

THE TREASURE OF ASTRONOMICAL RECORDS IN SOUTHEAST ASIAN STONE INSCRIPTIONS

B.S. Shylaja

Jawaharlal Nehru Planetarium, High Grounds, Bengaluru, 560001, India.

E-mail: shylaja.jnp@gmail.com

Abstract: Stone inscriptions are to be considered as unconventional sources of records of celestial events. Here we show examples of the wealth of information about celestial events contained in those from Southeast Asia. These include details of planetary positions and possible 'guest' objects.

Keywords: stone inscriptions, Southeast Asia, astronomical records, planetary positions, Indian calendar systems, notations of numerals

1 INTRODUCTION

Stone inscriptions are known to contain records of historical accounts and edicts, but they also serve as unconventional records of celestial events (Shylaja and Geetha, 2012; 2014a; 2016). They are abundant in Southeast Asian countries, and in India. They are edicts on royal grants of cash, kind and labourers to temples and scholars. The influence of Indian (Hindu) culture and tradition is easily recognizable in these inscriptions. They generally have the Indian (Hindu) calendric systems incorporated, and more importantly implement Sanskrit as one of the languages. The same *Śaka* count of the years (epoch CE 78) was maintained throughout Southeast Asia. This unifies the study within the continent.

The biggest treasure of stone inscriptions is available from *Kambhoja* which comprises parts of present-day Cambodia, Thailand and part of Vietnam. These inscriptions were first compiled and published by the French archaeologist and historian George Coedès and the Sanskrit texts with English translations are now available; thanks to the efforts of R.C. Majumdar (1953). Our study has revealed a record of the CE 1054 supernova as a metaphor on a stone inscription from Phum Da (Shylaja, 2019). The God has been described as "... one who can make a star shine as bright as Venus." An enquiry about the corresponding text in Khmer revealed an identical phrase (Kunthea Chome, pers. comm., February, 2019).

2 THE RECORDS

Stone inscriptions and their English translations are available in online sources. The details in them appear distinctly clear in specifying the time of the ritual associated with the record. The earliest example is from the sixth century. The *Śaka* numbers are usually denoted in the *bhūtasankhya* system (objects are specified for numbers, Earth means 1, eye means 2, fire means 3 and so on), and are used in inscriptions all over India. Here we describe some

examples—the numbers are from the catalogue of R.C. Majumdar (which also gives the first report).

The translated sources generally write only the *Śaka* number and sometimes add "and astronomical details follow". Rarely do we find the derivation of numerals. It is a challenging task to determine the phrase giving the numerals, as they usually get lost in the adjectives praising the Lord, the donor or the donee. For example, Lord Shiva is praised as one who is responsible for the brilliance of those planets that do not have retrograde motion—the Sun and the Moon (*avakramamaṇḍala*).

The Bayang temple inscription (no.8, first edited by Barth 15C.31) has two records on separate occasions engraved on the same stone. The *Śaka* numbers are given as *rasa* (taste 6) *dasra* (twins 2) *śara* (arrows 5) (625) and *ṛtu* (seasons 6) *vāri* (oceans 4) *dhīndra* (sensory organs 5) (645). These are to be read in reverse order as 526 and 546, equivalent to CE 595 and 624 respectively.

The next one with details is dated *Śaka* 550 given as *kha* (zero) *panca* (5) *indriya* (sensory organs 5). The other detail is that the Moon is in *Rohiṇī* (Aldebaran) on the third day in the month of *Mādhava*. This corresponds to CE 15 March 628.

Even more details can be seen in the next example of *Śaka* 561, which gives *puṣya* as the month, December–January, *kṛṣṇa* (second half of the lunar month) and the half Moon in Virgo. This takes us to CE 1 January 650. Furthermore, the word *jhaśodaye* (ascendant is Pisces) fixes the time around 12 noon.

Another example (no 30 Kedei Ang Temple Inscription) gives the details of the positions of the planets—*Śaka* 589; 10th day after New Moon of the month *vaiśakha*: Saturn is in Aquarius, Venus in Taurus, Jupiter in Sagittarius, and Mercury and Sun in Aries. This date can be fixed as CE 10 April 667 (see Figure 1).

