The Transmission of Buddhist Astral Science from India to East Asia: The Central Asian Connection

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Abstract

Among the bodies of auxiliary knowledge Buddhist missionaries brought to East Asia which had a lasting impact to the local cultures was the astral science. It comprises a broad range of related subjects such as cosmology, astronomy, metrology, calendrics, astrology and the worship of astral deities. The great interest in the subject is evinced by the fact that detailed accounts of these subjects found their way into a number of key Sanskrit Mahāyāna texts, as well as their Chinese translations such as the *Śārdūlakarṇāvadāna*, the *Mahāsaṃnipātasūtra* and Amoghavajra's *Xiuyao jing*. A comparison of the early Indian astral science and its East Asian version however reveals some key differences. In this paper, I will examine these differences and influences which may be attributed to Central Asian and other non-Indian sources.

Key words: Buddhist astronomy, astral science, Central Asia.

1. Introduction

The study of astral materials in the Buddhist corpus has been largely overlooked by scholars of both history of science and Buddhist studies in the past but remains nonetheless an important and rewarding topic for two main reasons.[2] First of all, the astral science (*jyotiṣa*) has played an important role in the Indian society throughout history. No respectable person of learning from India, from the earliest time to today, would be without some basic training in the science. This is certain true for the Indian Buddhists, many of whom had a Brahmanical education prior to their conversion. As such, the knowledge of the Indian astral science, comprised of cosmogony, cosmology, calendar making, metrol-

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[2] Some preliminary but notable attempts have been made by Eberhard 1940, Zenba 1956 and Niu 2004 where astronomical materials gleaned from various East Asian Buddhist sources were examined. A comprehensive survey of the Buddhist astral materials which takes into consideration all the critical philological details together with their Indian antecedents is a desideratum.

ogy, astronomy and astrology, is often tacitly assumed in practically all Buddhist texts, from the *Āgama* to the later tantric works. Thus, despite the *vinaya*'s cautions against the improper use of such "worldly knowledge" or the *tiracchānavijjā* (literally, beastly or vulgar knowledge), astral materials in fact have a ubiquitous presence in the Buddhist corpus.[3] Broadly speaking, such knowledge enables the author to delineate time, space and the worldview through which the narrative takes place. Without a proper understanding of this backdrop, our interpretation of Buddhist texts would be bound to be incomplete. Secondly, materials from the exact sciences provide us some of the most striking clues concerning the transmission and evolution of the Buddhist texts. As this body of knowledge is highly idiosyncratic and has undergone a gradual, continuous process of transformation due to the constant advance of scientific understanding and the multidirectional interaction among cultures, the astral materials embedded within each Buddhist text often contain unique features resulted from the convoluted transmission of these texts. Such variations are most evident in the corpus of Chinese Buddhist translations which captured the continual evolution of Buddhist texts brought to China from India and Central Asia spanning over nearly a thousand years.[4]

2. Buddhist Astral Science vs. its Mainstream Non-Buddhist Counterpart

As showed by the Buddhist hagiographies such as the *Gaoseng zhuan* 高僧傳, the itinerant monks from India and Central Asia, renowned often for their mastery of the astral science, were responsible for introducing this mixed body of foreign knowledge into China. To understand the nature of this body of knowledge, one should examine how the Buddhist monks acquired such knowledge in the first place and what the underlying motivation for its acquisition was. In a number of *vinaya* passages, accounts were given how the Buddha advised the monks to become acquainted with the astral science for practical purposes such as reckoning the correct dates for the *upoṣadha*-s, the fortnightly ceremony which includes the recitation of monastic rules.[5] We can thus assume *prima facie* that the astral science which underlies the Buddhist texts is not original. In fact, in the *Śārdūlakarṇāvadāna* 摩登伽經／舍頭諫太子二十八宿經 and the *Mahāsaṃnipāta* 大集經, two of the important early sources on Buddhist astral science, the astral materials therein were attributed to the caṇḍāla King Triśaṅku and the sage Jyotīrāsa respectively, both non-Buddhists. The descriptions of the twenty-eight *nakṣatra*-s and their associated lunar astrology and astral worship, the description of the demon *Rāhu* and the Indian reckoning of seasons and time, naturally find their correspondences in the oldest Indian astral lore as described in the *Taittirīya-saṃhitā* and the *Atharvaveda*.[6]

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[3] DN2, SN4.14. The questions over the so-called *tiracchānavijjā* and how vaguely it was defined were recently treated in Fiordalis 2014. The Buddhists objected to their practice for personal gain, which was seen as a distraction from the path of salvation (Gombrich 1971: 148–9). The efficacy of such skills was however never denied and in reality such transgression among the monastics was commonplace (Gombrich 1997: 174–5).

[4] Mak 2012a, 2012b. On the process of translation of the East Asian Buddhist corpus and the related issues, see Funayama 2013.

[5] MV.2.18; T(1452)24.415b; T(1426)22.549a.

[6] Mak 2012a.

