

## Astronomical significance of two Mohenjodaro seals

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**Abstract.** It is shown that the Mohenjodaro Seal No. 420 is a representation of the four constellations corresponding to the four cardinal points of vernal equinox, summer solstice, autumnal equinox and winter solstice at the epoch of 3000 BC. Similarly it is shown that the Mohenjodaro Seal No. 430 represents the remarkable configuration of the sun, moon and five planets on 7th February, 3104 BCJ, which corresponds to the so called beginning of the astronomical Kaliyuga.

*Key words* : Mohenjodaro seals—solar system

### 1. Mohenjodaro Seal No. 420

It is often stated that the zodiacal constellations i.e. the *Rāśis* were borrowed by the Indians from the Greeks. The Indian names of the *Rāśis* from *Meṣa* to *Mīna* indeed appear to be the translations of the respective Greek nomenclatures from Aeries to Pisces. However, it is unlikely that the Indians, who invented the system of 27-28 *Nakṣatra* (asterisms) for specifying the position of the moon, would not have hit upon the idea of 12 *Rāśis* to specify the position of the sun during each month. There is evidence to show that this was the case albeit with different set of animals to represent the *Rāśis*. We would like to draw attention to one such evidence in the form of the Mohenjodaro Seal No. 420.

Around 3000 BC the position of the sun on the four cardinal days was as follows :

- Vernal equinox —  $\alpha$  Tau (*Rohini*) in Taurus,
- Summer solstice —  $\delta$  Leo (*Pūrvā Phālguni*) in Leo
- Autumnal equinox —  $\alpha$  Sco (*Jyesthā*) in Scorpio
- Winter solstice —  $\alpha$  PsA (*Śatabhisag*) in Aquarius.

Mohenjodaro Seal No. 420 (figure 1) depicts exactly these positions by four animals around a central figure, which represents the four Indian zodiacal constellations. On the lower right we have the he-buffalo instead of the bull or Taurus. It is followed in the clockwise order by the tiger instead of the lion i.e. Leo, the elephant instead of the Scorpio and the wild boar instead of Aquarius. For the identification of the elephant we refer to *R̥gveda* 2.23.1 where the elephant god Ganesh or *Brahmaṇaspati* is called *Jyestharājā* (the lord of *Jyesthā* i.e.  $\alpha$  Sco). In fact the three *Nakṣatras*, *Anurādhā*, *Jyesthā* and *Mūla*, which form the constellation of Scorpio, beautifully represent the head and trunk of an elephant. For the identification of the wild boar we refer to the puranic story of *Varāha* who lifted

## Mohenjodaro (M 420)



## Prajāpati Brahmā

Figure 1. Mohenjodaro Seal No. 420.

the earth from the ocean, which is an allegory to rejuvenation of the sun after the winter solstice. As Fomalhaut ( $\alpha$  PsA) is the only bright star in this region, it was identified with the horn of the wild boar.

The figures of Ganesha and he-buffalo are again significant from the point of view of the Vedic cosmology. At that epoch, in the six months from *Jyestha* to *Kārtik* the sun was in the northern hemisphere or the *Devayāna* assigned to the gods. Hence Ganesh was made the leader of the gods i.e. Ganapati. Similarly, during the next six months the sun was in the southern hemisphere or *Pitryān* assigned to *Pitrs* (the manes) and lorded by Yama. Hence its beginning was represented by the he-buffalo which is the *Vāhana* (vehicle) of Yama.

The central figure in the seal, with the *lingum eructus* position is that of *Prajāpati Brahmā*, the lord of the civil year which was started at the autumnal equinox. According to the mythological story based on a tale described in *Rigveda* 10.61.5 to 9, *Prajāpati* was enamoured by his daughter. When she took the form of a she-deer, *Prajāpati* went after her in the form of a he-deer. Seeing this heinous crime Rudra killed him by shooting an arrow.

