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Auditorium Cave: oldest known cave art in the world

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Introduction

The Bhimbetka rock art site complex south of Bhopal, central India, is topographically dominated by a series of prominent quartzite towers. Being located on a hilltop, they are visible from a distance of many kilometres. These residual structures range in height to about 23 m. Undercutting through weathering has facilitated the formation of hundreds of shelters, and some of the towers feature horizontal walk-through caves at ground level. Some of these cave systems have three or more entrances. The largest of them is located in Auditorium Rock, the highest point of the range, peaking at 619 m above mean sea level. This rock tower forms the natural focus of the site complex, and it contains the most spacious of the caves and shelters.

Auditorium Cave, with its Gothic vaults and soaring arches, has a temple-like ambience. This is attributable to both the sizes and layout of the passages. In plan view, the cave resembles a right-angled cross, the four branches of which are roughly aligned with the cardinal compass points (Figure 1). The 'stem' of this cross, the longer passage, points to the east, and it opens to the natural main entrance. Where it meets the much shorter, three other passages, a room of up to 16 m height has been formed. Here, precisely in the natural focus of this layout, is a large boulder resting on the remains of some earlier rock falls. With the cave floor being fairly level, the boulder is clearly visible from all four entrances. It thus resembles a naturally formed altar or pulpit.

The boulder's side facing the cave's eastern passage bears a flat, near-vertical panel that is positioned square to that passage. That distinctive panel is the most central and the most focal feature of the entire cave. As the cave itself may in turn be considered the central element of the Bhimbetka complex, it would not be surprising if this distinctive spatial and topographical focus might have been experienced even by early people occupying this site.

In recognition of the boulder's centrality, Indian archaeologists have named it the 'Chief's Rock', or 'King's Rock'. There is no evidence of ritual use justifying such a name, but I have retained it in recognition of the pronounced spatial arrangement of the site's features, and the apparently realistic possibility that its early occupants perceived this

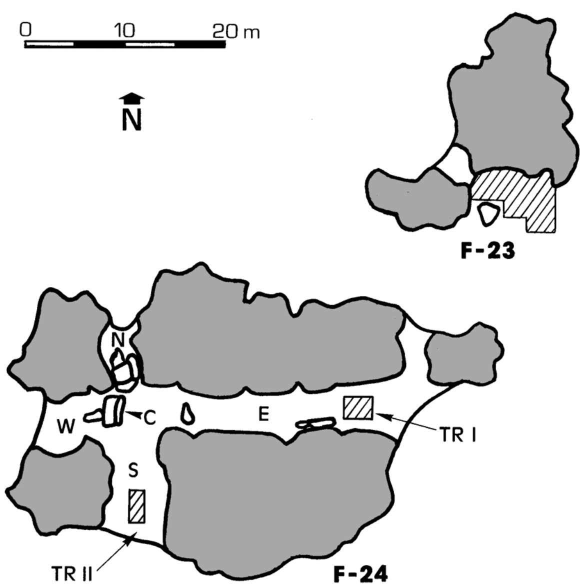

Figure 1. *Plan of Auditorium Cave, Bhimbetka IIIF-24, and adjacent Misra's Shelter, IIIF-23, south of Bhopal. C - Cupule panel on east side of Chief's Rock; N, E, S, W - the four passages of Auditorium Cave; TR 1 and TR II - excavations.*

aspect. Despite its spatial focus, the vertical panel on Chief's Rock bears only few remaining traces of human modification. Nevertheless, they are among the principal subjects of this paper, because of their outstanding importance to studies of very early palaeoart.

Archaeological background

Archaeological studies began at the Bhimbetka complex only in the 1970s, especially with the work of V. S. Wakankar, S. K. Pandey and V. N. Misra. These and other scholars conducted excavations at several sites, beginning in December 1971. By 1975, excavations had been carried out in eleven sites of the Bhimbetka main hill: A-28, 29, 30 and 33; C-12 and 16; F-14, 16, 22, 23 and 24. The most important of these are trench II in IIIF-24 (Auditorium Cave) by Wakankar, and trench I in IIIF-23 (the adjacent rockshelter) by Misra. Both sites yielded fairly similar archaeological and sedimentary sequences, consisting of a thin Holocene overburden covering substantial series of Pleistocene facies. The dominating components are in both cases the Acheulian strata, accounting for 2.4 m of sediment in F-23, but only for less than one metre in F-24. Hence our more complete information about the Acheulian of Bhimbetka comes not from Auditorium Cave itself, but from the adjacent shelter (IIIF-23, which I have called Misra's Shelter), from which also the most comprehensive reports come (Misra 1978). Bhimbetka has provided very important information about the Indian Acheulian, because until its excavation, nearly all such information had come from alluvial sites and surface collections. Such sites are numerous in many parts of the country and have been examined (and selectively collected from) since the 1860s, but until the work at Bhimbetka, only one primary Acheulian site had been excavated in India (Bose 1940; Bose and Sen 1948). Misra's painstaking work thus represents the first attempt of analysis through time of such material in India. His findings suggest a gradual development from the Acheulian to the Middle Palaeolithic, with a few handaxes and cleavers still occurring in the lowest 10–15 cm of the latter deposit (Misra 1978: 71). Wakankar (1975: 15) notes that an evolution from the earlier pebble tool tradition he perceives in Auditorium Cave to the overlying Acheulian is not evident at Bhimbetka. Indeed, the two are separated by an occupation hiatus of 50–60 cm in his trench II.

