A Note on the Islamic Influence on the Astronomical Instrumentation of the Chosôn Dynasty

SHI Yunli*

In the first half of the 15th century, King Sejong initiated an astronomical reformation in his kingdom — the Chosôn Korea. The reformation was marked with the compilation of a series works on astronomy and computistic techniques, as well as the re-equipping of the royal observatory. In a large scale, the reformation was based on Chinese astronomy, but Islamic astronomy also played a remarkable role. In a former finished article, I have dealt with th e Islamic influence on the computistic respect of the Korean astronomy through the Korean adaptation of the Chinese-Islamic Computus *Huihui lifa*, which took great gravity in the official system of astronomy of the Chosôn dynasty[1]. The present note will draw attention to another respect of the Islamic influence in Korea, i.e. to indicate that to what degree, if any, Korean instrument makers in the early Chosôn dynasty received their enlightenment, directly or not, from Islamic world. In the section 1, I will reexamine a device claimed by some modern scholars to be an "astrolabe" ever made by an ancient Korean official. Then, in section 2, I will discuss the possible channels for the Korean designers of the auto-striking clepsydra to acquire inspirations from Islamic world and China. And finally, I will discuss other two Korean instruments to discuss their possible connections with the Islamic instruments introduced in the *Yuanshi* (元史, Standard History of the Yuan Dynasty).

1. Astrolabe in Korea

In the modern world, astrolabe has become an emblem of Islamic astronomy and science in the Middle Ages. It is believed that an astrolabe was also constructed in Korea in the 14th century.

According to the *Chungbo Munhon Pigo* (增補文獻備考, Revised and Expanded Edition of the Comprehensive Study of Civilization), in 1525, a Korean official called Yi Sun (李純) obtained copy of the *Gexiang xinshu* (革象新書, New Discourse in Astronomy) from China, in which a heaven-observing device called Mongnyun (目輪, or Mulun as

* University of Science and Technology of China. Dibner Institute for the History of Science and Technology, MIT E56-100, 38 Memorial Drive, Cambridge MA 02139, USA.

pronounced in Chinese, i.e. eye-wheel) is described. Yi Sun constructed a piece of this device with extremely exquisite workmanship in accordance with the description in the book and presented it to the king, who in turn ordered to place it in the Kwansang gam (觀象監, the Astronomical Bureau of the Chosôn Dynasty)"[2]. The *Gexiang xinshu* is a book written by Zhao Youqin (趙友欽), a Chinese astronomer of the early Yuan Dynasty. According to some scholars, this Mongnyun is "the first astrolabe of which we have been able to find any record in Korea"[3]. This claim seems justifiable because there is indeed an astrolabe among the seven Islamic astronomical instruments presented by the Muslim astronomer Zhamaluding (札馬魯丁) to Yuan emperor Kubilai, as recorded in the *Yuanshi*[4]. In 1402, copies of newly completed *Yuanshi* were imported from China into Korea[5]. The description of the seven Islamic instruments was thus brought to the notice of Korean astronomers in the early Chosôn dynasty and completely cited in a book written by Yi Sunji (李純之) [6], a court astronomer to King Sejong (世宗大王）. Therefore, it should have been possible for either Zhao Youqin or Yi Sun to get acquainted with the astrolabe.

Unfortunately, however, we can not find any word in the *Gexiang xinshu* related to an astrolabe, while the description of this instrument in the *Yuanshi* is obviously not detailed enough to enable a reader to make a duplication. As for the Mongnyun (or Mulun) itself, it is actually a set of diagrams, as described in the *Gexiang xinshu*, used by Zhao Youqin to illustrate his unique doctrine of parallax. He realized that there should be a positional difference when the sun or moon was observed from the site of Dizhong (地中, the center of the flat earth) and the center of the heavenly sphere respectively because of the perspective effect of the eye[7]. In his book, a detailed explanation of this doctrine can be read as follows:

> Now let us illustrate it with a diagram. Draw a cartwheel with its spokes representing the scale of the big heavenly circle in more than 360 degrees, its rim representing the sphere of fixed stars and its axle the center of the universe. Cut yellow and black paper in shape of the sun and moon respectively, and place the sun near the rim and the moon near the axle. … Draw another big cartwheel of the same kind but in a different size, with double the diameter and circumference, on a piece of translucent paper. This piece of translucent paper can be properly called an eye-wheel with its axle representing the observing eye. By putting the axle of the eye-wheel right upon the axle of the former wheel, you get an imitation of an eye

