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Journeys of the Modest Astronomers : Korean Astronomers' Missions to Beijing in the Seventeenth and Eighteenth Centuries

Les voyages des modestes astronomes : les missions des astronomes coréens à Pékin aux XVIIe et XVIIIe siècles

謙卑的天文學旅行者：十七十八世紀出使北京的朝鮮天文學者

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Journeys of the Modest Astronomers: Korean Astronomers' Missions to Beijing in the Seventeenth and Eighteenth Centuries[1]

Lim Jongtae

Our conventional image of astronomers has commonly depicted them as calm observers of the sky in isolated places. In contrast, recent research in the history of modern Western science increasingly emphasizes the central role of astronomers'travel in producing knowledge and in establishing their professional identity. To observe major astronomical phenomena, for which only certain limited sites allowed a perfect view, or to satisfy other practical needs of navigation, cartography, and meteorology, astronomers either traveled to remote places themselves or had their agents travel to those places for them. Astronomy in modern Europe might therefore be considered one of the "field sciences," consisting of a long-distance network, through which men, artifacts, and knowledge circulated under the control of the academies and observatories at the imperial metropolises. Since astronomers had come to view their travel as an important means to serve the cause of science and the empire, traveling became crucially incorporated into astronomers'self-perception. They portrayed themselves as the emissaries of scientific empires dispatched to peripheral worlds.[2]

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2. Pyenson 1989; Harris 1998; Pang 2002.

The central role of travel in astronomy may also be found in non-Western empires, in particular that of the Qing dynasty (1644-1911). The Qing maintained its own bureaucratic network, through which astronomical data, collected throughout its territory and in the regions under its political influence, came to be gathered in institutions located in Beijing. For example, in a grand cartographical survey of the empire in the early eighteenth century, the Qing emperor dispatched imperial astronomers, including European Jesuits at his court, to various parts of the empire and its "tributary states," such as Tibet and Korea.[3]

This picture of a traveling astronomer as portrayed by recent scholarship is mostly an outcome of historians'conscious efforts to follow the itineraries of the imperial astronomers dispatched from the metropolitan center. How differently then would the matter look, if we were to turn our attention to people at the margins of the imperial traveling network? Would we find only the "indigenous people" or the "local informants" who passively received the visits of the imperial guests or, if allowed to exercise a modicum of agency, occasionally provided them with their folk wisdom?[4]

This article aims to present a picture seen from the peripheries of the Qing empire by examining the cases of the two official astronomers of the Chosŏn dynasty (1392-1910) of Korea who made their journeys to Beijing in the mid-seventeenth and early eighteenth centuries, respectively. Although their travel was conditioned by the politico-epistemic hierarchy between the two dynasties, Korean astronomers never viewed themselves as mere local informants who by their traveling would do no more than reinforce the already powerful metropolitan center. They traveled to Beijing with a more ambitious aim, namely to acquire the secrets of astronomical calculation possessed by the Qing Bureau of Astronomy (*Qintianjian*), the inner mechanism of which was less than transparent and thus not easily accessible to the visitors from a tributary state of the empire.

This article thus examines the unremitting efforts of Korean astronomers to gain access to the center of astronomical calculation, while paying close attention to the sociopolitical, cultural, and institutional settings that conditioned their efforts. In the course of the travel that offered the Korean astronomers both frustrations and opportunities, I shall argue that traveling to the metropolitan center became crucially incorporated into their self-portrait.

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3. Jami 2012: 277-279. On the Kangxi Atlas project, see Foss 1988: 220-240.
4. Recent research in the history of modern European science increasingly emphasizes the contribution of indigenous knowledge of non-Western (colonial) societies to building modern (Western) science. See, for example, Drayton 1999; Raj 2007.

They presented themselves modestly as the astronomers of a "marginal state" who could not expect to be competent in their specialty without making pilgrimages to the imperial metropolis. This rhetoric of modesty reflected the paradoxical position of the Korean official astronomers, who could promote their sociocultural interests only by negating their ability to be competent in their specialty on their own.

1. "An astronomer traveling to the center": self-portrait of a court astronomer

In the summer of 1710, Hŏ Wŏn, an official astronomer of the Royal Bureau of Astronomy (*Kwansanggam*) in Korea, wrote a preface to an astronomical manual that he had compiled for his fellow astronomers in the Bureau. The contents of the manual, as reflected in its title, the *Classified Collection of Manuscript Pieces for Calculating Celestial Phenomena According to the New Methods* (*Hyŏnsang sinbŏp sech'o ryuhwi*), were mathematical algorithms, arranged by subtopics for making civil calendars and predicting eclipses and other planetary phenomena. This was not Hŏ's original work but rather an outcome of Hŏ's two journeys to Beijing in the preceding decade, during which he learned from a Qing astronomer how to calculate ephemerides according to the new *Shixian li* method, the official calendrical system of the Qing dynasty since its official promulgation in 1644.

Written in classical Chinese that was not especially elegant—perhaps typical of a technical manual authored by a lower functionary official—Hŏ's preface nevertheless reveals vividly the complex position of calendrical astronomy and its practitioners in a country at the margins of the Qing imperial world order. Speaking both to his fellow astronomers and high court officials, Hŏ's voice in the preface oscillated between pride and modesty, reflecting his dual rhetorical aim, which was to emphasize the significance of his recent achievement while at the same time apologizing for the incompetence that Korean astronomers had previously shown.

First, Hŏ boasted that his compilation of the *Classified Collection of Manuscript Pieces* marked the completion of the long-delayed court project for astronomical reform (*kaeryŏk*)—that is, the conversion of the state's official astronomy from the previous *Datong li* to the new *Shixian li* system. Although the Chosŏn dynasty had issued its civil calendar according to the new Qing system since as early as 1654, Hŏ argued that this was not a perfect implementation of the new system. Because the astronomers of the Bureau were incapable of predicting planetary movements and solar and lunar eclipses

according to the new method, they therefore relied upon the old system in those important tasks of calendrical astronomy. However, with the publication of his manual, which contained all of the important algorithms for calculating ephemerides according to the new system, he proudly announced:

> For the next two hundred years hereafter, there will never be a repetition of the previous failures in making annotations for civil calendars and in predicting eclipses. Therefore, there would never be a case in which [the calendrical astronomy of the state] shows even the smallest discrepancy in [predicting the movements of] the celestial images. How could this be a shallow contribution to the state's governance [in the matter of] "being in reverent accordance [with the broad heaven] and delivering [seasons to the people] respectfully (*hŭmyak kyŏngsu*)"?[5]

In the last sentence, Hŏ alluded to a passage from the *Classic of Documents* (*Shujing*), which described the Emperor Yao's world-ordering act, in which the emperor ordered his legendary astronomers, Xi and He, to be in "reverent accordance" (*hŭmyak*) with the broad heavens, to observe the movements of the sun, the moon, and the stars, and to "deliver respectfully" (*kyŏngsu*) the seasons to the people.[6] Drawing on this classical locus for a sagely origin of the state's calendrical astronomy in Chinese antiquity, Hŏ emphasized the significance of his compilation of the manual, which would keep the state's calendar in exact accordance with the heavenly phenomena, and thereby contribute to realizing the ideal kingly governance of the state.

