**The Temple of Heaven as Calendar:**

**The Paradox of Time Tracking and Time Telling in Late Imperial China**

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**Abstract**

Focusing on the Temple of Heaven as calendar and time-telling monument, this article explores the inherent paradox within the function and symbolism of this ritual architectural complex from the perspective of the understanding and representing of time. Ideally, the Temple of Heaven should have existed in the impeccable ritual system of imperial China, which celebrated the harmony between time, space and political power. However, when the first emperor of the Qing dynasty (1644-1912) appointed the German Jesuit Johann Adam Schall von Bell (1591-1666) to be the Director of the Bureau of Heavenly Observation, Schall launched a fundamental project to reform the traditional Chinese calendar based the most recent European developments in astronomy, which, in the eyes of the conservatives, posted a huge challenge to the existing ritual system exemplified by the perfection of the Temple of Heaven. During the conflict between European Jesuits and Chinese conservatives, the Temple of Heaven existed in an awkward situation between time tracking and time telling, which manifested as conflicts between ancient astrology and the ever-changing practice of astronomy, between the scientific dimension of time and the religious manipulation of time, between the production of knowledge and the exercise of political power based on esoteric knowledge. Indeed, we could say that the fundamental paradox of the Temple of Heaven as calendar consists in its inability to separate time telling from time tracking that occasionally serves as its flip side. In other words, if the maintenance of power consists in the production of knowledge on calendar, this knowledge can also present its most radical threat.

**Keywords:** Chinese calendar, astronomy, paradox, the Temple of Heaven, Urban Beijing, time and space

**Introduction**

Much like the Mesopotamians, whose ziggurats inspired the imaginary architectural structure of the Tower of Babel, people of ancient China also maintained an ambition for communicating with heavenly deities.  There are a number of architectural structures and landscape monuments reflecting that ambition, such as Mount Tai, Buddhist pagodas, the Bright Hall (*mingtang*) and the Temple of Heaven.  The Temple of Heaven in Beijing, whose name reflects its symbolic function, features a massive staircase to facilitate the emperor’s communion with heaven, in a ceremony on the Winter Solstice that was conducted for centuries, ending with a final performance in 1913 by President Yuan Shikai (1859-1916) during his effort to restore the imperial system under his family name.

This essay focuses on the Chinese practice of communicating with heaven, firstly, at the religious level through the emperor, and then at the scientific level through the court astronomers. The communion with heaven was the core of Chinese politics until the fall of the last dynasty in 1911. There are many ancient documents, paleography, archeological studies and architecture and urban planning examples that provide abundant evidence of cosmological interest and its impact on Chinese politics. The ever-changing Chinese politics and technologies constantly exerted influence over how the communication with heaven was achieved for thousands of years. In all results of the communication, I am focusing on the understanding of the movement of the universe, which in turn would be translated into a traditional Chinese calendar and some divination activity planning embedded in the calendar.

As I have argued in a previous article, the design of the Temple of Heaven, especially that of the Circular Altar Mound, was an architectural representation of a traditional Chinese calendar, with the Chinese emperor’s participation representing a fourth dimension of the universe—time—thereby fulfilling his role as the proprietor of the “mandate of heaven.” The spatial structure of the Temple of Heaven was intended to consolidate the triangular relationship between time, space and political authority.  The internal structure of the Circular Mound Altar at the Temple of Heaven represents the cycle of spring, summer, autumn and winter, and the passage of time. When the emperor walked around it, he was transforming himself into the moving hand of a huge clock, and thus the embodiment of heaven’s movement. [[1]](#endnote-1)

