

# The Lion Capital from Udayagiri and the Antiquity of Sun Worship in Central India

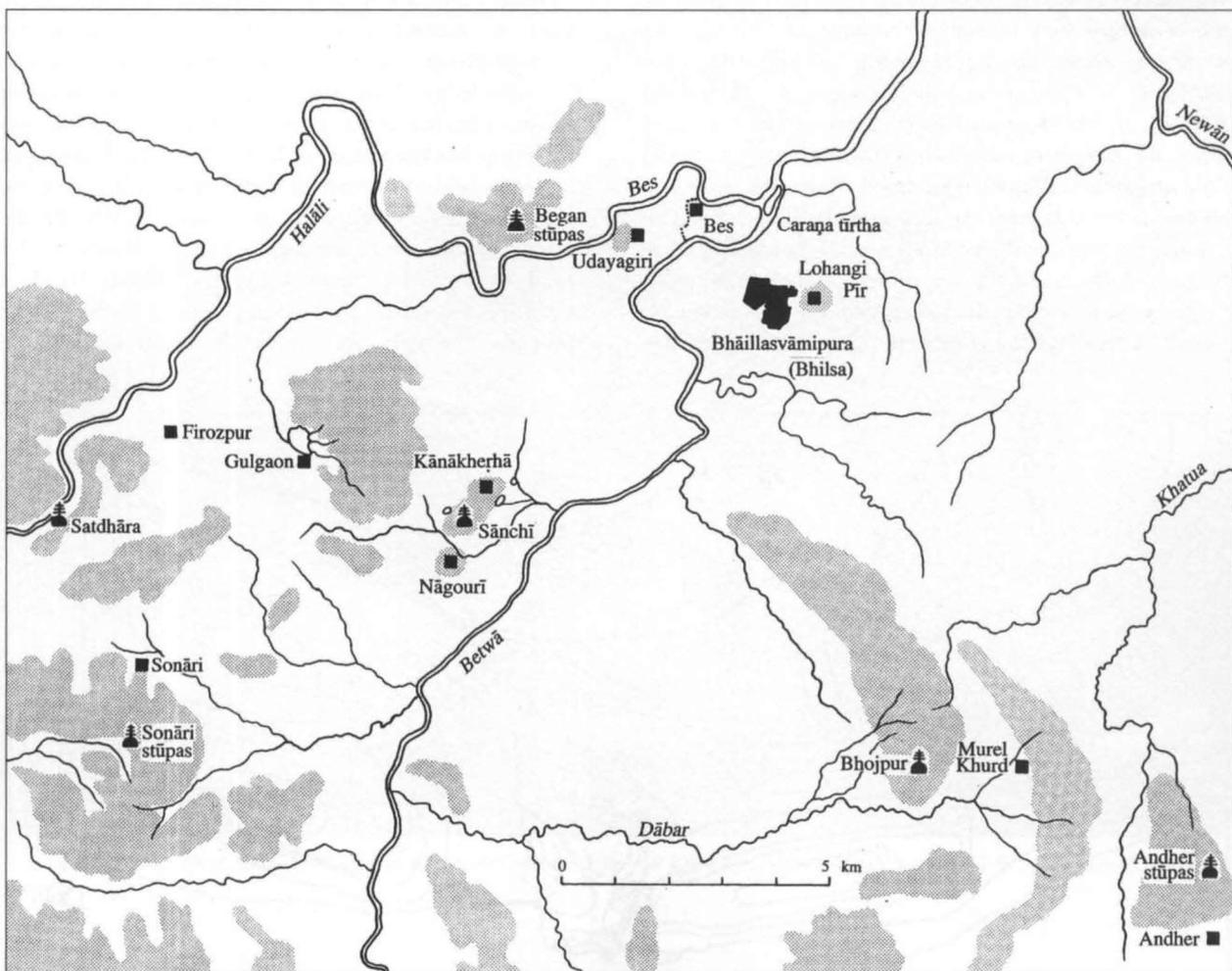
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## 1. Introduction.<sup>1</sup>

The monasteries at Sānchī and nearby sites leave little doubt regarding the social and cultural prominence of the Buddhist saṅgha in the Vidiśā region during the last three centuries BCE.<sup>2</sup> Buddhism was, however, obliged to share the religious landscape of central India with other cults of considerable power and antiquity. As this is a subject which has received little attention to date, the present paper takes up some early material which points to the veneration of the Sun god at Udayagiri from at least the second century BCE.<sup>3</sup>

## 2. Discovery and early publication.

Udayagiri, located just west of ancient Vidiśā, consists of two large sandstone hills or plateaux joined in the middle by a low ridge (Figure 1-2). Along the eastern side of the ridge are a group of well-known cave temples dating to the early years of the fifth century CE.<sup>4</sup> As the present authors found existing maps of the site to be inaccurate and inadequate in practically every respect, a scientific survey was organised and a series of detailed plans prepared. As will be clear from Figure 2, the hills have a shallow U-shape, with the northern hill touching



1. Vidiśā region. Map showing some of the leading archaeological and historical sites to the circa thirteenth century.

the banks of the river Bes. The prominence of Udayagiri attracted the attention of Edward Fell and John Bagnold, the first colonial officers sent to survey the antiquities of the area in 1818-19. Bagnold made a drawing of the Varāha image, the oldest surviving document of the sculpture.<sup>5</sup> Slightly later, in the 1850s, Charles Crump visited the site and produced the more detailed water-colour, illustrated here in Figure 4.<sup>6</sup> This shows the core area before it was encumbered with the emblems of twentieth-century progress: a metalled road, a boundary wall and a monstrous concrete shed designed to 'protect' the monument.

Alexander Cunningham was the first archaeologist to study Udayagiri in depth. Among his discoveries was the lion capital which is the subject of the present essay. Cunningham briefly described the capital as follows: 'Immediately over the caves there is a large square platform, beside which I found the bell capital of a large pillar surmounted by a lion'.<sup>7</sup> He gave no further details but subsequently included a drawing in his *Inscriptions of Asoka* (given here as Figure 5). Although this was the first published drawing, the illustration was provided without commentary on Cunningham's part. Thereafter, the sculpture was officially photographed in situ on several occasions, the oldest photograph appearing here as Figure 6. The capital was subsequently shifted, in 1927-28, to the Archaeological Museum in Gwalior.<sup>8</sup> Since the sculpture has been at Gwalior it has drawn little attention. Williams mentioned the capital briefly in an article on Udayagiri and opined that it belonged to the second century BCE.<sup>9</sup> More recently an attempt has been made to relate the sculpture to other early work in the region, notably the railings of stūpa 2 at Sānchī. Based on this stylistic comparison, the lion capital has

been dated to the closing decades of the second century BCE.<sup>10</sup> No other views on the piece have been published.

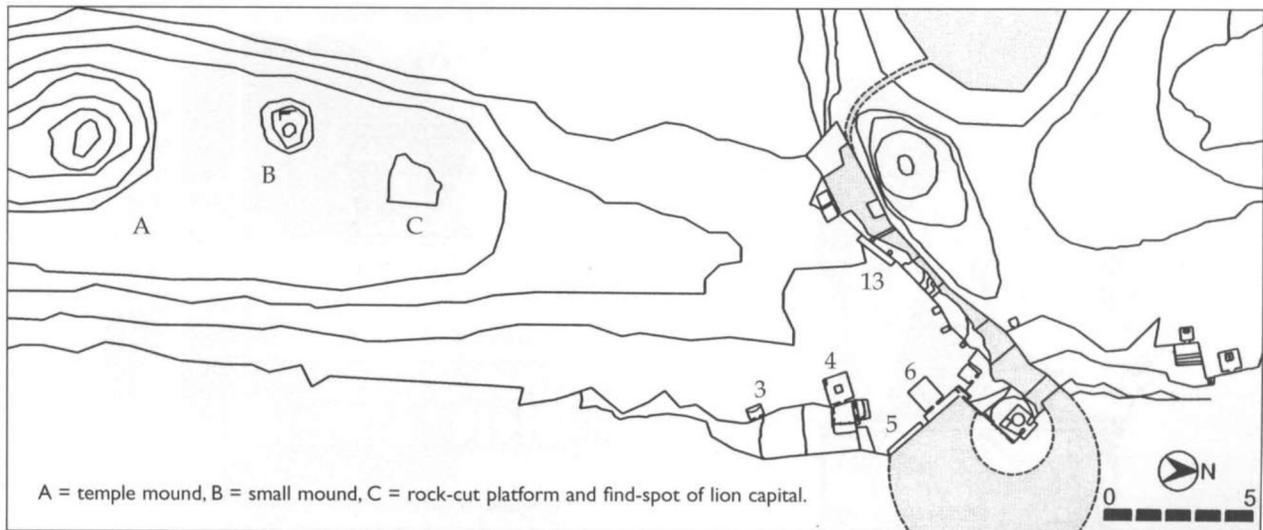
### 3. Description, location and reconstruction.

As will be seen from the illustrations given here, the crowning lion is shown seated on his haunches (Figures 6, 7). The head is missing but an approximate idea of its appearance can be gleaned from a piece in Allahābād.<sup>11</sup> Below the lion is a wide circular base with various animals carved in low relief. On one side is a bull, two fabulous winged creatures and a gaur, on the other is a winged tiger, an elephant, a horse and a double-humped camel. The likely meaning of this parade is taken up below (see section 11). Below the animals is a bell-shaped lotus capital (since arrival in the museum the lower portions have been restored in plaster).

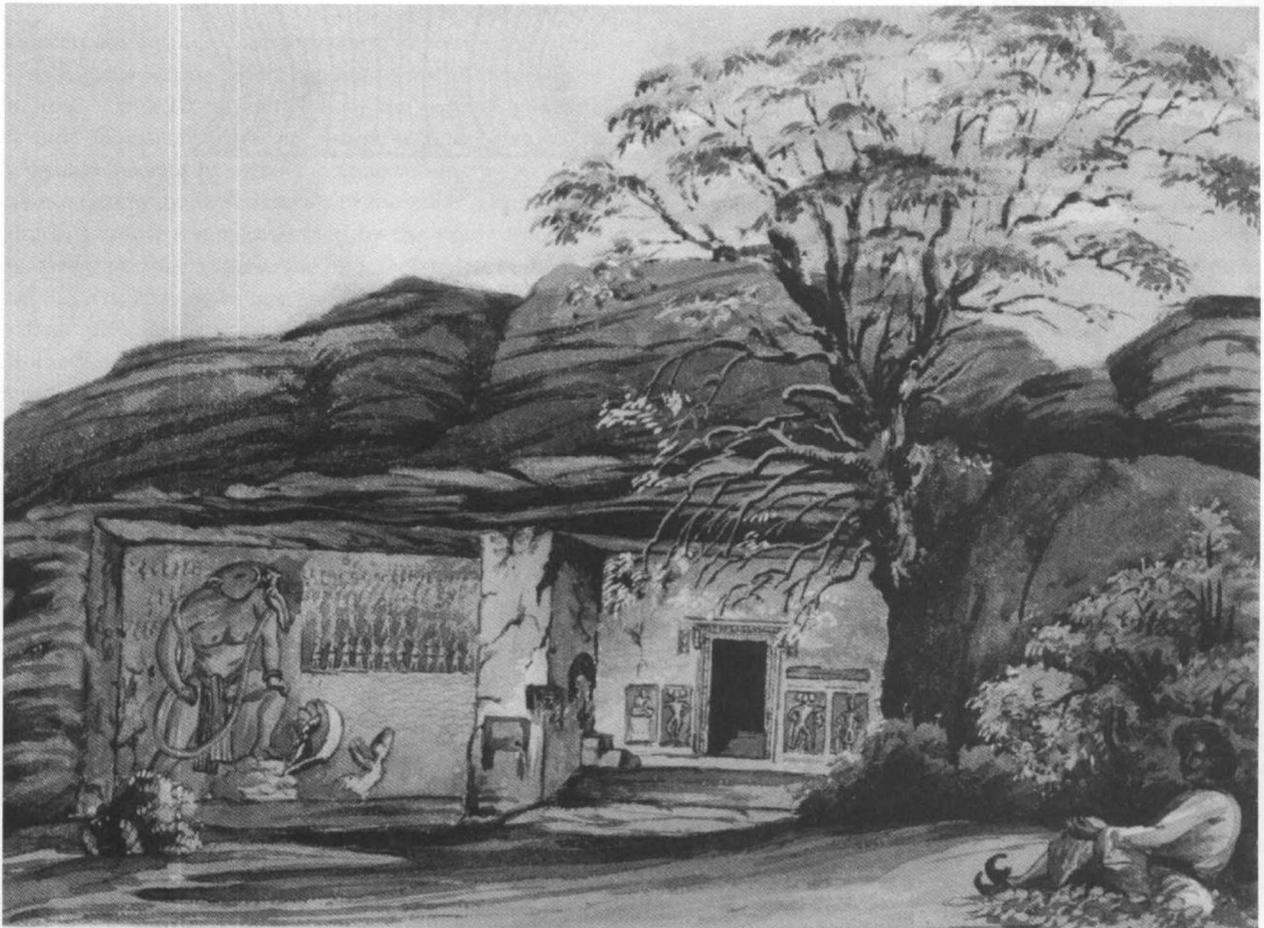
In the course of exploring Udayagiri and its history, the present authors were interested in discovering the original position of the lion capital in an attempt to elucidate the early history of the site. To this end, the old photograph given here in Figure 6 was taken to Udayagiri and a day spent trying to find the location. After an extended search, the distant hill in the photograph was identified as that near Began village and the rocky ledge in the immediate background identified as part of the low ridge that joins the two larger hills. As quarrying has been more or less restricted at Udayagiri, the ledge behind the capital is the same as it was in the early twentieth century. A close examination of the ground in the immediate area led to the discovery of a small chip of the capital's beading (Figure 8). This confirms beyond doubt that the capital rested at this location. The chip was evidently created when the