The Vedic astral lore practiced by the Buddhists represents not only a substratum of astral beliefs common to different traditions in the South Asian subcontinent; in some cases the covert Brahmanic learning of the Buddhists may be noted as in the case of Kumārajīva. In his translation of the **Mahāprajñpāramitopadeśa* (*Dazhidu lun* 大智度論, T1509, dated circa 405 CE) attributed to Nāgārjuna, Kumārajīva describes the length of the four types of months as follows:[7]

1. 日月 Solar month (*sauramāsa*): 30.5 days
2. 世間月 Civil month (*sāvanamāsa*): 30 days
3. 月月 Lunar month (*cāndramāsa*): $29\frac{32}{62}$ days[8]
4. 星宿月 Sidereal month (*nākṣatramāsa*): $27\frac{21}{67}$ days

Beside the characteristically Indian concept of the "four types of months," the unexplained fractions of the lunar and sidereal months can only be explained by the algorithm provided in the *Vedāṅga-jyotiṣa* (VJ), where 62 synodic months or 67 sidereal months or 1830 days were assumed in a cycle of five solar years known as *yuga*.[9] The values for the four types of month would therefore be i) $1830 \div (12 \times 5)$; ii) 30 (by definition); iii) $1830 \div 62$, and; iv) $1830 \div 67$.

Similarly, in later works such as the **Lokaprajñapti-abhidhārma-śāstra* 立世阿毘曇論 (T.1644) translated into Chinese by Paramārtha in 559 CE, the algorithm indicating the daylight change in a year is also identical to that of the VJ.[10] Thus we can see that the Buddhists, not surprisingly, inherited some of the earliest astral materials from the Vedic tradition which were prevalent throughout the early centuries of common era in the South Asian subcontinent and naturally, also in the neighboring regions in Central Asia under its influence.

While the Buddhist materials generally mirror their Brahmanical or mainstream Hindu antecedents, the picture is complicated by the changing face of the Indian astral science. As Greco-Babylonian elements gradually emerged in non-Buddhist Indian astral texts since the early centuries of the common era, parallel evolution of astral ideas may also be noted in the Buddhist texts, in particularly in their Chinese translations centuries later. In the South Asian subcontinent, new concepts such as the reckoning of days from an distant epoch, the cycle of seven planetary days, and the fundamentals of horoscopy were established by the fifth century in the *Siddhānta*-s, or the classical Sanskrit astronomical

[7] T1509.25.409, also in the stone sūtra tablets *Fangshan shijing* (Figure 1).

[8] In all extant versions of the text: $29\frac{30}{62}$. The latter is most likely an error resulted from an early haplography.

[9] VJ ed. p. 45 fn. 1. In the later Sanskrit texts, the *yuga* takes on progressively larger values, from 165 years in the *Yavanajātaka* and 2,850 years in the *Romakasiddhānta*, to 180,000 years in the *Saurasiddhānta* (Mak 2013b: 78–79). The so-called *mahāyuga* as exemplified in mainstream *jyotiṣa* texts such as the *Sūryasiddhānta* consists of 4,320,000 years. The expansion of astronomical cycle is most likely an attempt to arrive at more accurate astronomical values expressed in fraction. The Buddhist astronomical cycle known as *kalpa* has an exceptionally large value devoid of the astronomical significance of its Hindu counterpart.

[10] Namely, $d(x) = 12 + \frac{6}{183}x$ where x is the time elapsed from the winter solstice and $d(x)$ is the length of daylight (Pingree 1981: 536–537; Niu 2004: 199).

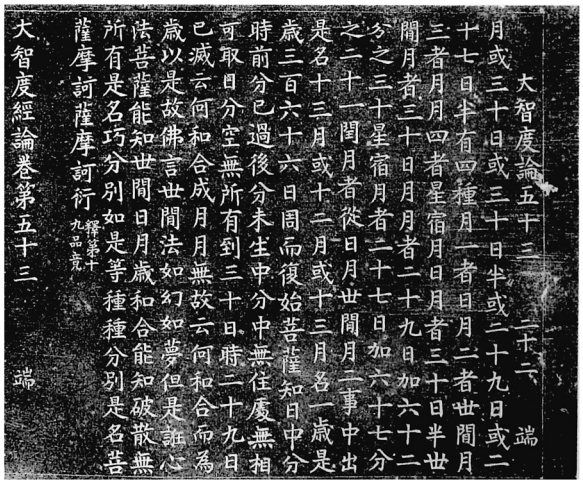

Figure 1. Excerpt from Fasc. 53 of *Dazhidu lun* (Fangshan shi jing 房山石經 塔下 5165)

treatises. These ideas subsumed and in some cases simply replaced the early Vedic astral science. In the Buddhist texts, on the other hand, one continues to find the old and the new juxtaposed against each other.By and large, we can see that this new form of Indian astral science which was to become part of the mainstream Hindu astral science down to the modern time, was not adopted by the Buddhists. The Buddhist astral corpus retains its unique outlook due to two reasons: firstly, the inherent conservatism of religious texts preserves old and often outdated knowledge; secondly, some of these new influences came not from India, but from other sources as the texts were brought to China via Central Asia.

3. Central Asian Influences as seen from Sanskrit and Chinese Sources

Some of the Central Asian interpolations and other non-Indian influences may be inferred when we compare the Chinese translations of the astral text with their extant Sanskrit parallels. While textual variants alone neither explain nor identify their origins, the discovery of manuscript fragments in Central Asia corresponding to the contents of Chinese and Tibetan translations and not to the Sanskrit materials extant in India or Nepal point to the likelihood of such influences. Such variations are noted in the two works we mentioned above, namely the *Śārdūlakarṇāvadāna*, translated by Zhu Lüyan 竺律嚴 and Zhi Qian 支謙 in 230 CE (T1300) and again by Dharmarakṣa 竺法護 in the early fourth century (T1301), and the *Mahāsaṃnipāta*, translated by Dharmakṣema 曇無讖 in 426 CE (T397(1–13)) and by Narendrayaśas 那連提耶舍 in the late sixth century (T397, 14–17).