Why then had Hŏ's self-proclaimed completion of an astronomical reform been so long delayed? Was it not because of the incompetence, or worse, the dereliction of duty of the astronomers in the Bureau of Astronomy? Perhaps anticipating this line of accusation against his profession, Hŏ advanced an interesting apology for his fellow astronomers. In this, Hŏ's voice turned very modest, taking for granted the inability of Korean astronomers to accomplish an astronomical reform on their own.

> As for the New [*Shixian li*] system, a Westerner named Tang Ruowang (Adam Schall von Bell) illuminated its principle and established its method. It corresponds to the celestial movements very precisely, to the extent that its precision goes far beyond all the previous systems… Alas! Even the Great Country (*taeguk*, i.e., China), having numerous men of talents, had failed to produce a man like him (i.e., Schall), who was in fact the only one after Wang [Xun] and Guo [Shoujing]. [If this

5. Hŏ [1711] 1986: 3-5.
6. Sun 1986: 10-12.

> being so in the Great Country], how could men of a marginal country (*p'yŏnbang chi in*) expect to be capable of [the new calendrical astronomy] without learning it [from the Great Country]?[7]

Hŏ claimed that the mastery of the new calendrical system was beyond the capacity of the astronomers of a marginal country. In Hŏ's usage, the term "margin" was not defined only geographically; it had an epistemic connotation as well. Since the astronomers at the margin had by nature limited intellectual capacity, he argued, a journey to the center was indispensable for mastering the astronomical system of the "Great Country."

> For this reason, the Court of our Dynasty in the previous reign period issued an order upon *ch'ŏmji* Kim Sangbŏm, an official of the Royal Bureau of Astronomy, to travel to the north to study (*pukhak*) [in Beijing]. After many years of traveling to the north, however, the method that Kim acquired was only a rough outline of the solar path and the lunar position. As for the method of the movements of the seven governors and the eclipses of the two luminaries, he had acquired none of them. After traveling back and forth for a decade, he was buried in vain in a remote foreign land. Since then, our state has continuously relied upon the incomplete method of the solar path and the lunar position.[8]

The reason for the technical incompetence that Korean astronomers had previously shown, according to Hŏ's diagnosis, lay in the interruption of the "travel to the north" after Kim Sangbŏm's failed attempts in the early 1650s. As an inevitable consequence of this long-lasting disconnection from "the north," Hŏ claimed, the calendar began to show serious errors, as indeed happened in the *ŭryu* year (1705-06), when the local calendar differed from the Qing calendar in the lengths of the lunar months.[9] This failing eventually caused the

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7. Hŏ [1711] 1986: 3-5. Wang Xun and Guo Shoujing were astronomers in the Yuan dynasty, famous for having made the *Shoushi li* calendrical system. This system was continuously used, with some modifications, through the end of the Ming, although it was differently titled the *Datong li* system.
8. Hŏ [1711] 1986: 3-5.
9. For the discrepancy between the Qing and Chosŏn calendars in the *ŭryu* year, see *Sŭngjŏngwŏn ilgi* (hereafter *SJWIG*), Sukchong 30/12/11; 12/18 (1704-1705). This means the entries for the 11th and 18th days, the 12th month, in the 30th year of King Sukchong's reign. The dates, months, and years are according to the Chinese lunisolar calendar. I add in parenthesis the corresponding years in the Gregorian calendar. In this case, the 30th year in King Sukchong's reign corresponds to a year between 1704 and 1705 C.E.

Chosŏn court to resume dispatching its astronomers to Beijing, and, this time, to choose Hŏ Wŏn for the mission.

> In the winter of the *ŭryu* year, the Court issued a special order upon Your Subject [Hŏ] Wŏn to follow in the footsteps of [Kim] Sangbŏm. Upon receiving the order, Your Subject went to Yanjing (Beijing) and acquired exhaustively the two calendrical methods from an official astronomer of the Imperial Bureau of Astronomy named He Junxi… Now, the important task of an astronomical reform has fortunately been completed after sixty-odd years of endeavor.[10]

By ascribing the previous failures in calendrical astronomy to the halting of astronomers' travels to Beijing, Hŏ's apology impressively expressed another, perhaps more fundamental, aspect of a Korean astronomer's self-perception of his own profession. In this, Korean astronomers were portrayed as those who, by being displaced from the center of astronomy, were destined to journey toward that source of knowledge.

To give a sense of nobility to this otherwise frankly modest self-portrait, Hŏ called the travel of Korean astronomers to Beijing an enterprise of "*pukhak*." This is an allusion to a phrase in the *Mencius*, one of the Neo-Confucian *Four Books*, in which Mencius praises the deeds of Chen Liang, a man from the barbarian southern state Chu, who nevertheless "loved the Way of the Duke of Zhou and Confucius and thus went to the north to study in the Middle Kingdom."[11] Drawing on this passage, Hŏ attempted to legitimize the Korean astronomers' travels as following the exemplary deeds of the noble barbarian who allegedly aspired to replace local customs with the culture of "the Middle Kingdom." It was indeed a forceful strategy for the cultural legitimation of astronomers' travels to China, considering that the "*pukhak*" enterprise had represented for centuries the cultural aspiration of Korean literati elites who themselves had attempted to adopt Chinese culture and thereby to transform their dynasty into a cultural equivalent of the "Middle Kingdom."

In sum, Hŏ's voice in the preface oscillated between confidence and modesty. As a result, his self-portrait of the Korean astronomers was riddled with self-contradictions and confusions. As cited above, Hŏ promised that, with the compilation of the manual, "[calendrical astronomy in Korea] would never show the smallest discrepancy with the celestial images for the next

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10. Hŏ [1711] 1986: 3-5. The two calendrical methods mentioned by Hŏ are the methods (1) for calculating the solar and lunar movements from which to make a civil calendar, and (2) for predicting the planetary movements and the solar and lunar eclipses.
11. Zhu 1983: 260.

two hundred years." Yet Hŏ's ambitious claim for the right to observe "the celestial images" starkly contradicted his self-portrait as an astronomer from a marginal country who was not entitled to confront directly the "heavenly images." It might be said that Hŏ had made a promise that neither he nor any other astronomer in Chosŏn was able to keep on his own.

2. "An astronomical reform in a tributary state": the political and diplomatic setting of the astronomers' mission

The inner contradiction found in Hŏ's preface should not be viewed merely as an expression of the author's personal character. Obviously, Korean astronomers, including Hŏ himself, did not travel to Beijing merely to satisfy personal curiosity about the new astronomy. They traveled as government officials with specific goals given them by the court. In other words, their journey was an official tour bound by institutional constraints of the government bureaucracy of Chosŏn and the politically hierarchical relationship between the Chosŏn and Qing courts. The inner contradiction in Hŏ's preface should therefore be viewed as being deeply rooted in the doubly marginal position Hŏ and his fellow astronomers assumed in the state bureaucracy of Chosŏn on the one hand and with respect to the Qing imperial world order on the other.

