until the end of the *Cultural Revolution* (1976), Xi Zezong had very little time (and later almost none) for his planned research.[301]

On the Soviet influence, Chen stated that scientists were generally pushed "to be left-leaning even much more so than in the Soviet Union. Many people learned Russian (before the Sino Soviet split in 1959), including Xi Zezong, who studied Russian in Harbin for two years. However those that learned were not actually able to speak the language but many of them (also including Xi) translated Russian books. It was new information for this author to hear that Xi Zezong was never heard speaking Russian by his colleagues.

As far as a hierarchy in China's scientific institutions of that period is concerned, Prof. Chen Jiujin said that directors of academic institutes had a large degree of autonomy and party secretaries did not have the final say over them. However, as Xi Zezong stated in his oral autobiography, during some periods nothing could be done without the consent of the party secretaries and every single journal article even had to be approved by them.

300 As with many other institutions, the *Cabinet for Research on History of Natural Sciences* worked out its own plan forpublications, translations and other activities shortly after its establishment in 1957.

301 Guo 2011.

This author also asked Prof. Chen several questions on Xi Zezong, because of his importance to the primary research for this thesis. On this, the author was able to refine some hypotheses and also to obtain some new information. Xi was persecuted at the beginning of the Cultural Revolution for writing about sunspots[302] and the sun's limited lifetime as well as for a photo of Mao Zedong found in his personal booklet of Mao's *Highest Directives* which had been scratched. Chen Jiujin commented on this that Xi was indeed persecuted for his writings about sunspots,[303]but it was only a secondary reason. As he stated, even Mao Zedong himself had reportedly opposed making links such as those between himself and the Sun. The main reason for the very harsh persecution was the scratched photo of Mao Zedong. Although it may have been done by a child, Xi Zezong was blamed for it by his colleague Wang Jianmin 王健民, who later left the *Cabinet* (the actual name of this colleague was new information to this author) and who accused him of scratching it himself. He was expelled and ordered to sweep the streets. The Red Guards also turned his home upside down. This eventually led to his suicide attempt by swallowing insecticide and through electrocution. He was discovered after the attempt by a neighbour who notified his *danwei* (employer) and he was transported to a hospital which saved his life. As far as this event is concerned, compared to Xi Zezong's oral autobiography, the interview brought more details (for instance on the role of his colleague who accused him) and helped in working out the predominant reason for Xi's persecution.

In 1966, Xi Zezong and his colleague Bo Shuren 薄树人 (1934–1997) prepared a large monograph on the history of Chinese astronomy for publication. This author also inquired on the fate of this book. It was handed to a publishing house just before the Cultural Revolution broke out and later could not get published. The manuscript was lost for a long time, later it was even literally rescued from a dustbin, then for some time it lay forgotten in a library. Finally, after it was rediscovered again, it was published with revisions in the 1980s.

Along with Xi Zezong and Wang Shouguan, Chen Jiujin was also sent to the *May Seven Cadre School* during the Cultural Revolution, but to a different place, to Henan Province. He spent almost one year there cultivating the land and building houses. When asked on the reason why the intellectuals were sent to such institutions to be educated through

302 Xi 1957.

303 In the popular perception of Mao in China, Mao Zedong was regarded as equivalent to the sun, so it was unthinkable that the sun could have 'spots' or a 'limited lifetime'.

labour, Prof. Chen expressed his opinion that Mao Zedong had regarded these people as worthless and as "eating the bread of idleness" (吃闲饭). Generally, in a similar manner to Wang Shouguan, Chen Jiujin also complained of almost zero leadership and a lack of guidelines on what to do in the *Cabinet* during this period in their field of research. He literally said "You could come to your workplace to have a chat, to play chess which was also possible…writing articles was not allowed, all the journals had been stopped anyway."

Chen Jiujin stressed his belief in materialist theories, however he added that it was wrong to connect materialism only with the communists, because these were two different concepts and the materialists had existed since the ancient times.

4. A comparison of Chapters on the Tang, Song, Yuan and Ming Periods in *A Short History of Astronomy* (Zhu Wenxin, 1935) and the *History of Chinese Astronomy* (collective work, Li et al., 1981)

This chapter aims to compare accounts of the Tang (618-906 AD), Song (960-1279), Yuan (1271-1368) and Ming (1368-1644) periods in the history of astronomy, as outlined in the following two books: *A Short History of Astronomy* 天文学小史 by Zhu Wenxin, published by the Shanghai Commercial Press in 1935 and *History of Chinese Astronomy* 中国天文学史 written by a number of authors and published by the Science Press 科学出版社 in 1981. Both of these works can be considered to be very representative and comprehensive within this field in each of the studied periods. Zhu Wenxin's work from 1935 was the first of its kind as the first modern monograph written by a Chinese individual which used a modern scholarly ("scientific") approach in the writing of the history of Chinese and also Western astronomy. The second collaborative work from 1981 focused on Chinese astronomy only and was the result of long term efforts of a team of researchers in the *Cabinet for Research on History of Natural Sciences* (since 1975 called the *Institute*), that had begun as far back as 1959 as part of the 'Twelve Years Plan' for the *Cabinet*. Its finished manuscript was twice lost during the Cultural Revolution, was later found again and then revised and reworked in the late 1970s and early 1980s. The period of Tang, Song and Yuan dynasties is generally considered the peak of astronomical development in Chinese controlled domains, based predominantly on the domestic tradition and their own resources.

What will be compared in these two different historical accounts? Beginning with a brief comparison of the language, style and structure, the main object of comparison will be the narrative and content, specifically which topics are present or absent in the corresponding chapters of the two monographs and how similarly selected topics are dealt with in both quantitative and qualitative terms. In other words, for example, whether the evaluation of the same phenomenon in either of the monographs is positive or negative and how much space is devoted to the same phenomenon.

Tang, Song, Yuan and Ming Periods in Zhu Wenxin's Short History of Astronomy

In Zhu Wenxin's Short History of Astronomy, these four dynastic periods are covered in a single chapter. The Ming period (1368-1644) is the last Chinese dynastic period that Zhu Wenxin included in his first volume *The History of Ancient Astronomy*. It is also the last part of its larger section entitled *The History of Chinese Astronomy* which is dedicated to the

astronomical traditions practiced in China. The Ming dynasty is considered to be the period at the end of which the advent of ’new astronomy’ occurred in the Western world, subsequently also bringing these new thoughts and inventions to China. In his foreword, Zhu Wenxin had already singled out the advent of telescopic astronomy along with the first astronomical use of a telescope by Galileo in 1609 and the occurrence of theoretical astronomy in the first decades of the 17th century (the Kepler Laws) as the turning points between ’ancient’ and ’new’ astronomy. [304]

The structure of this book is shown in its entirety in Chapter 2.4. Because the structure of this book is very different from the second monograph and its table of contents is quite short, it is listed here in its entirety.

Volume 1: The History of Ancient Astronomy

History of Chinese Astronomy

5. From Tangyu to Zhou and Qin
6. Two [Periods of] Han
7. Wei, Jin and Southern and Northern Dynasties
8. Tang, Song, Yuan and Ming

History of Western Astronomy

9. Babylon
10. Egypt
11. Greece
12. Rome
13. India
14. Arabia
15. Western Territories

304 Zhu 1935:9.

16. Western Europe

Volume 2: The History of New Astronomy

6. The History of Astronomy in the 16th Century
7. The History of Astronomy in the 17th Century
8. The History of Astronomy in the 18th Century
9. The History of Astronomy in the 19th Century
10. The History of Astronomy in the 20th Century

It can be seen that the historical sections are narrated chronologically in the first large section dedicated to Chinese astronomy, while in the section on Western astronomy the different nations are outlined one by one. Traditional Chinese astronomy was given about one quarter of the space in the whole monograph (altogether 46 pages in the original). The chapter on the Tang, Song, Yuan and Ming periods covers more than 1000 years of history and is 14 pages long.

This chapter as well as the rest or the monograph is written in a literary language based on the written idiom of the late Qing period with some innovations in vocabulary and a more regular sentence structure. The style contains lots of parallelisms. as is evident from the later text. Although it could be loosely classified as Classical Chinese based on its grammar and part of its vocabulary, when juxtaposed with the passages quoted from dynastic histories ot is evidently much closer to the modern language than to those historical registers. In the introduction to the chapter, Zhu Wenxin exaggerated the power the development level of China during the first millennium CE in a similar manner to how he had done in earlier chapters:

> From Han [206 BC-220AD] until the beginning of Tang [618 AD], dissolving and unification were the general trends in the Central Plain, but in these four hundred years of turmoil, the achievements of astronomy and meteorology did not decline. In the Sui and Tang periods, at the time of a sudden outburst of astronomical development, at the beginning of Tang, there was a strong state whose territory had spread to distant lands, it annexed Korea in the East, reached Persia in the West, subordinated Annam in the South and crossed Gobi in the North and in a conciliatory manner got to distant countries and spread culture to distant territories. The Nestorians came from Persia and were allowed to build churches in the Central Plain, the Arab Muslims came and were allowed to build mosques in Guangdong, Xuanzang went via Turkistan to India, collected Buddhist sutras and thus their fame and teaching spread to the far

> regions. Therefore, Chinese education and knowledge routinely spread to India, Persia, Arabia and via the Arabs got into Western Europe. The dynasties Tang, Song, Yuan and Ming cover more than one thousand years, when China held for a long period the front position in the world..[305]

Except for the section quoted above, any political and social background that would explain the changes in conditions and the ebbs and flows of the peaks and troughs within the development of astronomy in the long period of the Tang, Song, Yuan and Ming dynasties is quite scarce. Moreover, the periods of disunion (such as the Five Dynasties, 907-960 CE) almost entirely absent.