It is therefore clear that Bhimbetka has been an important key site in the context of Indian Palaeolithic research. Of relevance here is also the geographical proximity of the find site of the Narmada cranial fragment. Despite its massive torus this find is of an archaic *Homo sapiens* in my view, and whatever its true age is (which remains unknown), it would seem to fit somewhere into the chronological sequence represented by the Bhimbetka strata. It seems possible to me that this hominin fossil relates chronologically to one of the Bhimbetka Acheulian levels.

Our current knowledge of the Middle Pleistocene (and earlier) hominin occupation of India remains relatively limited, and even the Late Pleistocene remains inadequately explored. Although the Lower and Middle Palaeolithic stone tool traditions are widespread (Petraglia 1998), represented in massive quantities and typologically well explored in India (Korisettar 2002), their absolute chronology has remained largely unresolved so far. This is due both to a paucity of excavated sites (most known sites are surface scatters) and a pronounced lack of well-dated sites. There are some preliminary indications that the Middle Palaeolithic commenced prior to 160 ka (160 000 years) ago. At Didwana (V. N. Misra et al. 1982; V. N. Misra et al. 1988; Gaillard et al. 1986; Gaillard et al. 1990), thorium-uranium dates for calcrete associated with Middle Palaeolithic industries (V. N. Misra 1989) range from 144 000 years upwards. Their validity is reinforced by a thermoluminescence date of 163 000 ± 21 000 years BP from just below the level dated by $^{230}Th/^{234}U$ to 144 000 ± 12 000 years BP. A single thermoluminescence date for a Middle Palaeolithic deposit in a sand dune in Rajasthan has been reported to be >100 000 years BP (Misra 1995; Korisettar 2002).

Another indicator of age comes from the Jhalon and Baghor formations in the central Narmada and Son valleys, rich in mammalian faunal remains and stone tools. They contain a layer of Youngest Toba Ash, up to 3 m thick (Acharyya and Basu 1993), which has been dated at 74 000 ± 2000 years BP in Indonesia, based on argon and potassium-argon determinations (Chesner et al. 1991). At the upper end of the time scale, carbon isotope dates as young as 31 980 + 5715/ - 3340 (Mula Dam, Maharashtra) and 33 700 + 1820/ - 1625 years BP (Ratikarar, Madhya Pradesh) have been reported for Middle Palaeolithic horizons (V. D. Misra 1977: 62).

Prospects for a comprehensive temporal framework are at least as bleak for the Lower Palaeolithic period, which is represented primarily by Acheulian industries. However, this dominance of Acheulian forms may well be an artefact of collecting activities that may have favoured the easily recognisable Acheulian types, notably well-made handaxes. Several attempts to use the thorium-uranium method, at Didwana, Yedurwadi and Nevasa (Raghvan et al. 1989; Mishra 1992), placed the Acheulian beyond the method's practical range (which ends at about 350–400 ka BP). But one of the molars from Teggihalli did yield such a date (of *Bos*, 287 731 + 27 169/ - 18 180 $^{230}Th/^{234}U$ years BP), as did a molar from Sadab (of *Elaphus*, 290 405 + 20 999/ - 18 186 years BP) (Szabo et al. 1990). However, an *Elaphus* molar from the Acheulian of Tegihalli is over 350 ka old.

While the Lower Acheulian remains essentially undated, preliminary indications suggest a late Middle Pleistocene antiquity for the Final Acheulian. Thorium-uranium dates from three calcareous conglomerates containing Acheulian artefacts suggest ages in the order of 200 ka (Korisettar 2002). These results are from the sites Nevasa (Pravara Basin), Yedurwadi (Krishna Basin) and Bori (Bhima Basin). The most recent date so far for an Indian Acheulian deposit is perhaps the uranium-series result from a conglomerate travertine in the Hunsgi valley (Karnataka), which seems to overlie a Late Acheulian deposit (Paddayya 1991). The travertine's age of about 150 ka at Kaldevanahalli appears to confirm that the change from the Lower to the Middle Palaeolithic occurred between 200 and 150 ka ago. Recently, the EIP (Early Indian Petroglyphs) Project has tackled the question of the Palaeolithic chronology with OSL dates from Daraki-Chattan, Auditorium Cave and Misra's Shelter, the preliminary results of which would suggest that the Lower Palaeolithic ends only about 106 ka ago at Bhimbetka (Bednarik et al. 2005). This work is continuing, however. Recent work by R. G. Roberts, the OSL dating specialist of the EIP Project, at two Middle Palaeolithic sites in India has similarly produced results that are clearly too young. The sites Khuteli and Ghogara feature the Toba tuff and ash layer, yet 'most quartz grains do not yield OSL ages as old as 74 ka' (pers. comm., R. G. Roberts Dec. 2008).

In addition to these very sparse dates from the earliest periods of Indian history, there are several presumed 'relative datings', but these were always subject to a variety of qualifications. Early research emphasised the relation of artefacts to lateritic horizons (but cf. Guzder 1980) and biostratigraphic evidence (de Terra and Paterson 1939; Zeuner 1950; Badam 1973, 1979; Sankalia 1974), which often resulted in doubtful attributions. Sahasrabudhe and Rajaguru (1990), for instance, showed that there were at least two episodes of laterisation evident in Maharashtra and that extensive fluvial reworking occurred. Attempts to overcome these limitations included the use of fluorine/phosphate ratios (Kshirsagar 1993; Kshirsagar and Paddayya 1988–89; Kshirsagar and Gogte 1990), the utility of which was affected by issues of re-deposition of osteal materials (cf. Kshirsagar and Badam 1990; Badam 1995). Similarly, attempts to use weathering states of stone tools as a measure of the antiquity of lithics (e.g. Rajaguru 1985; Mishra 1982, 1994) are plagued by the significant taphonomic variables involved in weathering processes (cf. Bednarik 1979). The emergence of anomalous results and inconsistencies established in recent years illustrates a distinct need for a chronological framework based on a series of reliable numerical age estimations, especially from undisturbed Lower and Middle Palaeolithic occupation deposits. Moreover, I regard the lithic typology of the late Lower Palaeolithic and Middle Palaeolithic industries of India as largely unresolved, and believe that the strict application of the western European terminology is unsuitable. Local typologies need to be developed for Mode 2 and 3 industries, based not only on acheuloid attributes, but also on levalloid and Micoquian-like features. At present I regard India as lacking a reliable lithic typology for much of the Pleistocene.