Anchored by the concept of architecture as a calendar, this essay explores the inherent paradox between time tracking and time telling, which manifested in conflicts between the production of knowledge and the exercise of political power based on esoteric perception.  I have borrowed the concepts of “time keeping” and “time telling” in Wu Hung’s discussion of the traditional Chinese political systems’ efforts in regulating and displaying time. According to Wu’s definitions, time tracking/time keeping is about tracing, measuring and gauging invisible time. Time telling, on the other hand, communicates a uniform time to a community (Wu, H., 2003). In other words, time telling is the action of informing, publicizing and reminding the official time to the populations. As far as this essay is concerned, time tracking allowed the Chinese imperial government to render an order of seasons, months, 24 solar terms, days and hours; time telling was the means by which the Chinese government publicized official time through calendar publication, monumental architecture and seasonal ritual events. My approach is to relocate this architectural structure of the Temple of Heaven within a larger religious context of astrology, dating back to the Bronze Age of early China, and construct a logical connection with other ritual and political infrastructure, such as the legitimacy of Chinese emperors and the production and propagation of Chinese calendars. Focusing on the Temple of Heaven as calendar, this article explores the inherent paradox within the function and symbolism of this ritual architectural complex from the perspective of understanding and representing time. It also visits the Calendar Case (*liyu*, 1644-1669) in the Qing dynasty (1644-1912), as the Calendar Case was arguably the most drastic conflict around the issues of Chinese calendar, politics and European knowledge systems.

**Inscribing Time into Space: The Temple of Heaven and the City of Beijing**

In the year 1530, Emperor Jiajing (1507-1567) of the Ming dynasty (1368-1644) revived ancient ritual traditions of conducting religious ceremonies outside the palace (Baratta and Magli, 2021, 769) . [fig 1] In planning ritual architecture construction, the emperor and his scholars decided that the design of the Temple of Heaven should follow the model of the Bright Hall (*mingtang*) of the Zhou dynasty (1046-256 BCE) (Wu, J., 2006, 134).  The Bright Hall was the place where the emperor held important court meetings and sacrifices. As the essential royal architecture and central component of the ritual architectural system, the Bright Hall was first seen in the literature *Yi Zhou Shu* (Lost book of Zhou), of the Western Zhou dynasty (1046-771 BCE). According to “Kaogongji,” *The Rites of Zhou*, of the Eastern Zhou dynasty (770-256 BCE), the Bright Hall of the Zhou Dynasty was developed from Xia- and Shang-dynasty concepts. It consisted of five rooms built according to the “*yin* and *yang* five elements” configuration, which allowed the Zhou emperor to carry out the “monthly move to one room (*yueling*)” according to the “four seasons and five elements” cycle (Zhang, D., 2004,130-131).  According to *Huainanzi*, an important Chinese classic written in the 2nd century BCE, “*Shennong* (a mythical Chinese ruler) tasted and ate new grains according to the season and worshipped ancestral/heavenly spirits at the Bright Hall.” For centuries, the Bright Hall was “the greatest thing among all things,” and “manifested the deepest meaning of all meanings” (Ames, 1994, 143). The Bright Hall’s architectural space symbolized the schedule of the ruler with seasonal/monthly changing duties and demonstrated the fusion between time and space.

Overall, the Bright Hall provided a representation of the universe and its order and required the emperor’s participation to embody and fulfill that order. Being a three-dimensional building, the Bright Hall invited the emperor—the Mandate of Heaven—to manifest the fourth dimension: time (Wu, H., 2003, 109).  James Sellmann also discussed in his book, *Timing and Rulership in Master Lü's Spring and Autumn Annals (Lüshi chunqiu)* that the concept of time was closed connected with the order of the universe, therefore instrumental in imperial politics. Emperor’s *yueling* activities in ritual architecture politized time and legitimized his position. (Sellmann, 2012). Taking Wang Mang (45 BCE- 23 CE)’s Bright Hall as an example, the structure was surmounted by an astronomical observatory called *lingtai*.  Inside the hall, there were twelve rooms corresponding to twelve months, surrounding a central chamber which symbolized the midpoint of the year.  In the words of Wu Hung: “It was the emperor who linked these static spaces into a temporal/spatial continuum: he would begin his year in the first room at the northeast corner (where the *yang*ether rose) and move clockwise through the hall. Each month he would dwell in the proper room, dress in the proper color, eat the proper food, listen to the proper music, sacrifice to the proper deities, and attend to the proper affairs of state” (Wu, H., 2003, 120).  As a living embodiment of the Mandate of Heaven, the emperor’s movements represented the symbolic movement of the universe, which could be recorded in a calendar and embedded in a religious architectural space.