In general, this chapter of Zhu's work is focused more on astronomical systems (this author often calls them astronomical systems in this thesis, because they comprise much more than just a 'calendar' which has only phases of the Moon, equinoxes and solstices, but in this instance these calendrical systems also include the ephemerides of planets, etc.; for instance Sivin simply uses the term 'system') and provides the reader with their lists and specific features for each dynastic period, arranged chronologically. Besides the fact that calendar making, production of ephemerides and calendar reforms have always been crucial for any astronomical or astrological activity, the reason why calendars were written about at length here could also be Zhu Wenxin's already prepared material for his previous work *Lifa tongzhi* 历法通志 (Calendrical Annals) which he was able to use. As the number of calendars listed is very large, an exhaustive comparison and the way they are treated in the two monographs will not be attempted for each of them. Instead, focus will be limited to the three or four of the most important examples. The analysis of these examples follows.

In each dynasty, Zhu Wenxin highlighted some special features related to observation or instruments and gave them more space.

For the Tang period, these were Yixing's and Nan Gongyue's measurements of the distance that corresponds to the change in the altitude of the celestial pole of one degree (*du*), the establishment of observation stations across the empire, and Yixing's cataloguing and measurements of star coordinates. According to Zhu's text, Yixing discovered that stars had different coordinates (angular distances from the pole) than in the ancient times, and observed that 14 of the lunar mansions' constellations *xiu* moved more southwards and another 14 *xiu*

305 Zhu 1935:44. PhD thesis author's translation.

moved more northwards. This overview was followed by two quotations from late Qing astronomers Mei Wending and Qi Zhaonan and a comparison to the work of Edmond Halley:

> Mei Wending said: "What causes it - isn't it the motion of fixed stars that lets them move gradually northwards after the winter solstice and gradually southwards after the summer solstice ?" This issufficient [to show that] there was a proof of precession [in Yixing's time]. Qi Zhaonan said: "Since ancient times everyone said that the fixed stars followed the Heaven and did not move, [but] the Western methods first said that the fixed stars were also themselves moving, and their theories were very precise. When Yi xing measured it with a bronze instrument, he knew [that the coordinates] from ancient times and today did not correspond, thus he achieved priority over the Western methods." Only in 1718, the Englishman Halley observed that the angular distance of Sirius, Pollux and Arcturus from the ecliptic was different from [the times of Ancient] Greece, with the shift of Sirius especially apparent. From the time of Tycho Brahe the change was already visible, so therefore the proper motion of stars was known. [But] what was observed by Yi Xing, was 1000 years before Halley which proves [he made] an earlier discovery.[306]

The problem with this section is that Yi Xing did not discover the proper motion of stars like Halley did. This idea has been convincingly discredited by Xi Zezong in his article from 1959,[307] where he concluded that the changes in coordinates, as measured by Yi Xing, were caused mostly by precession and if not, then by errors of measurement. It must have been obvious to Zhu Wenxin, as an astrophysicist, that the cause of the shift of fourteen *xiu* southwards and another fourteen *xiu* northwards must have been caused by precession. However, the other deviations (not corresponding to precession) in positions measured by Yi Xing which had not been known by that time (and which Zhu did not even mention specifically) might have been considered as 'proof' of proper stellar motion discovery, though Zhu did not present the argument in this way and conflated the two different things together to convince the reader of China's primacy. In the middle of this section he simply switched from discussing precession to discussing proper stellar motion and it is unclear whether this was simply as a result of neglect or a deliberate manipulation. It seems that the idea of Yi Xing's apparent discovery of proper stellar motion had been circulating within the circles of Chinese historians of astronomy for quite some time.[308]

306 Zhu 1935:46. PhD thesis author's translation.

307 Xi 1959.

308 The same evaluation of Yi Xing's alleged discovery of proper stellar motion, even with the same quotations, appears also in Chen Zungui's Short History of Ancient Chinese Astronomy (1955), without any mention even of precession.

Another topic worth comparing is the mention of Indian astronomers being present at court during the Kaiyuan period (713-742 CE) of the Tang dynasty.

> In the Kaiyuan period the astronomical system Navagraha [*Jiuzhi li* in Chinese] from India was translated. The contemporaries thought it came from the Western Regions, its nomenclature and constants were strange and different, and that it was not worth taking as a model. In Tang astronomical chapters, there are only a few words about it, [but] its system can be seen in the *Kaiyuan zhan jing*, which gives a rough outline of the ancient Indian calendar.[309]

The tone of this mention is neutral aand in this sense it is quite contrary to the positive coverage as presented in the *History of Chinese Astronomy* from 1981, that criticizes ancestors for inability to adopt new system, as will be seen later.

Zhu also wrote about the different names under which the astronomical Bureau existed during the Tang dynasty (*huntian jian* 浑天监, *hunyi jian* 浑仪监, *taishi jian* 太史监 or *sitian jian* 司天台), and about the practice of preventing its officials from maintaining contact with other officials and ordinary people.

When Zhu wrote about the Song period, he emphasised the significance of establishing the two concurrent astronomical and astrological institutions *Taishi ju* 太史局 and *Sitian jian* 司天监, where the latter had the role of re-examining the results and predictions of the former. He acknowledged that this resulted in more efforts in calendrical reforms.

> However, everyone on the *Taishi ju* belonged to the Confucian branch of thought, whereas there were only astronomers and astrologers on the *Sitian tai,* therefore there was the calendrical system of the Confucians and the system of the astronomers. The Confucians exaggerated their speeches on the mysterious *li* and the astronomers and astrologers rigidly followed the numbers and so along with that different views of different schools arose and it easily led to fierce competition [among them] that continued for generations, which inevitably affected the calendrical records and resulted in more and more frequent reforms of calendrical systems . [310]

Unlike the *History* by Li et al. from 1981, this is also almost the only mention of any political or social influence on astronomy in the Song period. Zhu then wrote about the numerous Song calendrical systems (more than 20 were disseminated) and quoted their

309 Zhu 1935:45. PhD thesis author's translation.

310 Zhu 1935:47. PhD thesis author's translation.

classification and brief description from the astronomical chapters of the Song dynasty history.

He then offered quite a comprehensive and vivid account of Su Song's astronomical tower. He mentioned its predecessors Zhang Heng's 张衡 and Liang Lingzan's 梁令瓒 water-powered armillary spheres and introduced all the important elements of all stories on Su Song's device in quite some detail and also praised its clockwork mechanism. He described the loss of the astronomical tower when the Jin conquered the Song capital Kaifeng in 1127, and after the emperor Gaozong fled to the south, the troubles of the later Southern Song court with finding specialists in astronomy, astrology and instrument making in a somewhat similar manner to the way it was described in Li et al. (1981), as will be seen in the later text.

> When [emperor] Gaozong fled to the south, there was a desire to recreate the armillary spheres, but there were no specialists anymore, so he had people search [Su] Song's books to be presented to him by [Su] Song's son Xie, but when courtiers read them they were not able to understand them and Xie was not acquainted with his father's books either, so they were not able to recreate them [the armillary spheres], thus the observational expertise was almost lost.[311]

In the next section, on the Yuan dynasty, Zhu devoted the most space to Guo Shoujing 郭守敬, his observational instruments and his great calendrical system *Shoushi li* (*The Calendar Granting the Seasons*). In the first paragraphs, he highlighted this period as an especially flourishing one, he discussed the successful fight against superstition at that time as well as China being on the way to 'modern astronomy'.