There remains also wide disagreement about the antiquity of the Early Acheulian. Based on the potassium-argon dating of volcanic ash in the Kukdi valley near Pune to 1.4 million years ago, some scholars favour that magnitude of age for the earliest phase of that 'tradition' (S. Misra and Rajaguru 1994; Badam and Rajaguru 1994). An age of well over 400 ka is also suggested by thorium-uranium dating (S. Misra 1992; S. Misra and Rajaguru 1994). Others, especially Acharyya and Basu (1993), reject such a great antiquity for the Early Acheulian in the subcontinent. Similarly, Chauhan (in press) cautions that the ESR date of c. 1.2 Ma for Early Acheulian finds at Isampur (Paddayya et. al. 2002) remains tentative. However, Chauhan et al. (in press) and Chauhan and Patnaik (2008) have shown that lithics at the Narmada site Dhansi, less than 3 km south of the hominin site Hathnora, occur in a major formation of the Matuyama Chron, presumably placing them in the Early Pleistocene. The electron spin resonance dates from the Acheulian site of Isampur, averaging about 1.2 million years, currently the oldest Acheulian dates in India (Paddaya et al. 2002), support the long-range theory, which is also the more logical.

The earliest phase of human presence in India, of Mode 1 assemblages, consists of limited but tantalising references to archaic chopping tools, cores and flake tools, sometimes compared to those of the Oldowan, sometimes referred to as Soanian. Most of these occurrences are surface finds (e.g. Salel, Chowke Nullah, Haddi, Guzder 1980; or Nangwalbibra A, Sharma and Roy 1985; or Pabbi Hills in Pakistan, Hurcombe 2004) or come from alluvial or colluvial deposits, including conglomerate horizons (e.g. Durkadi, Armand 1983; or Mahadeo-Piparia, Khatri 1963). In very few cases, the Mode 1 industries have been excavated from secure stratigraphies, and they were found below Mode 2 strata at two sites. Cobble and flake tools were recovered well below extensive Acheulian evidence and separated from it by sterile sediments in Auditorium Cave at Bhimbetka (Wakankar 1975), as well as in Daraki-Chattan as noted above (Bednarik et al. 2005). These quartzite tools are partially decomposed at both sites and they were found in both cases below pisoliths and heavy ferromanganeous mineral accretions indicating a significant climatic incursion. In the case of the Bhimbetka finds, the objections (Jayaswal 1978, 1982) citing Misra's (1978) results in IIIF-23 are entirely irrelevant: the excavation in Misra's Shelter failed to extend below the Acheulian deposits (Bednarik et al. 2005), whereas that in IIIF-24, Auditorium Cave — a different site — certainly did, as did the excavation in Daraki-Chattan.

Since it is logical to expect human occupation evidence of the subcontinent for at least two million years (because of the presence of hominins in eastern

Asia by that time, e.g. Renzidong and Nihewan Basin; Zhu et al. 2001), it is to be expected that cobble or chopping tools should precede the bifaces of the Acheulian, and one would have assumed that these have attracted some attention. Indeed, the finds from Riwat and Pabbi Hills are dated to the Plio-Pleistocene and the Early Pleistocene (Rendell et al. 1989; Hurcombe 2004), matching the age of the earliest Chinese finds. However, the Mode 1 assemblages remain remarkably neglected, apart from the notable syntheses by Dennell (1995) and Chauhan (2007, in press). There appears to be also confusion between 'primary' Mode 1 assemblages (those that precede Mode 2 occurrences chronologically) and 'regressive' Mode 1 features (of essentially much later, perhaps impoverished pockets of technology, which can be found in any part of the world and until well into the Holocene) (cf. Guzder 1980: 79; Corvinus 2002; Gaillard 2006). The former are recognised by deep weathering, early geological or stratigraphic context, and by specific features, such as the massive choppers from Daraki-Chattan with their distinctive bi-marginal trimming (also reported from other sites of the central region, such as Mahadeo-Piparia; Khatri 1963) and lack of any Levallois features. Vaguely similar lithics can occur in countless, much more recent traditions, but not in the distinctive combinations of genuine Mode 1 assemblages (for instance the tiny pebble tools of Kalpi are quite unrelated to proper Mode 1 types; Tewari et al. 2002). While it may be justified to argue that much of India presents sedimentary facies that are less than perfect for the preservation of osseous remains, which may partly explain the dearth of skeletal remains, this should not prevent the preservation of stone tools. Yet undeniably the lengthy first phase of human presence, so crucial to understanding hominin development in Asia, remains in effect largely unexplored.

The need for a secure chronological reference frame for the earliest Indian history is not merely a local, south-Asian issue, it is an issue of global relevance. The presence of early hominins in eastern Asia, by 1.8 or 1.9 million years ago at the latest, renders it almost inevitable that they also occupied India before they could have colonised the eastern regions (i.e. if we made the reasonable assumption that hominins initially evolved in Africa). Their development of maritime navigation about a million years ago in Indonesia as well as the relative sophistication of stone tool traditions in Flores and Timor (Bednarik 1995a, 1997a, 1999a, 1999b; Bednarik and Kuckenburg 1999; Morwood et al. 1999), demonstrating colonisation by seafaring, are of importance to questions of the cognitive and technological development of hominins. The proposition that very early palaeoart traditions developed in southern Asia adds further impetus to the idea that while Africa may have been the engine house driving physical human evolution, at least initially, southern Asia was a hub of cognitive and technological evolution. But in comparison to the archaeological attention lavished on eastern Africa, the Levant and south-western Europe, the Pleistocene human history of India has been significantly neglected. Yet its potential in illuminating key issues of hominin development may well be unequalled anywhere in the world.