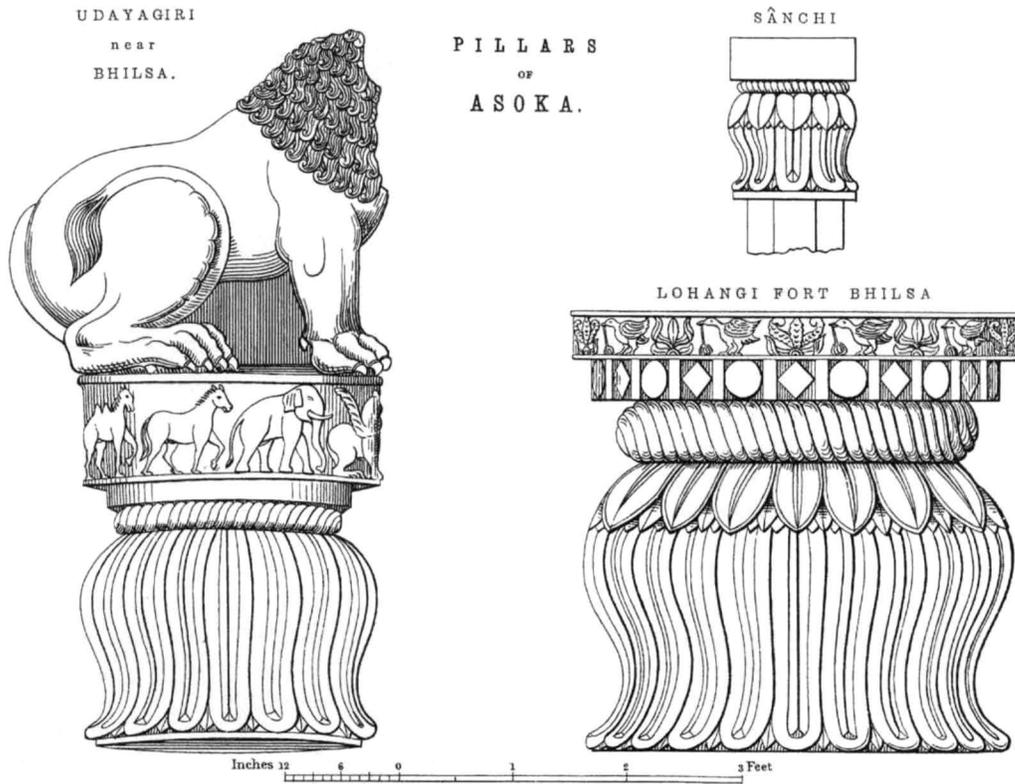
2. Udayagiri. General site plan.



3. Figure 3. Udayagiri. Plan of the central ridge showing main caves and archaeological features.



4. Udayagiri. Water colour entitled *The Cave Temples in the Oodeghur Hills near Bhilsa* by Charles Wade Crump (1825-57). Courtesy of the British Library.



Above

5. Drawing of capitals in the Vidiṣā region published in A. Cunningham, *Inscriptions of Asoka*, *Corpus Inscriptionum Indicarum*, volume I (Calcutta, 1877): plate XXX.

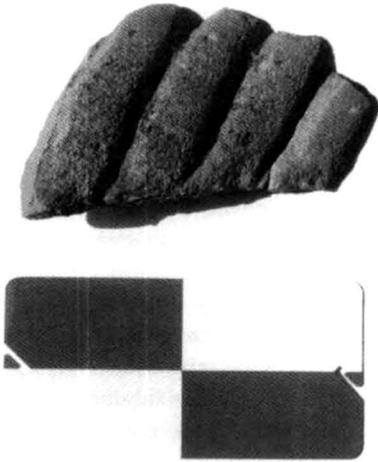
Below

6. Udayagiri. Lion capital *in situ* photographed in 1920s.

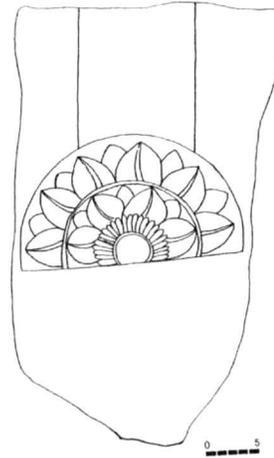
Right

7. Udayagiri. Lion capital. Archaeological Museum, Gwalior.





8. Udayagiri. Chip of the beading of the lion capital found *in situ*.



9. Udayagiri. Fragment of *vedikā*.

column fell and the capital crashed down on the ridge. The original setting of the capital seems to have been a mound about 10 m from where the capital was first found (Figure 3). Although some careful excavation would be needed to verify the accuracy of this proposal and to determine the character of the pillar's immediate precinct, a few fragments noted by the present authors may be described as these can be associated with the lion capital. The first is a railing cross-bar found in Udayagiri village. It is lenticular in profile and unornamented.<sup>12</sup> Immediately west of the ridge is a collection of miscellaneous fragments including a large upright with a lotus medallion and sockets matching those of the cross-bar just noted (Figure 9).<sup>13</sup> On the basis of these pieces it seems likely that the lion pillar was surrounded by a *vedikā* similar to those depicted in early relief sculpture. The pillar itself has fallen, the only surviving part being an octagonal section now lying in the passage at the northern end of the ridge (Figure 10). This fragment is 1.07 m in length; each face of the shaft measures 15 cm at one end and 16 cm at the other, showing the column was originally tapered. By analogy with the Heliodorus pillar, located nearby and dateable to the same period (Figure 11), we can assume that the Udayagiri column had octagonal and sixteen-sided mid-sections, a square base and a circular top. Assembling all these parts together we have produced the reconstruction given here in Figure 12. As just noted, the capital, column and *vedikā* seem to have been once set on the small mound on the ridge (Figure 3, location B). A large abacus, decorated with a *vedikā* pattern of the early type, was also found at Udayagiri, but its original place is difficult to determine and merits further study (Figure 13).<sup>14</sup>

#### 4. Pillars at Buddhist monasteries and Yakṣa shrines.

The placement of the lion pillar on the ridge is puzzling in so far as the location is not very prominent. It would have been a simple matter, and one well within the technological capacities of the period, to raise the pillar on the northern or southern hill. To give perspective to this setting, we need to digress briefly and consider some other pillars in the immediate area. At Buddhist sites pillars were set on hill-tops and these would have been visible for many miles in the surrounding countryside. At Sānchī, for example, the Mauryan column, originally surmounted by four lions and a wheel, was raised next to the main stūpa in the third century BCE. Slightly later, probably in the late second or early first century BCE, a smaller pillar was erected beside stūpa 5.<sup>15</sup> At Lohangi Pīr, a towering outcrop in the modern town, there is another bell-capital. This capital was among those published by Cunningham in 1877 (Figure 5).<sup>16</sup> Given the height of the rock, this column and capital would have been very prominent in ancient times. Unfortunately, the damaged nature of the capital seems to preclude identifying its cult affiliation. We do not face this problem with the Heliodorus pillar, a monument that has already drawn our attention (Figure 11). Equidistant from Lohangi and Udayagiri, this pillar carries an inscription recording that it was erected next to a Bhāgavata temple.<sup>17</sup> Unlike the Buddhist sites in the region, this temple was set on flat ground near the Betwā river, a spot that was inundated on more than one occasion. The area was excavated extensively by Bhandarkar.<sup>18</sup> During the course of this work, a number of fragments were found, indicating that there were a cluster of columns in front of the temple. The temple



10. Udayagiri. Pillar fragment in the passage.



11. Besnagar. Pillar of Heliodorus locally known as Khambh Bābā, photographed during excavations. Courtesy of the British Library.

itself was excavated by M. D. Khare but published only in a desultory fashion, a cultural tragedy given the great religious and cultural importance of the remains.<sup>19</sup>

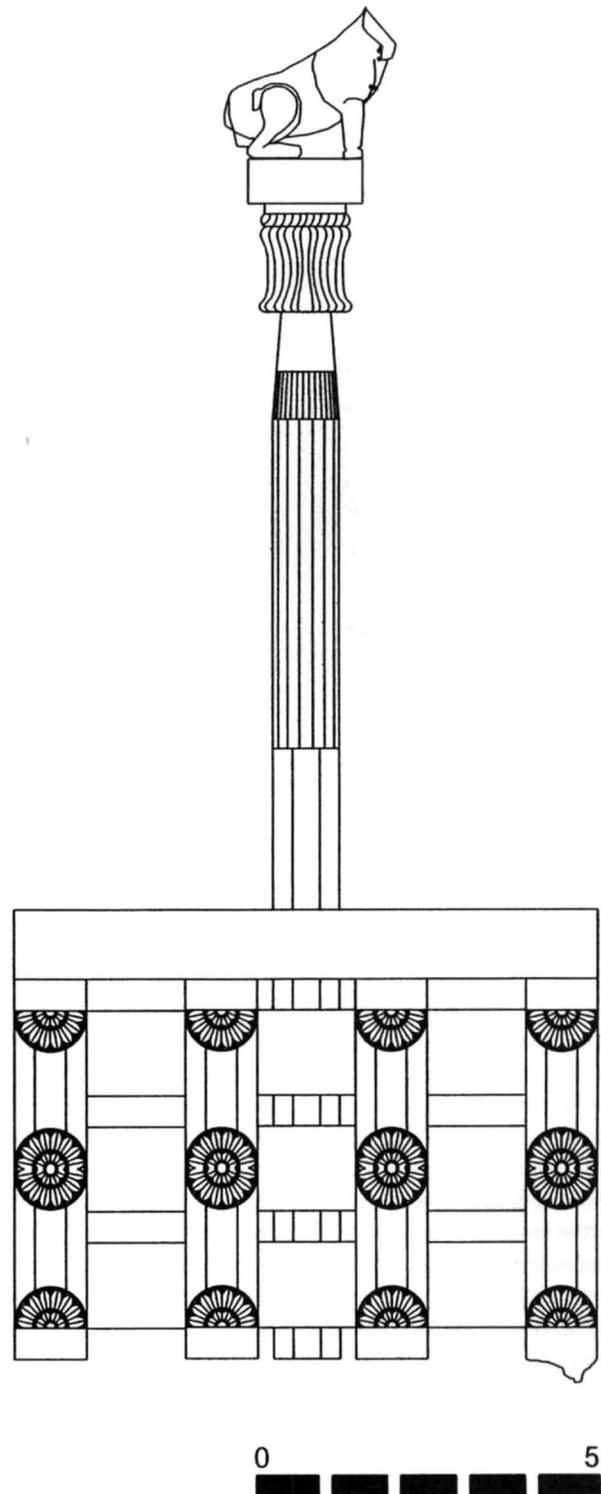
Another capital, representing the wish-giving tree (*kalpavṛkṣa*), was found near the banks of the Betwā about one kilometre downstream from the Heliodorus pillar. The location was documented in the map published by Cunningham; this has been re-published recently with corrections and annotations.<sup>20</sup> The massive (1.7m high) *kalpavṛkṣa*, now removed to the Indian Museum, Calcutta, has bags of money tied to some of the branches; next to the bags are conches and lotus flowers overflowing with coins.<sup>21</sup> As remarked by Coomaraswamy long ago, the *kalpavṛkṣa* was probably once placed on a column or *dhvaja stambha*. This is confirmed by the later practice of raising such trees on columns in the courtyards of Jaina temples; an example can be found at Ludarva located about 12 km outside Jaisalmer. Near to the Vediśā *kalpavṛkṣa* Cunningham reported a 'colossal female figure' which has also made its way to Calcutta.<sup>23</sup> Cunningham thought this an early portrait but it is, of course, a *yakṣī*. He dated it before the Sāncī gates, an estimate that is probably correct. In 1952 another *yakṣī* was found in the riverbed of the Betwā together with the accompanying *yakṣa*.<sup>24</sup> Both images are now in the Vidiśā Museum. The *yakṣa*, at more than three metres high, is the biggest in India. Although illustrated and discussed in scholarly publications from 1966, the find-spot has drawn little attention.<sup>25</sup> The only account, which appeared thirty-five years after the discovery, is in a little book by Niranjan Varmā, a long-time resident of Vidiśā. Varmā was present when about a hundred people tried to move the images but finally had to use chains and a tractor to do so. Varmā refers to the place as Dānā Bābā ghāṭ.<sup>26</sup> This was confirmed in October 2001 by the present authors who visited the place with Pdt. Gosvāmi, the current puṣārī at Khambh Bābā, the minor deity rooted to the Heliodorus pillar. Gosvāmi is knowledgeable about the old images in the neighbourhood and kindly pointed out the exact spot where the *yakṣa* was found. Like other places along the Betwā which are termed ghāṭs but which do not have formal steps leading to the river, Dānā Bābā ghāṭ is a non-descript part of the natural river bank. The likelihood is that the river has shifted over the last two-thousand years, burying or destroying the old ghāṭ.<sup>27</sup> In any case, the huge *yakṣa* was and is known as Dānā Bābā, indicating that the local people had long known it lay in the river, a fact actually mentioned by Lake in 1910.<sup>28</sup> Dānā Bābā ghāṭ seems to be the same place where Cunningham found the *kalpavṛkṣa* to judge from his map. As Coomaraswamy perceptively noted, the items hanging from the tree are the *nidhi*-s of Kubera. As Dānā Bābā also holds a big bag of money there can be little doubt he is none other than Kubera.<sup>29</sup> All these

