

Tentative Discussion on E. Diaz and the influence of *Tianwenlue* on the Chinese Astronomy

Yao Licheng

(Institute for the History of Natural Science, CAS)

J. Needham (1900-1995) said: “In the history of intercourse between civilisations there seems no parallel to the arrival in China in the 17th century of a group of Europeans so inspired by religious fervour as were the Jesuits, and at the same time so expert in most of sciences which had developed with the Renaissance and the rise of capitalism.”^[1] The Jesuits who arrived in China during the Ming and Qing Dynasties opened the gate, which the western and Chinese cultures could mutually exchange, and at the same time their ideas had strongly impacted on the Chinese society, culture and spirit. In the Ming Dynasty, the Confucianism was orthodox, and also took the prime place in the social function. The Jesuits, as Matteo Ricci (1552-1610), realized that they must emphasize common ground between Christianity and Confucianism and pass on the western knowledge of sciences as adjunct work if they desired to stay at China for ever and let the Christianity to root in the hearts of the Chinese^[2].

The Jesuits wanted to make a significant contribution to calendar reform and acquire the ruler's confidence by means of introducing the knowledge of occidental astronomy when the Bureau of Astronomy (钦天监) forecast mistakenly the solar eclipse in 1610^[3]. The western knowledge of sciences was completely different from the Chinese so that they brought about attention and interest from the Chinese scholars. Faced the new impact, Xu Guangqi (徐光启, 1562-1633) said: “(If the Chinese) want to surpass (the western), (we) must digest (these knowledge); before (we) digest (them), (we) must translate (their books).”^[4]. When referring to the occidental astronomy, Li Zhizao (李之藻, 1565-1630) said: “The knowledge of astronomy and calendar that they studied were more than that the former Chinese-scholars had done. They did not only show how they calculated, but also they could explain why they did so. They made the astronomical instruments of observing sky, observing sun, and each was exquisite and unsurpassed. Taking their calendar, we should translate it and publish.”^[5] Many of officials, include Xu Guangqi and Li Zhizao, admired whole-heartedly the occidental astronomy and propagandized it among the scholars. After Xu Guangqi and Li Zhizao acquired the permission from the emperor, they selected and organized people to translate the western books. E. Diaz was one of participants. The astronomical books that were translated

had not only an effect on the mathematics and astronomy themselves in China, but also changed the scholars' methods of problem-asking and problem-solving in China.

1. The time of E. Diaz entering into China

Emmanuel Diaz (Jr. 1574-1659), Portuguese, his Chinese name is Yangmanuo (阳玛诺), alias Yanxi (演西) . He entered into China in the late Ming Dynasty. He was recommended by the Jesuit missionaries in the calendar reform and making fire-weapon, and one of the important Jesuits during the Ming and Qing Dynasties. In 1615 (the 43rd year of the Wanli period), he wrote *Tianwenlue* (*Explicatio Sphaerae coelestis*), which was one of the earliest books the Jesuits introducing the knowledge of occidental astronomy, particularly in this book Diaz first referred to the telescope and Galileo's observations in Chinese.

Though E. Diaz had stayed and done missionary work for more fifty years in China, unfortunately there were a few materials about him. For example, the time of E. Diaz entering into China indeed was not ascertained, and there were a few different dates. Usually it has two dates, 1610 or 1611. So when E. Diaz is mentioned in the Chinese book, the date of his entering into China is always in 1610 or 1611. L. Pfister's (费赖之, 1833-1891) book *Notices biographiques et bibliographiques sur les jésuites de l'ancienne mission de Chine 1552-1773* (《在华耶稣会士列传及书目》) and J. Dehergne's (荣振华, 1903-1990) book *Répertoire des Jésuites de Chine de 1552 à 1800* (《在华耶稣会士列传及书目补编》) is manual that people study the Jesuits in China. The date of E. Diaz that circulating among the people in China derived from the two books. In fact, both of them didn't tell us the exact time of E. Diaz entering into China in their book, but L. Pfister only mentioned E. Diaz "A. 1610"^[6]. "A. 1610" means "arrivé dans la Mission", not "arrive in China" . The mistake was owing to the translator. According to L. Pfister and J. Dehergne, and the other information about E. Diaz, we could make sure his date of arrival in China. If E. Diaz had taught the theology for six years in Macao, then he arrivé dans la Mission in 1610, he and G. Ferreira left for Chaozhou together in 1611^[7], it is reasonable that he may be enter into China between 1604 and 1605.