According to Chinese historians, Tao Jin and Xiao Yu, the Shizong Emperor (r. 1522-1566) of the Ming dynasty commissioned the construction of the Hall of Great Sacrifice (Daxiang dian) in the Temple of Heaven in the name of building a Bright Hall. Later, the Hall of Great Sacrifice was named as Hall of Prayer for Good Harvests (Qinian dian), and gradually involved into a lager architectural complex (Tao and Xiao, 2016, 177-78). Although the halls in the Temple of Heaven differed in its physical appearance from its predecessor, the Bright Hall, it faithfully carried forward the tradition of “communication with heaven” and “time telling” through number, directional and color symbolism.  [fig 2]  Unsurprisingly, the overall urban plan of Beijing also embodies the cosmic order, rendering its urban space into a calendar model.  According to new research by Giulio Magli, the location of Beijing’s religious temples, the Temples of Heaven, Earth, Sun and Moon, were strongly interconnected with each other and with the Hall of Great Harmony (the great audiation hall in the Forbidden City) (Magli, 2020,182). The emperor’s annual ritual activities followed the regularity of celestial cycles of the calendar, with the Temple of Heaven standing for the winter solstice, the Temple of the Sun for the spring equinox, the Temple of Earth for the summer solstice, and the Temple of the Moon for the autumn equinox (Baratta and Magli, 2021, 45-7).  The timing of these ritual ceremonies, therefore, was in harmony with the locations of the temples. When the emperor was travelling around in the city of Beijing, or the Temple of Heaven, he was transforming himself into the moving hand of a huge clock, and thus the embodiment of heaven’s movement. In other words, the concept of time took spatial form in the Temple of Heaven, as well as in the imperial city of Beijing.

**Unification between Time Tracking and Time Telling**

Time tracking refers to the observation and calculation of movements of the cosmos, and consolidating these into the production of a calendar.  Time telling, on the other hand, consists in displaying official time to the public, which can be achieved by the mass production and distribution of official calendars as well as performing large-scale public ritual activities according to calendrical annotations.  Both time tracking and time telling were instrumental in maintaining imperial dominance as well as in shaping a community.  Therefore, ordering time through calendar manufacture and seasonal rituals were an essential aspect of a Chinese emperor’s duties.  Oversized chronographs were routinely commissioned by Chinese emperors as symbols of political control over a unified time/space (Zhang, S., 2012, 137). Generally speaking, Chinese imperial calendars would prescribe appropriate human activities and behaviors according to seasons, months or days within a year, and therefore, the production of official calendars was an essential part of the central government, regulating the correct rituals and administrative behavior for the ruler (Gao, 1987, 3).

The production of calendar knowledge in ancient times relied as much upon astronomy as on humanistic understanding.  From the Zhou dynasty until the Yuan dynasty, *qiantianjian*, the official bureau of astronomy, belonged to the Academy of History (Chen and Yang, 1998, 5-6).  In other words, the court historians were also the court astronomers and astrologers.  For example, Sima Qian of the Western Han dynasty, the author of the famous *Records of the Grand Historian*, was instrumental for the creation of the Taichu Calendar, which was officially promulgated in 104 BCE (Gao, 1987, 42-4).  Under the Yuan dynasty, *qiantianjian* Guo Shoujing (1231-1316), who was directly appointed by Kublai Khan, borrowed Islamic conceptions of astronomy and mathematics to construct new astronomical observation devices, allowing Chinese culture to set up a more accurate calendar system, which would be used over the ensuing 363 years, the longest period during which a calendar would be used in Chinese history (Needham, 1974, 109). Wang Xiaohu, a Chinese scholar, considers ancient Chinese astronomy and the crucial skills of time tracking as a secret science of the priest-historian-emperor (Wang, 2020, 113).  The practice of time tracking took place in the concealed imperial domain, through the emperor’s exalted wisdom.  The court astronomers were generally forbidden to communicate their knowledge to the public, and their insights were closely connected with political decision-making (Zhang, W., 2008, 160). There are a lot of records of celestial phenomena in ancient Chinese history books. According to *The Book of Changes*, “The heavens show various celestial phenomena, and the saints must imitate and follow them (The *I Ching*).” For the ancient rulers, it was imperative to understand the signs of celestial phenomena and make decisions accordingly such as conducting wars, making sacrifice and going hunting. Therefore, celestial phenomena and politics went hand in hand and astronomy was instrumental in consolidating the rule of the emperor (Sima, 1965, 3057). The emperors therefore firmly controlled the astronomical institutions, and court astronomers were the emperor’s principal imperial talents.