This story is depicted in the sky with *Mṛga* (Orion) as *Prajāpati*, *Rohiṇi* (Aldebaran) as his daughter and *Vyādha* (Sirius) as Rudra. The story is actually an allegory to the sliding back of the vernal equinox from *Mārgaśīrṣa* ( $\lambda$  Ori) to *Rohiṇi* ( $\alpha$  Tau), which is the same thing as the shifting of the autumnal equinox from the month of *Mārgaśīrṣa* to *Kārtik* at about 3200 BC.

The *Mahāśivarātri* festival had a special significance in the epoch of 3000 BC (Abhyankar 1990). At that time it represented the longest *śivarātri* of the year, which would be naturally closest to the winter solstice. As the night of *amānta Māgha* K 13/14 is called *Mahāśivarātri*, the sacrificial year, which used to start near the winter solstice in the ancient times, would have been started on *Phālgun* S 1 in the epoch when the *Mahāśivarātri* festival was initiated. At that epoch the sun would be in *Śatabhisag* *Nakṣatra* at winter solstice and the vernal equinox would be at *Rohiṇi* as shown in the Mohenjodaro Seal No. 420.

## 2. Mohenjodaro Seal No. 430

It is often assumed that Aryabhata's assumption that the sun, moon and five planets were in conjunction with the zero point of the Hindu zodiac, i.e.  $\lambda$  (285 AD) = 0, at the beginning of Kaliyuga from his astronomical constants. We would like to show that it was most probably based on an actually observed remarkable configuration of these bodies on 7th February 3104 BC in the first month of the sacrificial calendar, which is depicted in the Mohenjodaro Seal No. 430.

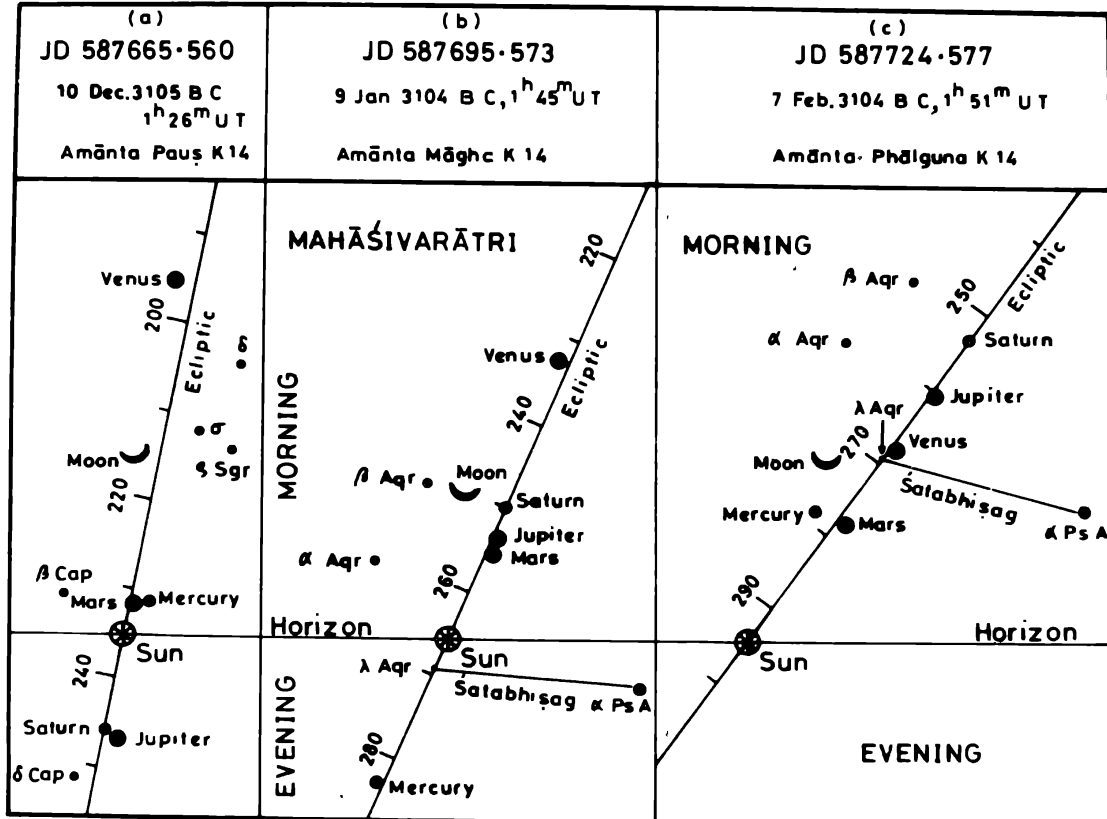


Figure 2(b) and (c). Planetary configuration on 9 January and 7 February, 3104 BCJ.

