Astronomy in Focus - XXX
Proceedings IAU Symposium No. XXX, 2018
M. T. Lago, ed.

doi:10.1017/S1743921319004010

Stone Inscriptions from South Asia as Sources of Astronomical Records

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Abstract. Stone inscriptions from all over India provide records of eclipses, solstices and planetary conjunctions. Extending the study to South Asia, to include Cambodia, Sri Lanka, Nepal and Thailand, threw light on many new aspects such as evolution of calendars independently from the influence of Indian system of time measurement as early as the 3rd Century BCE. Many interesting records of planetary conjunctions are available. One record from Cambodia hints at a possible sighting of the 1054 supernova, while another from Thailand suggests a pre-planetary nebula event.

Keywords. History of Astronomy, planets, eclipses

1. Introduction

Stone inscriptions were engraved to leave a permanent record of donations and grants given by the kings, their feudatories, chiefs, and village headmen. A good number of them record the heroic deeds of soldiers and commoners fighting enemies, or wild animals during hunting. In some cases they mark the self-immolation of ascetics, widows, and devotees. They also carry accurate records of the date in whatever local system, and show details of the positions of the Sun and Moon. Those details were written in different languages, and thus serve as important documents on celestial events.

The Archaeological Survey of India undertook the publication of these records (as Epigraphia Indica), and also the regional versions (as Epigraphia Carnatica), resulting in the *South Indian Inscriptions*. More than 40 volumes are now available, each averaging about 200 inscriptions (Shylaja & Geetha 2016a).

The most important aspect of this study for astronomers is the recordings of the visibility of the totality of solar eclipses. Five such records have been used, in order to place a limit on the path of totality and therefore on the range of ΔT, the variation of the rotation period of the Earth. In one case it has been possible to link a record with one from China (Tanikawa *et al.* 2019).

2. Inscriptions from South Asia

The influence of Indian culture and Sanskrit were widespread in S and SE Asia, so this type of documentation might well be expected outside India. Documentation and translations of inscriptions from several countries were carried out during the colonial era. This paper summarized the results, based on a limited number of records and references.

Sri Lanka. The majority of inscriptions from Sri Lanka were the edicts of Buddha. It is estimated (though no specific dates are mentioned) that they date back to 3rd Century BCE when King Ashoka spread the messages of the Buddha across SE Asia. The earliest dated record corresponds to 183 CE. The languages used were mostly Sanskrit and Pali. The method of reckoning the year is BE (Buddha Era); the name of the month and the

lunar phases are mentioned, but there is a conspicuous absence of the name of the day of the week (Vara) (see Epigraphia Zeylanika, Vol II and Vol III).

The count of the year in many records corresponds to Shalivahana Saka (78 CE). Numerals are written down as words and numbers; for example, 327 is written as 300 027, a method also seen in contemporary records in India.

One record uses the word *nabhomarakayam*, which is interpreted by epigraphists as lunar eclipse. Using the information that it was the 13th year *trisahita dasame* (or 3 with 10) of King Shrisanghabhodi (982–1017 CE), we arrive at the lunar eclipse of CE 955 Jul 14. The month is given as Nikini (a translation of Nabhas, the Vedic name corresponding to Jul/Aug). There is another record of a solar eclipse in CE 982 Sep (Müller 1883).

Nepal. Most of the inscriptions in Nepal are edicts for administrative purposes; they cover a period from about the 3rd century BCE to the 12th century CE. While the lunar phase and year count are available, the absence of a specific choice of events such as eclipses is noticeable. The information is therefore insufficient to deduce any astronomical event that could have occurred. Again, there is no mention of the vara (day of the week), and the Saka year is written in numerals (Agarval 2010).

Cambodia. Studies by French epigraphists have been a great help in understanding the texts which are available in Khmer; many are bilingual, and Sanskrit is also widely used. The inscriptions are now being translated to English. The historian Majumdar (1953) produced direct translations of Sanskrit verses, though the ones in Khmer have not yet been decoded fully. Most of the inscriptions provide complete details of the positions of the Sun, Moon (with phases), planets, nodes and even the ascendant (lagna), so the time of an event can be fixed quite precisely. The planetary positions are verifiable and agree within a few degrees with the positions from modern calculations. Interestingly, there is no emphasis on events like eclipses. While the year count is similar to the one on the mainland, Shalivahana saka, in some places the Chinese method of counting is followed.

In an inscription of 605 Saka (equivalent of 683 CE), the date is written down as numerals – the first ever record of decimal notation. Generally the numbers are written in text, e.g., "five added to six hundreds". In the South Indian records, numerals are avoided by following the bhuta sankhya system, whereby objects are used to specify a number; for example, an eye or a hand refers to 2, a 'muni' or sage ('wise man') to 7.