3.1. The *Śārdūlakarṇāvadāna* (ŚKA)

The ŚKA, which is part of the larger *Divyāvadāna*, contains a lengthy section on the astral science.[11] It describes largely the lunar astrology characteristic of the most primitive form of Indian astral science, which features the presentation of the twenty-eight *nakṣatra*-s starting with *Kṛttikā,* generally thought to represent the vernal equinox at around 2350 BCE.[12] When compared with the Sanskrit version extant, a number of astronomical details are noted only in the Chinese versions:[13]

i) A description of the asterism *wei* 尾 (= *mūla*) as having the shape of a scorpion, hence Scorpio;
ii) A description of the two systems of seven or nine planets, namely, the Sun, Moon, Mars, Jupiter, Saturn, Venus and Mercury, together with the additional Rāhu and Ketu;
iii) Gnomic measurement which are observable at about N43°;[14]
iv) Metonic cycle of seven intercalary months in nineteen years, together with an alternative system of "double intercalary months in five years";
v) Movement of the Sun throughout the year;
vi) Another set of the seven planets enumerated in an order identical to the Greco-Roman planetary week (☉☽♂☿♃♀♄);[15]
vii) Sidereal period of the seven planets.

It is noteworthy that such information is not found in the early Indian astronomical texts such as the *Vedāṅgajyotiṣa* which we described earlier. Just as striking here are the references to possibly a zodiacal sign (i), the Greco–Roman planetary week (vi), and an interest in planetary motion (ii, vii). These ideas of Greco–Babylonian origin were still in the process of being transmitted to India during the early centuries of the common era.[16] The incorporation of new Greco–Indian elements in Buddhist texts are nonetheless not surprising, as one may note the evident Greek influences on the Gandhāran Buddhist sculptures and works such as the paracanonical *Milindapañha*, whose protagonist was identified to be the Bactrian Indo–Greek king Menander I (r. 165/155–130 BCE). Somewhat surprising are other clues such as the gnomic measurement (iii) which points to Central Asia, possibly Samarkhand (N39°39′), as the origin of some of these interpolations.

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[11] Zenba 1952. A comprehensive treatment of the ŚKA and the early Buddhist astrology and astronomy are found in the Zenba's unpublished Ph.D. thesis: *Indo godai kagaku sisō-no bunkashiteki genkyū* インド古代科学思想の文化史的研究 (Kyoto: Kyoto University. Ph.D. Thesis, 1962).

[12] Yano 2011: 126–7. The idea was first suggested by Colebrooke in his *Essays on the religion and philosophy of the Hindus* (1858) and was supported by Weber in his *Indische studien* (1868). See also Macdonell and Keith 1912: 419ff.

[13] T(1300)21.404ff.

[14] Shinjō 1928; Yabuuti 1954: 585.

[15] The number of possible arrangements of seven planets is 7! or 5040. Hence, the probability of arriving at a particular order is only 0.02%.

[16] Pingree 1981: 8–11. The earliest Sanskrit astral text of Greco–Babylonian origin was generally thought to be the *Yavanajātaka* dated by Pingree to be 249/250 CE, with an Greek exemplar dated possibly earlier in 149/150 CE. These dates however have been shown to be spurious in Mak 2013a, 2013b, 2014a and the alleged antiquity and "Greekness" the work will need to be re-examined. Nonetheless, the Greco-Indian astral science can be said to be firmly established in India by the fifth century as the zodiacal coordinate was adopted in the *Āryabhatīya* (499 CE).

3.2. The *Mahāsaṃnipāta* (MSN)

The Central Asian influence in the Buddhist texts transmitted to China is most evident in the MSN, a massive collection of loosely related Mahāyana texts which according to Chinese Buddhist bibliographers, enjoyed great popularity in some of the oasis kingdoms along the Silk Road.[17] Their circulation in the Eastern Turkestan is confirmed by the discovery of fragments containing parts of this text, most notably from passages of the *Ratnaketu-parivarta* 寶幢分 and the *Sūryagarbha-parivarta* 日藏分. Sylvain Lévi, in his pioneering article titled *Notes chinoises sur l'Inde:IV. Le pays de Kharostra et l'écriture kharoṣṭhī* (1904), identified in the *Candragarbha-parivarta* 月藏分 two nearly identical sets of description of fifty-odd countries dispersed between Benares to China, which was described by the author to be "comme une revue géographique du monde bouddhique".[18] Though intertwined with supernatural descriptions, it describes nonetheless the part of Silk Road through which the Buddhist texts traveled, from India to China, with a particular emphasis on Khotan.

