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MEGALITHIC ASTRONOMY IN SOUTH INDIA

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Abstract: The megalithic monuments of peninsular India, believed to have been erected in the Iron Age (1500BC – 200AD), can be broadly categorized into sepulchral and non-sepulchral in purpose. Though a lot of work has gone into the study of these monuments since Babington first reported megaliths in India in 1823, not much is understood about the knowledge systems extant in the period when these were built – in science and engineering, and especially in mathematics and astronomy. We take a brief look at the archaeological understanding of megaliths, before making a detailed assessment of a group of megaliths in the south Canara region of Karnataka State in South India that were hitherto assumed to be haphazard clusters of menhirs. Our surveys have indicated that there is a positive correlation of sight-lines with sunrise and sunset points on the horizon for both summer and winter solstices. We identify five such monuments in the region and present the survey results for one of these sites, demonstrating their astronomical implications. We also discuss the possible use of megaliths in the form of stone alignments/ avenues as calendar devices.

1 INTRODUCTION

The megaliths of southern India form a class of enigmatic monuments (Ehrich, 1992), though nearly two hundred years of scholarly work has been devoted to them (Brubaker, 2001; Moorti, 1994). The first report of a megalith in India was by Babington (1823), in Kerala in southern India. The spectacular appearance of some of the megaliths in India attracted the attention of antiquarians early on (see Sundara 1975), but the first systematic excavation of a megalith was only carried out by Wheeler (1947) in 194x at Brahmagiri in present-day Karnataka State.

The work of these and other workers has established the date of the south Indian megalithic complex as contiguous with the Iron Age, that is, around 1500BC – 200AD (Moorti, 1994; 2008), though others have suggested the period 1200 – 500BC (Bauer et al., 2007). The origins of the megalithic culture in south India probably lie in the immediately preceding South Indian Neolithic (3000 – 1200 BC) (ibid.). Recent work by Morrison (2005) suggests that the construction of megaliths may have started as far back as the middle of the South Indian Neolithic.

The etymology of the word 'megalith' comes from the Greek words '*megathos*'—referring to the large scale—and '*lithoi*'—meaning the material, i.e. stone. Thus, megalith literally means 'built of large stones'. This terminology arose because the earliest monuments belonging to this category that were noticed were the ones with the most impressive surface markers. However, not all the monuments that are today categorized as megaliths in India were built of large stones! The usage of the misleading term 'megalithic' is, however, justified because of its antiquity and continued popular use. In the present context the term denotes a socio-religious expression of burying the deceased in a grave (which may or may not have a lithic appendage) accompanied by certain specific cultural traits of the period (Moorti, 1994; 2008).

A large majority of the south Indian megaliths are funerary in nature. However, the funerary aspect of this tradition is not entirely a new feature of the Iron Age. The antiquity of burial practice in India dates back to the Mesolithic period and marked burials began in the Neolithic (Agrawal, n.d.). Though evidence for an antecedent stage of 'megalithism' is found in the pre-Iron Age context, this tradition became very popular in the Iron Age and continued to survive into the Early Historic and even later periods. Though marked and unmarked burials were a feature of the Neolithic, the burials were mostly within the habitation areas and often within the living quarter itself; the Iron Age marks the emergence of a separate 'area of the dead'.

2 DISTRIBUTION AND CLASSIFICATION OF MEGALITHIC SITES

Though a few megalithic sites have been reported from North India (e.g. Burzahom and Gurfkral in Kashmir, and Gagrigol in the Kumaon area), by far the great majority of megaliths are found in the southern part of the country. The various megalithic types encountered are stone circles; dolmens; dolmenoid cists and cist burials; pit burials etc., apart from menhirs; stone alignments and avenues; as

well as rock-cut chambers; and the unique topikals and kudaikals of Kerala. In fact, in spite of this apparently bewildering variety of typologies one finds distributed all over the Subcontinent, they can be classified into a few broad categories.

For a detailed classification of Indian megaliths, the reader is referred to Moorti (1994; 2008). Basically, he classifies all megaliths into *sepulchral*—which contain the mortal remains of one or more human beings and *non-sepulchral*—which have no human remains associated with them. To the former category belong *pit burials* (unlined excavations where the remains are buried with a variety of surface markers like cairns or boulder circles etc.) and *chamber burials* (pits lined with stone slabs, often with a surmounting cap-stone, again with a variety of surface markers). In the non-sepulchral category fall megaliths like dolmens, menhirs, stone alignments and avenues. However, it may be pointed out that sometimes variations may be seen—such as menhirs being non-sepulchral in Karnataka, and markers for pit burials in Kerala (Sundara, 1975).