sculptures indicate that there was once was a substantial *yakṣa* precinct (*āyatana*) at Dānā Bābā ghāṭ and that a column with the *kalpavṛkṣa* was an important part of it.<sup>30</sup>

### 5. Religious history of Udayagiri.

The foregoing digression shows that a number of columns were raised at important cult sites around Vediśā in ancient times. Some were at Buddhist monasteries, others at the Bhāgavata temple and at least one at a *yakṣa* cult-spot. This is crucial in so far as it shows that columns served a number of purposes and that Cunningham's categorisation of the early Udayagiri material as 'Buddhist' is a very doubtful deduction at best.<sup>31</sup> There is nothing clearly Buddhist about the oldest sculptures from Udayagiri and there are no archaeological remains or inscriptions suggesting that stūpas once stood on the site. The present authors made an exhaustive examination of both hills at Udayagiri and although there are walls surviving to the height of one or two courses at many places, there are no rings of stone or vestiges of circular structures which might indicate that stūpas were built there. Excavation of the temple on the northern hill by Lake and Bhandarkar also failed to reveal any trace of a stūpa. Although both were searching in earnest for Buddhist remains, Bhandarkar going so far as to ransack the platform in an effort to find the stūpa he was certain lay below, nothing even vaguely Buddhist was found.<sup>32</sup> Ironically, Bhandarkar's was not an entirely unreasonable hypothesis as the temple on the hill at Ahmedpur, some kilometres north of Udayagiri, seems to have been raised on a stūpa base, probably in the fifth century.<sup>33</sup> But such was not the case at Udayagiri and it is reasonable to conclude, as a consequence, that Udayagiri was never a Buddhist site.

What then was the early cult affiliation of Udayagiri? Some hints are provided by archaeological and textual material which, taken together, present a reasonably coherent if fragmentary picture. We begin with *Mātaṅga Jātaka* (no. 497).<sup>34</sup> Embedded in this *Jātaka* is a short story describing an encounter between the Buddha and a proud brāhmaṇa named Jātimanta. The story goes that Jātimanta was living on the banks of the Vettavati near a town of the same name. Having resolved to break this brāhmaṇa's pride, the Buddha settled upstream on the same river. After cleaning his teeth, he threw the tooth-sticks into the river and these got entangled in Jātimanta's hair while he was bathing. Jātimanta was outraged and found to his horror that the Buddha, born as a low-caste Caṇḍāla, was living upstream. After heaping him with abuse, the brāhmaṇa ordered the Buddha to move downstream. The Buddha obliged. But his tooth-sticks then miraculously floated upstream and again got entangled in Jātimanta's hair. The brāhmaṇa flew into a rage and the Buddha cursed



12. Udayagiri. Reconstruction of the lion pillar with surrounding vedikā.



13. Udayagiri. Abacus fragment.

him: 'If you stay here, in seven days your head will burst into seven pieces!' In order to stop the curse from taking effect, the Buddha prevented the sun from rising on the seventh day. The people were thrown into confusion. They rushed to Jātimanta to see if this was his doing. He replied that it was not, but said that a Caṇḍāla living along the river was probably the source of the problem. The people accordingly went to the Buddha only to be told that the situation would not change until Jātimanta fell at his feet and asked for mercy. Jātimanta was dragged before the Buddha and thrown down in an effort to appease the Tathāgata. But the Buddha replied that he could not let the sun go because Jātimanta's head would burst onto seven pieces. Asked what should be done, the Buddha ordered that a lump of clay be brought and placed on the ascetic's head at the river side. He then let the sun rise, the lump of clay burst apart and the ascetic plunged into the water.

A number of points can be extracted from this narrative but in order to do so it is first necessary to explain the geography to which it refers. The Vettavatī is the Betwā, a river which appears frequently in Sanskrit literature as the Vetravatī. The identification of Vediśā with the Betwā in our *Jātaka* is the result of the compiler conflating the Betwā and its tributary the Bes. The later

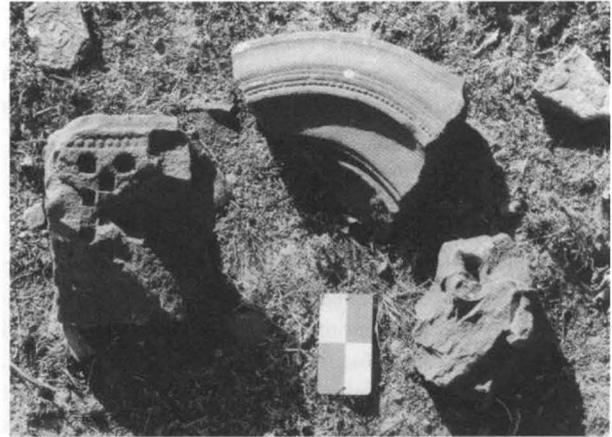
was anciently known as the Vedisā and this river did indeed give its name to the town.<sup>35</sup> Once this is untangled, it is clear that the story is set on the Bes, a river that flows past both Udayagiri and ancient Vidiśā. Upstream from both is the early Buddhist monastic site of Satdhāra (Figure 1). Our story thus seems to record friction between high caste brāhmaṇas at Udayagiri and low caste śrāmaṇas at Satdhāra. When the conflict came to a head, the Buddha stopped the sun from rising. The people took this to be the work of Jātimanta and rushed to him for advice. Although we should be cautious about reading too much into the story, the implication seems to be that the brāhmaṇas at Udayagiri were associated with the sun and that their presence there predated the arrival of Buddhism. The Tathāgata's ability to control or halt affairs crucial to Brahmanical life and practice is well illustrated by the story of the Kāśyapas, a narrative depicted in the Sānchī reliefs and thus current in central India from an early time. In this well-known episode, the fierce Nāga resident in the fire-temple of the Kāśyapas was subdued by the Buddha and even the wood, sacrificial fire and offerings of the brāhmaṇas are shown to be under the Buddha's control. Similarly in the *Mātaṅga Jātaka* it is the Buddha who ultimately controls the sun, not the brāhmaṇa residing at Udayagiri. Two details should be noted before leaving this story. The first is the Buddha's curse. Although it seems surprising that the Buddha should curse anyone, the structure of the narrative requires that Jātimanta be saved from the curse's power. As it was brāhmaṇas whose curses were traditionally feared, the reversal of roles is part of the story's critique of orthodoxy. This reversal penetrates even the content of the curse which is couched in terms of seven days, i.e. one week. In mature Indian astronomy, ever the domain of brāhmaṇas, the week begins with Sunday (Ravivāra). The second point concerns the clay ball (*mattikāpiṇḍa*) put on Jātimanta's head. The substitution of clay for an original occurs frequently in ritual practice and helps explain terracotta and clay images, the most startling ancient example perhaps being the clay model of a decapitated man which was placed under the fifth-century temple at Mansar. Even today in Tamil Nadu and Karnataka a 'sacrificial man' is hung from the scaffolding of buildings under construction, the head made from an inverted water pot. In north India an inverted pot is used alone.

## 6. Archaeological evidence for the Sun temple.

The identification of the sun with Udayagiri would have little authority if it rested solely on *Mātaṅga Jātaka*. We introduce it only because a number of inscriptions and archaeological finds point also to a connection.<sup>38</sup> The first and most obvious fact is the name Udayagiri, literally 'sunrise mountain', words that are first used in a

Paramāra-period inscription from Vidiśā. The Sun god referred to in this and other eleventh-century inscriptions was known as Bhāillasvāmi. This deity enjoyed a high reputation across north India and was receiving endowments from at least the ninth century.<sup>39</sup> Older and more substantial is the large figure of Varāha which was carved directly into the side of the hill at Udayagiri in the opening years of the fifth century.<sup>40</sup> The solar associations of this incarnation of Viṣṇu are well known and have been the subject of a book by V. S. Agrawala.<sup>41</sup> The intimate and early connection between Varāha and Sūrya is graphically illustrated by a fragmentary relief panel from Mathurā dating to the Kuṣāṇa period. This shows a four-armed Varāha holding two discs in his upper hands; carved on these discs are representations of Sūrya riding in his chariot.<sup>42</sup> Based on the foregoing evidence, the association of Udayagiri with inscriptions mentioning the Sun god Bhāillasvāmi may be regarded as plausible. The actual location of the temple can be traced to a large mound on the ridge above the Varāha image (Figure 3, location A). The mound, about 6 m high, is covered with crumbling brick and small carved fragments. On one side there is a large *āmalasāraka*, the serrated stone used to crown north Indian temples from the 7th century onwards.<sup>43</sup>

Some supplementary archaeological data may be added to that given above. One item of note is a broken image of Sūrya found by the present authors in a shrine at the southern edge of Udayagiri village. The Sūrya dates to the eleventh century. That this and other fragments were brought from the ridge is shown by the numerous small pieces which can still be found there. Some examples, larger than most, are illustrated here in Figure 14. All these pieces are carved in a brownish-red sandstone, a material which Paramāra craftsmen employed from the tenth century because it could sustain the sharp detailing and under-cutting characteristic of later sculpture. In the course of studying Udayagiri, the present authors noticed that in addition to the carved fragments just noted there are hundreds of small chips of reddish-brown sandstone scattered across the central part of the ridge. This does not occur anywhere else on the site. Now this particular stone is alien to the geology of Udayagiri. The hills consist entirely of a fine-grained white sandstone, something used frequently for free-standing images in the Gupta period. The distribution of reddish-brown fragments and chips thus demonstrates that Paramāra refurbishments focused quite exclusively on the ridge. The implications of this fact are clear, namely, that if indeed the temple of Bhāillasvāmi mentioned in the Paramāra inscriptions was at Udayagiri then it can only have been built on the ridge. Co-incidentally the fragments also show that the campaigns undertaken by the Sultans of Delhi to destroy the temple in 1234 and 1292 led to the building or



14. Udayagiri. Fragments of the Paramāra period found on the ridge.

buildings being quite literally smashed to bits.<sup>44</sup>

The Paramāra refurbishments were the last of many additions to the central ridge at Udayagiri. In addition to things already noted, the present authors found Gupta-period fragments which document building activity on the ridge during the *circa* fifth century. These fragments consist of cornices carved with dentil ends, friezes with lozenges and mouldings with small window motifs (*candraśālā*). All are extremely broken and much abraded. These Gupta fragments seem to be concentrated around the smaller mound on the ridge (Figure 3, location B).<sup>45</sup> On the smaller mound itself is a line of square stones, oriented along an east-west axis. This appears to be the edge of a plinth. About 10 m from this mound is an outcrop of rock, described by Cunningham as a 'large square platform'.<sup>46</sup> The rock shows many signs of modification. The eastern edge, about 8.3 m in length, has been neatly squared off. The northern side of the platform has also been worked and several big beams removed by splitting the stone with dowels.<sup>47</sup> On the top of the platform there are four evenly-spaced post holes, indicating that some sort of structure was placed there. In front of the holes there is a straight line incised on the platform's vertical edge. The likely meaning of these features will concern us in due course (see section 11). The southern edge of the platform is ragged and was accordingly modified by the addition of slabs. These have been removed but there are grooves and tendons for iron clamps which would have originally held the stones in place; the brown stain on the rock shows that the clamps were subject to corrosion. Such clamp-holes are difficult to date but were in wide use at Sānchī in the first century BCE. The development of the stone platform thus seems to have taken place at a relatively early date. The lion capital, found immediately beside the stone platform, takes us back to the second century BCE and shows that this part of Udayagiri had

special significance from at least that time. A tentative conclusion we draw from this evidence is that the lion capital may have been connected with the earliest form of Bhāillasvāmi who, in the second century BCE, was probably little more than an autochthonous deity.