The astral materials in the Chinese translations of the MSN are greatly mixed and are generally absent in the Sanskrit versions extant.[19] The astral materials found in the three *parivarta*-s of the Chinese MSN mentioned above are of very different nature and may be dated to different periods on astronomical ground.[20] The astral materials found in the *Ratnaketuparivarta* of Dharmakṣema's Chinese translation (T397–9) is dated 426 CE and is reminiscent of the one presented in the Chinese and Sanskrit ŚKA. In the latter part of the Chinese MSN compiled by Sengjiu 僧就 in 586 CE, an altogether different kind of astral materials is found in the *Sūryagarbhaparivarta* and the *Candragarbha-parivarta*, translated by Narendrayaśas in 585 CE and 566 CE respectively. In these two chapters, we find the earliest complete translation of the twelve zodiacal signs. In the *Sūryagarbha-parivarta*, the zodiacal signs were embedded within a presentation of the gnomic measurement, lunar longitude and associated astral worship for each month. One important Prākrit fragment (Figure 2) dated at around the sixth century CE is found to be corresponding to the Chinese and Tibetan translations of this astronomical tract.[21] An important word we can identify in this fragment but not in the translations is *hora* (Skt. *horā*, "ascendent", from Greek ὥρα), an important astrological concept originated from Greek astrological treatises.[22] As far as the presentation of the lunar mansions is concerned, instead of the archaic order starting from *Kṛttikā*, *Bharaṇī* is mentioned in one occasion, reflecting likely the precessional shift by 1300 BCE. Such renewal of astronomical knowledge is noted

[17] On the textual history of the text, see Hasuzawa 1930–1: 3–5, Braarvig 1993: xxxi–xxxii, Saerji 2005: 23–25.

[18] Lévi 1905: 262, 285.

[19] Cf. Kurumiya 1975, 1978. Similar astral materials are however found in the Tibetan version (Kurumiya 1979, Saerji 2005)

[20] Zenba 1957: 101–116.

[21] British Library Or. 15011/23, initially identified by Hoernle as an "astrological passage" (Hoernle 1916: 103–108 / MS 143a SB 2).

[22] This term appears again much later in the title of an eighth-century Buddhist astrological work *Fantian huoluo jiuyao* (**Brahmā-horā-navagraha* 梵天火羅九曜, T1311) attributed somewhat questionably to the learned Chinese Buddhist astronomer Yixing 一行. Later, the ascendent was almost always translated as *minggong* 命宮 due to most likely Persian influences (Itō 1980: 215–229, Yano 1986a: 38–40).

Table 1. Astronomical measurement in the *Sūryagarbha*

Month	Night-length (muhūrta)	Day-length (muhūrta)	Length of shadow (pada)
1	16	14	8
2	15	15	6
3	14	16	4
4	13	17	2
5	12	18	0.5
6	13	17	2
7	14	16	4
8	15	15	6
9	16	14	8
10	17	13	10
11	18	12	12
12	17	13	10[25]

also in the extant version of the VJ where two sets of lunar mansions are mentioned, one beginning from *Kṛttikā* and the other from *Bharaṇī*.

In the *Candragarbha-parivarta* we find a complete list of the twelve zodiacal signs in Chinese phonetic transcription, beginning with Meṣa (=Aries) and ending with Mīna (=Pisces), in the same manner as Ptolemy's *Tetrabiblos* (mid-second century CE) and all subsequent Indo-Greek texts whenever the zodiacal signs (Skt. *rāśi*) are mentioned. As shown in the *Sūryagarbha-parivarta*, Aries corresponds to the lunar mansion *Aśvinī*, which represents the latest equinoctial point at around 300 CE. This new coordinate was accepted since the time of Āryabhaṭa and the lunar mansions are enumerated from *Aśvinī* in all Siddhānta texts. Thus quite remarkably, in the Chinese compilation of the MSN, we find three sets of astronomical coordinates which reflect the three different periods separated from each other by around a thousand years.

The astral passage in the *Sūryagarbha* contains also astronomical measurements slightly more advanced than those noted earlier in the Chinse ŚKA. These include the use of the gnomon, the change of day-night ratio and the heliacal setting and rising of mansions.[23] Amongst the various measurements, what is of interest to us are the daylight ratio and gnomic measurements, given here as follows (Table 1).[24]

The above data present the middle of the second, fifth, eighth and eleventh month as spring equinox, summer solstice, fall equinox and winter solstice respectively. Based on modern calculation, 14.4 hours of daylight or a day/night ratio of 18 : 12 on summer solstice is possible only at a location of around 35°N.[26] This puts the maker of this measure-

[23] For general discussion on the tradition of gnomic measurements in India, see Subbarayappa 2008: 179–180. For possible Babylonian and Greek antecedents, see Neugebauer 1975: 736–746, 1979: 209–215; Yano 1986b: 24–26.

[24] T(397–14)13.280b–282a.

[25] E mended from 12. The pattern suggests the values for the tenth and twelfth month should be the same (Niu 2004: 107 fn.1).

[26] Yano 1980: 68; Rao 2000: 4–5. For a comparison of day-night length at various latitudes, see http:

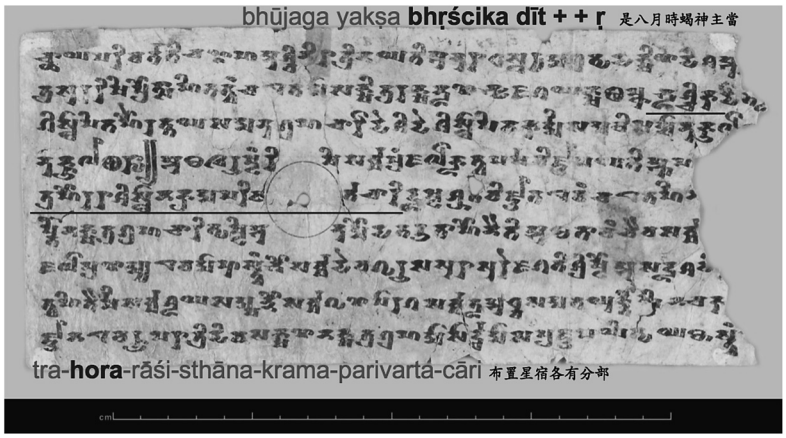

Figure 2. "Sūryagarbha fragment" from the MSN. British Library Or. 15011/23. ©The British Library Board.