Time telling, on the other hand, was to be exercised in an open social space (Wu, H., 2003, 120). For example, clock towers and drum towers, monumental in their sizes, whose major functions were to alert the public to the important times of a day, rather than tracking and calculating time, were usually located in the city center, or in the public marketplace.  Ritual ceremonies for the winter solstice at the Temple of Heaven, an event that would require months of preparation by the Department of Rites, would involve the participation of all the essential court officials, military leaders, the extended imperial family, servants and aides, constituting thousands of participants.  The ritual ceremony would also start with an imperial procession from the Forbidden City to the Temple of Heaven, accompanied by numerous symbolic flags and musicians, attracting thousands of civilians and dominating the attention of the populace (Liu, 2017, 67).  The monumental scale of the Temple of Heaven architectural complex also facilitated the public view. When the emperor ascended to the Circular Altar Mound of the Temple of Heaven, he would also pray to heaven for a good harvest year for all his subjects. Similar ceremonies would also take place at the Temple of the Earth (summer solstice), the Temple of the Sun (the spring equinox) and the Temple of the Moon (autumn equinox) (Dorian, 2021,132).

Through the mandate of heaven, the emperor was ideally capable of smoothly “translating” and “broadcasting” the esoteric knowledge of time into the public domain, through the mass production of official calendars and through ritual activities conducted at architectural complexes which facilitated time telling. Meanwhile, the emperor was skillful in navigating between time tracking and time telling, between concealing and displaying the knowledge of time. Ideally, he was also the one to translate the scientific aspect of time into the ritual/political aspect of it. In the Sui and Tang dynasties, the emperor had two astronomy observation sites, one in the palace and the other in the suburbs. The head of the astronomy bureau was usually appointed by the emperor. The imperial astronomer was usually also the imperial astrologer. The court astronomers were usually forbidden to communicate their knowledge to the public, and this knowledge was closely connected with political decision-making (Zhang, W., 2008, 160). The production and distribution of official calendars and political authority translated knowledge into mass-produced calendars, political rituals and sound from the clock and bell towers. In other words, when it came to time telling, the location of ritual buildings, the monumentality of architecture, and the shape of certain buildings all played an important role in communicating the knowledge of time. The Temple of Heaven was an architectural tool for telling time, similar to the Drum Tower and Bell Tower.

**The Calendar Case in the Qing Dynasty**

Compared to Europe, the Chinese had produced more official calendars. In the process of 2000 years, there have been more than 100 imperially-sanctioned calendars (Chen and Yang, 1998, 189). Different methods had been introduced in producing the imperial calendar and numerous adjustments had been made so that the court could more accurately calculate the time. Among those efforts, some had been achieved through non-Chinese (central plain) technologies. For example, in the Yuan dynasty, Kublai Khan brought in Muslim astronomers who introduced new concepts such as Euclidean geometry, spherical trigonometry, and Arabic numerals (Dolan, 2021, 137). However, it was not until the late Ming through the beginning of the Qing dynasty that the imperial calendar production went through a major transformation, which also resulted in the so-called “calendar controversy” or “calendar case” under the reign of the Kangxi Emperor of the Qing dynasty.

During the late Ming and the early years of the Qing dynasty, the introduction of European science and astronomy brought major transformations to the practice of imperial calendar production, resulting in the “calendar case” under the reign of the Qing Kangxi Emperor (Malek. 1998). Conservative officials, led by Confucian scholar Yang Guangxian (1597-1669), believed that the traditional parallel system of calendar knowledge and ritual activities, a harmony that was central to the traditions of Chinese government, was being challenged by European Jesuits, led by Johann Adam Schall Von Bell (1592-1666) (Xie, 2002, 43).  Schall Von Bell was a German Jesuit, astronomer and translator of many European astronomical books into Chinese.  Schall witnessed the transition from the Ming to the Qing dynasty in Beijing. He was trusted and respected by the first Qing emperor (Shunzhi), despite the fact that he served the Ming Emperor and help the regime to produce the *Chongzhen* calendar (*chongzhen* *lishu*) and cannons against Manchu armies. As soon as the Qing Emperor Shunzhi started his regime in 1644, Schall held the office of director of the Imperial Bureau of Astronomy (*qiantianjian*) , which lasted over 20 years.