### 7. Astronomical evidence: possibilities and problems.

The erection of a pillar with a lion capital next to the site of what seems to have become an important Sun temple led the present authors to consider whether Udayagiri had a special meaning with regard to the sun, i.e. whether the hill, and specifically the ridge, had some sort of astronomical significance. This consideration was prompted by the Sun temple at Modhera.<sup>48</sup> This was built in the reign of Bhima I (*circa* 1022-63), a near contemporary of the Paramāra ruler Udayāditya (*circa* 1070-93) under whom refurbishments of the Bhāillasvāmi appear to have been made.<sup>49</sup> The latitude of Modhera at 23° 58 is close to that of Udayagiri at 23° 31 and both are close to the Tropic of Cancer. The Tropics, however, are not static but move back and forth with time due to natural oscillations in the angle of the earth's axis. When Modhera was consecrated, probably in 1026 CE, the obliquity was 23° 56.5. This indicates that the temple was very close to the Tropic when finished and suggests that astronomical methods were used to site the building and that solar observations of various kinds were made there.<sup>50</sup> The shifting line of the Tropics (an issue taken up in section 10) suggests that Udayagiri may have once been a place of astronomic interest because the Tropic of Cancer passed directly over it.

Before exploring this possibility it is perhaps necessary to deal with the fact that scholars have tended to treat astronomical speculation about monuments with considerable scepticism. With the possible exception of the Jantar Mantar in Jaipur and the other observatories erected by Jai Singh, astronomy is an issue that has been left to narrow specialists. Aside from the problem that astronomical subjects tend to be mathematically complex and often difficult to verify historically, the inability to engage constructively with these issues is embedded in the practice of art history, archaeology and, to a lesser extent, Indology. Art historians, especially those who work on India, seldom visit monuments for extended periods of time. Their fieldwork involves short and intense periods of data collection: measurements are made, photographs are taken and comments entered in a journal. Analysis and comparison with other sites, which have been approached in the same manner, take place in the scholar's study, often in a different country. Archaeologists are obliged to spend more time 'on site', but their work is narrowly focused on a dig during the 'excavation season', often little more than a few weeks each year during the cool weather. Spatially and temporally

removed analysis is the norm, the write-ups by archaeologists often taking decades.<sup>51</sup> The problem is exacerbated by museums which, by their very nature, have encouraged a disembodied approach to sculpture and other material. This type of interaction is different from, if not exactly opposite to, the ways in which local people interact with old temples, images or sacred places. These days we don't dare call these people 'the natives', but we might as well given the style of analysis that is being used. In addition to knowing that local people do not move around and think about places as art historians and archaeologists, which is rather obvious when you put your mind to it, we can also be reasonably certain that people in the past did not interact with their sites as we do now. Without the hyper-mobility of modern times, and attendant distractions, they were obliged to see the places around them through time: at sunrise and sunset, during the heat of summer and the coming of the rains, as part of a ritual cycle punctuated by the occasional visit of a king or a holy man from outside. The ensuing cultural, historical and social density of sacred places have, of course, become important matters in European art history and archaeology.<sup>52</sup> In India, however, such concerns have yet to make a significant impact: we are still enthralled to the work or art, the great monument and the heritage site.<sup>53</sup> A possible exception to this is pilgrimage and pilgrimage places, but here the knife of scepticism cuts both ways: the amount of work on pilgrimage, out of all proportion to its historical significance, reflects not only the ease of modern travel but the fact that the snap-shot vision of the pilgrim seems to happily coincide with the time-frame of the visiting academic. Traditional text-based Indology is less culpable within the framework of this discussion despite the criticism its methods have invited.<sup>54</sup> Texts, after all, were composed because their authors meant that they should be read and studied. So while the Indologist may be deficient in memorisation and make use of analytical and comparative tools that the traditional Pundit finds strange or unsavoury he is still pursuing his text with an earnest desire for knowledge, a desire he shares with his more old-fashioned colleagues.<sup>55</sup>

Given the above, our study of Udayagiri has tried to move beyond static forms of analysis which isolate the site from its surroundings and which visualise the sculptures and other features as fixed objects frozen in space and time. The aim of this essay, as stated in the opening paragraph, is to make a contribution to the sacred historical geography of central India. This can be done by bringing space and time into the discussion, the very elements that prevalent forms of analysis tend to exclude. In most cases, of course, it is impossible to know how people moved around a particular place or how they may have interacted with particular sculptures or

physical features in the landscape. For this we normally have no ancient data. One constant, however, has been the sun, moon and stars, things we know were observed and studied from early times. For India the historical problem is that astronomy was renovated from the 5th century CE as observations and calculations became more precise.<sup>56</sup> The astronomical knowledge that prevailed before this change is known principally through Lagadha's *Jyotiṣavedāṅga*, a text which might be as early as circa 300 BCE.<sup>57</sup> The *Brāhmaṇas* contain informative statements about the sun, stars and seasons but no formal astronomy. As might be anticipated, there has been considerable debate about how these texts are to be interpreted. Without joining the controversies at any point, we would like to outline a few basic aspects of the astronomical system of the 'première période' (i.e. before Āryabhaṭa) with the specific intention of determining how this knowledge may help us understand Udayagiri.

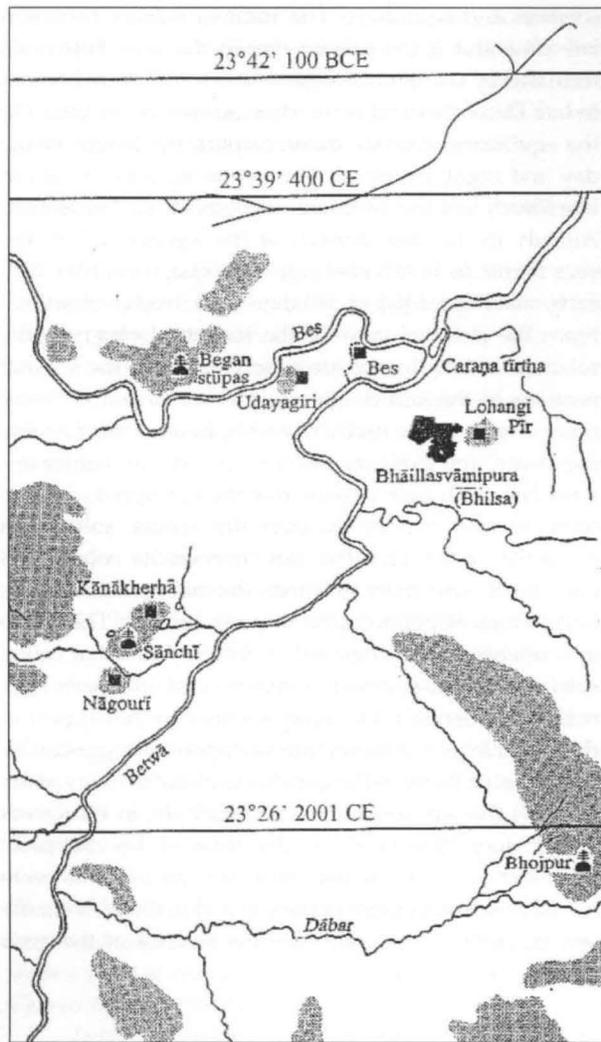
**8. Synopsis of the early Indian astronomical system.**

The survey given here is basic and intended primarily to show the bearing of solar events on certain archaeological and art historical problems; the historian of science can easily skip this section. Despite the elementary treatment of astronomy here, this represents, as far as we are aware, the first attempt to apply early astronomical systems to a specific site in India. We start with the most obvious of natural phenomena: the

solstices and equinoxes. The summer solstice occurs in late June and is the longest day of the year. Separated from this by six months is the winter solstice. This occurs in late December and is the shortest day of the year. On the equinoxes, also six months apart, the length of the day and night are equal. The vernal equinox occurs in late March and the autumnal equinox in late September. Already in the first *maṇḍala* of the *R̥gveda* (1.55.6) the year seems to be divided into four quarters of 90 days each, making a total of 360 days over twelve months.<sup>58</sup> From the point of view of the terrestrial observer, the solstices and equinoxes are closely linked to the shifting position of the sun relative to the horizon at different times of year. In the northern hemisphere, as most people are aware, the sun gets lower in the sky as winter approaches. With each passing day the sun appears to rise more toward the south until the winter solstice in December. After this, the sun reverses its course and appears to rise more towards the north, reaching its northern-most point on the summer solstice. These two movements were recognised in ancient India and called *dakṣiṇāyana* ('the southern progress') and *uttarāyana* ('the northern progress'). This terminology does not appear in the oldest texts but something analogous is suggested by the *devayāna* ('way of the gods') and *pitryāna* ('way of the fathers') that are mentioned, for example, in the *R̥gveda* (10.2.7 and 10.98.11).<sup>59</sup> By the time of the *Śatapatha Brāhmaṇa* (2. 1. 3.1-3) the *devayāna* and *pitryāna* were linked to the movement of the sun and to the seasons: the spring, summer and rains are the seasons of the gods

Season	Solar month	Lunar Month <sup>61</sup>	Solar event
Vasanta (spring)	Madhu	Caitra (Mar-Apr)	Vernal equinox
	Mādhava	Vaiśākha (Apr-May)	
Grīṣma (summer)	Śukra	Jyeṣṭha (May-June)	Summer solstice: Dakṣiṇāyana begins
	Śuci	Āsāḍha (June-July)	
Varṣa (rains)	Nabha	Śrāvaṇa (July-Aug)	
	Nabhasya	Bhādrapada (Aug-Sept)	
Śarad (autumn)	Iṣa	Āśvina (Sept-Oct)	Autumnal equinox
	Ūrja	Kārttika (Oct-Nov)	
Hemanta (winter)	Saha	Mārgaśīrṣa (Nov-Dec)	Winter solstice: Uttarāyana begins
	Sahasya	Pauṣa (Dec-Jan)	
Śīśira (dews)	Tapa	Māgha (Jan-Feb)	
	Tapasya	Phālguna (Feb-Mar)	

Table 1. Seasons and months of the year with corresponding solar events (approximately placed).



15. Vidiṣā region. Map showing position of the Tropic of Cancer at selected dates.

when the sun moves northward; the autumn, winter and 'dews' (*śiśira*) are the seasons of the fathers when the sun moves southward.<sup>60</sup> For the sake of clarity, the seasons and corresponding months can be displayed in tabular form (see Table 1).

The solar months, as their names indicate, probably began as six and were adapted to make twelve. The tendency to correlate the months and the seasons, each with their own savour, led to correspondences with other phenomena: the elements and bodily humours, the various soils, the plants which grow in these soils and the animals which eat these plants and which also, in the end, eat each other.<sup>62</sup> From the seasons thus rise the goods of sacrifice, the vegetal and animal offerings without which the *yajña* is not possible. The sacrifices, and later festivals too, are consequently tied to the year: the Vaiśvadeva is performed in the warm season, the Varuṇapraghāsa in the rainy season and the Sākamedha in the cold season.

The movement of the sun's path during the year can be charted by observing the point on the horizon where it rises and sets. The same observations can be made with regard to the moon. This type of observation, which allows time to be kept between solar events, involved noting the position of the moon in relation to the constellations (*nakṣatra*), the names of the lunar months being derived from the *nakṣatra*-s in which the full moon occurred.<sup>63</sup> As the *R̥gveda* (10.85.5) concisely states, the moon is that which shapes the year.<sup>64</sup> Over the course of a month the moon waxes and wanes, the starting point being taken as either the full moon (*pūṣṣimānta*) or the new moon (*amānta*). The *Taittirīya Saṁhitā* (7.4.8) states that the 'full moon in Phalgunī is the beginning of the year', indicating that the full moon was favoured from quite early times. However there was no universal agreement on this, just as there was no agreement about which month should start the year. Two systems prevailed side by side even in later times, one beginning in spring, the other in autumn (respectively *citrādi* and *kārttikādi*). Each day in the month ran from sunrise to sunrise or from midnight to midnight. In the *Jyotiṣavedāṅga* the natural or civil day (*sāvāna*) was divided into a number of smaller portions. From larger to smaller these time divisions were: *muhūrta*, *nāḍikā*, *kalā*, *kāṣṭha*, *aḥsara*.