ment to the northernmost or northwestern frontier of India, with the most likely candidates being slightly north of the modern day Kashmir or Kabul.[27] Suffice it to say, the data here point to a "northern" or "northwestern" connection of the MSN.

4. Further Central Asian Influences from the Eighth Century and Beyond

While the Chinese's overall understanding of Indian astral science continued to grow through the growing Buddhist exchange between China and India, as shown in examples such as Xuanzang's *Xiyu ji* 西域記 (646 CE), it was only by the eighth century CE when Indian astronomy has finally established itself in China, with landmark works such as the *Jiuzhili* 九執曆 (**Navagrahakaraṇa*) composed in 718 CE by Gautamasiddha,[28] and the *Xiuyao jing* 宿曜經 composed and compiled Amoghavajra and his disciples from 742 to 764 CE. The level of these works, however, can only be described at best as rudimentary. They appear to lack the sophistication of the astral works (both astronomical and astrological) developed in India at that time. Whatever its reason was, this paved ways for the rise and popularization of the non-Indian schools of astral science as we shall see.[29] At any rate, the new Buddhist astral works were nonetheless the first genuine attempt to present Indian astral science in a comprehensive manner, thus clarifying some of the uncertainties

//aa.usno.navy.mil/faq/docs/longest_day.php. A simulation of daylight duration in New Delhi at 77°12′ E 28°36′ reveals that daylight on the summer solstice does not exceed 14 hours (http://aa.usno.navy.mil/data/docs/Dur_OneYear.php).

[27] Unfortunately, the length of the gnomon was not given, which would have otherwise served as additional data to confirm our findings.

[28] On the astronomical work of Gautamasiddha and his family, see Chen 1985, Sen 1995. A comprehensive study of the *Jiuzhi li* was made in Yabuuti 1979. It should be noted that the reconstruction **navagrahakaraṇa* is very tentative as there is in fact no mention at all of the nine "planets", i.e. including the two pseudoplanets Rāhu and Ketu, in the extant version of the text.

[29] Mak 2012a: 5, 8.

Table 2. Sogdian, Middle Persian and Sanskrit names of the days of the week according to Amoghavajra

	"胡名"Sogdian	波斯名 Pahlavi	天竺名 Sanskrit
Sun 日曜太陽	蜜 myr	曜 (森勿)ēw	阿儞底耶 āditya
Moon 月曜太陰	莫 m'x	婁禍 (森勿)dō	蘇摩 soma
Mars 火曜熒惑	雲漢 (> 漠)wnx'n	勢 (森勿)sě	盎哦囉迦 aṅgāraka
Mercury 水曜辰星	咥tyr	掣 (森勿)čahār	部陀 budha
Jupiter 木曜歲星	鶻勿斯 wrmzṭ	本 (森勿)panǰ	勿哩訶娑跛底 bṛhaspati
Venus 金曜太白	那歇 n'xyδ	數 (森勿)šaš	戊羯羅śukra
Saturn 土曜鎮星	枳院 kyw'n	翕 (森勿)haft	賒乃以室折囉śanaiścara

left by earlier works such as the ŚKA and the MSN, as well as introducing a scientifically more advanced form of astronomical knowledge to the Chinese and the Chinese Buddhist world.[30]

Meanwhile, Central Asian materials continued to enter China. By then Chinese Buddhists were finally able to make clear distinction between Central Asia (*hu* 胡) and India (*fan* 梵). The cosmopolitan nature as well as the prosperity of the Tang society attracted not only Buddhists from India and Central Asia, but also those of other religions such as the Zoroastrians, the Syrian Christians (referred sometimes as Nestorians in earlier literature) and the Manichaeans from other parts of Eurasia. As Amoghavajra explained in his *Xiuyao jing*,

> "*In general, the seven luminaries, in other words, the Sun, the Moon and the five stars, exert their influences over human beings. Each of them takes turn each day, repeating in seven days. Its application is that the respective [seven luminaries] exert positive and negative influences over things. One should be careful when one uses it. However, if one does not recall right away [the day of the week], one may ask the Central Asians, the Persians or people from the Five India-s who should all know. The niganṭha-s (the Jains) and the Manicheans* 末摩尼 *perform ablutions on the day of mi* 蜜 *(Sunday). The Persians too make this an important day, maintaining such practices without forgetting them. Thus, the contemporary appellation of the seven luminaries of people from various countries is given as follows.*"

Following the explanation, Amoghavajra provides a description of the seven planetary days, together with their names in *Hu* (Sogdian), *Bosi* (Middle Persian or Pahlavī) and Sanskrit (Table 2).