The only two hominin fossil specimens of Asia found between the Levant and Java, the Narmada calvarium and clavicle, were both recovered at Hathnora (H. de Lumley and Sonakia 1985; Sankhyan 1999), about forty kilometres south of Bhimbetka, where Acheulian petroglyphs were first identified. The partially preserved cranium was initially described as *H. erectus narmadensis* (Sonakia 1984, 1997; M.-A. de Lumley and Sonakia 1985), but is now considered to be of an archaic *Homo sapiens* with pronounced erectoid features (Kennedy et al. 1991; Bednarik 1997a). Its cranial capacity of 1200 to 1400 cubic centimetres is conspicuously high, especially considering that this is thought to be a female specimen. The adult clavicle, however, is clearly from a 'pygmy' individual, being under two thirds of the size of most modern human groups. It is of an individual of a body size similar to *Homo floresiensis*. Both specimens are among the most remarkable hominin finds ever made, yet both remain widely ignored. There is, however, no evidence to show that the two finds are of the same individual, or even of the same sub-species. They simply co-occurred in the Unit I Boulder Conglomerate of the Hathnora site (H. de Lumley and Sonakia 1985). The rich accompanying fauna implies a middle or late Middle Pleistocene age for the hominin finds. It comprises three Elephantidae, five Bovidae, a hippopotamus, a horse, a pig and a cervid. The equally rich stone tool assemblage from the same unit consists of Late Acheulian to Middle Palaeolithic tools. The stratum extends elsewhere along the central Narmada valley and is generally rich in Middle and Late Acheulian industries, featuring a large number of handaxes, cleavers and discoids.

The hominin-bearing sediment at Hathnora has been suggested, without much tangible evidence, to be in the order of 200 000 years old. The only secure age information comes from a series of palaeomagnetic determinations, according to which the entire relevant sediment sequence at Hathnora is of the Brunhes normal chron, hence the human remains must be younger than 730 ka (Agrawal et al. 1988, 1989). On the other hand it is unlikely that they are under 150 ka old. Within this rather long interval, both tool typology and fauna point to the uppermost time zone. Having examined the Narmada calvarium I consider that its most likely age is in the order of 200 ka, because its fully modern cranial volume renders a greater age highly unlikely.

The petroglyphs in Auditorium Cave

In central India, no petroglyphs were reported until quite recently, and it appears that there had been no previous attempt to locate any (Bednarik et al. 1991). In 1990 eleven petroglyphs were observed in Auditorium Cave, which V. S. Wakankar had previously considered to be rock gong markings. Two of the petroglyphs, a cupule and a meandering groove (Figure 2), had been excavated by Wakankar in an Acheulian occupation deposit directly covering them (Bednarik 1993a, 1994a, 2001a, 2003; Chakravarty and Bednarik 1997: 58–9), but were not noticed by him. The overlying Middle Palaeolithic stratum is so solidly cemented by calcite deposition that the possibility of post-depositional disturbance can be ignored. However, it has been proposed that the remaining nine motifs (all cupules), although found above ground, are almost certainly of similar age (Bednarik 1996). They are located on the vertical panel of Chief's Rock. The petroglyphs occur in the central part of the cave, well protected from weather, yet they are extremely corroded due to their extraordinary antiquity. An age in excess of 100 000 years has been proposed, based on an attempt to analyse the microerosion of one of the Chief's Rock cupules, which placed its age beyond the range of the method (Bednarik 1996).

The two Auditorium Cave petroglyphs below ground were noticed before 1990 by Erwin Neumayer (1995), who was uncertain as to their anthropic origin. Michel Lorblanchet, a French specialist of limestone cave art, examined the site in 1993 and correctly judged what he saw to be natural rock markings rather than petroglyphs. Close reading of his report makes it very clear, however, that Lorblanchet examined not the petroglyphs (which by the time of his visit had already been concealed by the erection of the masonry wall), but mistakenly several natural depressions on bedrock on the southern side of the now greatly enlarged trench II of Wakankar that were not even exposed prior to the ASI modifications in 1991 (and could therefore not have been seen by me in 1990).

In my 1990 examination I was certain that the two boulder markings in Figure 2 are anthropic, but initially I remained hesitant to pronounce them so. Their obvious Lower Palaeolithic age seemed impossible to reconcile with rock art production. Only after examining the nine cupules above ground microscopically and thus realising their extreme antiquity did I gather the courage to propose the Lower Palaeolithic age of those below Acheulian sediments (Bednarik 1993a, 1994a).

Geologically the Bhimbetka hills form part of the Lower Vindhyan sandstone facies, but the rock is locally sufficiently metamorphosed to warrant the description of quartzite. No doubt the Bhimbetka tors owe their existence to such variations in consolidation. Auditorium Rock, like all of the Bhimbetka rock towers, is of a densely cemented quartzite of considerable colour variation. Munsell 7.5R-3/6 (dark red) with horizontal bands of a few centimetres width, of 7.5YR-8/4 (pink), occurs commonly, while Chief's Rock itself is around 4YR-7/4 (pink with brown tinge). This quartzite has been extensively quarried at Bhimbetka sites (including Auditorium Cave and Misra's Shelter) during the Palaeolithic. It accounts for the vast majority of all known Lower and Middle Palaeolithic stone artefacts in the area.