G. M. Ballabh has written a computer programme for calculating the positions of the sun, the moon and the planets on any desired date; his results are in agreement with and superior to the commercially available LOADSTAR programme. Figure 2(b) shows the position of these luminaries on 9th January 3104 BCJ (JD 587698.573) at the time of sunrise in Ujjain, which was the dawn after *Mahāśivarātri* of the year 3104 BC. We see that the sun is at  $\lambda = 272^\circ$  which is close to *Śatabhisag* (Fomalhaut). Hence the sacrificial year was started on *Phālgun* S 1, which occurred on 11th January 3104 BCJ. The positions of the luminaries at sunrise on 10th and 11th January are shown in figure 3(b); here the filled symbol represents the position of the moon on 10th January (*Māgha amāvāsyā*) and the open symbol represents its position on 11th January.

The configuration of the seven luminaries at the end of the *śivarātri* of the first month of the year is shown in figure 2(c). Here we see a remarkable assemblage of the moon and the five planets within the arc of  $25^\circ$  in the east which must have been visible to everyone in the early morning sky before sunrise on 7th February 3104 BCJ. In fact this configuration is very much more striking than that at the beginning of the well known Nebunasser era of 26th February 747 BCJ. (E. W. Woolard, 1942). People would certainly remember such a phenomenon for thousands of years and it must be the basis of the tradition that the seven luminaries came together at the beginning of the year around 3000 BC. Aryabhata was most probably harking back to this tradition, but he made the mistake of assuming that the confluence took place at the point of the vernal equinox of his days (400 AD) based on the wrong theory of precession.