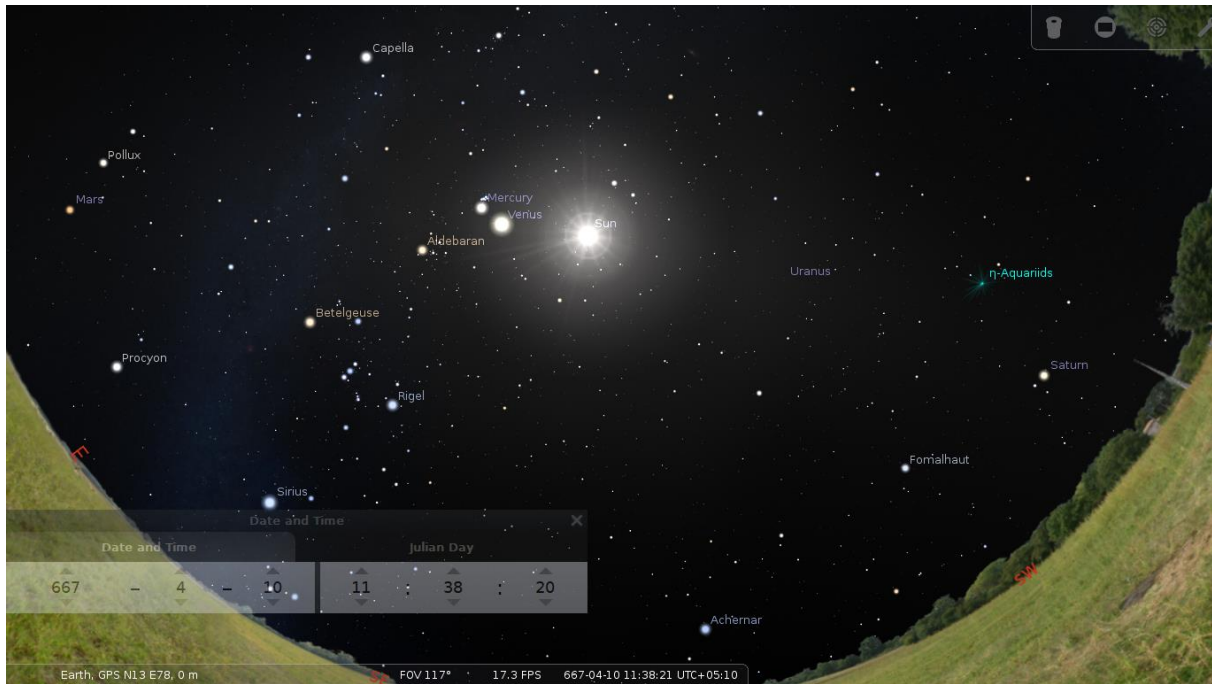


Figure 1: The Stellarium image of CE 10 April 667 shows the positions of planets. The grouping of Venus and Mercury is at the border of Aries and Taurus, the assigning was perhaps decided by the numerical values as prescribed in the contemporary almanacs.

2.1 Some Specific Events

Thus, we see that so many details are available here to fix the dates of celestial events such as conjunctions. Here we discuss some specific events that need more detailed analysis.

2.1.1 Possible Supernova Records as Metaphors

As mentioned earlier, the supernova of 1054 was referred to in a phrase that was an adjective for the Lord whose image was being installed. This phrase “*śukra tāra prabhāvāya*” meaning one who can influence a star to glow like Venus, is unusual.

Here is another example. The temples dedicated to Lord Vishnu glorify his various forms. The name *Trivikrama* is a bit unusual, and there are two inscriptions where this name is cited.

Trivikrama refers to the incarnation of *Viṣṇu* named *Vāmana*, who conquered the three worlds in three steps. The story narrates that he approached King *Bali*, who was known for his generosity, when he was performing a sacrifice and was offering land to all those who deserved it. The king was surprised by this request for land of a mere three steps, but as soon as this was granted *Trivikrama* grew to an enormous size. The whole Earth was just one step, the sky was another step, but where would he place the third step? The king offered his own head and was eventually pushed to the un-

derworld (*pātāla*). This name *Trivikrama* has gained a place in the sky as well. The three optical doubles in Ursa Major were named *Trivikrama* in the sixteenth century catalogue *sarvasiddhānta raja* by the astronomer Nityananda (Shylaja and Venketeswara Pai, 2019).

The first inscription that praises *Trivikrama* is Prasat Kok Po Inscription number 125. It provides the date as 926 Śaka (1004 CE). It describes the jewel (named *Koustubha*) on the chest of the Lord *Trivikrama* “... shining as bright as the sun.” This assumes importance because the star β Centauri is named *nṛpada* (the foot of a man). We may speculate if the poet imagined a human figure with the stars of Lupus and put the mythical act of putting the foot on the head of the king there. The hint is to the bright object—the supernova of 1006. (It may be that the foot of man was coined based on the Western name, but it is not known if the name Centaurus had been introduced by the tenth century).