Figure 2. *Cupule and meandering groove on boulder, the lowest-most part of which was covered by Acheulian occupation evidence, Trench II, Auditorium Cave, Bhimbetka.*

Chief's Rock is over 2.5 m high and 3.4 m wide. The actual eastern panel of it, the face we are concerned with here, measures 2.2 m in height. The massive boulder, weighing perhaps thirty to forty tonnes, originates from the roof of the cave. Long after it had fallen to the floor, in recent geological history, it split into two portions, apparently along the bedding planes of the rock facies. In sliding about a metre on its southern end, the eastern half of the boulder then became rotated relative to the larger western half, by about 16 degrees.

The quartzite of Auditorium Rock shows many varieties of surface preservation, which are clearly related to factors of weathering. Most particularly, insolation has been active outside the cave, while within, moisture has affected different surfaces differently. Some bedrock surfaces in excavation trench II have been preserved almost without alteration since the time they became covered by Acheulian sediments. Others nearby were severely affected by scalar surface fretting, attributable to moisture. Granular exfoliation, however, which is such a dominant feature in the weathering of softer sandstones, is practically absent on the Bhimbetka quartzite.

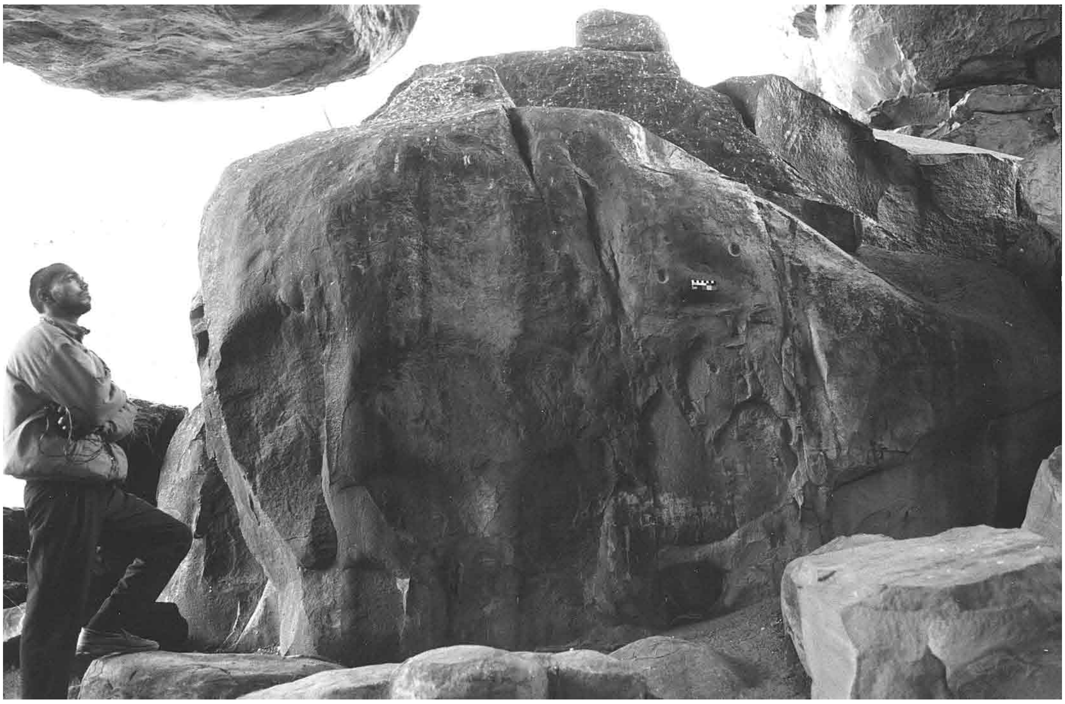

Figure 3. *Chief's Rock, Auditorium Cave, eastern side; the cupules can be seen.*

The surfaces of the upper portions of Chief's Rock are generally well preserved. On top of the rock there are clear traces of kinetic weathering (impact by rocks falling from the roof). Only the lower section of the eastern panel has suffered visible weathering damage. Several scales have become detached, probably because of subcutaneous salt deposition from episodic wetting or capillary action. Cutaneous exfoliation continues on this part of the boulder. Chief's Rock is one of the driest locations in the cave, being free of major precipitate deposition, but during the monsoons rain may be driven in from the high north entrance. The moistening of the sediment promotes some capillary moisture in the lower part of the panel, which has effected very slow weathering. Rock surfaces elsewhere have not been subjected to this process, and have survived since they became concealed under Acheulian deposits, with no more than superficial corrosion.

The fairly flat panel on the east side of Chief's Rock, measuring over five square metres, is nearly vertical, forming a natural 'blackboard' (Figure 3). It bears two types of rock art. Firstly, there are several barely perceptible marks of red pigment, presumably of an iron mineral such as haematite, which are clearly remnants of rock paintings. Significantly better-preserved rock paintings occur elsewhere in the cave (and in over 500 other sites at the Bhimbetka site complex; Misra 1978), especially high up on a wall a few metres south-east of Chief's Rock. None of the paint traces on the Chief's Rock art panel are superimposed over the petroglyphs.

