

Stone alignment with solar and other sightlines in South India

Large megalithic stone structures were created by man from Neolithic times for sepulchral as well as non-sepulchral purposes, including astronomy¹. One of the most spectacular and well known of these is Stonehenge in England, which has definite astronomical associations^{1,2}. While several such sites have been reported in Europe and other regions, so far no reliable report of a megalithic astronomical site has been reported from the Indian subcontinent, even though it has a history of habitation going back probably to 40,000 yrs BP or earlier³. The megalithic culture in the subcontinent is rich with sepulchral structures, but possible use for astronomical purposes has not been established. Here we report for the first time a megalithic construction most probably used for astronomical observations at a site in South India. Apart from solstice sightlines, there seem to be specific markers for the setting points of important stars. A unique feature of this observatory compared to those in Europe is that it does not have a central location from which observations can be made, but involves multiple sightlines with shadows of several stones falling on other marking stones during days of astronomical importance.

Megaliths in southern India are believed to have been erected during the Iron Age (1200–500 BC), though the practice may have originated in the Neolithic period (3000–1200 BC) and continued into the Early Historic Period (500 BC–AD 500)⁴. Several of these monuments are constructed using large stones, but there are adaptations such as chambers carved in soft rock. They are largely sepulchral monuments, but stone alignments with a large number of stones are also known. Stone alignments recorded in South India consist of stones arranged in a grid usually aligned to the cardinal directions^{5,6}. Here we show that at least one such stone alignment at Byse in South India has strong astronomical associations.

Nilaskal Byana (lit. ‘field with the standing stones’) is a small, flat clearing in Byse village (13°49′45″N, 75°00′43″E) near the town of Hosanagara in Karnataka. In 1975, the site was reported as containing several menhirs (single standing stones) arranged in no particular pattern⁶. The site has not been reliably dated and excavations of cist burials nearby

yielded red and black ware, but no iron objects were found⁷.

We surveyed Byse between 2007 and 2010. The site consists of 26 menhirs of which 13 are still standing (Figure 1 *a*). The largest standing menhir is 3.6 m tall, 1.6 m wide and 25 cm thick (Figure 1 *d*). The menhirs are in two clusters in an area roughly 60 m × 60 m, though 23 of the 26 menhirs are in an area 30 m (E–W) × 60 m (N–S).

Assuming that the fallen menhirs are close to their original locations, we have

studied the layout of the 26 menhirs for alignments of two or more stones to the sunrise/sunset points on the horizon for both solstices (Figure 1 *b*). Assuming an angular error of $\pm 2.5^\circ$, we expect 10 sightlines to align to any 5° interval on the horizon by chance. We obtained a total of 19 solstitial alignments. Some of these involved three menhirs, while most involved only two stones. There seem to be three-stone sightlines that ‘link’ the two clusters of menhirs together for the solar alignment.

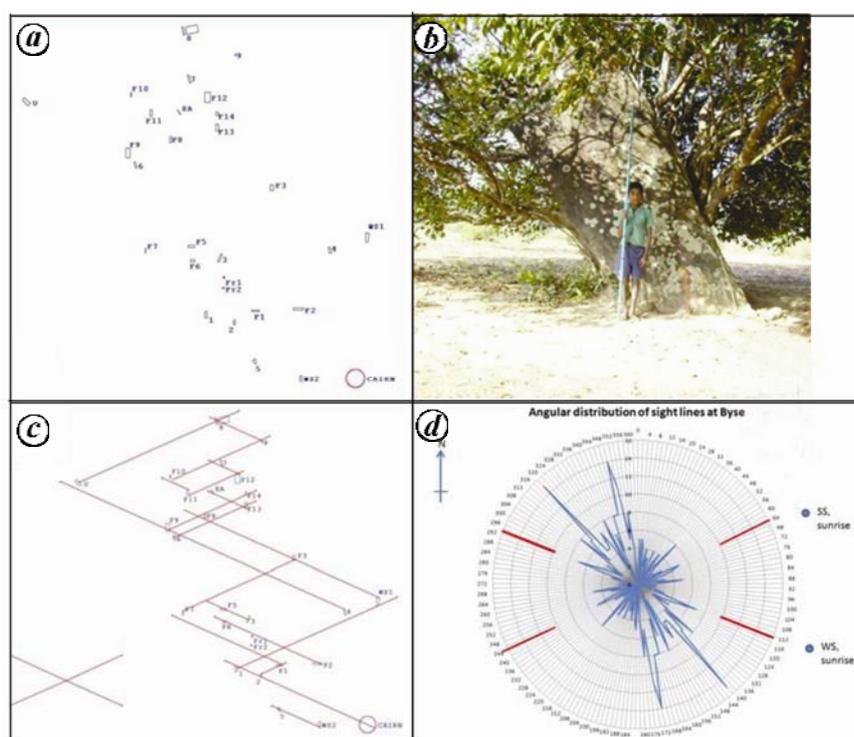


Figure 1. *a*, Layout of menhirs at Byse. *b*, Indicating sightlines to the solstices as well as the major and minor standstill moonrises and moonsets; *c*, Plot of directionality of all alignments of more than two stones at Byse; *d*, The largest menhir at Byse.

Table 1. The number of *k*-stone alignments expected by chance versus that actually observed for *k* = 2 to 7

Number of stones	Taking each edge as a sightline		Taking each stone as a sightline and 2 m separation	
	Expected by chance	Observed	Expected by chance	Observed
2	325	325	78	78
3	5.2	140	0.158889	13
4	0.0598	29	0.000221	1
5	0.000526	12	2.21E-07	1
6	3.68E-06	0	1.63E-10	0
7	2.1E-08	2	9.08E-14	0

In order to search for preferential sightlines (Figure 1c), we took the two edges of the stones to be to separate points since the stones typically tend to be about a metre wide. We took sightlines formed by any two stones and assumed that any stone within 1 m from the sightline belonged to the same sightline. The distribution of sightlines and the solstice points is given in Figure 1d. The results are given in Table 1, which shows that the sightlines are intentional rather than chance alignments. There are two sightlines of seven stones that point 11° west of north. The significance of the result does not change even if the midpoint of each stone is taken as the location. We have also calculated the alignments assuming each stone as a single object and the results are as expected (Table 1).

The most important are two sightlines in the 142° – 318° direction and 172° – 348° direction (from north as measured through east) with 16 and 14 lines pointing in this direction. Important stars that set at 348° in 1000 BC are Arcturus, Vega, Deneb and Capella, whereas Regulus and Pollux set at 318° . However, we desist from making stellar alignment interpretations, because of the large uncertainty of 2500 years in dating the monument.

The alignment of the menhirs at Byse seems intentional and possibly for astronomical purposes. At least for the sol-

stices, there are multiple sightlines to the same point on the horizon. This layout is different from other instances of astronomical alignments found in megalithic monuments elsewhere, which involve a centre of observation for any given astronomical event on the horizon. The intent of the site is not clear, but two of the menhirs are currently being utilized by the local population for ancestor worship. There are several unexcavated mounds in the clearing south of the menhirs, which also seem to suggest a sepulchral connection. Thus, this study provides the first strong evidence of a monument with intentional solar and possible stellar alignments among Indian megaliths.

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