

The President of the Archaeological Institute of America, Robert H. Dyson, Jr., University of Pennsylvania, is ex officio member of the Committee. Elizabeth A. Whitehead, General Secretary of the Institute serves as Chairman and co-ordinator of the activities of the Committee.

At its first meeting on March 23rd, 1977, the *Committee on East Asian Archaeology* agreed to study a number of substantive proposals. Immediate action will be taken to broaden the Visiting Lecture Program of the Institute by adding Asian scholars. Members of the Committee have agreed to make their services available to lecture to a number of the eighty-one societies of the Institute, which are located throughout the United States and Canada.

Committee members will also make known to colleagues working in countries of East Asia that the pages of *ARCHAEOLOGY* magazine are available to them for publication of their research. Phyllis Pollak Katz, editor of *ARCHAEOLOGY*, attended the initial meeting and will co-operate actively with the Committee.

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THE ACHEULIAN INDUSTRY OF ROCK SHELTER IIIF-23 AT
BHIMBETKA, CENTRAL INDIA - A PRELIMINARY STUDY¹

Introduction

It is over a century and a decade ago that the first Acheulian implement - a cleaver - was found by Robert Bruce Foote in a lateritic gravel pit at Pallavaram near Madras². During the following three decades Acheulian finds were made from many sites in peninsular India, mainly by Foote himself but also by some other amateur archaeologists. In the last three and a half decades systematic exploration of many regions in India for palaeolithic remains has been carried out by workers from several institutions, the majority of them from the Deccan College, Poona working under the inspiration and guidance of Professor H.D. Sankalia. Acheulian industries have been found over almost all of the country except the Indo-Gangetic plains and the western

coast. As a result of these studies the geographic distribution of Acheulian industries is now fairly satisfactorily known.³

But that is almost all we know of the Acheulian culture. We know virtually nothing of the way of life of Acheulian man. Even our knowledge of the real nature of Acheulian industries and, consequently, of their technological evolution and relative chronology is negligible. The main reason for this state of affairs is that until very recently palaeolithic research has been confined, with the exception of one early attempt at excavation⁴, to the exploration of secondary sites like riverine sediments, stream beds and surface occurrences of artifacts. The collections have, in the circumstances, of necessity been selective and heavily weighed in favour of finished and large tools. The artifactual material obtained from such contexts is naturally mixed both in time and space, and gives only a fragmentary and distorted picture of Acheulian industries. In the last few years there has been a welcome shift of attention to the excavation of palaeolithic sites. However, totally undisturbed palaeolithic sites are as yet very scarce. In this context the discovery and excavation of thick Acheulian occupation deposits in caves and rock shelters at Bhimbetka promises to add substantially to our knowledge of the Acheulian culture.

The Site and its Ecological Setting.

The site of Bhimbetka (70°37'E: 22°50'N) is located on the northern margin of the Vindhya Hills in the Raisen District of Madhya Pradesh (Fig.1). The Vindhyas run parallel to the Narmada river on its northern side. Though in the main they consist of Deccan lavas, between Bhopal and Itarsi they are composed of sandstones. The hills form a great scarp overlooking the Narmada valley and rarely exceed a height of 610 m (2000 ft)⁵. Near Bhimbetka the hills recede to the sides to form a broad extensive valley through which runs the Bombay-Delhi line of the Central Railway. The hills at this point also form a watershed. The drainage to the north flows into the Betwa river to ultimately join the Ganga valley while drainage to the south goes into the Narmada river. There is no perennial stream close to Bhimbetka, the nearest such streams being the Narmada some 25 km to the south and the Betwa 20 km to the north.