In the early system twenty seven *nakṣatra*-s are mentioned (*Jyotiṣavedāṅga*: ५: 18, 32-35; १६: 14, 25-28) but links between them and other phenomena were not used to develop a comprehensive astronomy, the implication being that a full account of *nakṣatra*-s was not regarded as essential. Neither was an account of the planets, which are seldom mentioned. An explanation for this can be found in the pragmatic bent of early Indian astronomers. The *Jyotiṣavedāṅga* was not intended as a comprehensive catalogue of the heavenly bodies and their movements. Rather, it was an enabling technology, i.e. a system of knowledge for scheduling sacrifices. The preamble to the *Jyotiṣavedāṅga* makes this perfectly clear: 'The Vedas were brought forth for the purpose of sacrifice; the sacrifices are laid down in order of time. Therefore he who knows astronomy, the science of reckoning time, knows the sacrifices.'<sup>65</sup>

The foregoing summary is necessarily much simplified and side-steps many difficult issues. Nonetheless it highlights the basic features of the early astronomical system and the main problem which the time-keepers faced, i.e. that the solar year, based on the solstices, did not coincide with the lunar year based on the waxing and waning of the moon. This is because the solar year lasts about 365 days while the lunar year lasts about 354. It does not take long for the two systems to diverge. As the heavenly bodies had their own rhythms, adjustments were needed. The problem was addressed in the *Jyotiṣavedāṅga* by adding a month at the end of the

third and fifth year resulting in a five year cycle or *yuga* of 1830 days.

### 9. Astronomical knowledge in central India.

That the *Jyotiṣavedāṅga* or some version of the data it contains was current in central India during the second century BCE seems likely given that king Bhāgabhadra of the Heliodorus pillar inscription is thought to have been a Śuṅga and that Puṣyamitra of the Śuṅga dynasty is recorded to have commissioned Vedic sacrifices.<sup>66</sup> Remnants of ancient sacrificial tanks have also been found during excavations at Besnagar.<sup>67</sup> We have, as a consequence, at least some historical basis for assuming that Vedic astronomy was current in central India during the second and first century BCE. In addition to determining the appropriate time for various rituals, rulers like Bhāgabhadra would have needed a viable calendar to deal with agrarian production, trade and military matters. More precisely, the king would have needed to know when the rains were going to come so that the royal share of the crop could be anticipated, when fords would be passable and toll-houses accordingly manned, when trading caravans might start to move and taxes levied. In matters of war, the king would have had to anticipate in what season marauding armies might start to march and when troops would have to be raised at home. Dealing effectively with these and related issues would have been especially pressing in the post-Mauryan age, a period characterised by increased monetisation, accelerated economic growth and a remarkable degree of mobility between regions. These practical concerns of government, mostly matters of prognosis and prediction, were not detached from the ritual cycle of ancient Indian kingship. Rather, a viable social order and stable universe were understood as resting on a continuum of appropriate acts, be they spiritual, ritual or royal. These interrelated and interdependent acts would have been regulated by a common calendar, a system of knowledge that was almost certainly controlled by brāhmaṇa astronomers (*mauhūrtika*).<sup>68</sup>

### 10. Solar observations at Udayagiri.

Precisely which astronomical text or texts were current in central India during the last two centuries BCE we shall probably never know. However the early lion capital and the configuration of the hill at Udayagiri give some hints about the observations which ancient astronomers might have made and the calendar they developed accordingly. The key geographical feature at Udayagiri for this purpose is the central ridge, something we have described in detail (see section 6 above). At the northern end of the ridge is a narrow passage (Figure 3). This

passage is a natural cleft in the rock which has been subject to modification in various ways. First of all, steps have been cut in the passage floor. There are two sets of steps placed side by side at different levels. This seemingly anomalous arrangement is explained by the fact that the lower stairs (on the northern side) are not actually stairs at all. The present authors found them to be water-worn in places and concluded that they originally functioned as a stepped water cascade. The precise channel through which water entered the cascade has been obscured by time but the source of the water was evidently the large tank at the head of the passage (Figures 2 and 3). Turning to the passage walls, the southern face has been carved with images, cave-shrines and a host of shell-inscriptions. The whole surface has been modified in some way and there is hardly any place where the original rock has not been worked. Some of the shell inscriptions are several metres high and as such are the largest examples in India.<sup>69</sup> These seem to be in superimposed layers at several points, indicating the inscriptions were engraved over a long period of time. That they pre-date the fifth century CE is shown by the Gupta-period images which have been cut directly into the inscriptions, obliterating them in part.<sup>70</sup> Additionally, some of the larger flourishes on the letters were lost when the upper walls of the passage were squared off to accommodate built structures, now completely missing. The north wall of the passage, unlike the south, is virtually untouched. Only one niche with a small female figure, probably Gaṅgā, has been introduced. There are a few notches for pillars and beams (now missing) and the rock has been trimmed very slightly in one place (opposite the large image of recumbent Viṣṇu). The only shell inscriptions are above and to the right of the Gaṅgā, high on the cliff face at the mouth of the passage.

From these features we can deduce that the northern face of the passage had some special significance which precluded modification. Even in the Gupta period, when every part was touched in some way, few changes were made. This remarkable diffidence about the natural rock is explained, in our view, by the long use of the passage for astronomical observation. To verify this hypothesis, we visited the site in different seasons and on equinox and solstice days. The summer solstice was found to be particularly significant, albeit a little warm. On this day, as will be clear from the brief disquisition on astronomy given above, the sun completes the *uttarāyana* and rises as far north as it will go on the eastern horizon. Now on this day at Udayagiri the sun rose in direct alignment with the passage and the rays of the sun illuminated the north wall after dawn without shadows. Throughout the day and at sunset the northern wall was again in line with the sun's position. Another feature of this solstice day, not discussed above in our astronomical survey, is that the sun reaches its

<b>SUMMER</b> Jyaiṣṭha - Āṣāḍha  pungent	<b>RAINS</b> Śrāvaṇa - Bhādrapada  acid	<b>AUTUMN</b> Āśvina - Kārttika  salty	<b>WINTER</b> Mārgaśira - Pauṣa  sweet	<b>DEWS</b> Māgha - Phālguna  bitter	<b>SPRING</b> Caitra - Vaiśākha  astringent

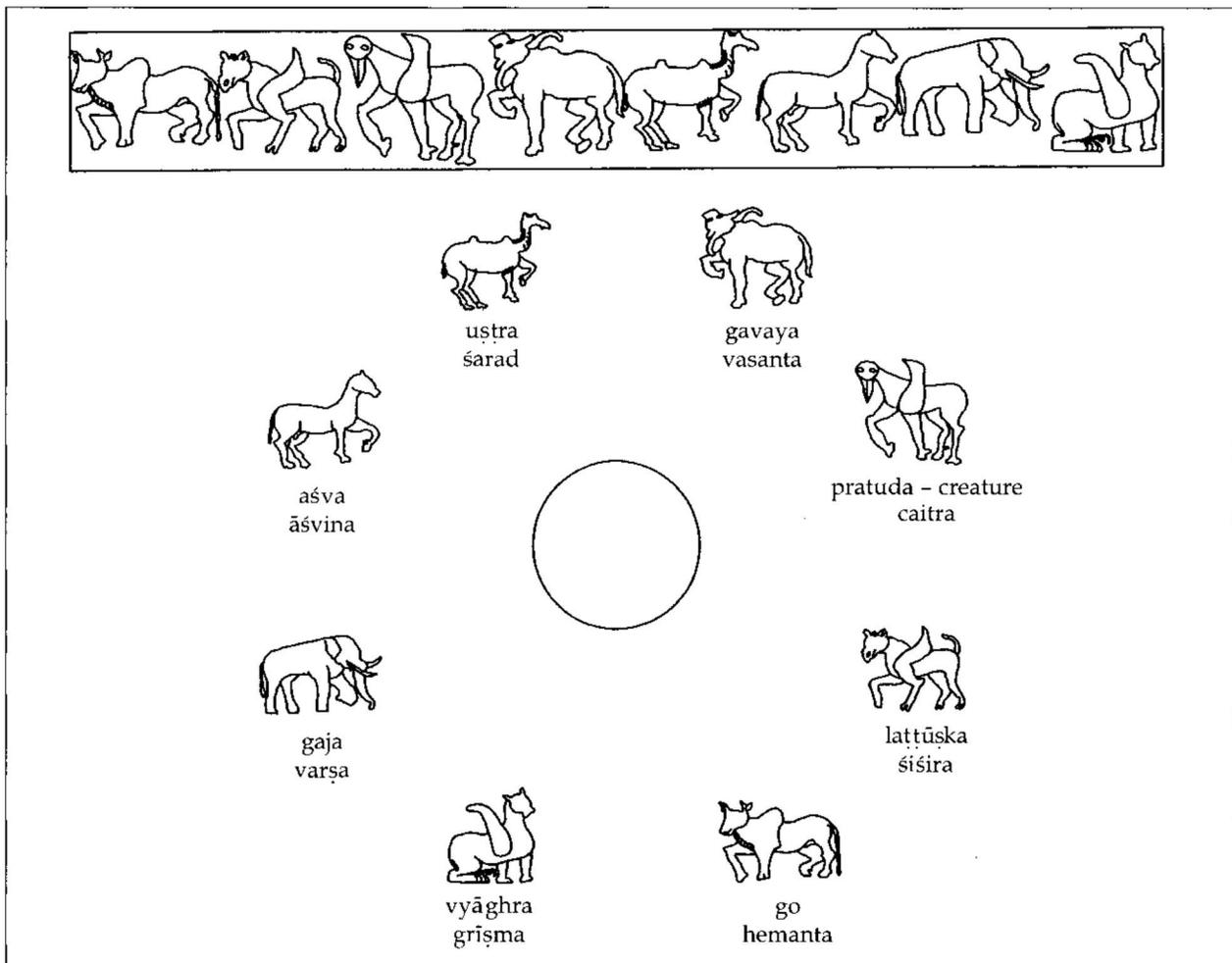
Table 2. Seasons and months with their corresponding humours and flavours.

<b>Vyāghra</b> tiger	<b>Gaja</b> elephant	<b>Uṣṭra</b> camel	<b>Go</b> bull	<b>Laṭṭūṣka?</b> griffin	<b>Gavaya</b> gaur
Jāṅgala guhāśaya (having hair)	Ānūpa kūlacara (bank dwellers)	Jāṅgala grāmya (domesticated)	Jāṅgala grāmya (domesticated)	Jāṅgala pratuda (those which peck)	Ānūpa kūlacara (bank dwellers)
The guhāśaya are sweet, heavy, unctuous, fortifying, they calm wind, of hot energy, good for those who suffer from the eyes and private parts	The kūlacara calm wind and bile, sweet of savour... the elephant is very dry and desiccant, of hot energy, and corrupting to bile, sweet, acid, salty, calms phlegm and wind.	All the grāmya calm wind, nourishing, they excite phlegm and bile, of sweet savour and digestion, they stimulate the fire, fortify.	The gavaya calms dyspnoea, cough, catarrh and irregular fever, good for fatigue and an excess of fire, purifying, it calms wind	The pratuda are astringent, sweet, dry, they feed on fruits, they excite wind, cold, they calm bile and phlegm	See Gaja for kūlacara. In addition: As for the meat of gavaya, unctuous, sweet, it dispells cough, of sweet digestion too.

Table 3. Animals on the Udayagiri capital with their classification and the characteristics according to Suśruta.

highest position in the sky. The height of the sun at noon depends on the latitude of the observer - on the Tropic of Cancer the sun stands directly overhead at 90°. At Udayagiri we noted that there were virtually no shadows in the passage on the solstice day because the passage directly paralleled the sun's east-west path. There was, admittedly, a narrow shadow along the southern wall when there should have been none. This is explained by the fact that the Tropic of Cancer now stands a few kilometres south of Udayagiri rather than directly on top of it. As the line of the Tropic moves back

and forth naturally in a predictable fashion, it is possible to recover the dates when the Tropic passed over the ridge. For the present publication we were unable to undertake the necessary calculations in a detailed fashion due to a shortage of research funding. However with the kind co-operation of our colleague Dr Silke Ackermann at the British Museum we were able to secure a few positions for selected dates in order to show how the Tropic has migrated back and forth across the site over the centuries. The results are shown here in Figure 17.