> located in the center of the universe. Observing from here, you see the moon at its actual position. Since, however, the surface of the flat Earth does not occur exactly in the middle of two hemispheres, but assumes such a position that more than a half of the heavenly sphere is above the earth's surface and less than a half is beneath it, we should move the axle of the eye-wheel to a lower spot to imitate an eye above the earth's surface. Under this situation, the observed position of the moon against the heavenly sphere is no longer the real lunar position[8].

From this text, we can see that the Mulun in Zhao Youqin's book has no relation with any kind of astrolabe. But there are evidences that an astrolabe may have been constructed and used in the Astronomical Bureau of the early Ming dynasty[9]. In addition, Jeon Sang-woon also illustrated to us "an astrolabe made by Yi Sun in 1525"[10]. Therefore, it is still an open question as for whether this kind of instrument also appeared in Korea before the 17th century when European astronomy, and therewith the European astrolabe, was introduced to this country. As for the astrolabe illustrated by Jeon Sang-woon, a misgiving may still exist, that is, how to make sure that this device is an Islamic astrolabe rather than a copy of a kind of simplified astrolabe such as the Honpyongui (渾平儀, Planisphere Instrument) invented by Nam Pyongchol in the mid-19th century[11].

2. Auto-striking Clepsydra

The Auto-Striking Clepsydra constructed during King Sejong's reign is the most brilliant monument of science and technology of ancient Korea. This clepsydra adopted a set of ball-operated power-transmission mechanisms in its time-annunciating jack work which, as asserted by Joseph Needham, was inspired by the third and fourth striking clepsydras described in al-Jazari's *Book of Knowledge of Ingenious Mechanical Devices* (1206). According to Needham, "it is quite possible that one of the Islamic mathematicians or astronomers who visited China at the time (of Guo Shoujin, 郭守敬) had a copy of al-Jazari's treatise in his baggage; it is rather likely that one or more would have read the treatise and have been able to explain its contents to Guo Shoujin or one of his colleagues"; finally, "through one or more Yuan intermediary instruments", this kind of devices "appear in full flower in King Sejong's Striking-Clepsydra"[12].

This is a quite reasonable postulation. According to Wang Shidian, an officer in the Yuan imperial Library, there were at least two books in Arabic or Persian on the constructions of clepsydras and other astronomical instruments preserved, together with other 242 Islamic books, in the Islamic observatory before 1273 in the Upper Capital (上都) of the Yuan Dynasty[13]:

1. *Sanadialate zao hunyi xianglou* (撒那的阿喇忒造渾天儀香漏), Eight Books on *Sanadialate* (transliteration of the Arabic word *San'aat Alat*), the constructions of armillaries and incense clepsydras.
2. *Heiyali zao xianglou bing zhuban jiqiao* (黑牙里造香漏並諸般機巧), two books on Heiyali (transliteration of Arabic word *al-Hiyal*), the construction of incense clepsydras and diverse ingenious devices[14].

Since Wang Shidian might not exhaust all Islamic books in his library which eventually amounted to "hundreds of volumes" by the end of the Yuan dynasty[15], one may expect more books on astronomical instruments, especially al-Jazari's work, in this library.

After Bejing was occupied by the Ming troops in 1368, all books in the Yuan Imperial Library were taken over by the Ming court and transported to Nanjing, the capital of this newly established dynasty. After Zhu Yuanzhang (朱元璋), the first emperor of the Ming dynasty, realized the superiority of the Islamic astronomy and astrology in some respects to those of the Chinese, he showed these books to several Islamic astronomers in his court and asked them to make some translations in cooperation with several Chinese scholars. From their work, the Chinese-Islamic astronomical tables and an astrological book, namely, the *Tianwen shu* (天文書, Kusyar ibn Labban'ss *Introduction to Astrology*[16]), was resulted[17]. It was during this time when Mashayihei (馬沙亦黑), one of the major Islamic astronomers served in the Ming court, finished his alleged book on astronomical instrumentation entitled *Faxiang shu* (法象書, Book on Astronomical Instruments)[18]. If this had been the case, he might have referred to the books on astronomical instrumentation from the Yuan imperial library and devoted some lengths in his own book to the construction of clepsydras. It is rather likely that this new book was collected together with the Chinese-Islamic astronomical tables by the Korean astronomers dispatched by King Sejong to China for astronomical knowledge and books[19] and thus become an accessible source in horology for the Korean designers of the Striking Clepsydra.