> Astronomy experienced its most flourishing period when the Yuan dynasty began. There were more than 13 kinds of observing instruments and 27 observing stations. Guo Shoujing, Wang Xun and others constructed a simplified armillary sphere [or torquetum] *jianyi* 简仪, skafe *yangyi* 仰仪, observing table *kuiji* 窥几, shadow marker (sharpener) *jingfu* 景符, etc., and the instruments' precision gradually improved. They created the *Calendar Granting the Seasons*, they removed the unfounded beginning of the epoch yuan 元, they reached their numbers on the basis of observation, and in addition, they burned erratic *yinyang* books and broke widespread superstition. In order to rectify astronomy, they washed away the groundless statements of divinations coming from antiquity. They started to follow the correct way of modern astronomy and before western methods entered China, nobody could compete with them; when Tang Ruowang 汤若望 [Johann Adam Schall von Bell] called Guo Shoujing the Chinese Tycho [Brahe], it was praise without exaggeration.[312]

311 Zhu 1935:49. PhD thesis author's translation.

312 Dtto.

Zhu gave quite a comprehensive and detailed account of the *Shoushi li*, following its structure and mathematical methods as described in written Yuan sources and also wrote on Li Qian's 李谦 *Treatise on Calendar Granting the Seasons Shoushi li yi* 授时历议 which compared many earlier calendric systems. Zhu called it a work which had made a great contribution to the understanding of ancient calendars, "searching the truth from the facts 实事求是".

At the end of the Yuan section (and also earlier when speaking about Yelü Chucai 耶律楚材), Zhu wrote about contact with Central Asia and the Arabs and on the calendars and instruments that they brought to China, emphasising that their technical level was not higher than the level of the Chinese made ones. This is not what the *History* by Li et al. (1981) stated on this topic.

As will be seen later, Li et al (1981) called the larger part of the Ming dynasty a period of the deepest decline in science. On the contrary, Zhu Wenxin's account of the Ming period was hardly ever negative in this sense. He did not even discuss explicitly any decline in science during the Ming period, he only mentioned that in the late Ming dynasty, with 'state power already in danger', substantial calendrical reforms could not be introduced:

> Among those who proposed reforms of calendrical astronomy were Li Defang 李德芳, Zheng Shanfu 郑善夫 and others, among special officials who repaired [instruments?] were Yue Hu 乐韄 and Hua Xiang 华湘 and others, among those who wrote books and [examined and] commented on them were Zhu Zaiyu 朱载堉, Xing Yunlu and others, then it came to the 'recruitment' of Western scholars who brought and translated Western methods [of astronomy], but the power of the state was already in danger, and thus no [new calendrical methods] were [officially] introduced.[313]

Since the history of Qing astronomy had already been integrated with the history of western astronomy in Zhu's book and therefore there was no special chapter devoted to the Qing period at this point, only at the end of this Ming section do we find a lament concerning an extreme decline during the Qing dynasty:

> In the 19th century, a period of rapid development of astronomy started in the West, but China was left far behind (一落千丈 was suddenly backward thousand *zhang*), and was hopelessly backward [to catch up to the West] (望尘莫及), no real records from the Astronomical Bureau survived, if we go [further back in time] to the precise and diligent observations of the people in ancient times, we can see the lack of enthusiasm and strong conservatism of the people that

313 Zhu 1935:52. PhD thesis author's translation.

> came later more clearly, and when we read the history of Chinese astronomy, one can't help but sigh with disappointment.[314]

Zhu Wenxin termed the Ming period a 'transitional period' (*guodu zhi shiqi* 过渡之时期) between Chinese and Western astronomy and also a 'key period' in the change from old to new astronomical calendrical systems (*lifa* 历法). He evaluated quite positively that "both astrological/astronomical chapters in Ming dynastic history 'combine' (融贯) the old and new, make a 'communication' (沟通) of Chinese and Western [knowledge] and [that] making a new way to write the dynastic history was the most important thing at the same time."[315]

Zhu wrote in much detail on how the Ming astronomical and astrological chapters were organised, how they were divided into parts, and he highlighted the parts that displayed specific influence from western astronomical knowledge:

> [The astronomical chapters'] section on Heaven and Earth (两仪篇), introduced the western theory of nine celestial spheres, it was the old method [of understanding the heavens] where Ptolemy put the Earth into [its] centre. [Another] section, Seven Governors (七政篇)[316] gives the Earth's perimeter value as well as the highest and lowest points (高卑) of the Seven Governors, all of that is based on real observations of Tycho Brahe. Furthermore, they say there that 'Saturn has ears' and "there are four little stars nearby Jupiter that run quite quickly around it and Venus shows phases similar to the crescent and full Moon," which was what Galileo observed at the beginning, after he had constructed the telescope.[317]

Zhu also wrote about the Ptolemaic classification of stars into six classes which also appear in the Ming dynasty history, about the first Chinese telescopic observations of open stellar clusters such as *Pleiades* (Hairy Head 昴 in Chinese) and *Praesepe*, (Pile of Corpses 积尸), about the observations of supernovae, on the Milky Way, etc., on measurements of compass deviation, on the introduction of western astronomical instruments to China and on other topics. All these achievements were evaluated by him positively.

However astrology (as in the Ming astrological chapter section 'Field Allocation' 分野, ie. political astrology) was assessed negatively and was viewed as old customs which are difficult to get rid of.

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314 Zhu 1935:56. PhD thesis author's translation.

315 Zhu 1935:52. PhD thesis author's translation.

316 The term Seven Governors refers to the Sun, Moon and five planets.

317 Zhu 1935: 53.

Zhu also dedicated much attention to the Muslim calendrical system *Huihui li* 回回历, which was inherited from the Yuan dynasty and translated and reprinted in the Ming dynasty history. Zhu mainly analysed errors in the calculation of the initial year of the Muslim Era, 622 CE, when converting it to the Chinese calendar. The problem was that the Muslim year was a pure solar year and there was an accumulated 21 year discrepancy. When the periods in lunar years were simply deducted, it did not correspond to the end of the *Kaihuang* era of the Sui dynasty (601 CE), as the Ming history outlined, but with the 5th year of the Tang era *Wude* (622 CE).

At the end of the chapter, Zhu expressed regret that although western calendrical methods had already been introduced at the end of the Ming period, no Western work translated at that time stepped out of the Ptolemaic (geocentric) doctrine. It was because "Copernican theory has not been confirmed yet and Kepler laws have not been discovered yet" and according to Zhu, the broader dissemination of these ideas in China still had to wait until the Qing dynasty's Qianlong era (1736-1796), when Jesuit scientist Michael Benoist *蒋友仁* (1715-1774) translated the Map of the Complete World *坤舆全图,* that also showed diagrams based on Kepler and Newton. However, in the concluding paragraphs he listed several influential books on (modern) astronomy that were translated into Chinese in the 19th century which followed.[318]

The Tang, Song, Yuan and Ming Periods in the *History of Chinese Astronomy* (Li et al. 1981)

For contrast, let us now see how these four periods within the history of Chinese astronomy - the Tang, Song, Yuan and Ming dynasties were portrayed in in the newer publication, the *History of Chinese astronomy* (Li et al., 1981).

As has already been mentioned above, the beginnings and progression of this work was rather complicated. What was published in 1981 was already the revised edition of the work, as the original monograph of the same title which was scheduled for publication in 1966 could not get published due to the outbreak of the Cultural Revolution. The collective of

318 At this point, Zhu considered the monograph On Heavens (谈天), compiled on the basis of a translation of John Herschel's work *Outlines of Astronomy* (1849) by Li Shanlan *李善兰* and Alexander Wylie *伟力亚烈 between 1851 and 1862, as the most influential.*

authors also partly changed; several authors had already passed away by 1981 and two others stopped their participation in the work for unclear reasons.

Here is the list of co-authors of the edition which was to be published in 1966 as outlined in the book's postface († marks the individuals who were already deceased by 1981):

†Wang Yingwei 王应伟	†Ye Qisun 叶企孙	Zhuang Tianshan 庄天山
†Liu Shikai 刘世楷	Yan Dunjie 严敦杰	Li Jiandeng 李鉴澄
Xi Zezong 席泽宗	† Qian Baocong 钱宝琮	Bo Shuren 薄树人.

In contrast, these were the co-authors of the 1981 edition:

Wang Baojuan 王宝娟	Wang Shengli 王胜利	Wang Jianmin 王健民
Lu Yang 卢央	Liu Jinyi 刘金沂	Li Jiandeng 李鉴澄
Chen Jiujin 陈久金	Chen Meidong 陈美东	Zhang Peiyu 张培瑜
Xi Zezong 席泽宗	Bo Shuren 薄树人 (and several other minor contributors)	

Bo Shuren 薄树人 is mentioned as the main editor, while the 'responsible editor' of the monograph was Li Changduan 黎昌断 (?).