As mentioned earlier, in India, the megalithic period is supposed to coincide with the Iron Age—roughly 1500 BC to around 200 AD, with some amount of overlap with the early-historic period. This seems to be based primarily on the occurrence of iron tools and implements among the burial goods found along with human remains in a large number of megaliths. This is by no means a sound means of dating all types of megaliths, but especially those non-sepulchral in nature, such as stone alignments and avenues. In fact, Sundara (1975) even wonders whether the afore-mentioned typologies belong to the south Indian megalithic complex at all.

3 OUR INVESTIGATION OFTHE KNOWLEDGE SYSTEMS OF THE MEGALITH-BUILDERS

The state of technology possessed by the builders of the megaliths has been understood by conventional archaeology. Industries such as smithery, carpentry, bead-making, etc. are known to have been prevalent and metallurgical studies of the iron found in graves and production areas have attested to the excellent knowledge of metallurgy in the period (see Mudhol, 1997). The socio-economic systems extant in those times have been studied well too (Moorti, 1984; 2008). However, not much is known about the knowledge systems of these ancient engineers and builders. That they possessed refined engineering skills, and hence some knowledge of mechanics, visualization and, by implication of geometry and mathematics, there can be no doubt. The elegant design of dolmens such as the ones found at Hire Benkal made of very heavy and large blocks of stone (Figure 1) or a laterite rock-cut chamber burial in Kerala, crafted to perfection (Figure 2) bear testimony to this.

Figure 1: Dolmens at Hire Benkal.

Figure 2: A well-crafted rock-cut chamber in Kerala.

In 2007 we started a project with the objective of examining megalithic monuments in order to formally understand the knowledge systems their builders possessed, especially in astronomy. This is part of a larger project to understand the origins of astronomy in India, headed by Professor Mayank N. Vahia, whose paper on Indian megaliths, with special emphasis on the stone circles of Vidarbha, appears separately in this volume (Vahia et al., 2011).

Our objective was to investigate if the sepulchral megaliths followed any preferred orientation patterns, and also whether indeed some of the non-sepulchral types were designed to keep track of celestial events on the local horizon. Our plan of action was to study all classes of megalithic monuments and examine their orientations. From the literature we short-listed sites typical of each category of megaliths, preferably in different geographical regions. Reconnaissance visits were to be made to each of these sites to assess the condition in which they survived and to make preliminary measurements, especially of orientations. Promising sites were to be short-listed and detailed measurements made, including horizon surveys. From the above, we would try to conclude if any orientational preferences existed and indeed, if any class of monuments was intended to keep track of celestial events like solstices and equinoxes.

4 SUMMARY OF SITES VISITED THUS FAR

Over the last three years we have visited the sites listed in Table 1, which are mainly in the southern Indian states of Karnataka and Kerala, and studied the various classes of megalithic monuments found there.

Table 1: Megalithic sites that we have studied.

No.	Site	Type of Megalith Present
1.	Brahmagiri, Karnataka	Chamber burials, pit burials
2.	Marayoor, Kerala	Dolmens, rock art
3.	Burzahoma, Kashmir	Neolithic/megalithic pit burials, menhirs
4.	Bandipur, Karnataka	Chamber burials (previously unreported site)
5.	Hire Benkal, Karnataka	Dolmens, dolmenoid cists
6.	Onake Kindi, Karnataka	Rock art
7.	Nilaskal, Karnataka	Avenue (?)
8.	Baise, Karnataka	Avenue (?)
9.	Hergal, Karnataka	Avenue (?)
10.	Mumbaru, Karnataka	Avenue (?)
11.	Thrissur, Kerala	Rock-cut chamber burials, urn burials
12.	Aihole, Karnataka	Chamber burials, dolmens
13.	Bachinagudda, Karnataka	Dolmenoid cists
14.	Hanamsagar, Karnataka	Avenue
15.	Kyaddigeri, Karnataka	Chamber burials (destroyed)
16.	Chik Benkal, Karnataka	Dolmenoid cists (dilapidated)
17.	Vibhuthihalli, Karnataka	Avenue
18.	Bheemarayanagudi, Karnataka	Avenue (disturbed)
19.	Gudde Maradi, Karnataka	Avenue (?) (Destroyed)
20.	Santhekkatte, Karnataka	Menhir(?)
21.	Rajan Koluru, Karnataka	Dolmens
22.	Kakkunje, Karnataka	Dolmens (dilapidated)
23.	Konaje kallu, Karnataka	Dolmens (dilapidated)
24.	Aaraga Gate, Karnataka	Avenue (?)