Talking about the possible "Yuan intermediary instruments" which gave "the immediate inspiration for the Striking Clepsydra", Needham drew our attention to the Baoshang luo (寶山漏, Clepsydra of Treasured Mountain) and Damingdian denglou (大明殿灯漏, Lantern Clepsydra of the Great Brightness Hall) made by Guo Shoujing in 1262-1279 for Kubilai (忽必烈) as well as the Gonglou (宮漏, Palace Clepsydra) constructed around 1350 by the Yuan empire Shundi (順帝). He thought it very possible that some careful Korean visitors to Yuan who had opportunity to observe these Chinese clepsydras might have understood the operating method of such clepsydras or collected some relevant technical documents[20]. He even imagined that some Chinese horological engineers (or even technicians from further west in Asia) might “have fled to Korea, where they could quite conceivably have preserved their skills for the generation or two between the fall of the Koryo Kingdom and the commissioning of the striking clepsydra by King Sejong in 1432[21]. But the problem is that so far we have not found enough information from the related literature to specify whether any kind of the ball-operated mechanisms were actually applied on the Chinese clocks mentioned above[22].

Apart from these “quit plausible” routes, as Needham put it, intervened by China, there might still be another shortcut for the designers of the Striking Clepsydra to get inspiration from Islamic mechanical devices. According to the *Real Record of the Chosôn Dynasty*, there were a remarkable number of Islamic people living in Korea in the early Chosôn dynasty[23], among whom some artisans can be found. For example, in the 7th year of King Taejo (太祖) (1311), “an Islamic monk named Dono (都老) came to our country with his wife and expressed their willing to become residents here. King Taejo ordered that a house was furnished for them to live in”. This Dono is obviously an artisan because five years later he manufactured a jewel with crystal from his own country, presented it to the throne and asked for permission to prospect and recover more crystal in Korea. After this request was granted, he was dispatched to several places for crystal[24]. It is highly possible that there were some other artisans such as this Dono lived in Korea and practiced their own handicrafts there in the early Chosôn dynasty. Among them there might be some that had knowledge of clepsydra manufacturing and thus might have enlightened the inventors of the Striking Clepsydra.

The ball-operated system in the Korean Striking Clepsydra also reminds us of the Beilou (碑漏, Stele Clepsydra) and Xingwanlou (星丸漏, Star-ball Clepsydra), which were quite popular in the Yuan dynasty and recorded in several sources from that period. For instance, we can find from the *Yuanshi* the following description of a Beilou used before 1297 in a public place in Beijing, the capital city of the Yuan Dynasty:

> The old clepsdra in the capital city was made of wood and shaped like a stele, and hence got its name of the Stele Clepsdra. Inside the clepsdra, there is a curved pipe-work with an in-let orifice at the top and an out-let orifice at the

> bottom. There are also some balls cast with brass. Drop the balls into the top orifice successively and they will roll down the pipe-work and finally hit on a cymbal to announce time[25].

And in Wang Yun's (王惲, 1227-1304) collected writings, there is a detailed record of a Xinwanlou, which reads as follows:

> In the capital city of the province Pingyangfu (平陽府), there used to be a clepsydra deployed in one of the city's gate-towers. Although people still remembered its name, the clepsydra was lost and only a bell and a drum were left there. Shortly after my term of the presidency of that province began, I was thinking about restoring its service with a new substitution and eventually gained a remaining design of the so-called wooden Star-ball Clepsydra. The clepsydra comprises two parallel screens of 100 *chi* in height and 50 *chi* in width. Between the screens, there are seven pipes connected to each other in a zigzag shape. Cast with iron 60 balls, and use them in cycle in correspondence with the timing system which divides one day-and-night's 100 ke into 6,000 minutes. […] The duration for a ball to run down the pipe-work represents one minute, 60 minutes make up one *ke*, and one night is divided into five equal intervals. This timing system finally became a fixed regulation. The new clepsydra was completed on the day Dingmao (丁卯) of the second month in the tenth year of Zhiyuan (1273) [26].