In 1645, Schall introduced the calculation of the true motion of the sun and moon by means of sinusoids, according to the common procedures of European astronomy (Salvia, 2020, 88). In 1646, Schall reedited the *Chongzhen lishu* and changed its name to *Xiyang Xinfa lishu* (Treatise on Astronomy and Calendrical Science according to the New Western Method), based on the most advanced European astronomy and science (Shen, 2014, 37-8). It won him favor and fame. Over his tenure, Schall instituted a major reorganization of the Beijing Ancient Observatory. [fig 3] He not only ordered a major reorganization of the Observatory and brought more accurate instruments from Europeans (Jesuits), but also introduced European science and concepts of astrology (Zhang D, 1998, 475-6). Schall’s position enabled him to procure special permission for the Jesuits to build their churches and to preach throughout the Qing Empire.

In 1650, Schall was at the height of his political power and even received imperial permission to build a new mission compound in the capital, later called the Nantang [Southern Church], because it was located south of the Imperial City (Salvia, 2020, 86). However, as soon as Shunzhi Emperor died in 1661, Schall’s position started to have a steep decline.

In the traditional Chinese calendar, besides the dates based on astronomical calculations, there were astrological annotations attached to each day, including divination statements about auspicious or ominous days with advice on what to do or not do in daily life (von Collani, 2013, 6). During the course of calendar reform, Schall not only translated Western astronomical works and revised the dates of the Chinese calendar within his sphere of responsibility, but also attempted to translate Western astrological works and proposed to reform the annotations based on Western natural astrology (Liu, L., 2020, 111). His calendar performed far beyond a publication based on mathematics and physics. In other words, he did not limit himself to merely the job of “time tracking”, as the Western astronomical knowledge he promoted started to deeply affect the emperor’s responsibilities in time telling.

On one hand, the Chinese emperors, especially the last emperor of an old regime and the first emperor of a new dynasty, were eager to replace a traditional but less-developed astronomy with a foreign but more-advanced mathematical physics, as a more precise understanding of time might legitimize their rulership (Jami, 2015, 476).  On the other hand, the consequent separation of the mastery of divine knowledge from the displayer of it, which is to say the paradox between time tracking and time telling, posed a significant challenge to the existing ritual system exemplified by the perfection ascribed to the Temple of Heaven and the city of Beijing.

From 1657 to 1664, Yang Guangxian launched numerous attacks on Catholicism and the European calendar system in his writings.  In late 1664, Yang won the case, and subsequently Schall and other Jesuits were imprisoned or expelled from the capital city, charged with plotting a rebellion after having “willfully miscalculated” the time and site of an imperial funeral of Prince Rong.  Yang took Schall’s place as Head of the Imperial Bureau of Astronomy (Ma, 2016, 76). It was not until December 1670 that the Kangxi Emperor himself wrote “Return to churches under the Imperial Edict” and pardoned all Jesuits. As Schall had already passed away by that time, Kangxi restored his reputation and appointed other Jesuits to the Imperial Bureau of Astronomy.

**The Paradox of Time Tracking and Time Telling in Late Imperial China**

Having lasted for about ten years, the “calendar controversy” seemingly ended with a victory for European astronomy. However, the Jesuit efforts to use science for the Catholic mission were still severely restricted, which was to say that it was not a total defeat for conservatives like Yang Guangxian (Zurndorfer, 1993). As demonstrated by a number of historians like Zhang Dawei, this conflict was rather a conflict between the Catholic religion and Neo-Confucian philosophy-politics, which manifested as debates over the new calendar developed by European science (Zhang D, 1998, 484). On one level, the calendar case demonstrated the conflict between the millennia-old Chinese ritual system and “western learning.”  On another level, the calendar case speaks to the paradox between time tracking and time telling embedded in Chinese political infrastructure.  Ideally, the implied integration between time tracking and time telling, as showcased by the Temple of Heaven’s predecessor, the Bright Hall, should have managed to obscure such possible conflicts.  The early sages who built the Bright Hall were also able to compute the movement of sun, moon and stars, as well as to deliver their celestial “messages” to the populace.