16. Udaygiri. drawing showing the placement of the animals on the abacus with their corresponding season or month.

### 11. Lion capital iconography.

The information given above shows that the passage at Udayagiri was used for solar observation in ancient times and that an important Sun temple was subsequently developed on the site. The question that now arises is whether this allows us to make some meaningful suggestions regarding the iconography of the lion capital (Figure 16). Imagining the column and capital *in situ* on the ridge above the passage, we can assume that the lion faced east toward the rising sun. The religious importance of the sun at dawn and the orientation of altars and ritual performances toward the east make this a reasonable premise. We might also note that later temples frequently have east-facing lions on the front steps and on the vaulted chamber above the entrance (*śukanāsa*).<sup>71</sup> Now the abacus of our lion capital carries eight animals in low relief. With the lion facing east, we would have, on the southern side, a winged tiger (*vyāghra*), elephant (*gaja*), horse (*aśva*) and double-humped camel (*uṣtra*). On the northern side we would have a bull (*go*), a winged creature with a curved beak,

another winged creature with a bird's head and a gaur (*gavaya*).<sup>72</sup> The most likely explanation for these animals is that they represent the seasons of the Indian year. The seasons are divided into two sets, one belonging to the *dakṣiṇāyana* and the other to the *uttarāyana* (see Table 1). The animals on the capital are likewise divided, one set on the south (*dakṣiṇa*) and one on the north (*uttara*). There are two problems with this correlation. The first is the number of animals on each side of the abacus. Ideally there should be two sets of three rather than two sets of four. The second problem is that even if we accept that the animals represent the seasons there are no direct indications of (a) which animal represents which season, (b) which animal should be taken as a starting point for the year and (c) in which direction our count should move once we have decided on a starting point. That there are no absolute standards regarding the commencement of the year (above section 8) exacerbates these difficulties.

As a way of dealing with these seemingly intractable problems we have had recourse to the typologies developed in early medical treatises, notably

Suśruta. The use of these categories is justified because ancient therapeutics was conceived within a framework of biogeography. To put it another way, food and the environment, both covered by the Sanskrit term *cara*, were regarded as integral to each other and both were seen as fundamental to the constitution of the body and its humours. Taking this point of view, a difficult one given the separation of medicine and geography in modern systems of knowledge, we can start by suggesting that the elephant represents the rainy season (*varṣa*). The elephant is classed as *ānūpa* ('wet, marshy') according to the typology of meats given by Suśruta and the elephant has long been regarded as Indra's vehicle, its swarthy mass compared to the heavy monsoon clouds in the rainy season (*nabhas*).<sup>73</sup> Given these cultural associations, the link between the elephant and the rains may be taken as a reasonably secure hypothesis. The horse immediately behind the elephant recalls the *nakṣatra* Aśvayujau and the month Āśvina (Pāli Assayuja). This month normally marks the end of the rains and it is the month in which the vernal equinox occurs. The historical and cultural implications of this particular month are explored below in our conclusion (see section 12). Behind the horse is a Bactrian camel with two humps, a northern animal seen occasionally in India before partition.<sup>74</sup> As the cold weather in India is perceived as coming down from the north, the camel may represent the onset of the cold, i.e. autumn (*śarad*). This would make the winged tiger an emblem of summer, a pleasing solution given the fierceness of the summer as a season and the tiger as a beast. This half of the abacus thus represents the *dakṣiṇāyana*, the half of the year when the sun is moving progressively southward. This identification is confirmed by the nature of seasons and the animals according to their medicinal characteristics. The relevant data is best summarised in tabular form (see Tables 2 and 3).

The half year discussed to this point shows not so much an exact correspondence with the medical tradition as a general relationship to it. We should hardly expect perfect symmetry for the simple reason that the relationship between the qualities (*guṇa*), savours (*rasa*) and humours (*doṣa*) can be expressed in a large number of combinations. Seemingly contradictory or competing characteristics (the *pratuda*, for example are simultaneously sweet and astringent) can be explained by the fact that a constituent can be altered if it is combined with different savours or humours. Despite these complications, there is a notable relationship between the animals on the capital and the characteristics of the relevant season. We start with the *dakṣiṇāyana*. The summer is pungent and dry, a period when wind increases. The *vyāghra* provides an antidote to this with his sweetness, unctuousness and heaviness; he also calms wind. The rainy season is wet and acidic, a period

when phlegm increases; the winds are at their peak. The *gaja* provides an antidote by being very dry; the elephant also calms phlegm and wind. The autumn is salty and is a period of phlegm and wind. The corresponding camel is not dealt with by Suśruta but it forms part of the domestic class of animals (*grāmya*). All these domestic creatures are sweet; they also calm wind and excite bile. The *grāmya* thus furnish an antidote to autumn's dominant characteristics. Although we should be cautious about our graphic model, the intersection of rising phlegm and declining wind seems to be marked by the month of Āśvina and the Autumnal equinox.

The other half of the abacus is more difficult. While this is logically the *uttarāyana*, and thus faced north, we do not know whether to start at the front with the bull or, alternately, continue our count in a clockwise direction with the gaur. A hint is provided by Suśruta who classes the gaur as unctuous and sweet. This balances the dryness and astringency of spring. The bile of the season is balanced by the general characteristic of all *kūlacara* creatures which collectively calm wind and bile. If we accept the gaur as an emblem of spring, this would make the bull an emblem of winter. This is the least satisfactory parallel, as the bull is sweet like the season. Cough and catarrh, it is true, are symptoms mostly likely met in winter and thus countered by the bull, but the parallel remains less compelling than those given so far. Perhaps an explanation is found in the fact that winter is the least complex season in terms of competing humours (see Table 2). The intervening animals between the bull and gaur are fantastic creatures and immediately present problems of identification. Both, however, belong to the category of 'those which peck' (*pratuda*). This group is collectively astringent, sweet and dry; they all calm bile and phlegm and excite wind. These characteristics balance the bitterness and rising bile of the 'dewy season'. By analogy with the southern side of the capital where the horse represents Āśvina, the animal with body of a quadruped and a pointed beak can be interpreted as a subset of the creature immediately in front of it. This creature can thus be taken as representing Caitra, the month in which the vernal equinox usually takes place.

The foregoing explanation has a certain logic in so far as the initial season of each half-year was placed at the front of the abacus, the tiger leading the *dakṣiṇāyana* and the bull leading the *uttarāyana*.<sup>75</sup> The results of the proposed scheme can be summarised in diagrammatic form (Figure 9). It is worth noting that the temptation to read the carvings in a clockwise fashion is actually illogical and based on our habitual use of clocks with dials. The ancient Indians had no such devices and were thus free to represent time in spatial terms quite different from our own.

The observations given above focus on the summer solstice and its importance in explaining the

iconography of the lion capital. But the summer solstices was, rather obviously, not the only observation with which ancient astronomers were concerned. Another important solar event was the winter solstice. This day is the exact opposite of the summer solstice – instead of being the longest day, it is the shortest; instead of the sun reaching the zenith, it reaches the nadir; instead of the sun rising in the extreme north, it rises in the extreme south; instead of there being no shadows at noon, the shadows are at their maximum length. The matter of shadows brings us to a final point which should be noted with regard to the lion capital and column. On the Tropic of Cancer at noon during the winter solstice the shadow would have been very close to the length of the column itself.<sup>76</sup> So where would the shadow have fallen? The probable place, based on observations made during the winter solstice in 2001, was the stone platform near to which the lion capital was first discovered (Figures 3 and 6). As already described in some detail (see section 6), this platform was subject to careful modification at an early date. In addition to the holes and markings already described, there are traces of radiating lines near the south edge of the platform. These lines, shaped something like a fan, appear to be part of a sun-dial. Thus if we are looking for an ancient Indian observatory, this platform is a likely candidate. The lion capital and column consequently seems to have served as some sort of gnomon (*śāṅkhu*), an instrument known to have been used in India from an early date.<sup>77</sup> Even if the specific observations and measurements that were made at Udayagiri cannot be recovered, it would appear that the rules found in the *Jyotiṣavedāṅga* for calculating the solstices, positions of the *nakṣatra*-s on successive solstices and their lunar days would have been carried out near natural features which facilitated observation and which would have consequently provided a convenient location for astronomical devices. We can also imagine an ancient water-clock being serviced by the tanks and channels in the passage at Udayagiri in order to calculate the *muhūrta*, *nāḍikā*, *kalā*, *kāṣṭha* and *akṣara*.<sup>78</sup> Based on these very preliminary suggestions, future research might involve micro-documentation of the visible traces on the site and a close study of these features in partnership with historians of traditional Indian astronomy. As theories and possible lines of investigation developed, this could lead, in the longer term, to some careful excavation work. The degree of interdisciplinary co-ordination and attention to minutiae required would necessitate a type of archaeology that is not practiced in India today. As there are no signs of such an archaeology developing in the present circumstances, we can only hope that this essay does not trigger off some ill-informed escapade of random digging similar to that seen at Satdhāra and Sāncī over the last few years.<sup>79</sup>

## 12. Concluding Remarks.

As will be apparent from the discussion given above, our concern has been less with a static description of Udayagiri and its remains than with cultural dynamics or, to be more precise, an 'archaeology of action and ritual'.<sup>80</sup> This focus took us to the passage at the northern edge of the ridge (Figure 3), a natural rock formation which appears to have served as a 'svayambhu' device for tracking a number of astronomical phenomena, the most important of which was the summer solstice. Although the passage may have been used for a long period, monumentalisation, in the form of the lion capital, column and its enclosure, occurred only in the second century BCE.

The capital provides hints about the calendar that was employed in central India at the time: the year was divided into six seasons and the month of Āśvina given special prominence. Although twelve months were almost certainly known, Āśvina appears to have been selected for representation because it is a crucial time in the agricultural year of central India. As a general rule, the rains have ended by September and toward the end of the month the crops are harvested. Āśvina is thus the harvest month. It is also the time when the soil becomes dry enough for ploughing, grooming and a second seeding.<sup>81</sup> While this winter crop might produce a modest harvest with the help of occasional showers and water-lifting devices, flood irrigation is needed to make it economically significant.<sup>82</sup> Nowadays, of course, irrigation is done using pumps, pipes and hoses. In ancient times the same end was achieved in the Sāncī area through a network of dams which were constructed from the third century BCE. This vast hydrological scheme, only recently discovered and published, radically increased the yield of the winter crop and may have even made a third crop possible.<sup>83</sup> If rice was being grown (unlike wheat at present in eastern Mālwa), then the third harvest would have been in Caitra, the month which, according to our suggestion, is represented by one of the *pratuda* creatures on the abacus. The establishment of an irrigation network would have required extensive planning and investment on the part of the ruling élites, the motivation being that they would have been the main beneficiaries of increased agrarian production. A crucial aspect of the new system, a movement from dry farming to irrigated agriculture almost as dramatic as the 'green revolution' of the late twentieth century, would have been a practical knowledge of the seasons, particularly those times when water was to be collected and when it was to be released into properly prepared fields. In central India, the release of stored water would have started from the end of Āśvina and, depending on water levels, continued to the end of Caitra. The development and management of this

system engendered a new social class of land-owning farmers, the *gahapati-s* of Buddhist literature whose appearance in the Vidiśā region is documented by donative inscriptions at Sānchi.<sup>84</sup>

The new agrarian system introduced in the second century BCE and managed by the *gahapati-s* was closely shadowed by the Buddhist monastic year with its period of retreat during the rainy season (*vassāvāsa*). The origin of the retreat is attributed in the *Mahāvagga* to a ruling the Buddha made in order to prevent wandering monks from damaging crops when the fields were wet.<sup>85</sup> In the *Vinayamukha*, a scholastic text composed in Thailand and based on a close study of Pāli traditions, the three-month period of 'residing for the rains' is fixed by the full moon having passed one day in the asterism of Āsāḷha, that is, the first day of the waning moon of the eighth month.<sup>86</sup> As Māgasira (Skt Mārgasīrṣa) is the first month of the Buddhist year, the eighth month is Āsāḷha (Skt Āṣāḍha).<sup>87</sup> The month for ending the rains retreat was thus Assayuja (Skt Āśvina). While this pattern does not work so well in the Andhra country and other parts of the south due to a second monsoon in October and November, in central India the end of the rains coincided neatly with the end of the retreat in Assayuja. This is not only a time for ploughing but also a time when the ground becomes sufficiently dry for cross-country walking, conditions that were ideal for *bhikṣu-s* on missionary tour. The ways in which the monastic ideal as described in canonical texts were understood and applied at specific places is still a subject in its infancy, but the foregoing comments should highlight that a compelling history of central Indian Buddhism, a history that goes beyond a few well-known and heavily-restored monastic sites, will require an understanding of the physical, social and economic landscape in which Buddhism was established and in which it operated for more than a thousand years.