One can easily realize the similarity of these two ball-operated clepsydras. But hitherto we have not been able to find any clue of their connection with Islamic clepsydra or horology. Contrarily, their tradition in China can be traced further back to the so-called Gundanlou (輥弹漏, Clepsdra of Rolling Metal Balls) described in details by Xue Jixuan (1134-1173), a scholar in the Song dynasty. In fact, the Gundanlou is similar to the Xinwanlou in the structure and working principle, but with smaller size. According to Xue Jixuan, this type of clepsydra was invented by a Buddhist living in the late Tang dynasty (618-907) named Wengao (文誥)[27]. Therefore, when considering the Islamic inspiration to the Striking Clepsydra, the influence of Chinese tradition still cannot be totally excluded.

3. Kyupyo and Kyuhyon Injiui

In 1491, three sets of an instrument called Kyupyo (窺標, Kuibiao as in Chinese, i.e. sighting torquetum) were constructed at the Kwansang gam by the order of King Songjong (中宗) and used in "observing the heavenly time so as to correct the discrepancy in the current time-keeping work". According to the king's edict concerning the construction of this instrument, its underlying principle is to measure the time by observing apparent positions, i.e. altitudes and azimuths, of some fixed stars at different moment[28]. It is highly possible that this instrument is an imitation of the Islamic triquetum (i.e. Zatushuobatai, 咱突朔八台) which is recorded as an "Instrument for Measuring the Stars of the Heavenly Vault"(測驗周天星曜之器) in the *Astronomical Annals* of the *Yuanshi* among the 7 Islamic instruments presented by Zhamaluding. Its structure is described in the *Yuanshi* as follows:

> In the east part of the wall encircling a round cell, there is a door. In the middle of the cell, there is a small stage, on which stands a brass pillar of 7.5 *chi* (尺) in height. A pivot is attached to the top of the pillar, connected and hung to which is a brass ruler of 5.5 *chi* long. Mounted on the ruler is a sighting torquetum of the same length, and another transverse ruler with scale is attached below to monitor the position of the free end of the hung ruler. Both rulers can be turned to either left or right targeting to all directions. They also can be adjusted up and down to observe in different altitudes[29].

The main function of this instrument is to observe the altitude and azimuth of a heavenly body. But it also can be used as a time measuring device since the altitudes and azimuths of the fixed stars vary with time. It is not difficult for us to realize the similarity between this instrument and the Kyupyo so far as their functions and such common components as sighting torquetums are mentioned.

Moreover, the Kyupyo may not be the only Korean instrument inspired by the Islamic triquetum from the *Yuanshi.* In 1467, King Sejo (世祖) made an instrument called Kyuhyon injiui (窺衡印地儀, Kuiheng yindiyi as in Chinese, i.e. terrestrial survey instrument with a sighting torquetum). According to Yi Yuk (李陸), a Korean official at that time, this instrument "is made of bronze and engraved with 24 cardinal points. There is a hole in its middle, from where a brass pillar is set up. A torquetum is connected to the top of the pillar with a pivot so that the torquetum can be turned up and down to observe (in different directions)"[30]. Obviously, the torquetum can also be revolved around and target to different azimuths. Although we have no idea about the exact size of this instrument, its structure appears even more similar to the Islamic triquetum than the Kyupyo. According to Korean literature from that time[31], the main function of this instrument is "to measure the geographic distance". But in an ode to it written by the king himself, the instrument is said to be helpful in "revealing the degrees of heavenly bodies and the shift of seasons", which means that this instrument can also be used in astronomical observations. That must have been the reason why King Sejo once "discussed the fine designing of the Kyuhyon injiui with the head of the Astronomical Bureau"[32].

Concluding Remark

Compared with China, it seems, Korea only had quite limited first-hand contact with Islamic world. But the influence of Islamic astronomy in Korea is still quite obvious. As long as the instrumentation is concerned, the impact from the Arabic world can also be sensed. In future, as we acquire more knowledge about Islamic devices in astronomy, it may be expected that more traces of Islam can be detected, especially from those special sundials that appeared during King Sejong's period.