The monograph is written in modern language. It is also quite differently structured, compared to Zhu's work from 1935. The continuous narrative account of the history of Chinese astronomy is given in the form of an 'overview' (概况) in four separate sections. Out of these four sections, the larger section three called "The Overview of Astronomy from the Spring and Autumn and Warring States [Periods] till the End of Ming" 从春秋战国到明末的天文学概况, where the Sui, Tang, Song, Yuan and Ming periods were included and divided into respective sub sections will now be discussed.[319] Unfortunately, no clue is given in the book's preface or postface regarding the authorship of any of the sections. This large section is preceded by section two on "astronomical knowledge of primitive and slave societies". It is followed by sections ten and eleven called "Chinese Astronomy from the End of Ming till Opium Wars" and "Modern Astronomical Undertakings" that finish their outline in the time of the 'old democratic revolution', the Xinhai Revolution, depicting the poor state of Chinese

319 These sub-sections numbered four to seven are:4. Sui, Tang and Five Dynasties, 5. Periods of Both Song, 6. Periods of Liao, Jin and Yuan and 7. From the Beginning of Ming till the end of Wanli Era.

astronomy at that time, and adding that after the Great October Revolution in Russia (1917) the Chinese Communist Party was soon established (1921) and astronomy could rapidly develop only in the socialist system.[320]

Unlike the other sections of the 'historical overview', it is only this section (*From Spring and Autumn… to Ming*) which is, due to the significance of the period described in the history of Chinese astronomy and due to the abundance of available material followed by special thematic chapters. These chapters are dedicated to the observations of 'fixed stars', to calendars, to solar and lunar eclipses, to the observations of objects in the solar system, to the development of cosmological theories, and to astronomical instruments and observatories related to this period.

Generally speaking, compared to Zhu Wenxin's work from 1935, these chapters dedicated to Sui[321], Tang, Song, Yuan and Ming dynasties in Li et al. are much more comprehensive, although many 'technical details' have been omitted in this style of 'overview' and have been given space in the specialised sub-chapters. Unlike Zhu's far older work, there is also much more space given to the political and social background that shaped the history of astronomy of that era. The text is written in a much more analytical way - it amalgamates its hypotheses and analyses them far more than the earlier work. It argued for instance, for specific causes of certain historical phenomena, logically structured into clear points. The narrative does not follow the structure of the written sources (specifically the astronomical chapters of dynastic histories) so slavishly. In contrast, Zhu's account of each dynastic period always starts with a detailed description of the relevant astronomical chapters of that concrete dynastic history, their organisation and gives the location of the most interesting facts within them. Zhu sometimes even followed this structure of dynastic histories for his narrative of that corresponding period. This is not found in Li et al. (1981).

From the text, the influence of historical materialism can also be clearly seen, especially in the opinion expressed that every politico-economic formation (in the Chinese

320 Li et al. 1981:251. The text also mentioned the advent of Marxism-Leninism as a key factor; the reasons given for the rapid development of astronomy under the socialist system were the final imposition of the materialist (and the 'only correct scientific') worldview as a state doctrine, the generous support of science by the government for economic and ideological reasons (fight against superstition and religion), etc. In the pre-war or pre-Communist, capitalist republican China, science (including astronomy) was considered as serving only the needs of idealism, the needs of the capitalist class and the bourgeoisie, therefore no substantial development could be achieved.

321 Probably due to its brevity, the Sui dynasty was omitted from Zhu's work.

case conforming to a dynasty) bears in itself the seeds of its own decay. These dynasties grew and blossomed at the start, but the issues of extreme exploitation of the masses and their dissatisfaction eventually brought them down, especially becausethe feudal system was 'rotten'. The phrases and vocabulary of historical materialism are quite frequent here, such as 'class struggle' 阶级斗争, 'class contradictions' 阶级矛盾, 'exploitation' 剥削 and 'brutal oppression of classes' 阶级的残酷压迫. A closer examination of the text will now be undertaken with a special focus on several specific phenomena that were described or evaluated differently in this modern text as compared to Zhu's work. These differences were due to the varying socio-political influences under which the text was written or due to progress within the historiography of astronomy that had occurred in the 46 years between the publication of these two monographs.

For instance, the condemnation of superstition appeared in Li et al. to a much larger extent and in a much more colourful way, in line with the way superstition was fought in popular astronomical articles or popular articles on the history of astronomy from the 1950s onwards. Here is a short section on Sui astronomy, vividly outlining how superstition was an obstacle for science.

> Astronomy of the Sui dynasty had not developed to the stage it should have had. In the process of seizing political power, the Sui [emperor] Wendi used superstitions such as astrological divination and the *chenwei* 谶纬 divination[322]. The calendrical system *Kaihuang li* that was used by the Sui in the beginning was created by the Taoist Zhang Bin 张宾 , an astrologer that had helped Yang Jian [the emperor Sui Wendi] to seize power. Therefore, and even though the calendar was not accurate, Yang Jian protected [this person] as best as he could. Liu Xiaosun 刘孝孙, Liu Zhuo 刘焯 and others led a resolute fight against Zhang Bin and Liu Hui 刘晖 who was appointed grand historian by being Zhang Bin's follower, but due to suppression by the despotic emperor, [this fight] ended in failure. Only after the death of Zhang Bin, the astronomer Zhang Weixuan 张胃玄 also used astrological divination to praise Yang Jian, which enabled the replacement of the *Kaihuang li* by his own calendar. Zhang Weixuan also brought along the astronomer and astrologer Yuan Chong 袁充, they extolled each other and ganged up with each other and repelled Liu Zhuo, whose calendrical system *Huangji li* could thus not be put into use. Feudal officials made obstacles for the development of science for their own benefit, Zhang Bin and Zhang Weixuan are two such prime examples.[323]

322 *Chenwei* 谶纬 were two kinds of divination combined, the earlier *chen* (Qin period), the prophetic remarks created by wizards and the later *wei* (Han dynasty). *Wei* were the divination books more closely connected with Confucian mysticism. *Chenwei* were mainly used for political divination.

323 Li et al. 1981:30. PhD thesis author's translation.

In the Tang dynasty, Li et al. highlighted the periods between the Zhenguan and Shunde eras (627-655 CE) and the Kaiyuan era (713-741 CE) as the most productive years of most significant development of astronomy. The stated reason was that production in society began to grow in the Zhenguan period and the economy and culture reached its peak in the Tang dynasty during the latter (Kaiyuan) period. Many innovations appeared, even in astronomy. In the Kaiyuan period, the special significance of Yixing's and Nan Gongyue's observations and measurements of star positions and related measurements of terrestrial distances (for instance the length of one degree on the Earth's surface) was underlined. Yixing's observations of 'stellar motion' were described much more briefly compared to Zhu's work, probably reflecting recent research in the field which refuted the hypothesis of the discovery of proper stellar motion:

> By using enhanced astronomical instruments, Yixing discovered the changes of positions of fixed stars between the ancient and modern times and gained new scientific data for his work on the calendar, which made his Dayan calendrical system one of the best ancient calendars.[324]

There is no mention of proper stellar motion in this section, it only states that Yixing discovered that the stellar positions were different. There is no commentary on what he had actually observed. Such a statement does not contradict Xi Zezong's research from 1959.

Also related to the Kaiyuan era, the role of Indian astronomers present at that time at the Tang court and the influence of Indian astronomy on China were evaluated quite positively:

> Tang dynasty at its peak supported the contacts of China with foreign countries. Indian astrology and calendric astronomy spread to China at that time, and there were also not a small number of Indians working on astronomy who moved to China. Despite the high development of astrology and calendric astronomy under the Tang, Chinese scholars still conducted research on Indian astrology and calendric astronomy and absorbed from it some things that were useful for their own reference. China paid respect to the Indian astronomical workers[325] who came, many of them were given responsible work on the central astronomical institution *Sitian tai*. The whole famous book *Kaiyuan zhanjing* was edited by Gautama Siddha, an Indian astronomer who moved to China. This book summarised most of the Chinese historical astronomical knowledge. Many astronomical ancient books and records from Han or before the Han period were preserved only thanks to this book. Tang calendric astronomy also spread

324 Li et al. 1981:31. PhD thesis author's translation.

325 The term 'astronomical workers' was a result of Maoist control of science; all workers were equal, so in vocabulary the suffix *–jia* for originally more distinguished professions switched to *gongzuozhe*.

to Korea and Japan and positively influenced work in the field of astrology and calendric astronomy in these two countries.[326]

This section clearly shows a much more positive evaluation of contacts with India at that time. Even though it is not explicitly noted here, one can read between the lines that Indian influence on astronomy at that time must have been very strong and that Indian astronomers acted as quasi teachers for the central astronomical institution. This is especially so when it is noted that their knowledge was 'absorbed' 吸取 and that the Indian astronomers were paid 'much respect' 很大的尊重. However, the text stressed that Chinese knowledge was also very developed and (maybe also due to Indian influence?) that it was capable of spreading to neighbouring countries in the Far East. In contrast, Zhu (1935) stated that the Indian system was translated, but was not worth taking on as a model for China. This change in evaluation was probably not caused by the improving relations between China and India; in any case they did not improve much in the intervening period, but it might have been the result of either research into the actual influence of the Indian calendar on China, or an effort to show openness to foreign influences (as a part of the 'Four Modernisations').

After the end of the Tang dynasty which was brought about by the "oppression of the masses" when the people could not "bear this extremely corrupt and reactionary government any more" and after the period of the Five Dynasties, the Song period is portrayed as a period of high economic and scientific development.