There are evidences to suggest that some of these non-Buddhist foreigners might have been much more skilled astronomers and astrologers than the Buddhists. The Buddhists' tacit use of non-Buddhist texts such as the *Qiyao rangzai jue* 七曜攘災決 (T1308) in

[30] Ironically, these works were poorly received as a whole. The *Jiuzhi li* was lost and was only rediscovered during the Ming Dynasty as part of the larger compilation *Kaiyuan zhan jing*. The last chapter of the *Xiuyao jing* which gives the formulae for date reckoning and weekday computation was lost in the Mainland and is preserved only in a few manuscripts in Japan recently rediscovered by Japanese scholars (Yano 1986: 113–124). By and large, East Asian Buddhists resorted to the earlier works such as the ŚKA and the MSN as the authority of Buddhist astral science.

the casting of horoscope, described in elaborate but insufficient details in the *Xiuyao jing* indicates so. The *Qiyao rangzai jue*, attributed to a certain "Brahmin from West India" named *Kaṃkuṭa 金俱吒,[31] was never recorded in the official Buddhist catalogues, but was transmitted to Japan through the Shingon or the Japanese Esoteric Buddhist tradition, included in Shū'ei 宗叡's catalogue of texts brought back to Japan from China in 865 CE.[32] Another text which was included in this catalogue was the *Duli yusi jing* 都利聿斯經 of five fascicles and other calendrical/astral texts. The presence of these non-Buddhist texts in the Japanese Buddhist catalogue once again confirms our suspicion that the East Asian Buddhists at that time lacked the astronomical expertise necessary to make full sense of the Indian astral science embedded in the Buddhist texts.[33]

Of particular interest is the *Duli yusi jing*, abbreviated often as *Yusi jing* 聿斯經. The work is no longer extant but was referred to by the Japanese Esoteric Buddhists up to the late Hei'an period.[34] An examination of the content of its versified version titled *Xitian yusi jing* 西天聿斯經, preserved in the Ming anthology *Xingxue dacheng* 星學大成, reveals the text to be closely related to the astrological poem of Dorotheus of Sidon (first century CE), which was circulated widely in the Near East in both their Middle Persian and Arabic translations toward the second half of the first millennium.[35]

4.1. Horoscopy in the West and the East[36]

As mentioned earlier (§3.2), horoscopic materials first appeared in China in the Chinese translation of the MSN. Although the names of the zodiacal signs appear in both phonetic transcription as well as in translation, there is no evidence that the Buddhist translators had a full or even proper understanding of the genethlical astrology which was already well established in India and in various parts of Europe at that time. As mentioned earlier, Amoghavajra was the first to present Indian genethlical astrology in a systematic manner

[31] For a general description and the scientific content of the text, see Yano 1986c. The inclusion of Sogdian names of the planets such as *huwusi* 鶻勿斯 (wrmzt) for Jupiter suggest its Central Asian and non-Indian origin. At any rate, *Kamkuṭa is most likely not an Indian and the first syllable *kam* may in fact be a variant of the Sino-Sogdian last name *Kang* 康, associated with the kingdom of *Kangju* 康居.

[32] T2174A 新書寫請來法門等目録.

[33] Similarly, the Esoteric Buddhists appear to have used the astronomical text *Futian li* 符天曆 (Nakayama 1964: 120–121). Hints of how these texts were used together are given for example in the Dunhuang document P. 4071.

[34] On the textual history of this text, see Mak 2014b.

[35] Ibid. Chinese and Japanese scholars to date have largely accepted the suggestion that the *Yusi jing* was a Chinese translation of a certain redaction of Ptolemy's *Tetrabiblos*, based on clues such as *simen* (four gates) referring to the four chapters of the work, and *Duliyusi* as a corrupt phonetic rendering of Ptolemaios in Pahlavī (P)-T-L-(M)-Y-W-S (Yano 1990: 218). In my examination of the work, however, some key elements such as the degrees of exaltation and a number of astrological concepts identified in the XTYSJ cannot be accounted for in the *Tetrabiblos*, but resemble closely to the first chapter of the Arabic translation of Dorotheus's astrological poem. While further investigation is still needed, *Duliyusi* could in fact be the Chinese rendering of Dorotheus (Gk. $\Delta\omega\rho\acute{o}\theta\epsilon o\zeta$) from a certain intermediary language. It may be pointed out that it is Dorotheus's work rather than Ptolemy's *Tetrabiblos* which belongs to the mainstream astrology practiced throughout the Western world during the first millennium.

[36] Yano 2004. A comprehensive treatment of the transformation of the representation of the heaven, including horoscopes and zodiacal signs will be undertaken in my upcoming paper "Zodiac in South and East Asia: Transformation and interaction with indigenous astral science as seen from textual and iconographical sources," to be presented in the 14th International Conference on the History of Science in East Asia, Paris, Jul 6–10, 2015.

in his *Xiuyao jing* dated mid-eighth century, though his horoscopy lacks the technical richness when compared with similar works such as Varahāmihira's *Bṛhajjātaka* or Ptolemy's *Tetrabiblos.* The impact of the Buddhists' early attempt to introduce horoscopy to China is negligible; nonetheless, its influence may be noted in the later Chinese texts as noted in the Chinese names of the zodiacal signs such as *mojie* 摩羯 (Capricorn) from the Sanskrit equivalent *makara*.