All the petroglyphs on this panel are cupules (or cup marks; 'hemispherical' depressions made by pounding the rock with a pointed stone tool). There are nine

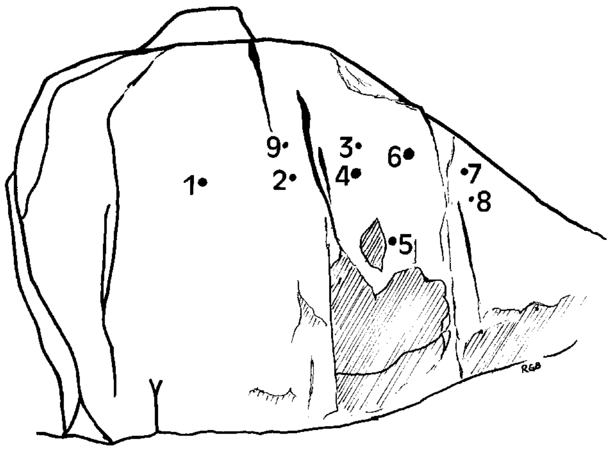

Figure 4. *Elevation of the eastern panel of Chief's Rock, Auditorium Cave, Bhimbetka, showing the distribution of the cupules (1–9).*

cupules present, of greatly varying depths. Percussion with a stone tool, probably hand-held, produced them. Cupules are one of the most ubiquitous features in world rock art, they are extremely numerous and they occur in all continents (Bednarik 1993b). In view of the large cupule observed in nearby trench II, covered by Acheulian deposit (Bednarik 1993a), the nine cupules on Chief's Rock are of very considerable importance, and the question of their age is crucial.

Figure 4 shows an elevation view of the rock art panel on Chief's Rock. In order to describe the cupules on it effectively it was necessary to number them for identification. They are numbered from left to right, except number 9 because it is of slightly doubtful status. There is no reasonable doubt about

Cupule No.	Horizontal dimension	Vertical dimension	Maximal depth
1	35	37	3.7
2	44	49	3.9
3	36	35	3.5
4	52	58	11.9
5	40	45	9.4
6	54	64	13.4
7	45	44	12.0
8	22	24	1.1
9	60	79	8.8

Table 1. *The dimensions of the nine cupules on Chief's Rock, Bhimbetka. All measurements are in millimetres.*

the remaining eight marks, they were clearly made by human hand.

Table 1 provides the physical dimensions of the cupules. We see from it that they are of greatly varying depths, ranging from 1.1 mm to 13.4 mm. In most of them, their vertical extent exceeds their horizontal dimension somewhat. The deepest point of all seems to be below the centre of each cupule, which is probably related to the production process: blows were administered from above rather than from below or sideways. This is a common characteristic of cupules and similar rock markings whenever they occur on vertical surfaces. The 1.8-m-wide rock platform in front of the Chief's Rock art panel is likely to have been the floor the producers of the cupules were standing on. Most of the marks are between 1.5 m and 1.7 m above that platform, i.e. at ideal working height for an average-size adult man. Interestingly, if the entire block is rotated back into the position it was in before Chief's Rock broke in two (which means raising the southern end), the prominent cupules 1, 2, 4 and 6 form an almost perfectly horizontal alignment. This suggests that the cupules were produced before the boulder broke up, although it does not necessarily demonstrate that.

Cupules 3, 4, 5 and 6 bear minor recent impact damage, and faint traces of it are also discernible in Cupule 2. This damage was probably caused when people tested Wakankar's suggestion that Chief's Rock was used as a rock gong. Needless to say, this was irresponsible, and under no circumstances should that practice be repeated. The markings are not related to the use as a rock gong (lithophone), they are primarily cupules and thus a common form of rock art (Bednarik 1993b, 2008).

Microscopic examination of the cupules shows the presence of various types of small-growth lichens, the dominant species being dark-grey to black. An orange-coloured type occurs only sporadically. The rock surface in and around the cupules is equally weathered, and there is no appreciable difference in surface structure evident under the microscope. The only weathering clearly visible on the upper part of the panel, next to most cupules, is microerosion (Bednarik 1992a). Although the percussion origin of the cupules is beyond question, this process has removed all traces of cleavage edges, crushing or crystal fracture, and no conchoidal surfaces have remained. Cupules Nos 9 and especially 2 are largely covered by tiny gnarled ridges of precipitate, possibly carbonate, forming terrace-like arrangements visible only under magnification. These formations are darkly coloured and extensively corroded. Very thick speleothems (cave precipitates) occur in the middle part of the eastern passage, about 12 m from Chief's Rock, where there is considerable seepage from the top of the rock tower.

The probable age of the Chief's Rock cupules

The question of the age of these cupules is of significance to Indian rock art research. Their Pleistocene antiquity is geomorphologically almost self-evident, and no rock art of that period had been demonstrated to exist at any other site in India until 1996. There is no archaeological evidence available that would indicate the age of the petroglyphs on Chief's Rock. The presence of two Lower Palaeolithic petroglyphs just 6 m away, found below undisturbed archaeological layers, may be suggestive, particularly as one of them is also a cupule (Bednarik 1993a, 2001a). However, mere co-occurrence at the same site does not provide conclusive evidence that the cupules on Chief's Rock itself also have to be of Acheulian age.

The only independent means of testing this proposition is by direct geomorphological evidence from the cupules themselves, and from features they are related to. So far, we have seen that the degree of microerosion in all the cupules is such that a Holocene age is totally out of the question. Microerosion analysis (Bednarik 1992a) has been attempted to shed more light on the question of their antiquity. Particularly detailed information is available from cupule No. 5, which is located much lower than the main group (Figure 5). It occurs on a surface that is much more recent than the cupule, formed by cutaneous exfoliation around it. In other words, only the deeper part of the cupule is preserved. This part itself has since been subjected to a second cycle of the exfoliation process. Immediately to the left of the cupule, just 15 mm from it, begins a large exfoliation scar where the 10–20 mm lamina has become dislodged already long ago. The rock around the cupule is loose, and once it does become dislodged, only the very base of the cupule will remain behind. The remnant cupule will then be less than one millimetre deep.