The orientations of the various types of megaliths were measured. Some of the sites were found to be heavily disturbed (Chik Benkal, and parts of Brahmagiri) or completely destroyed (as at Kyaddigeri), making visits to these worthless from the viewpoint of collecting data. Two sites, at Bandipur and at Aaraga Gate, which turned up during our studies, were subsequently confirmed as previously-unreported. The sites at Nilaskal, Baise, Hergal, Mumbaru and Aaraga Gate were suspected to be avenues (i.e. menhirs arranged in some pattern) after reconnaissance, in spite of claims to the contrary in the literature (hence the '?' in the table above), so Nilaskal and Baise were visited twice more and surveys made of the menhirs.

5 PRELIMINARY RESULTS

As mentioned earlier, orientations were measured at all of the sites, wherever possible. In the case of sites with very large numbers of monuments (e.g. Hire Benkal, Hanamsagar and Vibhuthihalli), only a few random monuments and bearings were measured.

5.1 Sepulchral Megaliths

In general, the older typology (by stylistic dating) was found to be either without any preferred orientation pattern or mostly south-facing. The later typologies were mostly east- or west-facing. A large majority of the east- and west-facing monuments face points on the horizon that are well within the annual range of sunrise and sunset, leading to the conclusion that it was intended that they face sunrise or sunset on some days of the year. In this paper, we concentrate on the non-sepulchral avenue class of monuments.

5.2 Avenue Monuments

Among the non-sepulchral typologies, the avenue seems like a potential candidate for astronomical use. Two kinds of avenues were encountered during our surveys. The first consisted of the established avenue sites of Northern Karnataka, such as Hanamsagar, Vibhuthihalli, etc. According to Allchin (1956), Paddayya (1995), Kameswara Rao (2005) and Kameswara Rao and Thakur (2010), these are grids of rough, undressed stones of varying dimensions and in large numbers. Our preliminary surveys at Vibhuthihalli conformed to the established view that the rows of stones were loosely aligned to the cardinal directions. That is to say, that the stones—which are believed to have been rolled down the slopes of the low, boulder-strewn outcrop to the west of the avenue and manoeuvered into position—are scattered closely along grid-lines that align to the cardinal directions. At Hanamsagar, though we do not have survey data to substantiate the facts, we call into question the very shape of the monument. An aerial view taken from the hill on the west seems to suggest a curvature in the alignment of the rocks (see Figure 3).

Figure 3: A view of the stone alignments at Hanamsagar.

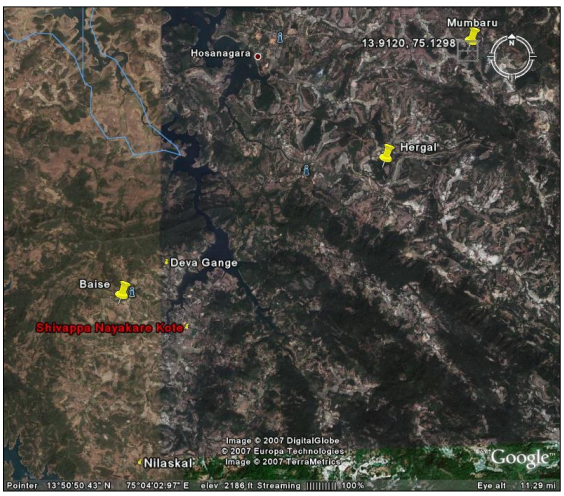

Figure 4: Location of the four menhir sites.

5.3 The Nilaskal Group of 'Menhir Sites'

Near the town of Hosanagara in southern Karnataka is the Nilaskal group of 'menhirs sites' described by Sundara (1975; 2004). These 'menhirs' were also reported by Narasimhaiah in 1959 and subsequently studied by Sundara. Sundara (2004) also reports three other sites, at Baise, Hergal and Mumbaru. For the locations of these sites, refer the Google Earth image in Figure 4.