Greek horoscopy was transmitted throughout Eurasia during the first millennium of our era and various schema of horoscopes survive in different traditions even today (Figure 3). Horoscopy, together with the astral science it entails, was transmitted to China most likely via the *Yusi jing* described earlier. From the tenth century onward, there was a proliferation of astrological works which appear to be inspired by this work.[37] Besides the highly technical details of horoscopy, all these texts share the same representation of the cosmos, that is the heaven divided into twelve equal portions corresponding to the twelve *signs* of the Zodiac and the twelve astrological *places* (Figures 4, 5).[38]

Further non-Indian influences from the Central Asia may also be seen in the representation of the Virgo as two women instead of one, translated in the *Xitian yusi jing* as the "double female", or *shuangnü* 雙女, an East Asian variant so far not attested elsewhere.[39] The corresponding iconography is noted also in a number of Dunhuang cave paintings and manuscripts and had become standard in the East Asian representation of the Zodiac (Figure 6). It is not clear whether it was a misinterpretation of the "bicorporeality" (Gk. *δίσωμον*, Skt. *dvisvabhāva*), one of the three categories of houses to which Virgo belong, together with other "bicorporeal" signs Gemini, Sagittarius and Pisces.[40] However this unusual reinterpretation took place, it indicates the role Central Asia played in the transmission of "Western" astral science to East Asia.

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[37] See Mak 2014b.

[38] The radial type, standard in Japan among the esoteric Buddhist and somewhat rare among the Chinese horoscopes, may also be noted (Yabuuti 1969: 190, Needham 1956: 352 Plate XVII).

[39] XTYSJ 7.41 (V). This variant was attested also in P. 4091 and was adopted in later practically all Chinese astral treatises including the Buddhist translations.

[40] Cf. *Tetrabiblos* 1.11, and also Vettius Valens 1.2 where the bicorporeality and two-naturedness were specified for Virgo. Other variants include Gemini, represented as a male-female couple, a representation adopted also in India as seen in the *Yavanajātaka* and the *Bṛhajjātaka*, and naturally, also all Buddhist works.

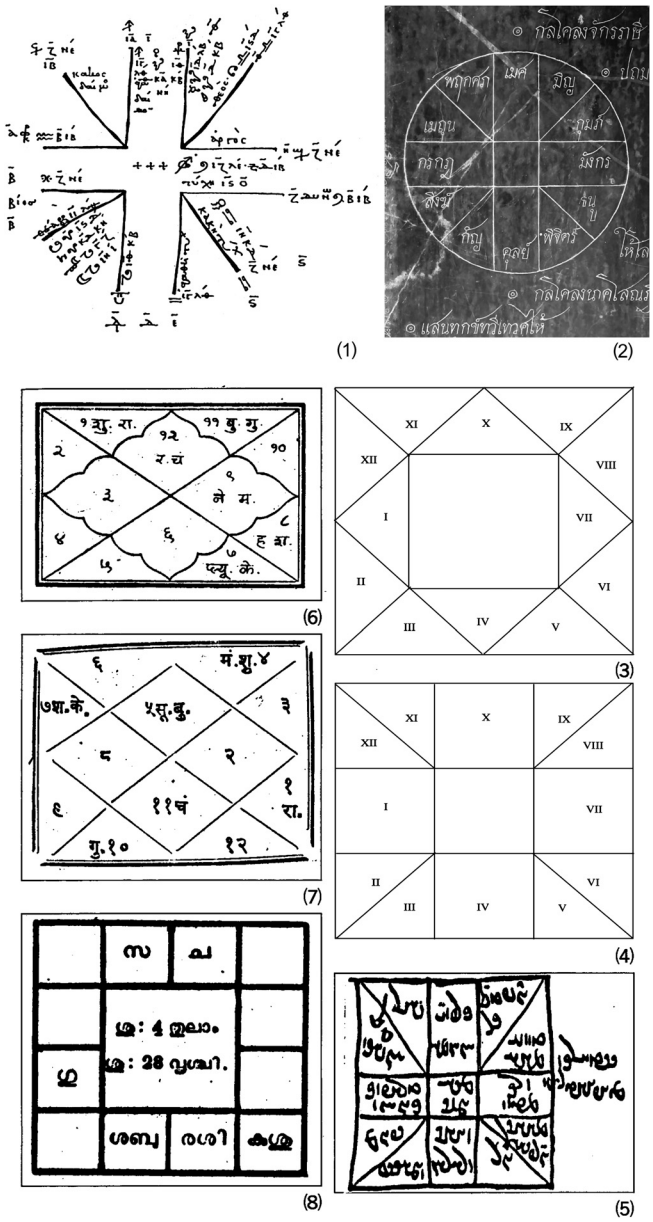
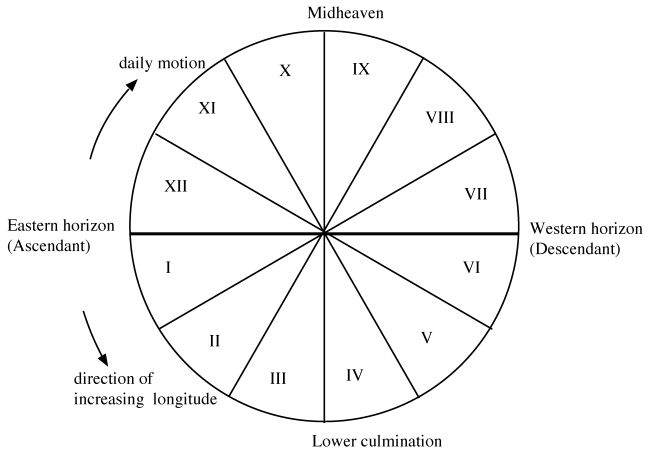


Figure 3. Horoscope schemata from various traditions. (1) Top Left: A tenth century Byzantine reproduction of a Greek Horoscope (? 497CE);[41] (2) Top Right: A nineteenth century Thai *cakrarāśi* inscription.[42] Other horoscopes (3–8) from Yano 1986: 42. (3)/(4) Medieval Europe; (5) Medieval Persia; (6)–(8) Modern India.