First, the astronomers at the Chosŏn court were lower-ranked functionaries in the state bureaucracy who, together with the officials of other specialties, such as foreign languages, medicine, painting, and calligraphy, constituted a distinct sociocultural stratum in late Chosŏn society, collectively called *chungin*. Serving at the government offices in their respective specialties, the *chungin* officials played an indispensable role, satisfying various technical needs of the government. Yet they did so as mere "tools" to be employed under the supervision of the *yangban* literati officials who, allegedly as men of a higher culture in literature, history, and philosophy, took the position of the ruling elites of the dynasty.[12]

Among the important matters where the court needed the *chungin* officials' service were its diplomatic relations with Qing China. For this reason, the Korean embassies sent to the Qing included, in addition to a few literati envoys, various kinds of *chungin* officials: interpreters (*yŏkkwan*), doctors (*ŭigwan*), painters (*hwawŏn*), and transcribers (*sajagwan*). While carrying out

12. Extensive research has been done on the origin, the social status, and the sociocultural roles of the *chungin* officials in late Chosŏn Korea. See, for example, Park 1983; Han 1988.

their ordinary duties, such as translation (*yŏkkwan*), seeing to the envoys' health (*ŭigwan*), carrying diplomatic documents (*sajagwan*), and making copies of documents and paintings of strategic and artistic importance (*hwawŏn* and *sajagwan*), these *chungin* officials also performed a variety of other functions in the missions, for instance, in commercial trade and information gathering.[13]

From the mid-seventeenth century, the *chungin* astronomers, called *ilgwan*, were also included in the missions as a result of the court's heightened interest in learning the *Shixian li* system. In Beijing, however, as astronomers from a tributary state, they were to experience still another kind of marginalization, this time with respect to the Qing Imperial Bureau of Astronomy. This layer of marginalization reflected the lower position of their ruler, the Chosŏn king, with respect to the Qing emperor, given that calendrical astronomy played an important role in managing the hierarchical relationship between the two. This being so, Hŏ Wŏn's oscillating self-perception, mentioned in the preceding section, might also be viewed as a reflection of the awkward position of the Chosŏn court with respect to the Qing in the matter of calendrical astronomy.

To the Chosŏn king, calendrical astronomy, or the official calendar in its materialized form, symbolized at once his sovereignty over his state and his submission to the Chinese imperial world order. On the one hand, the Chosŏn king promoted calendrical astronomy to show himself off as a Confucian monarch who, like the legendary Emperor Yao, regulated his people's lives by issuing the official calendar. However, the Chosŏn king's aspiration to be another Emperor Yao was compromised to a considerable degree by his lower position in the hierarchical world order dominated by the imperial dynasties of China. In this, the Chosŏn king was supposed to be the ruler of a "tributary state," whose mandate to rule his state was not given by heaven, but, in principle, by the emperor at the Beijing court. This so-called tributary relationship between "the Middle Kingdom and the outer barbarians" was to be managed, again in principle, by a series of rituals, including the emperor's annual granting of calendars to his tributary states. This ritual of receiving the imperial calendar, or *zhengshuo* (literally, the first day (*shuo*) of the first month (*zheng*) of a year in the Chinese lunisolar calendar), symbolized the tributary

13. An ordinary Korean "winter solstice mission" consisted, in principle, of thirty-five envoys. Seven of them were literati members (the main and associate-envoys, a secretary, and their attendants), and the remaining twenty-eight members consisted mainly of the *chungin* officials—mostly interpreters, except for a few officials of other specialties. On the composition of the mission personnel and their respective duties, see Yu and Yi 2002: 46-51. As for the roles of the painters and the transcribers, see Chŏng 2008.

rulers'submission to the imperial power which, by issuing the calendar, set out the rhythm of the people's lives for "all under heaven."[14]

This politically ambivalent stance of the Chosŏn king toward the matter of calendrical astronomy both promoted and limited his astronomers'efforts to possess techniques in calendrical astronomy, putting them in a very awkward situation in their ordinary work of calendar-making. The tributary relation of Qing and Chosŏn required that the Korean Bureau of Astronomy reissue only the calendars given by the imperial court. But considering the long and complicated process of calendar making, including the publication and distribution of the calendar, the Bureau could not simply wait for the imperial calendar for the next year, which was normally brought by envoys to Seoul in the eleventh month.[15] This means that the Bureau of Astronomy had to calculate calendars independently and much earlier than the arrival of the imperial calendars.[16] However, the independence of the Chosŏn Bureau in astronomical calculation should be understood only in a limited sense, because the results of calculation by the Korean astronomers, or the local calendar made by the Bureau, had to be in exact accordance with the imperial calendar. Otherwise, differences between the calendars of the two countries might cause serious diplomatic problems.

A series of embarrassing experiences caused by discrepancies between the local and imperial calendars provided the Chosŏn court with more than enough reason for its investment in the project of learning the *Shixian li* system. This project thus aimed at a self-contradictory goal: to possess an independent ability to implement the new astronomical system in order to keep the local calendar in accordance with that of the Qing.

The project began soon after the Qing adopted the Jesuit-inspired *Shixian li* as its official astronomical system. As is well known, upon the Qing occupation of Beijing in 1644, the German Jesuit Adam Schall von Bell presented to the Shunzhi emperor the astronomical treatises that Xu Guangqi had submitted to the Ming Chongzhen emperor about a decade previously. On the basis of the treatises, newly titled the *Treatises onCalendrical Astronomy According to the New Western Method* (*Xiyang xinfa lishu*), the Qing promulgated the

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14. For a general survey of the Chinese world order based upon the so-called "tribute system," see Fairbank 1968. As for Qing-Chosŏn relations, see Chun 1968. Lim 2012 examines the introduction of the *Shixian li* system into Chosŏn from the perspective of the Qing-Chosŏn tributary relations.
15. Regulations on the "calendar mission," including its travel schedule, are specified in Sayŏgwŏn [1720, 1882] 2006: vol. 1, 198-199.
16. On the detailed process of calendar making in late Chosŏn period, see Hu 2000: 28-32.

Shixian li calendar for the second year of the Shunzhi reign period (1645-1646).[17] Seen from the politico-ritual function of astronomy in regulating the hierarchical relations of the two countries, the Ming-Qing dynastic change and the Qing adoption of a new calendrical system signaled that it was time for the Chosŏn court, now a tributary state of the Qing, to change its astronomy from the *Datong li* of the previous Ming dynasty to the *Shixian li*, a calendrical system that was to regulate the new imperial world order.[18] Thus, soon after the news of the Qing astronomical reform spread to Korea, some court officials, including the Minister of Rites, Kim Yuk, submitted memorials to the king that emphasized the urgent need to adopt the new Western system employed by the Qing.[19]

But the first meaningful effort of the Chosŏn court to learn the new Qing astronomy was made three years after Kim's proposal, only after finding serious discrepancies between the two calendars. In the third month of the twenty-sixth year of King Injo's reign period, the Royal Bureau of Astronomy reported that the local calendar for that year, calculated from the old *Datong li* system, showed discrepancies with the Qing calendar "not only in the fortnight periods but also in the intercalary month."[20] According to the report of the Ministry of Rites, the local calendar inserted the intercalary month after the third month of the year, while the Qing *Shixian* calendar inserted it after the fourth. This discrepancy might cause confusion in diplomatic matters with the Qing, and therefore the court had no choice but to use the dates of the Qing calendar, at least in the diplomatic documents to be sent to the Qing.[21] After endorsing this ad hoc measure, the king nevertheless complained: "We should not keep going on in this manner for every occasion [wherein we find discrepancies between the two calendars]." A fundamental solution had to be sought immediately. He thus ordered that a capable official, one whose mission