The thin bridge between cupule 5 and the scar to its left, 15 mm wide, is of considerable importance in the relative dating of the cupules. As depicted

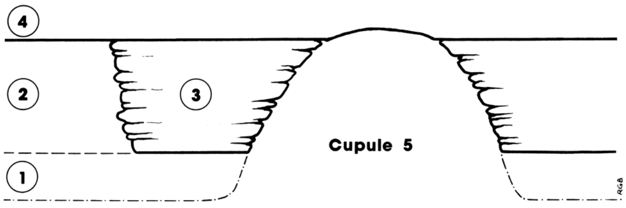

Figure 5. *Section through cupule No 5 on Chief's Rock, viewed from top, showing the development of a wafered layer and the sequence of previously detached exfoliation laminae; nearly natural size.*
1 - Exfoliated lamina 1; 2 - Exfoliated portion of lamina 2; 3 - Remaining portion of lamina 2, with wafered stratification; 4 - Sound rock core.

in Figure 5, the currently exfoliating rock lamina has a wafered appearance in section, and while one might argue that this weathering process could have commenced before lamina 1 became detached, it is obvious that the edge of lamina 2 along the exfoliation scar must postdate the detachment of lamina 2 in that area. Hence the wafering along this margin must also postdate that event. Fortunately I detected several thin slivers of stone among these wafer-like laminae that protruded far enough to examine them under the binocular microscope. Their edges were well-rounded and there can be no doubt that this would have required some tens of millennia at least to develop to the stage observed, in this kind of environment of minimal exposure to rainwater.

It can be certain that the cupule was originally made on perfectly sound rock, because if the rock had already begun to deteriorate, it would have fractured and shattered by the percussion blows. It follows from this that we can construct a 'minimum' relative age for the cupule, consisting of successive periods or processes, none of which could have overlapped with the others:

1. The time span between the execution of the cupule and the commencement of the exfoliation of the first lamina. Its duration is unknown.
2. The duration of the laminar exfoliation processes that led to the detachment of the first lamina. Depending on moisture availability, this may be from a few millennia to several tens of millennia.
3. The duration of the processes leading to the detachment of lamina 2 immediately to the left of the cupule. A similar order of time as in item 2 is involved.
4. The time span required to cause the wafering of the margin of the remaining lamina 2, e.g. just left of cupule 5. This would require quite a number of millennia to develop to the present state.
5. The time span required for fracture edges on individual wafer laminae to attain the degree of rounding now evident, which we have noted would involve some tens of millennia.

It follows from this that the actual age of cupule No. 5 would have to be at least in the order of many tens of millennia, and that it may well be in excess of 100 000 years. Certainly, it is impossible to accommodate the cupule in the Holocene, on geomorphological grounds alone. Similarly, it is very unlikely to be from the latest part of the Pleistocene, i.e. the Upper Palaeolithic period. Moreover, Wakankar has observed an absence of Upper Palaeolithic occupation deposit in Auditorium Cave, finding the Middle Palaeolithic deposit immediately under the Mesolithic. The absence of an Upper Palaeolithic occupation deposit does not prove that the cupules could not be of that period (Upper Palaeolithic evidence has been found elsewhere at Bhimbetka), but it does coincide with the apparently greater age of the cupules on geomorphological grounds.

Another line of argument concerns the separation of Chief's Rock into two boulders. If this event does postdate the execution of the cupules, as suggested above, it would provide a minimum age for them. Unfortunately, dark coatings of precipitates conceal the fracture surfaces on both halves. The macro-wanes along the upper edges of both fractures are well developed, measuring up to several millimetres, but the edges are much less weathered along the sides. This does not seem to provide a reliable indicator of age. Besides, such reasoning would rely on the purported relationship between the splitting of the rock and the event of cupule manufacture, a relationship that remains unproven.

On the basis of this geomorphological analysis and reasoning, the cupules are most probably of either Middle Palaeolithic or Lower Palaeolithic age. More cannot be said with any degree of certainty. Microerosion study of the cupules has been useful in investigating the possible durations of specific phases of geomorphological history. However, this method cannot provide a reliable estimate of age, due to three difficulties:

a. The surface of the cupules is too much eroded to permit the identification of fracture edges or their micro-wanes. This in itself renders an age of over 100 000 years highly likely.
b. The past exposure to moisture, while certainly much less than in the open, is unknown to us.
c. We have no microerosion calibration curves for the region in question.

The only other useful strand of evidence is the presence of one nearby cupule found below Acheulian deposits. We know with certainty that it was not visible at the time the Middle Palaeolithic commenced, having become well covered by sediment at that time. It cannot possibly have been visible to the Middle Palaeolithic occupants, so it cannot have inspired them to copy it. It would then be a complete coincidence if the Middle Palaeolithic residents had used the same method of creating rock marks. This is of course possible, and we know that Middle Palaeolithic people of Europe and Australia certainly created cupules (Bednarik 1993b). However, it would seem to be an odd coincidence if two peoples, one of the Middle and one of the Lower Palaeolithic, had created similar rock art at precisely the same location, independent of each other. Logic therefore suggests that it is much more likely that the cupules on Chief's Rock art are of the acheuloid or chopping tool tradition. In short, it is suggested here that they should be tentatively considered to be Lower Palaeolithic, and that this proposition be subjected to refutation attempts in the future. Excavations in future years or centuries are expected to further clarify the issue, because it seems very likely that more petroglyphs will be uncovered in the vicinity of Chief's Rock once a greater part of Auditorium Cave is excavated.