These sites consist of a large number of menhirs made of either quarried stone slabs (as at Nilaskal) or natural elongated stones of lenticular cross-section (Hergal and Mumbaru), or a combination of both (Baise; Figure 10). The menhirs at Nilaskal were recorded as menhirs, "... erected haphazardly, unlike those of Vibhutihalli or north Karnataka." (Sundara, 2004; cf. Sundara 1975). They were also recorded as being about twenty in number, with the remnants of a few more. However, our studies have revealed the remains of more than one hundred stones at Nilaskal (see Figure 5). We have also noted that all these menhirs are erected with their long axis of cross-section oriented north-south (Figure 6). In addition, we have recorded evidence for many pairs of stones forming sight-lines to the sunrise and sunset points on the local horizon during both the solstices, at Nilaskal as well as Baise (Figures 7 and 8). In fact, at Baise, all the menhirs pair up with other menhirs to frame the rising and setting Sun at the solstices, effectively forming a 'solstitial grid' (see Figure 9). We can say for certain that these sight-lines appear to be intentional, although we do not have sufficient evidence yet to determine whether the menhirs were arranged to form a 'calendar device' to keep track of time by observing the solar cycle.

The matter is complicated by the observation of what appears to be sepulchral typologies (a disturbed cairn, as well as several cairn-like mounds) in the vicinity of the menhirs at Baise. Menhirs in Karnataka were believed to be largely non-sepulchral, as the excavation of menhirs at Maski etc. indicates. However, Sundara's observations of cists near Baise and our observations suggest that all menhirs need not be non-sepulchral. Interestingly, Sundara's (2004) study of several exposed cists near Baise yielded pottery and human bones but no iron objects. This, coupled with his observation of Neolithic pottery shards at Nilaskal during a chance excavation for a road (Sundara, 1975), may even point to an earlier chronological time-frame for these menhirs sites.

Figure 5: Some of the menhirs at Nilaskal.

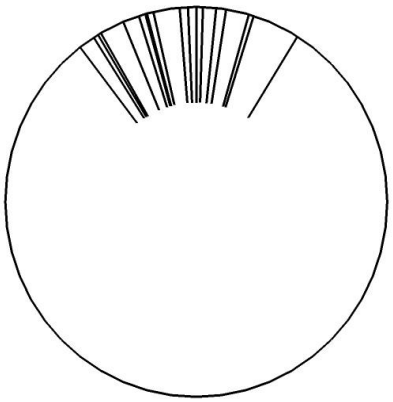

Figure 6: The orientation of menhirs at Nilaskal.

Figure 7: The winter solstice sunset framed between two of the menhirs at Nilaskal.

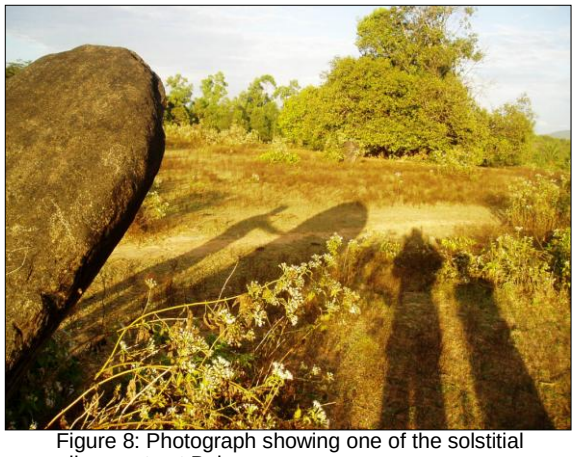

Figure 8: Photograph showing one of the solstitial alignments at Baise.