17. Jami 2012: 35-37.
18. It was as a result of the Qing military campaign in 1637 that Chosŏn became its "tributary state." From then on, Chosŏn officially received calendars from the Qing instead of from the Ming. But because the Qing calendar was almost the same as that of the Ming, Chosŏn continued to rely on the old Ming method. See, for example, *Chosŏn wangjo sillok* (hereafter *CWS*), Injo 17/04/27 (1639-1640). On the issues of calendrical astronomy at the Chosŏn court in the period of Ming-Qing dynastic transition, see Jun 2004: 12-20.
19. Those proposals are recorded in the *CWS*, Injo 23/06/03; 12/18 (1645-1646).
20. *SJWIG*, Injo 26/03/07 (1648-1649).
21. *SJWIG*, Injo 26/03/07.

would be to learn the new astronomy, would henceforth accompany annual missions to the Qing court.[22]

Upon this directive, an astronomer named Song Innyong was dispatched to Beijing twice that year, only to discover that it was never an easy task to learn the new method during such short stays in Beijing.

This pattern was to be repeated for over a century, through the mid-eighteenth century, in the course of which the Royal Bureau of Astronomy learned the Qing astronomy bit by bit. A rough outline of the process can be summarized as follows[23]:

• In the first year of King Hyojong's reign (1650-1651), the Korean calendar, still calculated from the old methods, showed discrepancies from the Qing calendar in the length of the lunar months and the intercalation. Accordingly, the court dispatched Kim Sangbŏm to Beijing four times from 1651 to 1654. Kim learned eventually how to calculate the civil calendar in accord with the new method. The Chosŏn court was thereupon able to issue its own *Shixian* calendar starting from the year 1654.

• In the thirtieth year of King Sukchong's reign (1704-1705), the court found that the local *Shixian* calendar for the next year differed from the Qing calendar in the length of the lunar months. This time, Hŏ Wŏn was sent to Beijing to solve the problem. During his trip, he learned what had remained unstudied since the death of Kim Sangbŏm. From that point on, the Chosŏn court was able to issue its official "planetary calendar" (*ch'iljŏng ryŏk*) according to the *Shixian li* system.

• In the third year of King Yŏngjo's reign (1727-1728), the court dispatched an astronomer named An Chungt'ae to resolve many discrepancies between the Qing and Chosŏn calendars. These were, as would later turn out, an outcome of the Qing implementation of a new system from the previous year, based upon the new treatise entitled the *Thorough Investigation of Calendrical Astronomy* (*Lixiang kaocheng*). An's mission in this year thus marked the beginning of the project to introduce the *Thorough Investigation* from the Qing, which would be carried out for several years thereafter.

• In the tenth year of King Yŏngjo's reign (1734-1735), after spending several years in learning the *Thorough Investigation*, the Bureau of Astronomy still found a major difference between the two calendars in the length of the lunar months

22. *Ibid*.
23. This process is well documented in Jun 2004: 15-40.

of the year. An Chungt'ae, sent again to resolve the problem, found that the Qing Bureau of Astronomy had recently made several new modifications to their system, particularly in the matters of the starting point of calendrical calculation (*liyuan*) and the method of describing the solar and lunar paths.

• In the seventeenth year of King Yŏngjo's reign (1741-1742), the Bureau of Astronomy again discovered an accumulation of discrepancies between the two calendars and dispatched to Beijing an astronomer named An Kungnin. Ignatius Kögler, a Jesuit astronomer who was then the director of the Imperial Bureau of Astronomy, gave An news of another major astronomical reform. The Qing Bureau was reportedly compiling the *Sequel to the Thorough Investigation of Calendrical Astronomy* (*Lixiang kaocheng houbian*), which would be completed in the following year, 1742.[24] The Chosŏn court thereafter sent astronomers to Beijing almost every year in order to report on recent changes in the Qing calendrical system.

3. Institutionalizing astronomers' travel to Beijing

As evident from the previous discussion, the way that the Chosŏn court carried out "astronomical reform" was simply to send its astronomers to Beijing on the occasion of the annual tributary mission. In these cases, the Korean embassies included professional astronomers, whose assignment was to obtain calculation manuals and instruments or to learn the methods directly from the Chinese astronomers in the Imperial Bureau of Astronomy.

The scheme of dispatching astronomers to Beijing, first suggested by Kim Yuk in his memorial in the winter of 1645-1646, was first implemented in 1648. This was continually repeated, in spite of occasional pauses, well into the early nineteenth century. For about a century, from 1648 to 1751, astronomers were sent to Beijing approximately twenty-five times, to which might be added several instances in which official interpreters or *yangban* literati were sent for astronomical purposes without accompanying astronomers.[25] Excluding the long suspension of astronomy missions from 1655 to 1705, the court dispatched astronomers almost every two years on the average. The frequency of astronomy missions, however, sharply increased during the mid-eighteenth century, a period of frequent Qing astronomical reforms. From 1741, in particular, the astronomy mission became even an annual event, and it was

24. On Kögler and the compilation of the *Sequel*, see Jami 2012: 378-379.
25. This number is based upon the court records in *CWS* and *SJWIG*. There could have been more cases that are not recorded in those documents.

specified as such in the *Sequel to the Great Code for the State Governance* (*Sok taejŏn*) promulgated in 1746.[26] Korean astronomers'travel to Beijing was an institutionalized government mission in its fullest sense.

To support astronomers'travels, the Korean court enacted a set of rules and regulations in the first decade of the project, particularly during the years of Kim Sambŏm's missions in the early 1650s. These were needed mainly to deal with the practical difficulties that the astronomers would confront in their missions. At first, when he proposed the project, Kim Yuk seems to have underestimated its difficulties. Only one mission with one or two astronomers, he predicted, would suffice to master the new *Shixian li* system.[27] But, as it turned out in Song Innyong's mission, Song simply could not acquire even the basic part of the *Shixianli* system during his two travels to Beijing.

The difficulties that plagued the astronomers'mission can be summarized in terms of the following three categories: first, the technical difficulties of the *Shixian li* astronomy; second, the political constraints arising from the Qing regulations on matters of calendrical astronomy and the behavior of the Korean envoys; and last, the problem of communication between Korean and Qing astronomers.