According to J. Dehergne, E. Diaz left for Goa in April, 1601 and got to there in October at the same year^[8]. E. Diaz had studied in Goa for 3 years, then he, A. Vagnoni (高一志, 1566-1640) and F. da Silva (林斐理, 1578-1614) together left for China by ship in April, 1604. In July, they arrived at Macao in China, and E. Diaz stayed at there since he was ill. In fact, I think that E. Diaz arrived in China in July, 1604.

2. E. Diaz and the calendar reform in the late Ming Dynasty

There was an eclipse on December 15, 1610, but Qintianjian (the Imperial Astronomical Bureau) made a mistake in forecasting it, so that their mistake brought out complains and criticisms from many officers and scholars. At that time, Qintianjian had used *Datong Calendar* (《大统历》) to be engaged in astronomical activities. *Datong Calendar* had been applied for about three hundreds

years since the Ming Dynasty was established. By the Ming Dynasty's law, any people had no permission to study astronomy and take part in astronomical activities in private. If they were found to do it, they would be punished or executed. So *Datong Calendar* fell into disrepair for a few hundred years without amending. People appeal to government for calendar reform. As for this eclipse, the Jesuits, as Diego de Pantoja (龐迪我, 1571-1618) and so on, also forecast it before, and their calculation coincided with the observational result^[9]. It was luck for the Jesuits because they and occidental astronomy were regarded seriously with it, and the Jesuits enlarged their influence in China by means of chance of calendar reform. After forecasting incorrectly this eclipse, there were several officials who submitted written statements and asked to translate books of occidental astronomy from 1611 to 1613. As E. Diaz was proficient at astronomy among the Jesuits, Diego de Pantoja invited him together and went to Beijing from Nanjing. The aim of this travel took part in the translating work and made prepare for the calendar reform of the government. Then he wrote *Tianwenlue*, which explained systematically the prime thought and concept of occidental astronomy. In 1615, *Tianwenlue* was firstly published in Beijing.

3. Influence of *Tianwenlue* on the Chinese astronomy

Tianwenlue is written in catechetical form and has 4 chapters, 25 questions and 23 figures.



Fig. 1 Aristotelian crystalline spheres
(*Tianxuechuan*, vol. 5, *Tianwenlue*, p. 3)

It introduced Aristotelian cosmic theory, namely crystalline spheres, and expounded elementary knowledge of the western astronomy. The first chapter is *How many layers are there the heaven and what position are the seven planets* (七政); In the chapter, E. Diaz introduced the comic theory, which it has the skies of twelve layers. It had the sky of precession more than the celestial spheres of the eleven skies. The second chapter is *the proper motion of the solar layer and the which degrees are the sun away from the equator*; it explained annual apparent motion of the equator, the Sun and the ecliptic on the zodiac, twenty-four solar terms and so on. It also expounded the irregular motion of the sun because the skies of Qizheng (seven planets) were not concentric with the Earth. The third chapter is *the day or night has changed long or short with the changing of the latitudes*; the fourth chapter is *the sky of moon is the first layer and its proper motion*. In the chapter, E. Diaz firstly introduced eccentric (the truckle system) to show the differences of the eclipse time in Chinese. Particularly, the first reference to the telescope in Chinese is the end of *Tianwenlue* in 1615, and it was the first time that it told the Chinese the discoveries made with Galileo's telescope. *Tianwenlue* expounded the four satellites of the Jupiter, the waxing and waning of the Venus, the rotation of the Sun^[10], and so on. *Tianwenlue* was known in China for that. It showed that even if it was in that backward age, disseminate of scientific discovery was very fast. Design of geometrical models of cosmic systems is one of the occidental astronomy traditions, but ancient Chinese astronomy had not this trait, so that when the Jesuits introduced the occidental cosmic models in the end of the Ming Dynasty into China, they promptly arouse the Chinese attention and interesting^[11]. Because *Tianwenlue* is one of the earliest books referring to western astronomy by the Jesuits, in fact, it