The reason for the high economic development of the Song period was outlined here as having its foundations in agricultural reforms. "Peasants paid a tax of a half or of 60% of their harvest" and this promoted their activity. Thus the "activity of working masses" together with the development of crafts (along with the high "exploiting taxation") created material conditions for the development of the sciences that is exemplified in this section by the statement that the process of great inventions such as gunpowder, the compass and the printing press (from movable wooden blocks) was finalised in the Song period.

Astronomical instruments reached a high degree of precision and their construction incorporated new revolutionary designs. Shen Kuo's armillary sphere was mentioned at this point as a forerunner of the later Guo Shoujing Simplified Instrument 简仪 (or a torquetum). Mechanical water or mercury clocks were also mentioned here, together with Su Song's

326 Li et al. 1981:31. PhD thesis author's translation

Astronomical Tower, lost in 1127 after the Jin invasion. In this passage the tower is considered to represent the peak of clock making of that era and its key parts are viewed as forerunners of modern mechanical clock components, such as the escapement.[327]

The reasons for this big effort to reach such a high degree of precision and development were structured into the following points: The first was the need for calendrical reform since in this period calendrical reforms were at their most frequent in Chinese history. During the Song dynasty, on average, every 20 years there was a calendar reform; the second reason was the needs of maritime navigation caused by the development of overseas trade, where besides the compass, astronomical observations were the primary method of navigation; and finally the third (last but not least important) reason was the 'astrological superstition' practiced by the Song rulers:

> Astrological superstition was also a motive for the Song rulers to consider the observation of heavenly phenomena as important. Feudal rulers used astrology to advocate the theory of the Mandate of Heaven as a tool for consolidation of their own power. As in the Northern Song period, the invasions and harassment (侵扰) by the Liao (Khitans) were very frequent and national power was relatively weak. Also because of the protection of the Northern Song government, the conniving bureaucratic gentry conducted the policy of land consolidation that led to distinct class contradictions and the people from time to time staged uprisings. In this situation of contradictions and hunger, the rulers turned to the superstition of astrology. They hoped to get some 'warnings' and 'indications' from the 'Old [老 Friendly] Heaven' from the heavenly phenomena they observed. [As a result] the Northern Song held on very tightly to the monitoring of abnormal heavenly phenomena at the central astronomical institution *Sitiantai.* Therefore, the Northern Song government also went so far as to establish another astronomical institution in the imperial compound in order to check and proofread the reports that were delivered by the *Sitiantai*. This extraordinary vigour could not have been without an effect on the fact that astronomical observations were considered important.[328]

The conclusion of this paragraph is quite in consensus with Zhu Wenxin's conclusion: that the duplicity of the institutions at the Northern Song court lead to a higher precision and more sophisticated calendrical reforms. But in Li et al. there is much more insight into the 'superstitious' behaviour of the ruling classes that must have been condemned as unscientific and backward, and the authors added that their behaviour was in fact the result of their cooperation with the 'conniving bureaucratic gentry' 纵容官僚地主 that resulted in much exploitation of the masses.

327 Especially the parts called *tianguan* 天关 and *tiansuo* 天锁.

328 Li et al. 1981:33. PhD thesis author's translation.

Due to the dual set of institutions which existed, the amount of measurements of stellar positions and the extreme amount of work done in the field of solar, lunar and planetary movements during the Song period was especially praised here.

Li et al (1981) also mentioned the big effort made to bring the calendar in line with the production cycle of the agricultural masses. This was represented by the compatibility of the calendar with the 'Monthly Orders' *yue ling* 月令 which were key to the peasants and which told them what activities should be done at what time of the year. At this point, the authors highlighted Shen Kuo's proposal for calendric reform called *Shi'er qi li* 十二气历[329] which was later abandoned, in spite of the fact that it was quite progressive. However, this process of 'exploration and searching' in the field of calendric astronomy was considered in this passage to be the basis of the success of later Yuan astronomy and the great calendric system *Shoushi li* (*The Calendar Granting the Seasons*).

At this point, the authors also analysed the decline of astronomy during the Southern Song period which started after 1127 when the imperial court fled to today's Nanjing and later to Hangzhou because of the Jin invasion. According to the authors, this decline was caused not only by the 'corrupt ruling classes' and their 'reactionary policy', but also by the fact that knowledge of astronomy and astrology was banned among the ordinary people and was state-monopolised. The contribution of the Southern Song period to the history of Chinese astronomy was therefore quite weak, because it was almost impossible to find those people who understood the heavens, as many of the former officials fled to unknown places. The authors explicitly stressed at this point that astronomy suffered the consequences of separation from the masses:

> After the Southern Song was established, [the court] wished to build an armillary sphere *hunyi,* but [this task] was impossible to carry out, as it was not possible to find a builder for a very many years. They went as far as to find Su Song's son and took *Xin yixiang fayao* ['Essentials of a New Method for Mechanising the Rotation of an Armillary Sphere and a Celestial Globe'] written by Su Song, but that did not help them to understand the matter and anyway, they were not even able to read it! Eventually they found something that looked like a model of an armillary sphere abandoned by the Jin, so they copied it as a drawing of a gourd ladle on a calabash 按葫芦画瓢造了一架. On the contrary, this reality is proof that the development of astronomy is inseparable from the practice and experience of the broad [masses of the] people. After it left the people, astronomy lost its vitality.[330]

329 This reform was quite a sophisticated combination of solar and lunar calendars.

330 Li et al. 1981:35.

This passage seems to be in accordance with government proclamations of 'science serving the people' and efforts to reach closer ties between science and the masses in the 1950s and 1960s.

However, the Southern Song dynasty was considered to have had at least some achievements in the field of astronomy at this point; its calendrical work, namely the *Tongtian li* 统天历 calendar which was described in this passage as the result of efforts of 'calendrical workers among the people' 民间历法工作者. Unlike the later Ming dynasty, the Southern Song rulers had not banned ordinary people from studying *lifa* (calendric systems or calendric astronomy)[331]. What seems to have been banned during that time was the broader knowledge of the heavens including the stars, constellations, comets, meteors, their nomenclature and especially political astrology (this is what is found under the term of *tianwen*). However due to the pressure of the 'conservative forces', the *Tongtian li* system was in use only for a couple of years and then the reforms stopped until the Yuan *Shoushi li*.

Unlike Zhu (1935), the authors of Li et al. (1981) devoted much attention to Song philosophers and their views of heaven and earth. They highlighted these with materialist views, such as those of Wang Anshi (1021-1086) who wrote in *Bo jin tian ren ganying lun* 驳斤天人感应论:[332] "Heaven, Earth and Man are not so closely related, recorded eclipses and earthquakes all have common parameters, it is not necessary to be afraid of them."[333] This argument (辩驳) was considered by Li et al. (1981) to have much weight and was the reason that Song astronomers took for instance, the eclipses of the Sun and Moon as natural phenomena governed by certain 'objective laws' and did not ascribe these phenomena to 'empty and untruthful theories', such as the emperor's virtuous behaviour or his moral mistakes.

The following are the authors' views on Neoconfucianist *li* philosophy (*lixue*) and its relationship to heavenly phenomena:

> The philosophers of *li* loved to talk about the Universe very much. Because the feudal ruling class felt its own weakness, being under the attacks of frequent peasant uprisings, they needed to bind their own doctrine of the Heaven being much more

331 Here it refers to ability to make a calendar according to the movements of Sun, Moon and planets.

332 司马温公传家集，卷七十五.

333天地与人了不不相关。簿蚀，震摇皆有常数，不足畏忌。

> closely linked to the Earth. The philosophers of *li* made their *san gang wu chang* principle[334] an eternal cosmic 'thing-in-itself' and the root of a myriad things (万物) in the World (世界), [thus they called] the *san gang wu chang* the incarnation of the Heavens and its equivalent, called the 'Heavenly Principle' (天理). This gave *li,* which came from the philosophers, a intimidating sacred character. At the same time, the science of the Song period developed to a relatively high level. If the philosophers of *li* wanted to contend with materialist thinking, they inevitably had to bend the achievements of science in order to fit [these scientific] results into their theoretical frame. For instance: Zhu Xi's theory of moving oceans and continents is similar to this.[335]

In this section, the philosophers of *li* (理学家) with their idealist views which were considered to be aimed at subordinating the population, were clearly portrayed as a backward, reactionary force that represented hindrance to the development of science, although they sometimes brought some "progressive but not fully scientific thoughts" and the problems which astronomy was quite sure of solutions to, they solved "in utter disorder 混乱不堪".

Moving on now to the section that is dedicated to the non-Han dynasties of Liao (Khitans, 907-1125), Jin (Jurchens, 1115-1234) and especially Yuan (Mongols, 1206-1368). These dynasties whose culture was rather nomadic had intense economic and cultural contacts and military conflicts with the Han population that resulted in large seizures of Han Chinese lands and finally, even to the seizure of the whole territory. In this section, they are described as having absorbed the higher culture of the Han and also under Han influence to have gradually abandoned their system of a slave society and eventually replaced it with a feudal one.