First, the *Shixian li* system, devised by the Western Jesuits, was based upon a European astronomical model that was completely alien to the traditional Chinese calendrical system in which the Korean astronomers had been trained for centuries. Although they immediately noticed the apparent differences of the *Shixian li* from the previous system, such as in the method for setting the fortnight periods, the esoteric parts of the new astronomy were mostly hidden from them. These could not be mastered by an astronomer during a month's stay in Beijing. Thus, in 1650, Yŏ Ijing, the director of the Royal Bureau of Astronomy, suggested to the king a more prudent approach to the project:

> The Western [astronomical] texts contain the techniques from a remote foreign land. Although they were not similar to the old methods, the discrepancies [between the two calendars] were seen only in the matter of the fortnight periods, which differed by one or two days [from each other]. Without knowing in detail the hidden methods of the [new system], it seems very difficult for us to make a final decision about whether or not to discard the old and to follow the new.[28]

If the technical difficulties of the new method were already insurmountable,

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26. *SJWIG*, Yŏngjo 28/02/16 (1752-1753).
27. *CWS*, Injo 23/12/18 (1645-1646).
28. *CWS*, Hyojong 1/07/19 (1650-1651).

the situation worsened because of what might be called the political constraints imposed by the Qing. The Qing court simply did not cooperate with Korean efforts to learn their astronomy. Calendar making was considered an imperial prerogative and thus not to be practiced by its subjects, not to mention the ruler of a tributary state. Even though the Ming and Qing courts in reality seemed to overlook the "illegitimate" practice of calendar making by the Chosŏn, they never allowed the Koreans free access to their astronomical knowledge. In his proposal, Kim Yuk expressed his awareness of this difficulty.

> The practice of calendar making by foreign countries is what the Middle Kingdom does not allow. It is therefore impossible for us to send envoys and to make an official request [to the Qing] to learn [their astronomy].

Only "illegal" measures, such as secretly contacting the Jesuit and Chinese astronomers, were available to the Koreans.[29]

Another political factor that caused difficulty in the mid-seventeenth century was the antagonistic political relations of the two dynasties in the direct aftermath of the Qing military campaign against Korea in 1637. Highly suspicious of Korea's loyalty to the new imperial regime, the Qing court imposed strict regulations on the behavior of the Korean envoys in Beijing. Thus, Song Innyong, dispatched to Beijing in the spring of 1648 with the mission to contact Adam Schall, was forced to spend most of his stay confined to the Korean residence in Beijing, with no chance of meeting the alleged founder of the *Shixian li* system.[30]

Although Song was able to meet Schall during his second visit, in the winter of the same year, he soon encountered another kind of difficulty. His only means of communication with Schall was "brush talk" using Chinese, which was not a very effective means for communicating technical knowledge.[31] Owing mainly to this problem, we are told, Song could learn from the Jesuit "only the method of calculating the solar movement."[32] Considering that the Korean court astronomers were not by training specialists in foreign languages,

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29. *CWS*, Injo 23/12/18 (1645-1646). For example, the main envoy of the 1720 Korean embassy, Yi Imyŏng, contacted the Jesuits in order to purchase from them books on astronomy. However, the Jesuits declined his request, for the reason that those books were classified by the court as secrets and thus not to be sold to foreigners. See Lim 2013: 303-304.
30. *SJWIG*, Injo 26/09/20 (1648-1649).
31. *CWS*, Hyojong 1/07/19 (1650-1651).
32. *SJWIG*, Hyojong 1/07/19.

the problem of communication would not be greatly abated, even if they chose as their counterparts the Chinese or Manchu astronomers rather than the Western Jesuits. They needed a better means of communication with imperial astronomers who spoke different languages.

To cope with these difficulties and other contingencies in the astronomy mission, the Chosŏn court in the early 1650s established a series of rules and regulations and thereby set out the precedents to be followed, with some modifications, in the subsequent course of a century-long astronomy project.

First, mainly out of an awareness of the technical difficulties presented by the new astronomy, Yŏ Ijing, the director of the Bureau of Astronomy, organized in 1650 a study group of a few chosen astronomers. This inner study group, whose assignment was to investigate the new method thoroughly, was not established as an alternative to "studying abroad." According to Yŏ's plan, it was intended as a "preparatory course" for the future mission to Beijing. The five astronomers selected were required to study the new method as much as they could without help from the Qing astronomers. The astronomers would thereby identify their last remaining questions that were to be brought to Beijing. This exercise also aimed at choosing the most capable astronomer in the Bureau, who would then to be sent to Beijing to solve those questions. After three months, Kim Sangbŏm was selected. It was reported that only Kim among the five could "understand the methods of the solar paths and the lunar positions, except only for a few points of discrepancies."[33] He traveled to Beijing the next year. There, it is reported, he completely learned how to make civil calendars according to the new *Shixian li* method.[34]

This study group operated as a temporary measure to cope with the calendar discrepancies in 1650 but seems not to have survived after Kim Sangbŏm was selected as the future leader of the astronomy project. Nevertheless, the system for selecting the astronomer to be sent to Beijing was later institutionalized, perhaps sometime in the eighteenth century.[35] This suggests that Korean astronomers in this period did not regard travel to Beijing as a mere hardship to be avoided. On the contrary, it was an opportunity to gain professional honor, a privilege allowed to only a selected few. Appreciating Kim's contribution to the "astronomical reform" of the dynasty, the court in 1653 promoted his official rank at court to the rank 3A, the highest rank that a *chungin* official could climb to in the bureaucracy of the Chosŏn dynasty.[36]

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33. *SJWIG* and *CWS*, Hyojong 1/07/19 (1650-1651); *SJWIG*, Hyojong 1/10/16.
34. *CWS*, Hyojong 3/03/11 (1652-1653).
35. Sŏng Chudŏk [1818] 2003: 64-65.
36. *CWS*, Hyojong 4/01/06 (1653-1654); *SJWIG*, Hyojong 4/01/24 (1653-1654).

The second difficulty encountered by the astronomy mission, arising from the political constraints by the Qing court, could be circumvented by employing various "illegal measures." But the "illegal measures" or "secretly purchasing (*milmae*) books and techniques" tended to entail additional costs incurred in negotiating with relevant persons in the Imperial Bureau of Astronomy. In other words, if astronomical manuals and techniques owned by the Qing astronomers were to be offered, they had to be exchanged for corresponding "gifts."

The rules of the Chosŏn court in support of the expenses of the astronomy mission were first extended in 1648 after Song Innyong returned empty-handed from his first mission. Beginning with Song's second trip, upon the request of the Bureau of Astronomy, the government began to provide the astronomer, like other mission personnel, with "traveling expenses" (*panjŏn*). These expenses consisted of clothing, rice, and other Korean local products to be used for various purposes during the mission, including paying the Qing officials as "gifts."[37] Perhaps the modest success in Song's second mission was an outcome of this support. But Song's achievement was still modest, and the Bureau claimed that the usual "traveling expenses" were not enough to meet the ever-increasing demand for "gifts" from the Qing side. Upon the request of the Bureau, therefore, the court in 1652 would provide additional money for astronomy missions, amounting to two hundred silver *taels*.[38] By the early eighteenth century, "200 silver *taels*" became the standard amount of financial support for each astronomy mission.[39]

Third and last, there was an easy solution for the problem of communication between Korean and Qing astronomers: using the official interpreters. First suggested in Kim Yuk's memorial in 1645-1646, this scheme of pairing an astronomer with an interpreter was first implemented in Kim Sangbŏm's missions, to the success of which an interpreter named Yi Chŏm reportedly made a crucial contribution.[40]