The word *dhumakethu* is mentioned for a comet; however the date is not readable.

The names of the zodiacal constellations start to appear after about the 7th Century, e.g. *Bhouma* (son of the Earth, Mangala, Mars), *Induja* (son of the Moon, Budha, Mercury), and *Arka* (the Sun). *Guru* (Jupiter) is with the Moon in *apa* (water, Sagittarius). Venus, Shukra, is in *keeta* (a small creature, viz. Scorpius).

An inscription in Sanskrit and Khmer (Fig. 1) for worship by an ascetic includes a phrase praising Lord Shiva by *shukra tara prabhavaya*, and may be a record of SN 1054.

There are many Sanskrit inscriptions in and around Angkor Wat. Many of them have been translated into French, through the efforts of Cedes (1968). One of the inscriptions (Beer 1967) refers to the year 1217 of the Saka era (corresponding to 1295 CE), or the 12th day of the first half of the month of Vaishakha, on a Thursday, in the month Chitra, when the king erected two statues. The Sun and Saturn were in Taurus, Mars and Rahu in Gemini, the Moon in Libra, Jupiter in Scorpio, Mercury, Venus and *Ketu* in Aries, and the ascendant in Cancer. *Ketu* can mean either a comet or a descending node. However, in the absence of either of them at the specified location, we deduced a possible pre-planetary nebula event based on the rings around it. A Chinese record reports a very interesting case of two eruptions in the same month, but is dated CE 1297 Sep 9–18 (Shylaja & Geetha 2014).

https://doi.org/10.1017/S1743921319004010 Published online by Cambridge University Press

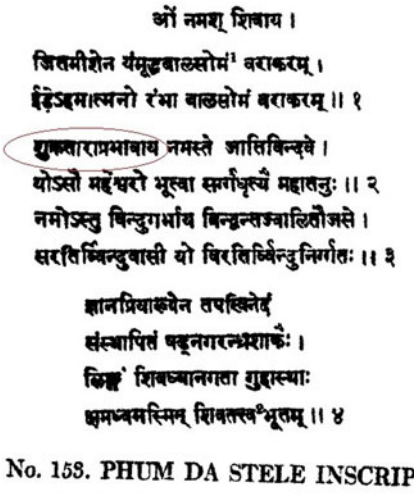
ओं नमश् शिवाय ।
जितमीशेन यंमूढबालसोमं[1] वराकरम् ।
ईड्डेऽहमात्मनो रंभा बालसोमं वराकरम् ।। १
शुक्रवाराप्रभावाय नमस्ते जातिविन्द्वे ।
योऽसौ महेंधरो भूत्वा स्वर्गधृस्यै महातनुः ।। २
नमोऽस्तु विन्दुगर्भाय विन्दुन्तज्वालितौजसे ।
सरतिर्भ्विन्दुवासी यो विरतिर्भ्विन्दुनिर्गतः ।। ३
ज्ञानप्रियाख्येन तपस्विनेदं
संस्थापितं षड्नगरन्ध्रशाकैः ।
लिङ्गं शिवध्यानगता गुहास्थाः
क्षमध्वमस्मिन् शिवतत्त्व[2]भूतम् ।। ४
No. 153. PHUM DA STELE INSCRIPTION,

Figure 1. The inscription of interest (number 153 on page 382 of Majumdar 1953) is from a small village called Phum Da in the Kampong Cham province, written partly in Sanskrit and partly in Khmer. The Sanskrit part has the *saka* year mentioned in the *bhuta sankhya* system as *sat* (6) *naga* (7) *randhra* (9). The phrase praising Lord Shiva include an adjective *sukra tara prabhavaya*, which means *"one who creates a star as bright as Venus"*, and could well suggest SN 1054 since the year (Saka 976) is equivalent to 1054 CE.

3. Conclusions

This study revealed that many interesting events are recorded in these inscriptions. It threw light on a different system of reckoning of time, called the 'Buddha era', which is not very common in India, and can help us understand the evolution of the calendars, e.g., through the introduction of the 12 zodiacal signs along with the 27 star system. It has also shown the importance of these records in the context of fixing the variation in the rotation period of the Earth (see Stephenson *et al.*, page 160).

The figurative description of CE 1054 is particularly interesting, as it could indicate the supernova. This possibility was missed by historians, who would be concentrating on the genealogy of kings, their coronations and the duration of their reigns.

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https://doi.org/10.1017/S1743921319004010 Published online by Cambridge University Press