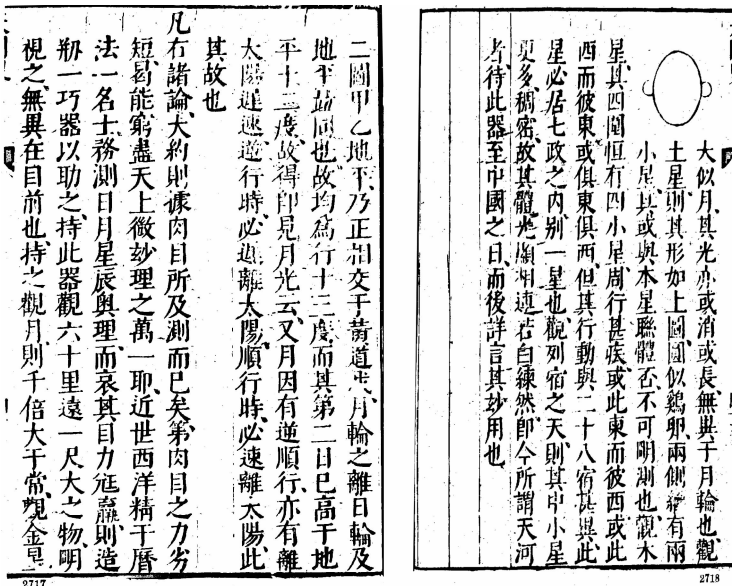


Fig. 2 The last two pages of *Tianwenlue*
(*Tianxuechuan*, vol. 5, *Tianwenlue*, pp. 46-47)

is easy to see that it had made a great impact on the thought and method of the Chinese. Although this calendar reform wasn't successful and didn't continue, these books had to have affected on the society in China. *Tianwenlue* was learned and published until the 19th century, and it was included those prestigious collections in China during the Ming and Qing dynasties, e. g. *Tianxuechuan* (《天学初函》, *First Collectanea of Heavenly Studies*), *Siku Quanshu* (《四库全书》, *Complete Library of the Four Treasuries*), and so on. Then *Tianwenlue* was introduced into Korea, and we should see that the effect widely spread at that time. The system and theory that it introduced was all new for the Chinese. But we should noted that there was not higher theory and complex calculation of astronomy in it, I think that *Tianwenlue* only played the role of enlightenment of western knowledge in China.

Wang Xichan (王锡阐, 1628-1682) was a famous astronomer and had written many astronomical works, and learned some new astronomical thought and methods from the western astronomy. He published the astronomical book, *Xiaoanxinfa* (《晓庵新法》, *The New Calendar of Xiaoan*) in the Qing Dynasty. In the sixth volume of his book, besides introducing the computing methods of the eclipse, he described the calculation of transit of Venus. The contents were first described in Chinese. How could Wang Xichan think of calculating the transit of Venus? Perhaps, Wang Xichan's method may derive from *Tianwenlue*^[12]. In *Tianwenlue*, E. Diaz expounded the transit of the Venus^[13]. In the second chapter, E. Diaz accounted for the reason why the Venus and the Mercury do not eclipse the Sun. The Jesuits only referred the phenomena of the inner planet's transit, but they didn't give their computing methods, and it was great that Wang Xichan was able to independently offer in virtue of E. Diaz's describing^[14]. *Chongzhen Lishu* (《崇祯历书》) is a large astronomical library, which was compiled in the *Chongzhen* period. Xu Guanqi was the series' general editor and the it was prepare for the calendar reform. The content of *Chongzhen Lishu* was almost introduced from occidental astronomical knowledge, and it contained much new astronomical knowledge, methods and instruments at that times. It mentioned E. Diaz' work and his book *Tianwenlue*^[15].