As far as astronomy was concerned, both Liao and Jin established their astronomical institutions on the basis of Song institutions, adopted the Song calendar, but also had some contributions to its later development.

What is evaluated quite negatively in this section is the fact that the Liao and Jin moved all the instruments and experts to their capitals, which resulted in the loss of some important apparatus, such as Su Song's Astronomical Tower, and hindered the development

334 The *san gang* 三纲 are: 君为臣纲，父为子纲，夫为妻纲, these are the 'guiding lights' which the ruler has for his subordinates, father for his son and a husband for his wife. The *wu chang* 五常 are "five constants" (sometimes also translated as "five relations"): kindheartedness 仁, appropriate morale 义, rite 礼, wisdom 智, credibility 信.

335 Li et al. 1981:35.

of astronomy and the calendar. On the other hand the authors stated that "it helped the astronomical development of the northern parts of our country."

A special feature of the Jin period was mentioned at this point as important for the later development of astronomy, especially later on during the Yuan period. It was a form of private education (*minjian jiangxue* 民间讲学).

> In education as an example, in the late period of Jin, private education was quite widespread. These kinds of private lectures were different from the lectures of that era's Southern Song classical academies. Many people not only lectured about Confucian Classics, but mainly lectured on science and technology. For instance, the great mathematician Li Ye 李冶 taught mathematics. Liu Bingzhong 刘秉忠, who was an important adviser to the founder of the Yuan, Kublai-Khan, also taught mathematics and astronomy, before he left the mountains. The great astronomers [of the Yuan] Wang Xun 王询(1235-1291) and Guo Shoujing 郭守敬 (1231-1316) were his students.[336]

The term 民间讲学 means private teaching among the people. It is apparent that it was a form of private study somewhere in the mountains' (or in a city), completely unofficial, where the pupil(s) studied with their master (one can imagine in a similar manner to that of martial arts). However, the fact that one of the greatest Chinese astronomers, Guo Shoujing, once had this kind of education makes it quite significant. In Zhu Wenxin's work from 1935, there was however no mention of this topic.

In 1234 the Jin lost to the Mongols and after a few decades, in 1271, after he conquered larger portions of Han territory, their ruler Kublai Khan officially proclaimed the Yuan dynasty (1271 – 1368) in the traditional Chinese manner.

It was Kublai Khan's unification of the country and establishment of a provincial system of government (feudalisation in spite of the Mongol traditions of 'nomadism' and a 'slavery society') which is considered at this point in the book to have brought good conditions for the economic, scientific and technological development of the country and for suitable conditions which allowed the "development of astronomy into its new peak". Another factor considered was the technological advancement connected with the centralisation of able craftsmen and officials of the Jin and Song astronomical bureaus in the hands of Kublai Khan.

In a similar manner to how Zhu Wenxin (1935) did, the authors of Li et al. (1981) also praised Guo Shoujing 郭守敬 (1231-1316) as one of the greatest astronomers and his

336 Li et al. 1981:37. PhD thesis author's translation.

calendar *Shoushi li* 授时历 (*Calendar Granting the Seasons*) as the "greatest calendric system of old China". They stressed that it was also the result of previous (Song period) efforts, not only in the field of more precise instruments that allowed them to gain more exact data but also in the field of computing methods. However, the authors did not go into that much technical detail and offered simply a list of the most important instruments (the technical details of the construction of the instruments was outlined in a special section). As far as the mathematical apparatus used by Guo and his contemporaries is concerned, the relevant section is much briefer than in Zhu (1935) - perhaps because of Zhu's own personal deep interest in mathematics; Li et al. mentioned only the reform of calculating with fractions, the reform of the intercalation of months and the introduction of formulae related to spherical geometry.

An interesting point of comparison is the account on the astronomical contacts of Yuan astronomers with Arabs and nations from Central Asia, also because of the growing importance of their influence on Guo Shoujing and his contemporaries which is shown clearly by modern historical research.

> Since the Yuan dynasty, our homeland's contacts with Arab countries in Central and Western Asia have become more intense. Our great inventions, such as gunpowder, printing technology and the compass were exactly in this period spread to Europe through the Arab nation. As far as astronomy is concerned, our astronomy also arrived in Central and Western Asia. Famous Ulugh-beg's and Ilkhanic tables both record certain content related to Chinese astronomy and calendar. At the same time, the Arab astronomer Jamal ad-Din (扎马鲁丁) and others also came to China, and brought along with them the astronomical instruments of the Arab nation. Jamal ad-Din also edited *Wannian li* [Calendar]. Kublai[Khan] once ordered it to be used.[337]

What is stated here essentially means that Chinese science and technology including astronomy were great at that time and they somewhat influenced the scientific works of Central Asia, but on the other hand, that the Arab instruments and astronomical and computation methods were also of some use for the Chinese. By the way, modern research on Chinese astronomy acknowledges a much more significant influence of Arab science on the work of Guo Shoujing and it mentions the direct collaboration between him and Jamal ad-Din.[338]

337 Li et al. 1981:38. PhD thesis author's translation.

338 Rossabi 2014:282.

If this paragraph is compared to Zhu (1935), he also very briefly mentioned Jamal ad-Din and his bringing seven Arab instruments to China. He even included their names in their original language transliterated to Chinese. However he only stated in this section that "their system [of construction] originated from another area and also that they were not able to surpass the former standards."[339] So there was much less commentary on the topic by Zhu, just the added comment that these instruments were somehow inferior in their design.

Both Li et al (1981) and Zhu (1935) briefly mentioned the large network of 27 observatories established in the Yuan period.

The authors of Li et al also wrote about the "integration of many Muslim ethnic minorities into the empire" that resulted in the establishment of the *Muslim Astronomical Bureau* (回回司天台) at the imperial court that was supposed to serve the needs of their economy and various aspects of their life.

The section on Yuan was concluded with the view that because of the insufficient feudalisation reforms by the Yuan government, the high corruption of ruling classes, the "class contradictions and ethnic contradictions" and the "enslavement-style racketeering methods" of Mongol noblemen, the promising conditions for the development of astronomy "were neutralised" or completely disappeared after the end of Kublai's rule. Eventually the entire dynasty was defeated after a large wave of uprisings in the 1360s.

When writing about the Ming period (1368-1644), the authors of Li et al (1981) dedicated the most space to their analysis of China's backwardness compared to the concurrent developments in Western science. The first several decades of Ming rule were evaluated rather positively, as agriculture and crafts were blossoming because the Mongolian noblemen and Han landlords were hit severely by previous uprisings and thus "strained land relations" became more relaxed. Overseas trade also flourished, Zheng He's maritime travels were in particular mentioned here in connection with advanced astronavigation, which was largely inherited from the previous dynasties of Song and Yuan, as well as the records of heavenly phenomena made by early Ming sailors while they sailed the distant oceans.

However the period from the year 1430 and roughly the next 200 years until the end of the Wanli era (1620) was described as a low point (低潮). The Wanli era was chosen by the authors as a dividing point after which capitalism started to take root in China and when

339 Zhu 1935:51. 異域之制，亦未能超越乎前規。

changes in production prompted developments in science and technology and also when Western scholars (European missionaries) started to influence Chinese science. After the end of the Wanli era, the narrative of this entire large chapter ends. This astronomical historical overview narrative eventually continues in Chapter 10, called "Chinese Astronomy from the end of Ming until the Opium Wars", where the end of Ming is termed as the 'renaissance' of Chinese astronomical research.[340]

At the beginning of the Ming period, the *Datong li* calendrical system was adopted, but in fact it was the old Yuan *Shoushi li* system, with only a series of adaptations including a recalculation of certain heavenly phenomena for the new capital, Nanjing. According to Li et al. (1981), for over two hundred years before the Wanli period (c.1620), no substantial reforms of the calendar occurred and if so, only cosmetic ones. Gradually the heavenly phenomena, such as new moons and solar and lunar eclipses began occurring with more frequent and larger discrepancies in their calculations and there were no efforts to solve these problems properly. It was also as late as the end of the Ming dynasty when new instruments began to reappear.

What was the reason for such deep stagnation? The authors of Li et al. (1981) mentioned several possibilities. The primary one was the growing 'class contradictions' that led to the persecution of certain classes and as a result, a hard dictatorship had to be imposed on the people. As one of the by-products of this, the ban on the private practice of astronomy was enhanced to also even include any knowledge related to calendar making, ie. the whole *lifa* 历法. Thus, not only *tianwen* 天文, comprising the interpretation of heavenly phenomena, political astrology, but also astronomy as the broader knowledge of heavenly nomenclature, constellations etc., was forbidden in the same way it was banned during the previous dynasties. However now the ban also included *lifa* 历法 with all of the calculating apparatus used for calendars which was also based on astronomical calculations. In the book, there are many quotations from historical sources describing harsh penalties for those who did not obey the new rules.