The role of interpreters in the astronomy mission was not confined to foreign-language translation, however. In fact, they engaged in the matter of "communication" in a broader sense. Being specialists in foreign languages, these interpreters took charge of various matters in the Beijing missions, including political, diplomatic, and commercial affairs. Having many years

37. *SJWIG*, Injo 26/09/20 (1648-1649).
38. *SJWIG*, Hyojong 3/09/24 (1652-1653).
39. See, for example, *SJWIG*, Sukchong 34/08/19 (1708-09); Sukchong 40/10/23 (1714-1715).
40. *CWS*, Hyojong 4/01/06 (1653-1654).

of experience in the tributary missions, they had acquired business know-how and had established personal connections in the Qing officialdom.[41] In the astronomy mission too, therefore, their service was essential in finding ways to approach relevant persons in the Imperial Bureau of Astronomy and in carrying out negotiations with them. In its recommendation of an interpreter to support Kim Sangbŏm's mission, for example, the Bureau of Astronomy described his ability as "having a good understanding of the affairs [in the mission business] in addition to having a ready tongue." In other words, he was an able negotiator.[42]

Given the crucial importance of negotiation with the Qing officials to the success of the astronomy project, the interpreters did not play simply a supporting role in the astronomy mission. Without their efficient intervention, the astronomers would have been incapable of carrying out their mission. In this sense, the official interpreters, together with their colleagues, the *chungin* astronomers, came to be the main actors in the "astronomical reform." Scientific practice in "the marginal state," required, more explicitly than in the case of astronomers from the metropolis, competence in foreign languages and business know-how.

4. Traveling to the unpredictable center

How well did the rules and regulations set down by the Chosŏn court in the 1650s to support the astronomers' travels work in the subsequent course of the astronomy project? Did they function well in helping the astronomers to gain access to the source of imperial knowledge in Beijing?

There is no general answer to these questions that can be validly applied to all cases over the period of a century. The rules and regulations functioned differently depending upon the ever-changing circumstances surrounding each individual trip. In fact, the government rules and regulations were made to cope with contingencies that the astronomers would meet during the mission, and contingencies by their nature tended to be beyond expectations based upon previous experiences. Similarly, the Chosŏn court's support of the astronomy mission was not always guaranteed, because the court often withdrew its formerly supportive stance and voiced skepticism about the costly astronomy mission. Korean astronomers therefore traveled to Beijing in a precarious

41. On the role of interpreters in the tributary mission, particularly in commercial trade, see Yu and Yi 2002: 36-70.

42. *SJWIG*, Hyojong 3/09/15 (1652-1653).

position, being vulnerable both to the contingencies awaiting them in Beijing and to the whims of Chosŏn court policy.

The interplay of these two factors, for example, ruined the second phase of Kim Sangbŏm's mission in the early 1650s. Soon after his success in learning how to construct the civil calendar, Kim proceeded to the next, more demanding, phase of the astronomy mission, namely to learn the method of planetary motions. But the hardship encountered by this mission arose not only from the technical difficulties of the task. The "Qing man" whom Kim and his interpreter contacted in 1651 asked from them an unexpectedly high price for the technical manual of the method. For this purpose, as we have seen above, the court provided 200 silver *taels* for Kim's second mission. But according to the report of the Bureau of Astronomy, the "Qing man" turned out to be a very unreliable person. In Kim's mission during the winter of 1653-1654, the Bureau reported, "the Qing man at first declined our request or postponed his final answer. As soon as he accepted our request, however, he asked us for gifts, the reason why we gave him the entire three hundred *taels* that the envoy, upon the Royal endorsement, had brought there. But, after all, he suggested that Kim visit him again in the next year, saying that many of the manuals were not yet completed and were in fact under revision…."[43] The "Qing man" evidently did not return the silver *taels* to the Koreans.

Meanwhile, the court, particularly the Ministry of Revenue (*hojo*), which was in charge of the expenses of the tributary mission, was becoming increasingly suspicious of the astronomy mission. The Ministry became impatient with Kim's continual travel, which cost a great many silver *taels* without any tangible benefit. The Ministry even suspected a possible embezzlement of the expenses by the astronomers and interpreters, under the pretext of satisfying the Qing man's greedy request for "gifts," because the expenses that the Bureau of Astronomy reported to have used in the mission, according to the Ministry of Revenue's estimation, was unreasonably high. "What those interpreters say could not be wholly trusted," added the Ministry.[44] In so saying, the Ministry expressed its deep distrust of the lower moral capacity of the *chungin* officials, particularly that of the interpreters. Perhaps, Kim Sangbŏm, too, could not escape from such a line of moral doubt from the high literati officials. Having once been able to issue its civil calendar according to the new system, the court now seemed to lose interest in supporting the cause of calendrical astronomy.

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43. *SJWIG*, Hyojong 5/09/14 (1654-1655). We do not know who the "Qing man" was. Nor is it certain that "the Qing man," mentioned several times in the reports of the Bureau, was the same person.
44. *SJWIG*, Hyojong 3/09/24 (1652-1653).

The court might have thought that Kim Sangbŏm was stressing the need to continue the astronomy mission not for purely astronomical reasons but to anticipate other benefits of the mission, such as opportunities to enjoy private commercial trade in Beijing, which was allowed to the mission personnel.[45]

It was under these hostile circumstances that Kim Sangbŏm made his last journey to Beijing, during the winter of 1654-55. Before Kim's departure, the Ministry of Revenue warned him, under royal endorsement, that if the mission failed again, Kim would have to return to the Ministry all of the previous expenses that he had used up.[46] Due to the lack of records, we do not know exactly what happened in Beijing that winter. In any case, it seems that Kim failed. As Hŏ Wŏn told us, Kim could not return from the journey, "being buried in vain in a remote foreign land."

But the travel by Korean astronomers to Beijing did not always end in tragedy. Hŏ Wŏn, who "followed in Kim's footsteps" half a century later, proved a happier case, in which all of the contingencies proved to be favorable to his mission.

First, in his initial mission, in the winter of 1705-1706, Hŏ was able to meet a person named He Junxi, an astronomer of the Imperial Bureau of Astronomy, who kindly helped Hŏ's mission for several years thereafter. He Junxi helped the Korean astronomer to purchase astronomical manuals and tables and taught him in person how to calculate ephemerides. Known to be a disciple of Yang Guangxian, the famous arch-enemy of the Jesuits in the 1660s, He Junxi seemed, by this time, to have successfully cultivated his own family, now seen to be one of the prominent clans in imperial astronomy at the Kangxi court. In the early 1710s, his sons, He Guozhu, He Guozong, and He Guodong played important roles in various imperially commissioned projects in the field of mathematical sciences.[47]

The favorable relationship between He and Hŏ seemed to reflect, at least partly, the ongoing amelioration of the Qing-Chosŏn political relationship in the early eighteenth century. Even though there had been little change