However, the very system of Chinese political power carried within it the seeds of its own perversion. In other words, if the maintenance of political power depended upon the production of esoteric knowledge of the calendar, that very same knowledge could ultimately emerge as the most radical threat to that power.  As a matter of fact, even the conservatives believed that the “new calendar” was a useful upgrade of their existing knowledge system.  When Yang Guangxian accused the Jesuits, and Schall in particular, of certain serious crimes, he mostly conveyed that Schall failed to carry out his calendar knowledge, which Yang or other contemporary Chinese could not compete with, in a manner which was inconsistent with other Chinese ritual principles. For example, when selecting a date and site for Prince Rong’s burial in 1658, Schall used the wrong set of geomantic principles (fengshui principles) (Zhang Z., 1998, 684). Among other errors, Schall failed to address the spatial dimension of time.  In other words, correctness of calendar was not the center of the debate, but the fusion between time tracking and time telling under Schall’s model was seriously and intentionally flawed, in Yang’s opinions. The mathematical and astronomical sciences and their applications were the only field where a serious dialogue between the two sides could be established (Jami, 2015, 475).

Moving back to our debate on Chinese architectural complexes and urban planning, as I pointed out in the early part of the article, there was a strong sense of time imbedded in those ritual architectural complexes, and the emperor’s physical activities played the key role in fulfilling the fourth dimension of it—time. Although the Jesuits were skillful in time tracking by producing a more accurate calendar compared to its Chinese predecessors, they struggled to achieve a seamless fusion between time telling and time tracking, whereas the latter involved a more complex knowledge system including geomancy; therefore, Schall’s calendar knowledge was quite isolated, inconsistent with other branches of Chinese cosmology and philosophy.

Traditional Chinese calendrical knowledge and urban planning belonged to a single symbolic system and actually constituted that system (Wang, X. 2020, 112). Both traditions had been developing relatively smoothly for thousands of years. However, after European culture started entering the imperial domain during the late Ming dynasty, the Temple of Heaven and similar time telling architectural complexes existed in an awkward disposition between time tracking and time telling, which manifested in conflicts between ancient astrology-cosmology-philosophy and the ever-changing practice of astronomy, between the scientific dimension of time and the religious manipulation of time, between the production of knowledge and the exercise of political power based on esoteric perception.  From the European Jesuits’ perspective, this scientific and mathematical model of astronomy embraced a more “Christian global model,” and therefore freed time tracking from Chinese imperial control (Salvia, 2020, 108). However, as long as time telling was still in the hands of conventional Chinese, they were unable to move the European understanding of time beyond its mathematical quality in ancient China.

From the perspective of the conservative Chinese, this calendar controversy demonstrates the fear that novel and foreign knowledge of time, from the context of “Western learning,” would eventually challenge the whole Chinese ritual system and render it obsolete. As pedantic as Yang’s arguments may have appeared, serious upgrades in time calculation did prove to be fundamental in changing the urban space and social structure.   With the introduction of the Gregorian calendar right after the fall of the Qing dynasty, the Temple of Heaven lost nearly all of its religious symbolism. [fig 4] Similarly, with the widespread adoption of modern clock time, traditional Chinese time-telling structures, such as Bell Towers and Drum Towers, were rendered silent and obsolete. The adoption of the Gregorian calendar and modern global time did not merely take effect at a technical level, but it tellingly altered the urban space of Beijing, which in turned shaped new social behaviors among its citizens and political leaders (Wu, H., 2003, 132). As far as imperial China is concerned, time tracking has never been a pure scientific or mathematical issue. Meanwhile, ritual architectural complexes and urban planning were not three-dimensional entities either.

1. I have argued that the Temple of Heaven’s Circular Mound Altar represented the cycle of a Chinese calendar in an unpublished article, tentatively titled, “Representing a Four-Dimensional Universe: Terraces at the Temple of Heaven in Beijing.”

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