Acknowledgement

I would like to thank Dr. Benno Van Dalen for his constructive comments and help.

Notes

1 Shi Yunli, 2003.

2 Hong Ponghan et al. 1770, *kwon* 2, pp.33ab.

3 Joseph Needham et al. 1986, p. 101; Jeon Sangwoon 1974, p. 73.

4 Song Lian 1370, *juan* 48, p.127. For recent researches, see: Tasaka Koda 1957; Willy Hartner 1950; Joseph Needham 1959, pp.369-372; Kazuhiko Miyajima 1982; Chen Jiujin 1996, pp.95-105; Jean-Claude Martzloff 1988; Yabuuchi Kiyoshi, 1997]

5 In this year, a copy of the *Yuanshi* was presented by the emperor of China to the king of Korea. See Hong Ponghan et al. 1770, *kwon* 242, 13b.

6 Yi Sunji, 1445, *kwon* 3, pp. 32b-34b.

7 Shi Yunli 1996.

8 Zhao Youqin 1280-1345, *juan* 3, pp. 11b-13b.

9 Shi Yunli 2003, p. 49.

10 Jeon Sang-woon 1975, p. 49; 1978, p. 73

11 Nam Pyongchol 1860, *kwon* 1, 43a-45b. For the discussion of the Honpyongui, see Shi Yun-li 1998 (2), pp. 52-53.

12 Joseph Needham 1986, pp. 41-44.

13 Wang Shidian 1342-1367, *juan* 7, pp. 14b-15b. Shang Du, built in 1255AD, was the first capital of the Yuan Dynasty before its capital was moved to Bejing in 1264AD.

14 For detailed discussions on the titles of Islamic astronomical works recorded in Wang Shidian's book, see Kasaka Kodo 1957; Ma Jian 1955; Yamada Keiji 1980, pp. 97-98; Jean-Claude Martzloff 1988; Chen Jiujin 1996, pp. 78-80.

15 Wu Bozong 1383.

16 Jean-Clude Martzloff [1986] believed that the *Tianwen shu* is translated from Ptolemy's *Tetrabiblios.*

17 Wu Bozong 1383; Michio Yano 1997

18 Chen Jiujin 1996, p. 119.

19 Before the construction of the new instruments, King Sejong dispatched several qualified astronomers to China to study astronomy and instrument making, and to collect related books as well (Yi Kungik 1800, *kwon* 3, p. 109).

20 Joseph Needham et al. 1986, pp. 40-41.

21 Joseph Needham et al. 1986, p. 44.

22 Joseph Needham et al. 1960, pp. 135-136 and pp. 140-142.

23 Chông Inji et al. 1448, *kwon* 31, p. 35b; 1454, *kwon* 1, p. 25a and *kwon* 25, p. 9b.

24 Chong Inji et al. 1448, *kwon* 13, pp. 3a; *kwon* 23, pp. 14b; *kwon* 26, pp. 4b.

25 Song Lian, *kwon* 172, pp. 18a-19b.

26 Wang Yun 1227-1304, *juan* 36, pp. 18b-19b. In 1190-1196AD, Zhang Xingjian (張行簡), a Chinese engineer who served the Jin Dynasty, also constructed a clepsdra with the name of Xinwan Lou. See. Tuo-tuo 1344, *juan* 22, 46b.

27 Xie Jixuan 1134-1173, *juan* 30, pp. 62b-64b. For detailed discussion of the Kundan lou, cf. *Zhongguo tianwen xueshi zhengli yanjiu xiaozzu*, 1990, pp. 210-211.

28 Hong Ponghan et al. 1770, *kwon* 2, pp. 32b-33a.

29 Song Lian 1370, *kwon* 48, pp. 13a.

30 Hong Ponghan et al. 1770, *kwon* 2, pp. 32b.

31 Sin Sukju et al. 1471, *kwon* 41, pp. 12b.

32 Sin Sukju et al. 1471, *kwon* 41, pp. 20b-21a. Jeon Sangwoon [1974, pp. 295-296] pointed out that this is a triangular surveying instrument. But Joeph Needham et al. [1986, p. 102] believed that “this is likely have been an adaptation, for celestial observations, of a terrestrial surveying instrument”.