4. Conclusion

J. Needham said: "To seek accomplish their religious mission by bringing to China the best of Renaissance science was highly enlightened proceeding." ^[16]The Jesuits propagated the western astronomy with the chance of the calendar reform, and translated many books of the western astronomy into Chinese. The occidental astronomical knowledge opened the Chinese views and had great affection on them. In 1615, E. Diaz wrote *Tianwenlue* in Beijing, and it was one of the earliest translated works.

Tianwenlue introduced the basic astronomical knowledge, but the astronomical knowledge, including the figures of cosmos or the Earth, the sizes of planet or cosmos, the reason of the eclipse, etc. were great different from the Chinese traditional astronomy, especially they

sounded reasonable, so that it influence many peoples.

References

- [1] Needham J. Science and Civilisation in China. Vol. 3. Cambridge: Cambridge University Press, 1959. 437
- [2] Gu Weiming. Ji Du Jiao Yu Jin Dai Zhongguo She Hui, Christianity and Modern Society in China. Shanghai: Shanghai People's Publishing House, 2010. 29
- [3] Jiang Xiaoyuan, Niu Weixin. Tian Wen Xi Xue Dong Jian Ji, Collects of Western Astronomical Learning to East. Shanghai: Shanghai Bookstore Publishing House, 2001. 270
- [4] Xu Guangqi. Xu Guangqi Ji, Collected Works of Xu Guangqi. Beijing: Zhonghua Book Company, 1963. 374
- [5] Li Zhizao. Li Dai Tian Wen Lv li Deng Zhi Hui Bian. Collection of Astronomy and Calendars in Dynasties. vol. 10. Beijing: Zhonghua Book Company, 1976. 2538-2539
- [6] Pfister L. Notices biographiques et bibliographiques sur les jésuites de l'ancienne mission de Chine 1552-1773. Chang Hai: Imprimerie de la Mission Catholique, 1932. xvi
- [7] Pfister L. Notices biographiques et bibliographiques sur les jésuites de l'ancienne mission de Chine 1552-1773. Feng Chengjun tr. Beijing: Zhonghua Book Company, 1995. 110
- [8] Dehergne J. Répertoire des Jésuites de Chine de 1552 à 1800. Gengshen tr. Beijing: Zhonghua Book Company, 1995. 185
- [9] Xu Guangqi. Zeng Ding Xv Wen Ding Gong Ji, Revise and Enlarge Collected Works of Xv Wen Ding Gong. vol. 1. Shanghai: St. Ignatius Cathedral of Shanghai Library, 1933. 16-17
- [10] Du Shengyun, Cui zhenhua et al. Zhong Guo Gu Dai Tian Wen Xue de Zhuan Gui Yu Jin Dai Tian Wen Xue, The Shunt of Chinese Ancient Astronomy and Modern Astronomy. Beijing: Science and Technology of China Press, 2008. 249
- [11] *ibid* [3] . 358
- [12] Xi Zelong. Lun Wang Xi Chan de Gong Zuo, On Wang Xi Chan's Work. In: Chen Meidong, Shen Rongfa. eds. The Studied Collection Of Wang Xi Chan. Shijiachuang: Science and Technology of Hebei Press, 2000. 11-13
- [13] Diaz E Tianwenlue. Li Chizao, Tianxuechuan, vol. 5. 14
- [14] *ibid*. [12]
- [15] Xu Guangqi edited, Pan Nai assembled. Chongzhenlishu, Fu Xiyangxinfalishu Shiz Hong. Shanghai: Shanghai Century Publishing Group, Shanghai Classics Press, 2009. 59
《日躔历指》“推太阳之视差及日地去离远近之算加减之算第八”
“按：天问略等书，皆言地体居天中，止一点。是也。然各重天高下大小不等，各天与地球比例之大小亦不等，惟恒星一重天，比于向下诸天，甚远甚大，以地球较之，极微无数可论，故测候之家，以恒星为求视差之本。”
- [16] *ib*. [1] . 449