Discussion

Irrespective of their antiquity, the nine cupules on Chief's Rock are an important feature of this site of world significance. Auditorium Cave contains not only the first identified Pleistocene rock art of India, but also one of the oldest known rock art occurrences in the world. The two Lower Palaeolithic petroglyphs (Bednarik 1993a) in trench II have been re-buried by the Archaeological Survey of India for protection and preservation when the trench was greatly enlarged southwards and eastwards in 1991, and a substantial masonry wall with steel railing was erected. The cupules on Chief's Rock, however, remain fully exposed to damage by site visitors. As noted above, under no circumstances must they be damaged further, and I have suggested that all stones of sizes suitable for hammering be removed from the whole of the cave floor. Prompted by the world's first discovery of Lower Palaeolithic rock art I have also initiated the nomination of Bhimbetka for World Heritage listing (Bednarik 1994b). Strangely, the eventual nomination documents (Ray and Ramanathan 2002a, 2002b) make no mention at all of the petroglyphs of Bhimbetka, which is perhaps attributable to the scepticism of the archaeological establishment at my bold proposal.

However, as early as 1996, new evidence had been tendered suggesting that I had been right, with the discovery of a second quartzite cave with extremely early cupules, apparently of Lower Palaeolithic antiquity (Kumar 1996). This prompted the establishment of the EIP (Early Indian Petroglyphs) Project, the purpose of which is to have an international commission examine my claims and those of G. Kumar (Bednarik 2001b). The subsequent excavation of Daraki-Chattan has yielded substantial and conclusive evidence that the 540 cupules and three linear grooves in that cave were made well before the Late Acheulian occupation of the site, and are indisputably related to a Lower Palaeolithic habitation horizon dominated by chopping tools, located just above the site's bedrock. Twenty-six of the cupules were found in and below the Acheulian layers, having exfoliated from the cave walls at the entrance, and continued all the way down to the oldest human occupation of this ancient site. Even the hammer-stones with which some of the cupules had been made were found with the chopping tools of the lowermost sediment deposit. Moreover, there are several further early cupule sites now known in Madhya Pradesh and Rajasthan, potential candidates for Lower Palaeolithic antiquity. The most promising among them are Bajanibhat (Kumar and Sharma 1995) and Pola Bata (Bednarik et al. 2005).

The comprehensive evidence from Daraki-Chattan has shown beyond reasonable doubt that Lower Palaeolithic rock art, comprising mostly cupules and occasional linear grooves, does exist in central India, that it is attributable to a chopping tool industry found well below an acheuloid tradition, and that my initially audacious claim for Auditorium Cave is no longer controversial. The empirical evidence at the Bhimbetka site is, admittedly, much weaker than it is at Daraki-Chattan, but if Lower Palaeolithic petroglyphs occur at one site of Madhya Pradesh, it should not surprise us that there are others. On the contrary, they are to be expected to exist. Why should only one site have survived of a tradition that persisted no doubt for tens of millennia? It follows that my previous evidence from Bhimbetka has been reinforced and my reasoning has been vindicated.

Nor should it surprise us that the earliest rock art found in India consists largely of cupules, or that rock art was produced in the Lower Palaeolithic. Both factors are entirely consistent with the evidence available to us. In the first instance, the earliest known rock art from all continents consists either of cupules, or of cupules and linear grooves. The oldest rock art we know of from Europe are the eighteen cupules found on the underside of a limestone slab placed over the burial of a Neanderthal child in the cave La Ferrassie, France. This interment, grave No. 6, is part of a Middle Palaeolithic cemetery (Peyrony 1934: 34). Africa may well yield Lower Palaeolithic rock art, a prime contender being some cupule sites in the Kalahari Desert recently found by P. Beaumont and colleagues. In Australia it is generally agreed that the continent's oldest surviving rock art comprises mostly cupules, Pleistocene examples of which occur widely and in huge numbers (Bednarik 1993b). It is thought that this tradition, occurring in Australia both in deep limestone caves and on exposed granite boulders, was introduced from southern Asia at least 60 000 years ago (Bednarik 1997a). In the Americas, no rock art of such antiquity is anticipated, but interestingly a similar pattern can be observed among the early rock art traditions. In North America, the 'pit-and-groove' petroglyphs (cupules and linear marks) are generally regarded as the earliest rock art form (Heizer and

Baumhoff 1962), and in South America, rock art also commences with cupules and linear grooves (Crivelli M. and Fernández 1996; Bednarik 2000). In short, India is merely part of a global, universal pattern, which has much less to do with the kind of rock art created first, but much more with the kind of rock art that was taphonomically the most resistant (Bednarik 1997b) and therefore the only form capable of surviving immense time spans.

The second point to consider is this: is there any fundamental empirical objection to the possibility of finding rock art of the Lower Palaeolithic period? The answer is that the occurrence of such traditions is to be expected. We have for many years known that the people of the Lower Palaeolithic engraved linear patterns on bone, ivory and portable stone (Bednarik 1992b, 1995b; see Bednarik 2003 for comprehensive summary), so what conceivable reason could they have had not to engrave on rock as well? We have known for over 150 years that they used beads, which are conceptually more complex than intentional, non-utilitarian rock markings (Bednarik 2005). Red pigment has certainly been used by Lower Palaeolithic hominins, and we can only assume that they coloured surfaces with it, be they surfaces of rocks, artefacts or their bodies. The proposition that hominins of some hundreds of thousands of years ago could not have made simple rock markings, when we know that they used beads and pendants, having already around a million years ago developed the capability of building seagoing water craft large enough to carry colonising parties, is preposterous. Seen in the context of the cognitive faculties we can fairly attribute to the people of the second half of the Lower Palaeolithic, it is perfectly reasonable to expect them to create non-utilitarian markings on rock, some of which may have survived.

They have indeed survived in rare cases, at least in central India, where they currently constitute the oldest known rock art in the world.

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