The second reference to *Trivikrama* appears in the Angkor Thom Inscription no 116 attributed to the period of Jayaraman IV who flourished during CE 942–970. The verse is followed by another describing the weapons in the two hands of the idol of the God—they razed *Rāhu* (the ascending node personified as a demon) who had engulfed the Sun and the Moon.

The speculations can be confirmed by searching for a more elaborate description, which may be available in part of the inscription in the Khmer language.

2.1.2 The Interpretation of Ketu

The inscription dated Śaka 1217 attracted the attention of Arthur Beer (1951) because of the word *Ketu*. This inscription is from the Angkor Wat temple in Cambodia, which runs to 67 verses. French archaeologist Henri Mouhot found this 'stele'. It reads as follows:

In the year 1217 (of the Śaka era – corresponding to 1295 AD) on the 12th day of the first half of the month of Vaiśākha, on a Thursday, under Chitra ... the king erected these two statues. Sun and Saturn were in Taurus, Mars and Rahu in Gemini; Moon in Libra; Jupiter in Scorpio; Mercury, Venus and Ketu in Aries. The ascendant being in the sign of Cancer ... (ibid.).

It should be noted that in this inscription the positions of both *Rāhu* (ascending node) and *Ketu* (descending node) have been specified, but they are not 180 degrees apart. The date 28 April 1295 agrees very well for all the other planets except *Ketu* (Balachandra Rao, private communication). Beer (ibid.) explored the possibility of *Ketu* being 'Keid', the invisible planet, cited by Arab astronomers. *Ketu*, with the prefix *Dhūma* (smoke), is also the word for a comet.

Another inscription mentioning the solar eclipse of 15 May 1295 at the ascending node is very handy in deciding the positions of the nodes (Shylaja and Geetha, 2014b). The longitude of *Ketu* is at 15^h 57^m and the cited position in Aries is obviously incorrect. That leads us to the question: Was there any object mistaken for a comet in and around Aries around this time?

One possibility is the pre-planetary nebula eruption of NGC 7662 which has two ellipsoidal shells (Guerrero et al., 1996). The kinematic ages are $(700 \times d/800)$ years and $(1050 \times d/800)$ years, where d is the distance, derived as 800pc. If '*Ketu*' in the inscription is this event of brightening mistaken for a comet, it is the record of eruption as a new bright star 700 years ago.

2.1.3 Other Interesting Events

An online resource in French has provided some details. It talks of the two versions of the *Sūryasiddhānta* that were in use. Conjunctions with bright stars like Aldebaran also are recorded. We see a lunar eclipse recorded on CE 3 May 980 at Angkor Thom, Phum Ta Tru (IK 474,02). The *Viṣṇuvasankrānti* (the vernal equi-

nox) is recorded on 25 March 1042, in Kamphang Nai, Thailand (IK 372) (Billard, 2006). However, these two records do not give any other details. The original inscriptions need to be studied again, since the footnotes for the tables indicate that many other details are also available. It is certainly difficult to understand the discussion without the original texts.

We notice that there are two records spaced apart by a month approximately. The planetary positions are also provided and are verifiable. This is for the Śaka 589 (CE 667). The first one corresponds to 29 March and the second 15 April. The planetary positions match and the movement of Mercury from Aries to Taurus is recorded. There is another inscription

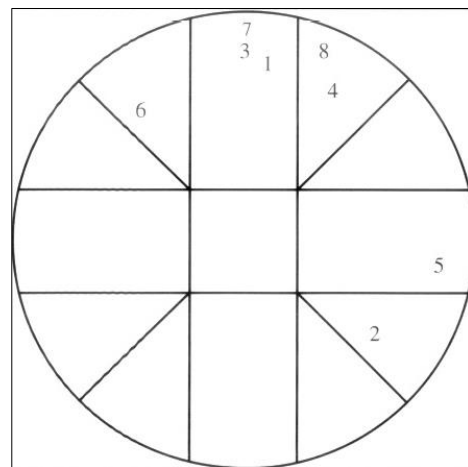


Figure 2: The diagram depicting the planetary positions for 17 March 704 at 19h 16m, reproduced from Billard (2006). The note adds that the Moon's position in Sagittarius is missing. It should be interesting to see how the planet names / symbols are engraved. The photograph may be viewed here <https://db.sac.or.th/inscriptions/inscribe/detail/1433>

dated CE 17 March 704, with a horoscope also written down marking the planetary positions as shown in Figure 2. Billard (2006) was able to identify the position of the Moon from these details.