Bibliography

Chen Jiujin (陳久金)

1996: *Huihui tianwen xueshi yanjiu* (回回天文學史研究， A Study of the Islamic Astronomy in China). Nanning: Guanxi Jiaoyu Chubanshe.

Chông Inji (鄭麟趾) et al.

1448: *Taejo Sillok* (太祖實錄, Real Record of King Taejo). Reprinted in the *Chosôn wangjo sillok* (朝鮮王朝實錄, Real Record of the Chosôn Dynasty). Kwangju Chikhalsi: Kwangju, Chonnam Saryo Chosa Yonguhoe, 1991-1995.

1454: *Sejong Sillok* (世宗實錄, Real Record of King Sejong). Reprinted in the *Chosôn wangjo sillok*.

Hong Ponghan (洪鳳漢) et al.

1770: *Chungbo Munhon Pigo* (增補文獻備考, Revised and Expanded Edition of the Comprehensive Study of Civilization). Reprinted in Seoul: s.n., Kwangmu 11 (1908).

Jean-Claude Martzloff

1988: Les Contacts entre les Astronomies et Mathetiques arabes et Chinoises, in *Actes du Duuxieme Colloque Mghrebin*. Published in Tunis.

Jeon Sangwoon 全相運

1974: *Science and Technology in Korea––Traditional Instruments and Techniques*. Cambridge: the MIT Press.

1975: *Hanguk Kwahak Jisul Sa* (韓國科學技術史, History of Science and Technology in Korea). Seoul: Chongum Sa. Japanese version of this book was published in 1978 in Tokyo.

Joseph Needham

1959: *Science and Civilization in China*, Vol.3. Cambridge University Press.

Joseph Needham et al.

1960: *Heavenly Clockwork*----*The Great Astronomical Clocks of Medieval China*. Cambridge University Press.

1986: *The Hall of Heavenly Records* — *Korean Astronomical Instruments and clocks 1380-1780*. Cambridge University Press.

Lee Ki (李吉) et al.

1550: *Songjong Sillok* (中宗實錄, Real Record of King Songjong). re-printed version in the *Chosôn wangjo sillok.*

Ma Jian (馬堅)

1955: An Explanation of the Islamic Books in the *Annals of the Yuan Imperial Library*. *Guangming ribao* (Guanming Daily), 1955.7.5.

Miyajima Kazuhiko

1982: A New Identification of the Islamic Astronomical Instruments Recorded in the Astronomical Annals of the *Yuan Shi*. Science and Technology in Asia: Festschrift for the 77th of Prof. Yabuuchi Kiyoshi, pp. 407-427. Kyoto: Dohosha.

Nam Pyongchol (南秉哲)

1860: *Uigi Chipsol* (儀器輯說, Collected Introduction to Astronomical Instruments). Reprinted in Yu Kyun-loh edt., *Han'guk kwahak kisulsa charyo taegye: Ch'ônmunhakp'yôn* (韓國科學技術史資料大系天文學篇), Soul t'ukpyolsi, Yogang chulpansa, 1986, vol.10.

Shi Yunli (石云里)

1995: Cong Zhao Youqin de tianwen sixiang kan 'diyuanshuo' zai yuanchao de chuanbo (從趙友欽的天文思想看"地圓說" 在元朝的傳播，The Spread of the Round Earth Concept in the Yuan Dynasty — a Study of Zhao You Qin's Astronomical Thought). In Wang Yusheng ed., *Diqi jie guoji zhogguo kexueshi huiyi lunwen* (Proceedings of the 7th International Conference on the History of Science in China. January 1995), Zhengzhou: Daxiang Chubanshe, 1999, pp. 38-42.

1998: *Gudai zhongguo tianwenxue zai chaoxian de liuchuan he yingxiang* (古代中國天文學在朝鮮的流傳和影響，The Spread of Ancient Chinese Astronomy in Korea and Its Influence. Ph.D. Dissertation. University of Science and Technology of China.

2003: The Korean Adaptation of the Chinese-Islamic Astronomical Tables, *Archive for History of Exact Sciences*, vol. 57, pp. 25-60.

Sin Sukju (申叔舟) et al.