Place	Branch
I	卯 mǎo
II	寅 yín
III	丑 chǒu
IV	子 zǐ
V	亥 hài
VI	戌 xū
VII	酉 yǒu
VIII	申 shēn
IX	未 wèi
X	午 wǔ
XI	巳 sì
XII	辰 chén

Figure 4. Twelve places (topoi) and the Chinese earthly branch in XTYSJ.

Figure 5. Chinese horoscope schema (*Xingxue Dacheng* 1.5) [Zodiacal signs mine].

[41] Neugebauer and Van-Hoesen 1959: 156. The twelve places are placed counter-clockwise starting with the ascendent at the ten o'clock position, hence above the horizon.

[42] Inscription from Wat Pho, Bangkok (photography by the author). The horoscope gives the Pāli names of the twelve zodiacal signs starting from *meṣa* (Aries) counter-clockwise at twelfth o'clock position.

Figure 6. "Double Female"— a unique East Asian iconography of Virgo. Left: Dunhuang fresco from Mogao cave 66 (eleventh century?); Right: Block print work on Buddhist iconography titled *Bukkyōzu'i* (eighteenth century?).

5. Conclusion

From the foregoing survey of astral materials transmitted to East Asia throughout the first millennium of the common era, we can see some overall trends. First of all, works such as the ŚKA and the MSN contain materials of Vedic India which account for their archaism while new influences of ultimately Greco–Babylonian origin gradually crept in. The Buddhist astral corpus thus from the very early stage has the outlook of a mélange of materials of various origins, filtered through the Indian, Central Asian and even the Chinese lens, and as a result, should not be spoken of as a homogenous whole. By the eighth century, further Central Asian influences become evident as intellectual exchange among the foreigners and the East Asians intensified. Such exchange is noted by the fact that the East Asian Buddhists had to resort to the more astronomically and astrologically sophisticated works composed by non-Buddhists such as the *Yusi jing* and the *Qiyao rangzai jue*. These works are of neither Indian nor Chinese origin, but are the results of such rich multicultural exchange (Figure 7), where the Central Asians of various religious affiliations played a vital role in their transmission.

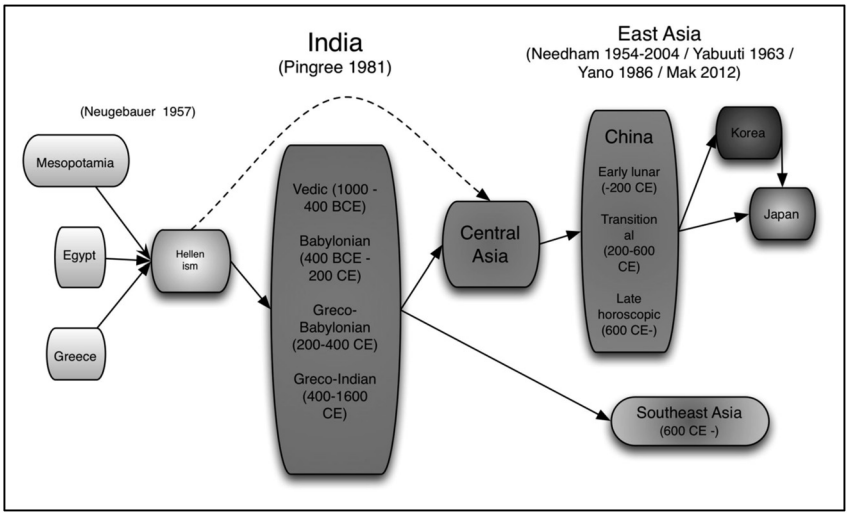


Figure 7. Eastward transmission of Greco–Babylonian Astral Science.

Abbreviations

DN *Dīghanikāya* (ed. PTS)
MSN *Mahāsaṃ nipāta* (T397)
MV *Mahāvagga* (ed. PTS)
SN *Saṃyuttanikāya* (ed. PTS)
T Taishō Tripiṭaka edition. *Taishō Shinshū Daizōkyō* 大正新修大蔵経. Edited by J. Takakusu and K. Watanabe. Tokyo: The Taisho Issai-kyo Kanko Kwai. 1924–1931.
VJ Vedāṅgajyotiṣa by Lagadha. Edited by Kuppanna Sastry & K. V. Sarma. *Vedāṅga Jyotiṣa of Lagadha in its Rk and Yajus Recensions*. New Delhi: Indian National Science Academy, 1985.
XTYSJ *Xitian yusi jing* 西天聿斯經 (ed. *Siku Quanshu* / Mak 2014b)
YJ *Yavanajātaka.* David Edwin Pingree (ed.). *The Yavanajātaka of Sphujidhvaja*. Harvard Oriental Series, V. 48. Cambridge: Harvard University Press, 1978.

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