The observations made in this article show that it is an oversimplification to think of a 'Buddhist period' with respect to central India in the last three centuries BCE. Although Buddhism was pre-eminent, it was not the only ontological and cosmological dispensation. Cults connected with Yakṣa-s and with Vāsudeva were prevalent in the Vidiśā region, as was veneration of Śiva in his phallic form.<sup>88</sup> At Udayagiri, rock shelters and lithic scatters suggest the hill was inhabited from at least Chalolithic times.<sup>89</sup> Long use of the hill for astronomical purposes and the worship of Sūrya as Bhāillavāmi probably pre-dates the arrival of Buddhism by several centuries. The gigantic shell inscriptions incised on the walls of the passage at Udayagiri, probably from the second century CE onward, attest to the ongoing sanctity and influence of this locale, a power felt so keenly that people were compelled to leave their special marks there. The site retained its aura of spiritual authority in later

times to such an extent that both the Guptas and Paramāras were obliged to add their own imagery, much of it amplifying the solar and astronomical associations of the site. All these subjects have only been partially explored and highlight the rich opportunities for historical research that lie ahead.

## NOTES

1. The authors would like to thank the agencies and organisations which helped their research on Udayagiri and related topics: the Indian Council for Historical Research, the British Museum and the Society for South Asian Studies. Special thanks are due to the Leverhulme Trust which provided a research fellowship for the second-named author of this paper.
2. On these sites see, most recently, Willis, *Buddhist Reliquaries from Ancient India* (London, 2000) and "Buddhist Saints in Ancient Vedisa", *JRAS* 11 (2001), pp. 219-28.
3. Spelling of place names in this article follows Survey of India maps. However when referring to ancient places we have used the Sanskrit or Prakrit forms from texts or inscriptions. Unless otherwise noted, abbreviations follow the list given in *Buddhist Reliquaries from Ancient India*, p. 10.
4. The paucity of scholarship on this site is reflected in the following bibliography which includes all key items published to date: D. R. Patil, *The Monuments of the Udayagiri Hill* (Gwalior, 1948); Debala Mitra, "Varāha Cave at Udayagiri - An Iconographic Study", *Journal of the Asiatic Society* 5 (1963), pp. 99-103; J. C. Harle, *Gupta Sculpture* (Oxford, 1974), figures 8-17; Phyllis Granoff, "Mahiṣāsuramardini: An Analysis of the Myths", *East and West* 29 (1979), pp. 139-51; J. G. Williams, *The Art of Gupta India: Empire and Province* (Princeton, 1982), figures 35-39; M. A. Dhaky, Krishna Deva, Michael Meister, eds. *Encyclopaedia of Indian Temple Architecture: North India, Foundations of North Indian Style* (New Delhi, 1988), figures 15-16.
5. Raymond Head, *Catalogue of Paintings, Drawings, Engravings and Busts: The Collection of the Royal Asiatic Society* (London, 1991), p. 25. The drawing of the Varāha is here correctly identified for the first time. Bagnold's drawings were evidently meant to accompany Fell's report, but Bagnold's early death in 1821 led to the separation of the papers, the drawings ending in the Royal Asiatic Society and Fell's description in the British Library as part of the Colin Mackenzie manuscripts.
6. BL: OIOC WD 3089, folio 14. Patricia Kattenhorn, *British Drawings in the India Office Library*, vol. 3 (London, 1994), p. 101.
7. Cunningham, "Udaygiri or Udayagiri", *ASIR* 10 (1874-77), p. 56.
8. The accession register of the museum records that it arrived in 1927-28 but the entry indicates the sculpture was first acquired in 1920 and kept in Phool Bagh before being brought to Gujari Mahal.
9. Williams, "A Recut Aśokan Capital and the Gupta Attitude towards the Past", *Artibus Asiae* 35 (1973), p. 228.
10. Willis, *Buddhist Reliquaries from Ancient India*, p. 87.
11. Pramod Chandra, *Stone Sculpture in the Allahabad Museum* (Poona, 1970), plate XXXIII.
12. The piece measures 54 cm h x 63 cm w x 18 cm deep; this is undoubtedly the same cross-bar seen by Cunningham and given as "2 feet 1 inch in length and 1 foot 10 inches in

- breadth, with a thickness in the middle of 7 1/4 inches." *ASIR* 10 (1874-77), p. 55.
13. This does not seem to have been noted by Cunningham unless we assume that the broken pillar he mentions (*Ibid.*, p. 55) had been incorrectly measured, something not altogether unlikely.
  14. Mentioned Cunningham, *ASIR* 10 (1874-77), pp. 55-6.
  15. John Marshall, Alfred Foucher and N. G. Majumdar, *The Monuments of Sanchi*, 3 vols. (London, 1940), plate 106.
  16. Also discussed and illustrated in D. Stadtner, "A Śunga Capital from Vidiśā", *Artibus Asiae* 37 (1975), pp. 101-02.
  17. For a recent edition of this record, R. Salomon, *Indian Epigraphy* (Oxford, 1998), p. 265.
  18. Bhandarkar, "Excavations at Besnagar", *ASIAR* (1913-14): 187ff.
  19. M. D. Khare, *त्रिदिशा* (Bhopal, 1985), pp. 89-93 describes his excavation of the temple and the discovery of the pillar bases for the columns. A reconstruction of the temple is found in Khare, "Discovery of a Vishṇu Temple near the Heliodorus Pillar, Dist. Vidisha (M.P)", *Lalit Kalā* 13 (1967), pp. 21-7.
  20. *Buddhist Reliquaries from Ancient India*, map 2.
  21. The *kalpavṛkṣa* is illustrated in A. K. Coomaraswamy, *Introduction to Indian and Indonesian Art* (London, 1927), figure 10.
  22. *Ibid.*, p. 229 and Coomaraswamy, *Yakṣas* (Delhi, reprint 1980) notes to plate 1. Coomaraswamy's dating of this piece to the third century BCE or older cannot be accepted; it is more likely of the first century BCE.
  23. *ASIR* 10 (1874-77): 44, illustrated in Coomaraswamy, *Introduction*, figure 8. The sculpture has since been painted black as a "conservation" measure.
  24. R. C. Agrawal, "Unpublished Yaksha-Yakshī Statues from Besnagar", *Lalit Kalā* 14 (1971), p. 47.
  25. *Ibid.*, tells us that the yakṣa "was discovered by Sri Raj Mal Madavaiyya in the river Betwā, near the Heliodorus Pillar". Pramod Chandra, "Yaksha and Yakshī Images from Vidisa", *Ars Orientalis* 6 (1966): figure 4-6; on p. 158 Chandra offers only that the images came to light "due to a fall in the Betwa River in the course of an unduly hot and long summer". Most recently the *yakṣa* has been illustrated in *The Dictionary of Art* (London, 1996) vol. 15, p. 430.
  26. *निरंजन वर्मा, दशार्ण-दशिन* (New Delhi, 1987), p. 116. Varmā places Dānā Bābā ghaṭ about 50 feet in front of Triveṇī, the local designation for the confluence of the Betwā and Bes. This is not quite correct and probably due to faulty memories. It might be noted that Pdt Gosvāmi reports that the image was not broken when discovered.
  27. H. H. Lake, "Besnagar", *Journal of the Bombay Branch of the Royal Asiatic Society* 23 (1910), p. 141. In the course of his excavation Lake uncovered an old stone ghaṭ, completely buried in alluvium and 600 feet (about 200 m) from the present course of the river. From the level of this ghaṭ Lake concluded that the Betwā is about 3 m lower than it was in ancient times. The precise location of Lake's ghaṭ cannot be determined as the map meant to accompany his article was not published; the whereabouts of the original has not been traced.
  28. *Ibid.*, p. 140.
  29. Coomaraswamy, *Yakṣas*, notes to plate 1.
  30. For precincts see Jan Gonda, *The Meaning of the Sanskrit Term Ayatana* (Madras, 1969).
  31. *ASIR* 10 (1874-77), p. 55. On the basis of the cross-bar and upright (described above) Cunningham asserted that Udayagiri once had a stūpa of similar proportions to that at Bhārhut, but that this was entirely erased by "Brahmanical prosecutors". How they missed Sānchī in this undertaking Cunningham does not venture to say.
  32. Bhandarkar, *ASIRWC* (1915), pp. 65-6. The search for Buddhist remains under temples is still going on, indicating the ever present danger of *a priori* assumptions on the part of archaeologists, see Hans Bakker, "Religion and Politics in the Eastern Vākāṭaka Kingdom", *South Asian Studies* (in this issue). We are grateful to the author for supplying us with an advance copy of this article
  33. The remains are as yet unpublished. The temple on the hill at Ahmedpur has a doorframe of the fifth century but this has been reset in a relatively modern shrine
  34. V. Fausbøll, *The Jātaka*, 7 vols. (London, 1877-97) 4, pp. 388-90; translation in E. B. Cowell et al, *The Jātaka or Stories of the Buddha's Former Births*, (London 1895-1907) 4, pp. 242-3.
  35. D. C. Sircar, *Studies in the Geography of Ancient and Medieval India* (Delhi, 1971): 264-65; B. C. Law, *Historical Geography of Ancient India* (Paris, 1954), p. 336. The upper reaches of the Bes were renamed Halāli in the eighteenth century after Dost Muhammad Khan killed a host of Rājputs at Islāmnagar and threw their bodies in the river, see C. E. Luard, *Bhopal State Gazetteer* (Calcutta, 1908), p. 10. Inscriptions sometimes identify important places by reference to rivers, for example H. V. Trivedi, *Inscriptions of the Paramāras, Chandellas, Kachchapaghātas and Two Minor Dynasties*, Corpus Inscriptionum Indicarum, volume 7, (Delhi, 1978-91), number 98 (verse 45), mālavanadīrasthitāt bhāsvataḥ, referring to a well-known temple.
  36. Illustrated in Marshall, *Monuments of Sanchi*, plate 52.
  37. Bakker, "Religion and Politics in the Eastern Vākāṭaka Kingdom".
  38. Arguments for this case, summarised here in part, were first made in Willis, "Inscriptions from Udayagiri: Locating Domains of Devotion, Patronage and Power in the Eleventh Century", *South Asian Studies* 17 (2001), p. 48.
  39. D. C. Sircar, "Two Inscriptions from Bhilsa", *EI* 30 (1953-54): 214-16. The relevant records are listed in Willis, "Inscriptions from Udayagiri", appendix.
  40. See note 4 above for relevant publications of this well-known image.
  41. V. S. Agrawala, *Solar Symbolism of the Boar* (Varanasi, 1963).
  42. N. P. Joshi, "Kuṣāṇa Varāha Sculpture", *Arts Asiaticque* 12 (1965), pp. 113-19; the dedicatory inscription is given in K. Janert, "Mathurā Inscription on a Varāha Image", *JRAS* (1966), pp. 7-8.
  43. Illustrated in Willis, "Inscriptions from Udayagiri", figure 12.
  44. See the important discussion in Richard M. Eaton, "Temple Desecration and Indo-Muslim States", in *Essays on Islam and Indian History* (New Delhi, 2000), pp. 94-132. Doubts about our identification might well be raised because there is a Sūrya image on a Paramāra period door-frame in the old well at the Bijāmaṇḍal complex in Vidiśā town; an inscription mentioning Sūrya has also been found in the precinct; illustrated in A. P. Sagar "Vijayamandir - A Temple of Paramara Times at Vidisha", in *Art of the Paramaras of Malwa*, edited by R. K. Sharma (Delhi, 1979): plate 11. The Paramāra temple at Bijāmaṇḍal however, seems to have belonged to Śiva and the goddess given the sculptures recently found at the site. One possibility is that the Sun image was shifted to an undetermined location in Vidiśā town, a movement analogous to the transfer of the tutelary deity of the Jodhpur Rājputs from Mandor to Jodhpur fort. If Bhāillavāmi was indeed moved, this may have occurred