> From the beginning of the dynasty it has been strictly forbidden to practice astronomy and astrology; the one who practices astronomy and [created the] calendar will be sent to exile in the border regions, the one who creates a calendar will receive the death penalty. (…) When [emperor] Xiaozong's rule started, (…) there was an order to pursue the calendar makers

340 Li et al (1981):217.

> hiding themselves in the forests with the aim of either choosing them [for service] or killing them if they refused [the offer].[341]

Another explicit example, probably from a different historical source, is also described here:

> As it came to the late period of Ming, after the upper class feudal official Xie Yunlu 邢云路 handed a request for reform of the calendar, he even received attacks from the officials of the Astronomical Bureau accusing him of the private practice of calendar making (*sixi lifa* 私习历法), from here we can even better imagine how strong the oppression the astronomers among the people would feel before the late period of Ming. In the history of development of Chinese astronomy, the scholars from among the people were an important power. When this power was confronted with devastation during the Ming period, then stagnation in the development of Ming astronomy was very natural.[342]

Another important reason that the authors mentioned in this section was the general decline of Ming mathematics which had a crucial impact on astronomy, saying that the well developed algebra of Song and Yuan dynasties eventually became "lost knowledge" (绝学) during the Ming period.

Their last relevant reasons which are worth mentioning were the persistent influence of the 'idealistic' and 'enslaving' *li* philosophy and the system of state examinations which used the form of writing 'eight-legged essays' (*baguwen*) whose evaluation by examiners was completely based on imitating classical works as much as possible and which totally suppressed any form of independent thinking.

Below is a comparison table on the coverage of basic relevant topics in both books, Zhu (1935) and Li et al (1981). It compares the presence of a topic in either book and also the relative amount of coverage given to it.

Table: Comparison of selected topics

Topic	Zhu 1935	Li et al. 1981

341 国初学天文有厉禁；习历者遣戍，造历者殊死。至孝宗，弛其禁，且命征山林隐逸能通历学者以备其选，而卒无应者。Ming scholar Shen Defu 沈德符 in Yehuobian 野获编, quoted by Li et al (1981):39.

342 Li et al (1981):39.

Yixing's and Nan Gongyue's Measurements during the Tang period	Yes (more)	Yes (less)**
Yixing as a discoverer of proper stellar motion	Yes	No*
Indian astronomers at court during the Kaiyuan period	Yes (negative evaluation)	Yes (positive evaluation)
"Wizard from mountains" Shang Xianfu as head of the Astronomical Bureau	Yes	No
The economic development of the Song period as a basis for great astronomical achievements	No	Yes
Reasons for great astronomical achievements of the Song period (the need for calendrical reform, navigation, astrology)	No	Yes
Competition between astro-institutions during the Song period	Yes (more)	Yes (minimum)
Shen Kuo's solar calendar Shi'er qi li	No	Yes
Su Song's astronomical tower	Yes (more)	Yes (less)**
The prohibition on astronomical knowledge and the possession of astronomical materials among the masses during the Song period	Yes (less)	Yes (more)
The decline in the construction of instruments during the Southern Song period, the court's despair in looking for talent	Yes (less)	Yes (more)
Separation from the broad masses as a reason for the decline of astronomy in the Southern Song period	No	Yes
Philosophical debates of the Song period: *lixue* and materialism	No	Yes
"Political astrology" as a superstition	Yes (less)	Yes (more)
Public lectures (private academies) in territories controlled by the Jin	No	Yes
Yelü Chucai and the calendrical system Gengwu yuan	Yes	No
Contacts with Central Asia and Arabs during the Yuan dynasty (exchange of knowledge, instruments imported by Jamal….?)	Yes (negative evaluation)	Yes (neutral evaluation – reciprocal)
Guo Shoujing's instruments and his system Shoushi li (Calendrical System Granting the Seasons)	Yes (much more detailed)	Yes (less)**
Li Qian's Treatise on *Calendrical System Granting the*	Yes	No

Seasons

5. Conclusion

The primary aim of this thesis was to study nationalist and other political and social influences on the historiography of Chinese astronomy written in the pre-war and wartime Chinese Republic (1911-1949) and to compare how these influences changed and how the historiography of Chinese astronomy changed in general in the early period of the People's Republic of China before the onset of the Cultural Revolution (1949-1966).

In the process, the thesis also created new knowledge about aspects of historiography of Chinese astronomy in the two historical periods (focusing more on the first, earlier period). It pieced together the life of Zhu Wenxin 朱文鑫 (1883-1939) from both primary and secondary sources. The main findings are summarised in the following six sections below.

1) *The Narrow Relationship between the Historiography of Astronomy and Gu Jiegang's 'Reorganisation of the National Past' in the Republican Period*

During the period of the pre-war Chinese Republic, historians of Chinese astronomy studied their subject in order to explain and systemise historical astronomical sources and their use for modern scientific purposes, and it was shown that they were guided in this by the spirit of the 'reorganisation of the national past' that was backed at that time by many contemporary intellectuals. Shortly after the establishment of the Chinese Astronomical Society in 1922, research principles and a plan for the research on the history of Chinese astronomy were created, following the trends of these new historical methods.

During the 1910s and 1920s, many Chinese intellectuals who shared the ideals of the *New Culture Movement* (1915) and the *May Fourth Movement* (1919) advocated the *reorganisation of the national past*. Among them, the most significant were Hu Shi 胡適 (1891-1962) and Gu Jiegang 顧頡剛 (1893-1980). Seeing the introduction of Western scientific methods as a tool of modernisation, Hu Shi, Gu Jiegang and others strove for new objectivity in historiography by adopting Western style criticism and rejecting authority of Chinese classics and other schools of thought.

The influence of these ideas was evident when comparing historical papers in the journal Observatory Reports (*Guanxiang congbao* 觀象叢報) published before the May Fourth Movement and the research principles established by the Chinese Astronomical Society after the May Fourth Movement in 1922. The creation and publication of the

Observatory Reports from 1915 onwards by the Central Observatory led by Gao Lu 高魯 (1877-1947), who was also its editor-in-chief, was also intended as a preliminary phase for the establishment of the *Chinese Astronomical Society*. The main purpose of the *Observatory Reports* was to spread scientific and namely astronomical knowledge but also to recruit new members for the *Chinese Astronomical Society* from among its subscribers. Historical articles in the *Observatory Reports* were not been influenced by the contemporary ideals of the 'reorganisation of the national past' since they had been published prior to the *May Fourth Movement* and Hu Shi's and Gu Jiegang's relevant works and efforts.

The *Chinese Astronomical Society* was established in 1922 following the model of many Western countries which already had their astronomical societies at that time. Another reason for its establishment was to pool experience and expertise together as a reaction to the longstanding Chinese tradition in which imperial astronomers had been somewhat insulated as individuals and their achievements might even be entirely lost following a change in imperial dynasties.

Several members of the *Astronomical Society*, especially Gao Pingzi 高平子 (1888-1970) and Gao Lu were deeply interested in the history of Chinese astronomy and shortly after the establishment of the *Society* created the *Four Research Principles*. In these principles, they highlighted the need to use systematic and scientific methods in research on the history of Chinese astronomy as well as the need to apply research results according to scientific needs. Moreover, they created the *17 General Outlines* (or topics to be researched) that resembled Gu Jiegang's systemising principles of the 'reorganisation of the national past'. Both the *Four Research Principles* and *17 General Outlines* clearly showed that the historians of Chinese astronomy affirmed the use of these new methods of writing history proposed by contemporary intellectuals. Another example of the strong commitment to these new principles by one of the authors Gao Lu, was the obituary written by him for the most prolific historian of Chinese astronomy active in that period, Zhu Wenxin 朱文鑫 (1883-1939). In the obituary, Gao evaluated how Zhu's particular works conformed to the *Five Phases of Systemising History*, as outlined by contemporary scholars.

2) *The Spur from Japanese Historiography and the Nationalist Turn in the 1930s*

Many Chinese writings on the history of astronomy in the 1930s bore strong nationalist tones and strived to encourage national self-confidence. This thesis argues that this

was caused by the social and political climate after the Japanese occupation of Manchuria, which eventually called for the construction of a Sino-centric cultural tradition. This was the case with the *Short History of Astronomy* written by Zhu Wenxin in 1935 and the *Brief History of Chinese Ancient Astronomy* written by Chen Zungui during wartime but published much later in 1955.

The social and political climate that demanded the construction of the Sino-centric cultural tradition was primarily caused by the Japanese annexation of Manchuria and the reaction of intellectuals to it. A large proportion of intellectuals felt the need to make a contribution to the nation's self defence. Moreover, the construction of the Sino-centric cultural tradition was directly supported by the *Guomindang*.

Zhu Wenxin's younger uncle Ye Chucang was a prominent *Guomindang* member and a local leader of the party. Zhu Wenxin held several official positions as a result of Ye Chucang's help and therefore was close to the *Guomindang*. It is highly probable that Zhu was influenced by *Guomindang* party policies and actively took part in the construction of the Sino-centric cultural tradition.