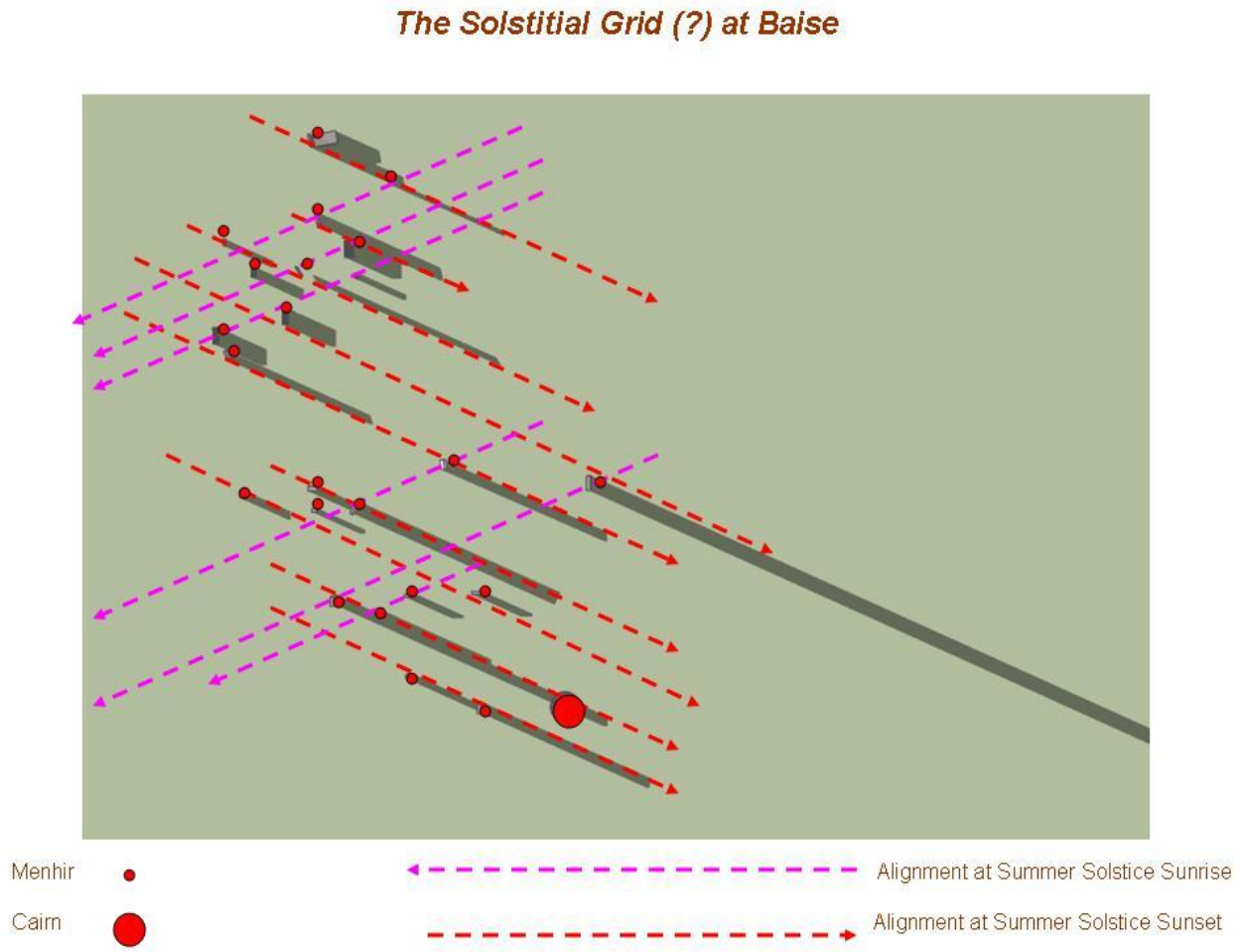

Figure 9: Diagram showing the 'solstitial grid' at Baise.

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Recently, we have chanced upon a hitherto unreported site at Aaraga Gate of similar typology in the same region, bringing the now known sites of this particular type to five. This leads us to propose this typology of menhir monuments as a new sub-class of avenue monuments, consisting of either natural boulders of elongated cross-sectioned or thin quarried slabs, oriented with their long axes of cross

section N-S and arranged so that pairs of them point to the sunrise/sunset points on the local horizon during solstices.

Also, at several places in the locality we have come across single stones near roads that conform to the same typology—an elongated cross-section with long axes oriented N-S—that leads us to wonder if they were parts of menhirs/avenue sites that were disturbed by road-building activities. If so, then this typology seems to have been quite prevalent in southern Karnataka.

6 CONCLUSION

The study of megalithic monuments to understand the astronomical knowledge of their builders, as evident from their form and orientation, is a challenging task, both because of the nature of the task itself and because of the fact that most of these monuments are unprotected (and thus have been heavily disturbed by development activities). Hence there is an urgent need to immediately study and document as many sites as possible. Our studies of the orienational preferences of megalithic monuments seem to suggest intentional orientation of several megalith typologies towards points of celestial significance on the local horizon. Especially interesting is the existence of a new sub-type of avenue monuments that consist of menhirs with elongated cross-sections oriented with their individual long-axes N-S and arranged such that several pairs frame the solstice sunrises and sunsets. While the intentional orientation of several pairs of menhirs to the solstice sunrises and sunsets does not by itself constitute a calendar device, a detailed survey and analysis of these sites could pave the way for a better understanding of megalithic astronomy in the Indian Subcontinent.

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