There are two more inscriptions for the same Śaka year with the astronomical details in the Khmer language. One record also mentions an intercalary month (ibid.). This is intriguing, and we speculate that some important event must have occurred in that year. This is justifiable since we have seen five records of a solar eclipse viewed in different geographical locations (Shylaja and Geetha, 2016).

Another inscription has relevant details pictorially represented, akin to a horoscope (see



Figure 3: The Stellarium image of 21 April 967 to accommodate all the planets except Jupiter. All of these lined up in the east would have been a great sight at dawn.

https://www.persee.fr/doc/befeo_0336-1519_2006_num_93_1_6044).

The Sambapur Pillar inscription of Śaka 614 and 629 refers to a physician who lived for over 80 years. He is stated to have lived for 'one thousand months' (*āyursahasramāsa*). The same record has been discussed by Billard (2006), with a footnote on whether these are lunar or solar months. Interestingly, this event of an individual surviving 1000 Full Moons, is celebrated even today in southern India as 'sahasra candra darśana', which is effectively the 80th birthday + a couple of months.

Inscription number 188 is in the Pali and Khmer language. This is dated Śaka 1230 and historians attach importance to the mention of the *Hinayana* sect of Buddhism.

The inscriptions numbered 4 and 5 are important because they provide the earliest notation in the decimal system for the Śaka number 626.

3 DISCUSSION

The sample of inscriptions, although small in number, offers a great insight into the procedure of writing details of planetary positions. Quite interestingly, these details are not seen after about the thirteenth century. However, records in the Khmer language need to be studied carefully in this aspect.

A larger sample from the Indian subcontinent (Shylaja and Geetha, 2016) does not show many examples of inscriptions with the

planetary positions recorded in such detail. The other major difference is the usage of the zodiacal signs. The southern Indian records give details of the lunar calendar—the phase (*tithi*) and position of the Moon (*nakṣatra* star), and sometimes the time in *ghaṭika* units. The *zodiacal rāśi* rarely find a place. Only a few examples have been found in the seventeenth and eighteenth centuries. On the other hand, the mention of *rāśi* may already be seen in *Kamboja* records by the sixth century.

Contemporary records not only in India, but in Burma or Srilanka, do not have *rāśi* names but only *tithi* are mentioned; sometimes the name of the *nakṣatra* (the star near the Moon) is mentioned (Shylaja, 2021).

It is also interesting to see the name of the Chinese New Year as well as Buddha era, along with Śaka, in several inscriptions.

The *Navagraha* are the nine heavenly bodies and deities in Hinduism that influence human life on the Earth. There is an interesting discussion about the earliest-known mention of the *Navagraha*, in CE 967, which is perhaps in the Khmer language (Asger Møllerup, online source). The Sanskrit equivalent in the no 102, Bantay Srei Inscription gives the details in the 44th verse (Majumdar, 1953). However, there is no mention there of the clustering of the nine planets. At the time, the planets Mars, Jupiter and Venus were in Gemini; the others (the Sun, Mercury and Saturn) were in Aries; and the Moon was in Scorpio (see Figure 3).¹ At the

time of the ritual for which this inscription was written Aquarius was rising.

4 CONCLUDING REMARKS

We see that many interesting deductions can be arrived at by the study of these stone inscriptions. It is planned to publish all the details of all the inscriptions with astronomical details. Though the online source by Billard (2006) provides the dates, the astronomical details are not listed. While the Sanskrit part has been made available by the monumental work of George Cedes, the Khmer language portions need to be studied very carefully. As is clear from Note 1, below, it is also important to revisit the inscriptions and examine them in minute detail.

5 NOTES

1. This inscription is about the grouping of the planets on CE March 704. Ambiguity arises because the French translation lists Śaka,890 (which corresponds to CE 968 and the planetary positions do not match) as the year, while the notation in the script says Śaka,889. This corresponds to CE 967 and the planetary positions match, as shown in Figure 3. Dr Orapin provided the

original photograph of the inscription, which was examined by Ms Geetha Kydala Gan-
esha. The verse begins with the number 89 followed by a dot and therefore the year is understood as 890. However, there is an unknown symbol before the 8 but resembling an 8. If we give weight to that symbol the number becomes 889 with a dot. The last word of the verse is *navashata..au* followed by yet another illegible syllable. This is clearly 889. We are studying the possibility that the symbol represents '8' and the dot is not zero, and we plan to publish these details separately later.