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45. In the mission of 1654, Kim Sangbŏm was reported to have brought too much "traveling expenses," which were transported by as many as "three horses." The king expressed his anger at Kim, denouncing his behavior as "very presumptuous." It seems that Kim had brought commodities to be sold in Beijing. See *Pibyŏnsa tŭngnok,* Hyojong 5/11/24 (1654-1655). In the Qing period, every Korean envoy was allowed to bring a certain amount of *ginseng* or silver to Beijing for private trade. See Yu and Yi 2002: 51-57. In 1734, a few officials at the Chosŏn court once again questioned the astronomers'commercial motives. See *SJWIG*, Yŏngjo 10/04/10 (1734-1735).
46. *SJWIG*, Hyojong 5/09/24 (1654-55).
47. Jami 2012: 260-283, particularly, 263-264, 268, 277-280.

in the Qing policy concerning astronomy, the new and improved political environment afforded Hŏ and his interpreter in Beijing much more room to maneuver than before in their negotiations with the Qing astronomers.[48] This might, at the least, have lowered the price of technical manuals or personal astronomy lessons from the Qing astronomers. Of the two hundred silver *taels* brought in Hŏ's second mission in 1708-1709, according to the envoy's report to the king, hundred *taels* were paid for the tables and manuals for calculating planetary movements, and about sixty *taels* for several books on astrology and instruments, two astronomical clocks, and a telescope for observing eclipses. Remarkably, the remaining forty *taels* were returned to the government.[49]

Second, the Chosŏn court's attitude toward calendrical astronomy also warmed considerably in the first decade of the eighteenth century. Various political factors, such as an improved image among the literati elites about the Qing dynasty and the ever-increasing interest of the king and his court in promoting royal power contributed to the change of the court's attitude toward the Qing *Shixian li* system. It was in this new climate of opinion that the Bureau of Astronomy aggressively proposed a full-scale implementation of the *Shixian li* system, an ideal that had remained unfulfilled for the previous half century. In their proposal, the Bureau officials criticized the previous state of calendrical astronomy as an undesirable mixture of the two different methods, the *Datong li* and the *Shixian li*. "[This means that] a state has a calendrical system consisting of two different methods," the Bureau continued, "a situation that is extremely inappropriate to the prestige [of our state]."[50] The Bureau proposed the implementation of the *Shixian li* system as a necessary requirement of kingly governance, and, quite unlike the case in the mid-seventeenth century, this claim was well accepted by the king and the high literati officials. Hŏ Wŏn was one of the main beneficiaries of this favorable climate at the Chosŏn court as concerned calendrical astronomy. In 1711, as seen above, Hŏ was able to announce the conclusion of an "astronomical reform" that had been delayed for half a century since Kim Sangbŏm's tragic death.

Notwithstanding Hŏ's confident voice, however, the compilation of the manual was not at all the end of the "astronomical reform." Ten years later, Hŏ had to make still another trip to Beijing to resolve the discrepancies between the

48. On the changing relationship between the Qing and Chosŏn Korea and its cultural impact upon Chosŏn society, see Kim 2009: 39-44.
49. *SJWIG*, Sukchong 35/03/23 (1709-1710).
50. *SJWIG*, Sukchong 33/02/27 (1707-1708).

calendars of the two countries in eclipse predictions and calendar annotations.[51] Worse, this pattern would be repeated for another half century, which suggests that the contrast between Kim and Hŏ should not be overemphasized. Although the circumstances surrounding the astronomy mission improved considerably in the eighteenth century, both in Seoul and in Beijing, the precarious position of the Korean astronomers which had ruined Kim's mission did not fully improve.

This can be illustrated by a passage in Hŏ's preface where he described the process of his learning from He Junxi.

> The method [of predicting planetary movements] was extremely difficult. Therefore, when learning it [from He], we exchanged dialogues item by item. There were cases, [in which we exchanged them] through short letters or through [notes on] small pieces of paper. I added them into a volume, which, for this reason, was titled the *Classified Collection of Manuscript Pieces* (*Sech'o ryuhwi*).[52]

In this, Hŏ Wŏn frankly showed the clumsy way of learning astronomical methods and of compiling the manual that he claimed marked the completion of an astronomical reform. Hŏ's piecemeal arrangement of knowledge in the manual might be viewed as a reflection of the awkward process of his learning, consisting of "brush talks" with the Qing astronomer in a series of visits of a few hours each, and exchanges of short letters and memoranda. It took almost five years for Hŏ to gather all of the necessary pieces and thus to comprehend, according to his claim, the whole picture of planetary astronomy.

Two years after the compilation of the manual, Hŏ had yet to repeat another round of astronomy lessons, this time from He Junxi's son Guozhu, then the Calendar Manager of the Five Bureaus (*wuguan sili*) in the Imperial Bureau of Astronomy. The lesson, however, was occasioned by the imperial astronomer's visit to Korea as a member of the imperial embassy in 1713, whose mission was to obtain geographical information about Korea, particularly concerning the Qing-Chosŏn border area, to be used in the great cartographic project commissioned by the Kangxi emperor.[53] Although greatly suspicious of the hidden Qing military intention behind their geographical survey, the Korean officials nevertheless welcomed He Guozhu's visit as a rare opportunity to learn about Qing astronomy, particularly about the astronomical instruments brought by the imperial astronomer.

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51. *SJWIG*, Kyŏngjong 2/06/12; 10/14; 10/20 (1722-1723).
52. Hŏ [1711] 1986: 3-5.
53. For He Guozhu's mission to Korea and its background, see Ledyard 1994: 298-305.

In spite of several factors favorable to the Korean side, however, Hŏ Wŏn's meeting with He Guozhu was, in a fundamental sense, not much different from the meeting with He's father in Beijing. First of all, being concerned about the possibility that the Qing envoys might provoke a diplomatic incident because of Korea's "illegitimate" practice of astronomy, King Sukchong and several high officials recommended that Hŏ conceal his identity as an official astronomer when approaching the imperial astronomer.[54] Perhaps realizing after all Hŏ's pervious connections with his father, He Guozhu reportedly gave some lessons to the Korean astronomer. Yet this was still only the beginning of another round of piecemeal learning. Upon Hŏ's requests to acquire books on astronomy, according to the Korean court record, He Guozhu responded that "the secret books on astronomy and astrology could not be given privately. After returning [to Beijing], I will ask the emperor to grant the books and instruments your country does not have. You would do well to make a visit to Beijing."[55] Hŏ made his third visit to Beijing the next year.[56]

Hŏ thus had to adopt the piecemeal way of learning, not only because the method was too difficult to master in a short period, but because the imperial astronomers did not let him know all of the "national secrets" at once. Behind all of the difficulties experienced by Korean astronomers in learning imperial astronomy lay the fundamentally unpredictable nature of the Imperial Bureau of Astronomy. Its inner workings and the knowledge produced in it were mostly hidden from the astronomers of a tributary country. It revealed itself to them only bit by bit and, in a lucky case like Hŏ's, through the kindness of imperial astronomers. Yet even in that case, the Imperial Bureau did not allow the visitors instant access to its whole workings. In spite of his successful relationship with He Guozhu, for example, Hŏ Wŏn seemed not to be aware that the Qing had just started an imperial project for renewing its mathematical sciences, a project that would culminate a decade later in the promulgation of the *Thorough Investigation of Calendrical Astronomy*.[57]

To the Korean visitors, the astronomical knowledge produced by the Imperial Bureau was fundamentally arbitrary. They had no way of knowing