1471: *Sejo Sillok* (世祖實錄, Real Record of King Sejo). Reprinted in the *Chosôn wangjo sillok.*

Song Chudok (陳周德)

1812: *Soun Gwanji* (書雲觀志, Annals of the Bureau of Astronomy). Reprinted in *Han'guk Kwahak Kisulsa Charyo Taegye: Ch'ônmunhakpy'ôn*, vol.8.

Tasaka Kodo

1957 *An Aspect of Islamic Culture Introduced into China*, Tokyo: toyo Bunko.

Tuo Tuo (脫脫)

1344: *Jin Shi* (金史, Standard History of the Jin Dynasty). Reprinted in the *Yingyin Wenyuange Siku Quanshu.*

Wang Shidien (王士點)

1342-1367: *Mishu Zhi* (秘書志, Annals of the Imperial Library). Reprinted in the *Xueshu Conybian* (學術叢編, Series of Sholarship), 1916.

Wang Yun (王惲)

1227-1304: *Qiujian Ji* (秋澗集, Epilogue of Autumn Ravine). Reprinted in the *Yingyin Wenyuange Siku Quanshu*.

Willy Hartner

1950: The astronomical Instruments of Cha-ma-lu-ting, Their Identification, and Their Relations to the Instruments of the Observatory of Maragha". Isis,vol.41,pp.184-194.

Wu Bozong (吳伯宗)

1383: *Tianwen shu* xu, in front of Hai Da'er et al. tr., *Tianwen shu* (a Book on Astrology). Reprinted in the *Congshu jicheng xubian* (A Comprehensive Collection of Ancient Series, continued edition), Shanghai, shagnhai shudian, 1994.

Xue Ji-xuan (薛季宣)

1134-1173: *Langyu Ji* (浪語集, Collection of Unstrained Words). Reprinted in the *Yingyin Wenyuange Siku Quanshu* (A Granvure of the Complete Books of the Four Stacks Preserved in the Wenyuan Pavilion), Shanghai: Shanghai guji chubanshe, 1983.

Yabuuchi Kiyoshi

1997: Islamic Astronomy in China during the Yuan and Ming Dynasties. Translated and partially revised by Benno van Dalen. *Historia Sciencentiarum*, vol.7-1, pp. 11-43.

Yamada Keiji

1980: *Jujireki no michi* (the Principles of the *Shou-shi Li*), Tokyo: Misuzu Shobo.

Yi Kungik (李肯翊)

1800: *Yôllyôsil kisu* (Narrative of Yi Kungik), reprinted version, Chosôn, Chosôn Kwangmunheo, 1913.

Yi Sun Ji (李純之)

1445: *Chega Yoksang Jip* (諸家曆象集， Selected Discourses on Astronomy and Calendrical Science of the Chinese Masters). Reprinted version in the *Han'guk Kwahak Kisulsa Charyo Taegye: Ch'ônmunhakpy'ôn.* Vol.5.

Zhao Youqin (趙友欽)

1280-1345: Ge*xiang Xinshu* (革象新書， New Discourse in Astronomy). Reprinted version in the *Yingyin Wenyuange Siku Quanshu*.

World Heritage Encyclopedia, the aggregation of the largest online encyclopedias available, and the most definitive collection ever assembled.Â Islamic influence on Chinese astronomy was first recorded during the Song dynasty when a Hui Muslim astronomer named Ma Yize introduced the concept of 7 days in a week and made other contributions.[20].Â They wrote many books on Islamic astronomy and also manufactured astronomical equipment based on the Islamic system. The translation of two important works into Chinese was completed in 1383: Zij (1366) and al-Madkhal fi Sina'at Ahkam al-Nujum, Introduction to Astrology (1004). â€œThe revelations of Greek thought on the nature of the exterior world ended with the â€œAlmagest" (of Ptolemy) which appeared about A.D. 145, and then began the decline of ancient learning.Â Page 2 of 19. Aspects of the Islamic Influence on Science & Learning in the Christian West March 2003.Â standard tools and weapons of all kinds; sailing ships; astronomical observation and the calendar; writing and the keeping of records; laws and civic life; coinage; abstract thought and mathematics; most of our religious ideas and symbolsâ€™. And he concludes that, `there is virtually no evidence for any of these basic things and processes and ideas being actually invented in the West.â€ 7.