The Japanese played an important role in stimulating research on the history of Chinese astronomy conducted by the Chinese themselves. On one hand they stimulated this research through their debates in their own works. The Japanese *Historians' School* advocated that the origin of Chinese astronomy was actually not Chinese at all and that it occured quite late, while the *Astronomers' School* supported the idea of the independent and earlier origin of Chinese astronomy and its significant influence on other cultures outside of China. The work of Shinjō Shinzō was translated into Chinese and published in China prior to the publication of Zhu Wenxin's *Short History of Astronomy*. On the other hand, it was anti-Japanese sentiment that encouraged new writings on the history of astronomy. This was the case with Chen Zungui who directly acknowledged anti-Japanese sentiment as his motivation and it was probably at least indirectly also the case with some other authors.

Although during the pre-war Chinese Republican period historians highlighted new ways and methods of writing historical works (especially Hu Shi and Gu Jiegang) and historians of Chinese astronomy also adopted these new principles, many works actually deviated from these ideas. In the case of the historiographical works written in pre-war China, a nationalist undertone was one of the main factors that caused this deviation. Zhu Wenxin's *Short History of Astronomy* is clearly an example of this.

If Zhu Wenxin's account of the origins of world astronomy and Chinese astronomy in his *Short History of Astronomy* is taken as an example, one can clearly see that it was written in a Sino-centric way. From Zhu's point of view, in antiquity, the other cultures learned from China and were far less developed, so astronomy (among other knowledge) spread from China to them. Actually, the origins of Chinese astronomy were still being debated in Zhu's time, but Zhu asserted only this one Sino-centric view and did not provide other alternative theories with much space. Among his accounts of other events in the history of Chinese astronomy, one can see that they were formulated in order to stimulate a national self-confidence. In Zhu Wenxin's work, one can find several categories of arguments that encourage patriotism and represent the Sino-centric view: 1) arguments that have a tendency to try to prove the primacy of Chinese astronomy indirectly by way of asserting the alleged cultural superiority of China in particular historical periods; 2) arguments which praised China's brilliant ancient history but which also brought some self-reflection albeit sometimes as a basis for soul searching and then with an added comment that later in the course of history "something had gone wrong" and China had fallen behind.; 3) arguments which anachronistically explained certain concepts as foreshadowing modern astronomy. All these categories of arguments are set out in chapter 2.4.

3) *The Professionalisation of the History of Astronomy after 1949 and the Need to Stimulate the Nation's Self-confidence*

The professionalisation of research on the history of natural sciences was the result of efforts by Zhu Kezhen who was vice-chairman of the Chinese Academy of Sciences at that time. It began with the establishment of the *Research Committee for the History of Natural Sciences in China* in 1954 and continued with the establishment of the *Cabinet for the Research on the History of Natural Sciences* in 1957. From the relevant sources it can clearly be seen that this professionalisation was motivated by the efforts to encourage national self-confidence as this kind of research was considered a tool for "conducting patriotic education and the encouragement of national pride" (according to one of Guo Moruo's key speeches; see chapter 3.2.2). Other main factors that prompted the creation of these institutions were the Soviet influence and the need for delineation from and competition with Joseph Needham's project - *Science and Civilization in China*. The institutions for research on the history of the natural sciences were a part of the *Twelve Year Long Term Plan* prepared under the supervision of Soviet advisors. This plan aimed to concentrate all resources in the key industrial sectors and bring them as close to the global level as possible. Historians of natural

sciences, including astronomy, also prepared their own twelve year plans that included publications, translations and the training of a large number of doctoral students. However, only a small portion of the plans was eventually realised due to the political campaigns of that period.

4) *Higher Perfection as a Result of Professionalisation: Xi Zezong versus Zhu Wenxin*

The professionalization of research on the history of astronomy led to higher diligence and a higher consistency in the quest to 'seek the truth from facts'. Some of the claims of China's primacies in astronomy mentioned in earlier works including those of Zhu Wenxin were refuted by the historiography of the post war PRC.

It should be added that in spite of the political campaigns that slowed down research work considerably at certain times, the existence of research institutions allowed a more intensive focus on research. The concept of to 'seek the truth from facts' *shi shi qiu shi* 实事求是, an ancient principle that can be traced to the Han dynasty (202 BCE – 220 CE), was enshrined with a new interpretation in 'Mao Zedong Thought' and in the political theories of all Chinese communist leaders since then. When the principle was allowed to prevail, it acted as a powerful corrective to unfounded hubris and boasting. Moreover, the need to compete with Western research on the history of natural sciences including astronomy also demanded the diligent analysis of facts, lest Chinese historiography of science not be able to withstand scrutiny when measuring itself against the West.

Chinese historical primacies in astronomy highlighted in earlier works, including those of Zhu Wenxin and Chen Zungui on the discovery of proper stellar motion by monk Yixing in the 8th century CE and Zhu Wenxin's account of Wang Xichan's prediction of the Venus transit were convincingly refuted by Xi Zezong (see chapter 3.2.4).

5) *Anachronism for National Glory*

While careful attention to facts led to certain claims of primacy being refuted, others were produced at the same time. There was a tendency to present certain Chinese concepts as early forerunners of modern astronomical theories, even though these concepts did not have a long term influence or did not contribute anything to understanding the nature of their particular phenomenon.

In the period of the early People's Republic, the tendency to highlight such Chinese historical primacies already began to appear to a lesser extent than in earlier times. However, there were still a lot of these kinds of tendencies, though much more carefully formulated than in the earlier works, if we take Li et al. (1981) as an example. The popular articles used a much more patriotic and boastful style. One example was the ancient Chinese concept of space-time that was allegedly a forerunner of Einstein's theories by two millennia. Another example was the *Xuan ye* 宣夜 theory that described the universe as infinite and the motion of celestial bodies as freely floating in space powered by the energy *qi*. This theory was discussed in chapter 2.4.2 on Zhu Wenxin's *Short History of Astronomy*. The *Xuan ye* theory was discussed also by the later work Li et al. (1981), where the authors wanted to show that the theory really did have some followers throughout history.[343] It was esteemed by Li et al. (1981) for its foreshadowing of the modern cosmological concept of the universe. Nonetheless, both the ancient Chinese space-time concept and the *Xuan ye* theory were just spontaneous concepts deduced from their author's intuition. In the history of Chinese astronomy, this theory was much less influential than the other two, *Gaitian* 盖天 and *Huntian* 浑天.

6) *Influence of Marxism*

Under the influence of Marxist literature, monographs and articles on the history of astronomy from the early PRC period were written in the spirit of historical materialism. Compared to earlier works, they observed far more their social and political context and were more structured and synthetically built. The *History of Chinese Astronomy* (Li et al 1981) that was originally meant to be published before the Cultural Revolution was written in this manner.

The influence of historical materialism is very visible in Li et al. (1981). When a particular period was discussed, material, technological and production conditions together with the relationships among classes were provided as a background to the evolution of astronomy. The authors paid much more attention to the broader political and social context of the events in the history of astronomy, structured their arguments and amalgamated their hypotheses with more diligence than the authors of earlier works. It should be added that the

343 Li et al. (1981):165-168.

influence of historical materialism is much more visible in monographs than in articles (except for fairly long ones). This topic is discussed in more detail in chapter 3.3.

Except for the visible influence of historical materialism, there are also the other factors that make Li et al. (1981), the newer work, different from Zhu's (1935). The chapters covering the preeminent period of Chinese astronomy in the Tang, Song, Yuan and Ming dynasties (7th to 17th century CE) in both books were compared in chapter four. Li et al. (1981) condemned superstition more strongly and also dedicated a lot of space to criticism of the idealist philosophy of Song philosophers of *li* when their cosmological concepts were discussed. On the other hand, Li et al. (1981) evaluated much more positively than Zhu (1935) the cooperation with Indians in the field of astronomy, when they worked in the Tang court in the 8th century CE. Also, astronomical contacts with the Arabs and Persians in the 13th century CE and later were evaluated positively, unlike in Zhu (1935). It could have been either the result of deeper research or an effort to demonstrate the openness to foreign influences in accordance with the *Four Modernisations*, launched by Deng Xiaoping 邓小平 (1904-1997) (much later after our studied period) in the late 1970s, but nonetheless before the book was eventually published. Li et al. (1981) and Zhu (1935) also significantly differ in their assessment of the Ming dynasty period (1368-1644). While Li et al. called the larger part of the Ming a period of the deepest decline of science and analysed the reasons for this, Zhu's evaluation is hardly ever negative in this sense.

This PhD thesis has demonstrated a clear thread that links the second phase of the historiography of Chinese astronomy in the pre-war Chinese Republic and the historiography of Chinese astronomy in the early People's Republic. The thread linking them was patriotic motivation and the need to encourage the nation's self-confidence. In both periods, this motivation was treated in a different way and had a different undertone.

This research might help contribute to understanding China's modernisation and the building of the Chinese state in both researched periods, for which the encouragement of the nation's self-confidence was an indispensable tool.

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