- as a result of the special association of the Sun with the Pratihāras (for which see *South Asian Studies* 15 [1999], p. 76) and Paramāras (*Ibidem.*, 17 [2001], pp. 48-9). The association of the Sun with Udayagiri nonetheless continued; the present authors found a sun-dial engraved on the rock surface above Cave 20. This carries a date of V.S. 1898.
45. This observation is necessarily provisional and would have to be verified.
  46. *ASIR* 10 (1874-77), p. 56.
  47. This stone cutting may have taken place subsequently, even in the nineteenth century, so not too emphasis should be placed on these traces.
  48. S. Huntington, *The Art of Ancient India* (New York, 1985), pp. 485-86; M. A. Dhaky, "Genesis and Development of Māru-Gurjara Temple Architecture", in *Studies in Indian Temple Architecture* (Delhi, 1975), figure 59.
  49. Udayāditya's connection with Udayagiri is discussed in Willis, "Inscriptions from Udayagiri", p. 49.
  50. This is suggested in N. Kamesvara Rao, 'Sun Temple at Modhera', *Bulletin of the Astronomical Society of India* 26 (1998), p. 1.
  51. The sociology of this practice merits detailed examination but we content ourselves with citing two monograph published by the same Society that is responsible for this journal. The twenty-year chronology is revealed by the publication details: Warwick Ball et al, *Excavations at Kandahar 1974 and 1975* (London, 1996) and Sven Helms, *Excavations at Old Kandahar 1976-1978* (London, 1997).
  52. The literature is now extensive but an introduction can be had from Ian Hodder, *The Archaeology of Process* (Oxford, 1999) and Christopher Tilley, *A Phenomenology of Landscape* (Oxford, 1994).
  53. Although scholars are starting to pursue these new ideas little, as yet, has found its way into print, a pioneering exception being Julia Shaw, "The Sacred Landscape", in *Buddhist Reliquaries from Ancient India*, pp. 27-38. The western notion of "art" is perhaps the silliest category imposed on the study of ancient India, one that has been introduced to suit simultaneously a number of political and economic ends: in India the nationalist struggle to establish an independent visual culture equal to that of Europe (but ironically without jettisoning its vocabulary or heirarchy of assumptions); in the West, the market's voracious necessity to create and validate new commodities for aesthetic consumption. Pramod Chandra, *On the Study of Indian Art* (New York, 1983) has masterfully combined these two agendas.
  54. For example R. Inden, *Imagining India* (Oxford, 1990) reviewed by Davd Kopf in *JAOS* 112 (1992), pp. 674-7; for a general survey of problems in the discipline Richard Eaton, "(Re)imag(in)ing Other<sup>2</sup>ness: A Postmortem for the Postmodern in India", *Essays on Islam and Indian History*, pp. 133-55. D. K. Chakrabarty, *Colonial Indology* (Delhi, 1997) raises a number of issues which are energetically analysed in C. C. Lamberg-Karlovsky, "Colonialism, Nationalism, Ethnicity, and Archaeology", *The Review of Archaeology* 18 (1997), pp. 1-14 and *Ibidem.*, 19 (1998), pp. 35-47; see additionally Daud Ali in *JRAS* 8 (1998), pp. 454-5.
  55. See the useful introduction Johannes Bronkhorst, "Traditional and Modern Sanskrit Scholarship", in *The Pandit: Traditional Scholarship in India* (Delhi, 2001).
  56. General introductions can be found in G. R. Kaye, *Hindu Astronomy*, Memoirs of the Archaeological Survey of India No. 18 (Calcutta, 1924); more recently and technically Roger Billard, *Astronomie indienne*, Publications l'Ecole Française d'Extrême-Orient Vol. 83 (Paris, 1971). The basic guide is David Pingree, *Census of the Exact Sciences in Sanskrit*, Memoirs of the American Philosophical Society, 5 vols. (Philadelphia, 1970-94); more concisely S. N. Sen, *A Bibliography of Sanskrit Works on Astronomy and Mathematics* (New Delhi, 1966).
  57. The editions are listed in Pingree, *Census*, 5, pp. 539-40 and discussed in G. Thibaut, "Contributions to the Explanation of the Jyotiṣa-Vedāṅga", *JASB* 46 (1877), pp. 411-37, reprinted in *Studies in the History of Science in India*, vol. 2 (New Delhi, 1982), pp. 479-502; more recently Pingree, 'The Mesopotamian Origin of Early Indian Mathematical Astronomy', *Journal for the History of Astronomy* 4 (1973), pp. 1-12. However see the important critique in Harry Falk, "Measuring Time in Mesopotamia and India", *ZDMG* 150 (2000), pp. 107-32. The *Jyotiṣavedāṅga* is preserved in two versions, the verses of the Yajus and Ṛk recensions hereinafter referred to as य and ऋ respectively. The *Paitāmahasiddhānta* belongs to the first century CE and was summarised by Varāhamitra in *Pañcasiddhānta*, see Pingree, *Census*, 4: 259; an archaic astronomy is also given in the *Sūriyapannatti* or *Sūryaprajñapti* the particulars of which are discussed in Thibaut, "On the Sūryapajñapti," *JASB* 49 (1880), pp. 107-27 and 181-206. This text probably belongs to the ninth century CE.
  58. T. Aufrecht, *Die Hymnen des Ṛgveda*, 2 vols. (Berlin, 1861-77) 1, p. 140. Kaye, op cit., also takes RV 1. 164.11 and 48 as referring to this system.
  59. Aufrecht, *Die Hymnen*, 1, pp. 281, 391.
  60. Julius Eggeling, trans. *The Satapatha-Brāhmana according to the Text of the Mādhyandina School*, Sacred Books of the East, vol. 12 (Oxford, 1882), pp. 289-90. As shown by the table given here this text is counting from the equinoxes rather than the solstices.
  61. The month Mārgaśira is also called Agrahāyaṇa. Our table represents the mature system and some elements cannot be taken as current or universally applicable in early period. The Pāli equivalents (taken up in section 12 below) are Maggasira, Pussa, Maghā, Phagguṇa, Citta, Vesākha, Jetṭha, Āsālhā, Sāvaṇa, Bhaddapada, Assayuja or Paṭhamakattika and Kattika.
  62. Francis Zimmerman, *The Jungle and the Aroma of Meats: An Ecological Theme in Hindu Medicine* (Delhi, 1999), pp. 33-5.
  63. So the *Sūrya Siddhānta* (14.16); we sidestep the problems surrounding *nakṣatra-s* for which the historiographical starting point is M. Steinschneider, "Ueber die Mondmansionen (Naxatra), und das Buch Arcandam", *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 18 (1864), pp. 118-201 with additions in 25 (1871), pp. 378-428.
  64. Aufrecht, *Die Hymnen*, 1, p. 366.
  65. *Jyotiṣavedāṅga* (यः 3; ऋः 36): vedā hi yajñārtham abhipravṛtāḥ kālānupūrvyā vihitaśca yajñāḥ | tasmād idam kālavidhānaśāstraṁ yo jyotiṣam veda sa veda yajñam ||
  66. E. J. Rapson, ed., *The Cambridge History of India* (Cambridge, 1922) 1, pp. 466-70; R. C. Majumdar et al, *The History and Culture of the Indian People: The Age of Imperial Unity* (Bombay, 1951), pp. 95-9. The survey given in these textbooks merits re-examination on the basis of numismatics.
  67. Bhandarkar, *ASIAR* (1914-15), pp. 73-5. Bhandarkar's analysis is, nonetheless, highly speculative.
  68. A seminal point of entry into this problem is R. Inden, "Changes in the Vedic Priesthood", in *Ritual, State and History in South Asia* (Leiden, 1992), pp. 556-77.

69. On shell inscriptions see Richard Salomon, "New Sankalipi (Shell Character) Inscriptions", *Studien zur Indologie und Iranistik* 11-12 (1986), pp. 109-52. More recently there has been much ill-informed speculation about shell inscriptions; claims about decipherment should be discounted. See Salomon, "A Recent Claim to Decipherment of the Shell Script", *JAOIS* 107 (1987), pp. 313-15.
70. Illustrated in Bakker, "Religion and Politics in the Eastern Vākāṭaka Kingdom", in this volume.
71. Devangana Desai, *The Religious Imagery of Khajuraho* (Mumbai, 1996), figure 23; Paul Mus, *Barabudur: Esquisse d'une histoire du bouddhisme fondée sur la critique archéologique des textes*, 2 vols (Hanoi, 1935) 2, pp. 145-55. Following Przulski, Mus takes the Sārnāth pillar as a 'pôle magique' and a "support du Soleil". There is little point in criticising this literary and Indological classic but it is worth noting that the supposed planetary symbolism of the Sārnāth capital needs to be revisited.
72. Sanskrit translations are approximate as we can only guess about the names of the fabulous winged creatures; for discussion of the terminology see Zimmerman, *Aroma of Meats*, pp. 80-8.
73. *Ibid.*, p. 33 and 142. For the seasons see Claus Vogel, "Die Jahreszeiten im Spiegel der altindischen Literatur", *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 121 (1971), pp. 284-326.
74. It is uncertain if Suśruta's *uṣṭra* included the Bactrian camel, but as he has nothing specific to say about the qualities of camel meat the question is not of importance. The representation on the Udayagiri capital may have had its source in coins or portable objects rather than actual animals.
75. Williams, "Recut Aśokan Capital", provides a photograph of the Udayagiri capital from the front.
76. The shadow would not have been exactly the same length as the column because on the winter solstice the sun is lower than 45° due to the value of the obliquity of the ecliptic. This is explained in James B. Kaler, *The Ever-Changing Sky* (Cambridge, 1996), p. 60 for which reference we are grateful to Silke Ackermann.
77. Devices are discussed in S. R. Das, "Astronomical Instruments of the Hindus", *IHQ* 4 (1928), pp. 256-69.
78. J. F. Fleet, "The Ancient Indian Water Clock", *JRAS* (1915), pp. 213-30, and especially his attempt to visualise the mechanism, p. 230, n. 1. In this respect attention may drawn to the large shallow tank cut into a damaged cave at the top of the passage; this has an outlet for water on one side and could have functioned as one part of a water-driven time device. The purpose of this cave is otherwise difficult to explain.
79. As an aside we would quote R. G. Collingwood who, writing in the 1930s, had some important and relevant criticism of archaeological practice: Once digging has been decided on excavation becomes a sport for human terriers, tempered by the possibility that scientific results - who knows? - may be forthcoming. Today, matters have reached a point when it can be said clearly and publicly that no archaeologist ought even to be allowed to excavate at all unless, when he is deciding to work on a certain site, he can answer the question "what historical problems lead you to that site, why do you think you can solve them there, and how exactly do you mean to go about it?"; unless, every time he orders a new trench to be opened or even a single shovelfull of earth to be moved, he is prepared to explain, in terms of historical questions and their possible answers, exactly why he is doing it; unless his record shows that, instead of nibbling away at this site like a small boy with a cake until nothing is left, he is capable of saying "now I have answered the question I came here to answer, and we are going home." See *The Principles of History*, edited by W. H. Dray and W. J. van der Dussen (Oxford, 1999), p. 65. Collingwood's ideas now dominate archaeological practice, but India, barring one or two exceptions, is still under the sway of Marshall and Wheeler.
80. P. Garwood et al, *Sacred and Profane: Proceedings of a Conference on Archaeology, Ritual and Religion*, Oxford, 1989 (Oxford, 1991). While this volume has provided useful stimuli, the tedious post-modernist rhetoric is a product of the 1980s and less helpful in the longer term, especially with regard to Indian subjects. Richard Bradley's idea of 'place as monument' is less polemically and more compellingly elaborated in his *Archaeology of Natural Places* (London, 2000).
81. This is based on personal observation of and participation in farm work at Jamundhana, Lalitpur district, where the second author of the present publication lived for about six months. That recent practice follows old patterns was verified by reference to the *Bhopal State Gazetteer*, p. 42. Luard additionally remarks that: "All important operations are governed by the influence of certain asterisms called *nakshatras* of which twenty-seven are recognised". While we might wish to see continuity in the use of astronomy for the regulation of agriculture and although there is no doubt some, it is important to note that crops and cropping techniques have changed as well as the terminology, for example *khariḥ* (one of the agricultural seasons) is an Indo-Islamic word of Arabic origin.
82. T. M. Srinivasan, "Water-Lifting Devices in Ancient India: Their Origin and Mechanism", *Indian Journal of History of Science* 5 (1970), pp. 379-89.
83. Julia Shaw and John Sutcliffe, "Ancient Irrigation Works in the Sanchi Area: An Archaeological and Hydrological Investigation", *South Asian Studies* 17 (2001), pp. 119-38.
84. Uma Chakrabarti, *The Social Dimension of Early Buddhism* (Delhi, 1987): appendix B; also Upinder Singh, "Sanchi: The History of the Patronage of an Ancient Buddhist Establishment", *Indian Economic and Social History Review* 33 (1996), pp. 1-35.
85. I. B. Horner, *The Book of Discipline*, 6 vols. (London, 1938-93) 4, pp. 183-84.
86. *The Entrance to the Vinaya: Vinayamukha*, 3 vols. (Bangkok, 1969-83) 2, pp. 84-85 and 1, pp. 231-34. The work was composed by Somdetch Phra Mahā Samaṇa Chao Krom Phrayā Vajiraṇavararasa (1859-1921).
87. *Ibid.*, 1: 231-34; Vogel, "Die Jahreszeiten", pp. 296-8.
88. This is an important subject but one beyond the scope of the present paper. Aside from the Vāsudeva temple at Besnagar and Yaśa-s noted above in passing, mention can be made of early images of Balarāma in sculpture and in cave paintings and images of Śiva in his phallic form at Nandaur and Pagneshwar (the latter discovered by Julia Shaw). These *lingas* probably belong to the second century BCE.
89. Although we have not discussed the caves and lithic material here, there are a number of rock shelters at Udayagiri. These form the northern-most part of a well-known belt of shelters with rock painting and associated antiquities in the Vindhyan range. The key sites are partially documented in E. Neumayer, *Lines on Stone* (Delhi, 1993).