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54. *SJWIG*, Sukchong 39/yun 05/13 (1713-1714). At this moment, the Korean side, including Hŏ Wŏn as well, did not know that He Guozhu was the son of He Junxi, who had established a close relationship with Hŏ.
55. *Pibyŏnsa tŭngnok*, Sukchong 39/08/01 (1713-1714).
56. *SJWIG*, Sukchong 40/10/23 (1714-1715). A Korean mathematician named Hong Chŏngha described his meeting with He Guozhu, which also occurred during his stay in Korea, in a very different tone. Hong emphasized the superiority of his own computational skill over the Qing mathematician's. See Jami 2012: 278-279
57. Jami 2012: 260-283.

in advance which constants and algorithms the Imperial Bureau would adopt in calculating ephemerides. The Imperial Bureau set the rules, constants, and algorithms—the core information of calendrical astronomy—for reasons that the Korean astronomers could not have predicted.[58] Finally, the Imperial Bureau was an ever-changing entity, and the directions, timing, and contents of its future reforms were beyond an outsider's prediction. In 1722, Hŏ Wŏn had to make his fourth, and perhaps the last, trip to Beijing to resolve the discrepancies that had recently appeared for unknown reasons. Later, the Qing Board of Rites informed the Chosŏn court, unusually in this case, that the Qing had changed the algorithms and constants for eclipse predictions.[59] Yet there was no way to know in any detail what happened within the Imperial Bureau of Astronomy without going there. During the mid-eighteenth century, when the Qing made a series of changes in the calendrical system, the Korean astronomers had to pay frequent visits to Beijing to keep up with the ever-changing astronomical methods of the Qing Bureau.

In 1727, the Chosŏn Bureau of Astronomy presented a memorial to the king in which the Bureau emphasized an urgent need to dispatch an astronomer to Beijing.

> From remote antiquity, the calendrical systems have been made by making adjutments to [the previous system] according to the observation of the phases of the moving *qi* and the changes of its magnitudes and numbers […]. But our state, being not able to understand the method of how make adjustments, has relied in every occasion upon the method of the Middle Kingdom as the way to examine thoroughly [the heavenly phenomena]. For this reason, our court, from the previous reign periods, continually dispatched astronomers there to learn the newly changed methods, and then had them calculate the calendar accordingly. Since doing this, there has been no case in which the Qing and the local calendars showed even the smallest discrepancy. Yet in the previous *kyemyo* year (1723-1724), the route to exchange diplomatic documents was blocked due to the trouble of transportation

58. For instance, the process of the Qing reform of its official astronomy in the 1710s, including modifications of a few astronomical constants and algorithms, was unknown to Korean astronomers. On this process, which would culminate in the promulgation of *Lixiang kaocheng*, see Jami 2012: 370-372.

59. *SJWIG*, Kyŏngjong 02/10/14 (1722-1723). The Qing did so in order to ask the Chosŏn court to report eclipse observations in Seoul, so as to check its own new method for eclipse prediction.

> […]. Since then we have had no means to address questions to the Qing, and the discrepancies accumulated year by year[60] […].

In this memorial, the Bureau openly acknowledged that calendrical astronomy in Korea was in a state of continuous dependency upon the Qing. This was a flat denial of Hŏ Wŏn's claim in the preface of his manual. Sixteen years before, Hŏ had hopefully expected that, with the compilation of his manual, "the calendrical astronomy of the state would never show any discrepancy with the celestial images for the next two hundred years." Yet, by 1727, the Bureau declared that this was an unattainable goal. The astronomical reform of the Chosŏn dynasty, or to put it in a more realistic way, the adoption of Qing astronomy, was not a project that could be completed in one stroke. Considering the unpredictable behavior of the Qing Imperial Bureau, the only way to keep the local calendar in accordance with the Qing calendar was, the Bureau argued, to keep in contact with the Imperial Bureau by means of continuous travel by Korean astronomers to Beijing.

As proposed in this memorial, a period of frequent travel to Beijing would soon begin, during which a number of court astronomers made successive journeys to Beijing to become the Xi and He of the Chosŏn king. Korean astronomers'travel to Beijing did not continue indefinitely, however. Rather, it ended in the late eighteenth century. This happened partly because Korean astronomers had by that period become confident in their mastery of the Qing astronomical system. But the Korean astronomers could not have gained this confidence if the Qing had maintained its previous vigor in calendrical astronomy. After promulgating the *Sequel to Thorough Investigation of Calendrical Astronomy* (*Lixiang kaocheng houbian*) in 1742, the Qing did not implement major changes to its astronomical system. The unpredictability of the Qing Bureau of Astronomy, which had forced the Korean astronomers to travel continuously to Beijing, thus lessened considerably.

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60. *SJWIG*, Yŏngjo 03/05/12 (1727-1728). The incident in the *kyemyo* year mentioned in the memorial perhaps refers to the chaotic situation at the Qing-Chosŏn border caused by the Chosŏn government's effort to abolish private trade at the border city, Zhamen, which had been dominated by a group of Qing transporters-cum-brokers, collectively called *lantou*. See Yu and Yi 2002: 112-114.

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Glossary

An Chungt'ae 安重泰
An Kungnin 安國麟
pukhak 北學
ch'iljŏngnyŏk 七政曆
Chen Liang 陳良
ch'ŏmji 僉知
Chongzhen 崇禎
Chu 楚
Chungguk 中國
chungin 中人
Datong li 大統曆
Guo Shoujing 郭守敬
He Guodong 何國棟
He Guozhu 何國柱
He Guozong 何國宗
He Junxi 何君錫
Hŏ Wŏn 許遠
hojo 戶曹
Hong Chŏngha 洪正夏
hŭmyak kyŏngsu 欽若敬授
hwawŏn 畵員
Hyojong 孝宗
Hyŏnsang sinbŏp sech'o ryuhwi 玄象新法細草類彙
ilgwan 日官
Injo 仁祖
kaeryŏk 改曆
Kangxi 康熙
Kim Sangbŏm 金尙範
Kim Yuk 金堉
kyemyo 癸卯
Kyŏngjong 景宗
Kwansanggam 觀象監
lantou 攔頭
Lixiang kaocheng 曆象考成
Lixiang kaocheng houbian 曆象考成後編
liyuan 曆元
milmae 密買
p'yŏnbang chi in 偏邦之人

panjŏn 盤纏
Qintianjian 欽天監
sajagwan 寫字官
Shixian li 時憲曆
Shoushi li 授時曆
Shujing 書經
Shunzhi 順治
Sok taejŏn 續大典
Song Innyong 宋仁龍
Sukchong 肅宗
taeguk 大國
Tang Ruowang 湯若望
ŭigwan 醫官
ŭryu 乙酉
wuguan sili 五官司曆
Wang Xun 王恂
Xi [and] He 羲和
X*iyang xinfa lishu* 西洋新法曆書
Xu Guangqi 徐光啓
yangban 兩班
Yang Guangxian 楊光先
Yanjing 燕京
Yao 堯
Yi Chŏm 李點
Yi Imyŏng 李頤命
Yŏ Ijing 呂爾徵
yŏkkwan 譯官
Yŏngjo 英祖
yun 閏
Zhamen 柵門
zhengshuo 正朔