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7 REFERENCES

- Beer, A., 1967. Astronomical dating of works of art. *Vistas in Astronomy*, 9, 177–233.
- Billard, R., 2006. Dates des inscriptions du pays khmer. *Bulletin de l'École Française d'Extrême-Orient*, 93, 395–428.
- Majumdar, R.C., 1953. Sanskrit inscriptions of Kāmbuja. *Asiatic Society Monograph Series*, 8, 381–382.
- Roy, N.R., 1936. *Sanskrit Buddhism in Burma*. Calcutta, University of Calcutta (<https://ia802908.us.archive.org/10/items/in.ernet.dli.2015.181497/2015.181497.Inscriptions-Of-Kambuja.pdf>).
- Shylaja, B.S., 2019. Records of supernovae from India. *Current Science*, 116(08), 1430–1433.
- Shylaja, B.S., 2021. Investigating the astronomical histories of India and Southeast Asia: the role of stone inscriptions. In Orchiston, W., and Vahia, M.N. (eds.), *Exploring the History of Southeast Asian Astronomy: A Review of Current Projects and Future Prospects and Possibilities*. Cham (Switzerland), Springer. Pp. 653–672 (https://doi.org/10.1007/978-3-030-62777-5_23).
- Shylaja, B.S., and Ganesha, G.K., 2012. Project Reports: Stone inscriptions as records of celestial events. *Indian Journal of History of Science*, 47, 533–538.
- Shylaja, B.S., and Geetha, K.G., 2014a. Planetary conjunctions and occultation records in stone inscriptions in India. In Sôma, M., and Tanikawa, K. (eds.), *Proceedings of the Intensive Workshop on Ancient and Medieval Data: Compilation of Eclipse Data and Examination of their Reliability*. Tokyo, National Astronomical Observatory of Japan. Pp. 43–48.
- Shylaja, B.S., and Geetha, K.G., 2014b. Records of Ketu in stone inscriptions. *Current Science*, 107(10), 1751–1753.
- Shylaja, B.S., and Geetha, K.G., 2016. *History of the Sky – On Stones*. Bengaluru, Infosys Foundation.
- Shylaja, B.S., and Venketeswara Pai, R., 2019. Indication of the stars of the *Saptarshi Maṇḍala* and its vicinity. *Journal of Astronomical History and Heritage*, 22(2), 294–300 (<http://old.narit.or.th/en/files/2019JAHHvol22/2019JAHH...22..294S.pdf>).
- Online sources:
https://archive.org/details/VtyV_sanskrit-inscriptions-of-thailand-by-dr.-satya-vrat-shastri-vijaya-books-delhi
<https://db.sac.or.th/inscriptions/inscribe/detail/1433>
<https://angkor-database.asia/publications/planetary-alignment-and-navagraha-at-banteay-srei>
https://cdn.angkor-database.asia/lib/docs/publications/planetary-alignment-and-navagraha-at-banteay-srei/Planetary_clustering_and_navagraha_at_Ba.pdf
https://www.persee.fr/doc/befeo_0336-1519_2006_num_93_1_6044

Dr B.S. Shylaja hails from Bengaluru. She obtained a Masters in Physics from Bangalore University, and a PhD from the Indian Institute of Astrophysics, Bengaluru, where she researched Wolf Rayet stars, cataclysmic variables, metallic line stars and comets.



She developed an interest in the history of Indian astronomy after joining the Jawaharlal Nehru Planetarium, Bengaluru, in 1994. She studied Ragoonatha Charry's monograph on the 1874 transit of Venus written in the Kannada language, and has published on Indian temple architecture viewed from an astronomical perspective. Meanwhile, her work on stone inscriptions as unconventional records of celestial events has produced interesting results.

The manuscripts of seventeenth century which were hitherto untouched have attracted her attention, yielding information on calculation procedures. A star catalogue also has been studied providing information on the names of the stars used by Indian astronomers.

Shylaja has published many papers in Indian and international journals and conference proceedings, plus the book *History of the Sky—On Stones* (2016, co-authored by Geetha Kydala Ganesha) and the translation with commentary of the seventeenth century manuscript *Gaṇitagannaḍi: Mirror of Mathematics* (2020, co-authored by Seetharama Javagal).