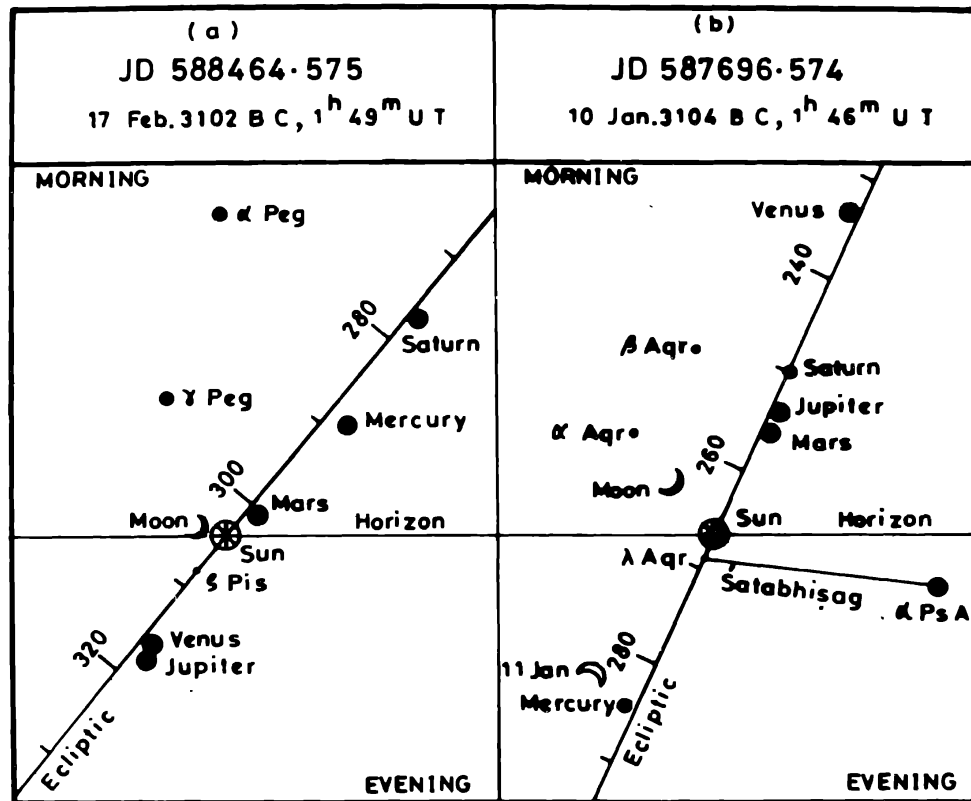


Figure 3(b). Planetary configuration on 10 and 11 January, 3104 BCJ.

It appears quite plausible that the seven figures in the Mohenjodaro Seal No. 430, shown in figure 4, represent the configuration of 7th February 3104 BCJ and the person in front of the firegod (Agni) within the branches of the peepal tree is starting the yearly sacrifice (*samvatsarasatra*) with the sacrificial goat behind him. The traditional date of 17th February 3102 BC is not far from this date and we can ignore the difference of two years in such a long time.

It may be noted that one of the figures in the seal has a halo over its head, so it most probably represents the sun. It has four figures in front of it and two behind. In that case the seal would be representing the actual configuration on the first day of the year viz. 11th January 3104 BC i.e. *Phālgun* S 1 with Venus, Saturn, Jupiter and Mars seen ahead of the sun in the morning and the moon and the Mercury seen behind the sun in the evening as can be seen in the figure 4.

### Mohenjodaro (M430)

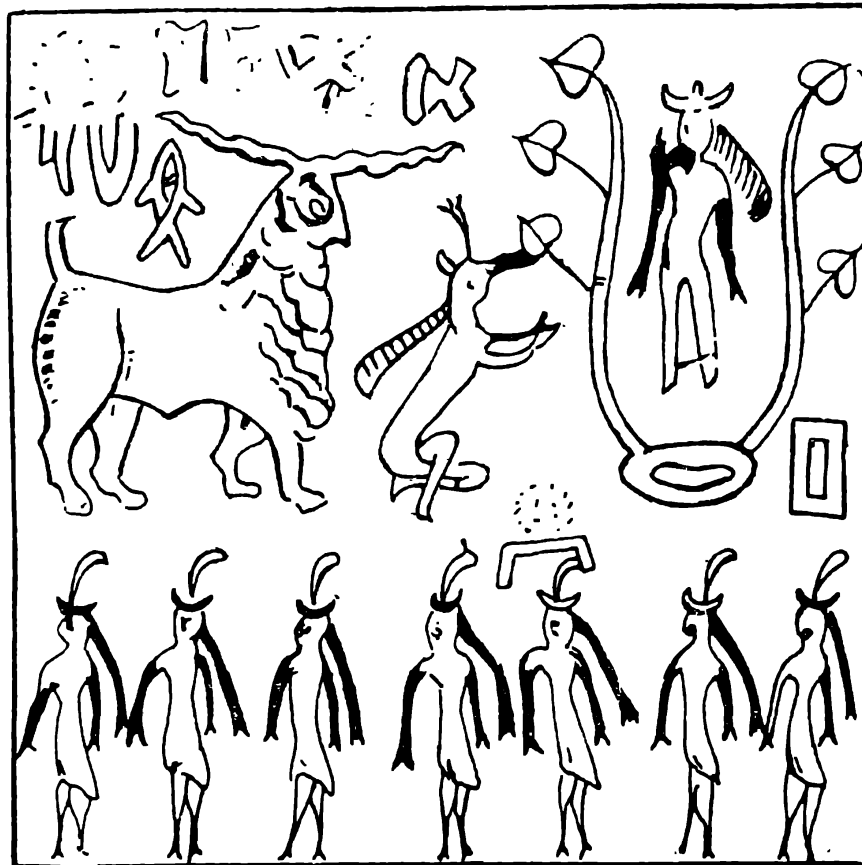


Figure 4. Mohenjodaro Seal No 430.

### References

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