Bhimbetka (corrupted form of the Hindi name Bhimbaithka, meaning the sitting place of Bhima, one of the heroes of the epic Mahabharata) is the name applied to a hill about a kilometre long (east-west), half a kilometre broad

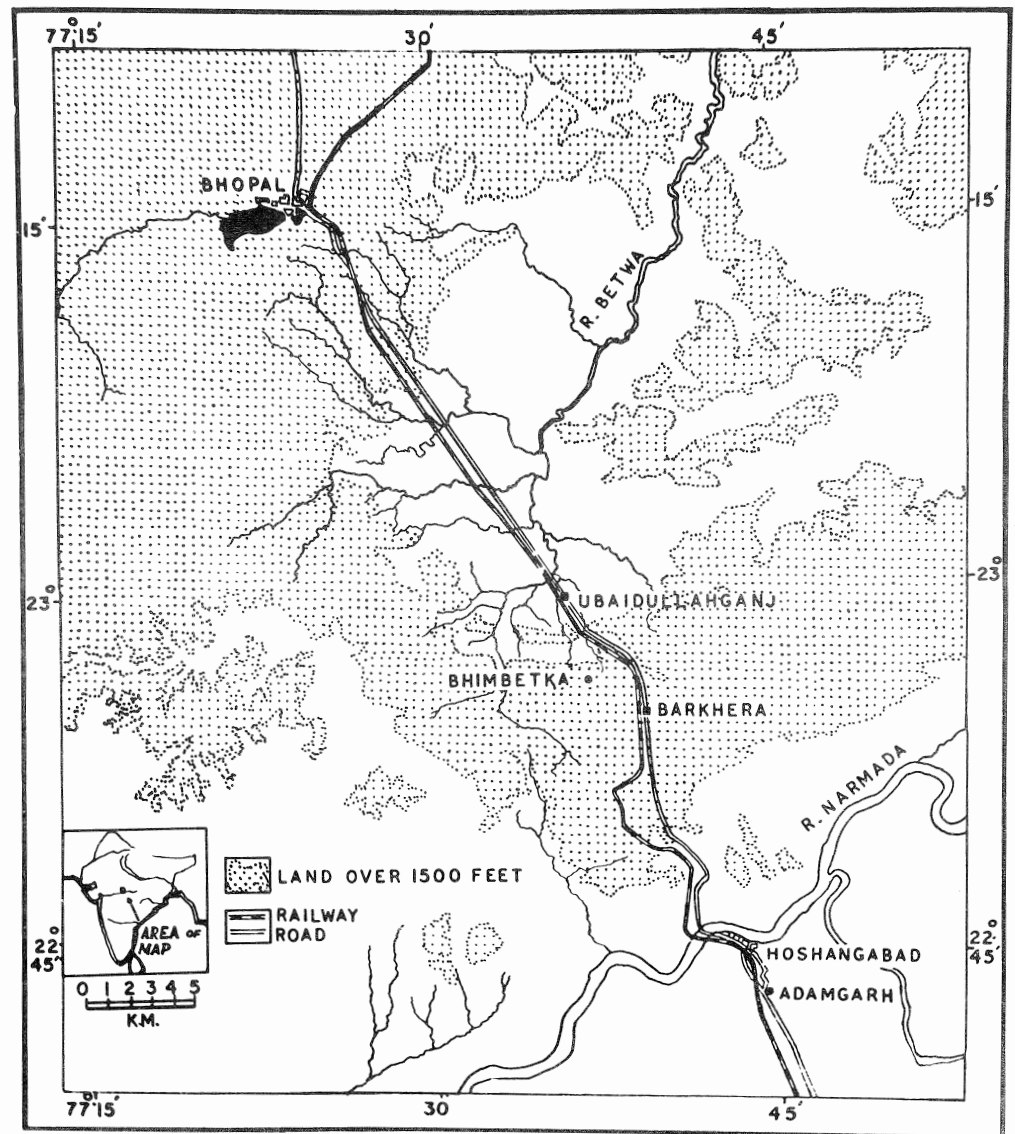


Fig. 1 Map of Bhimbetka region

(north-south) and over a 100 m high from the plain level and (650 m above mean sea level). The hill lies about two kilometres south of the tiny tribal hamlet of Bhianpur (original form Bhimapura, meaning the village of Bhima) which lies close to the southern side of the railway line and the Itarsi-Bhopal highway running parallel to it. It can be approached on foot or by jeep from the village. The village is situated 45 km south of Bhopal and 30 km north of Hoshangabad and is almost midway between the towns of Obaidullaganj in the north and Barkhera in the south (Fig.1). A prominent feature of the hill is the presence on its top of a chain of discontinuous monolithic rocks which gives from a distance the appearance of a fort and are conspicuous in the local topography (Plate Ia). Many of these rocks have been weathered to form caves and rock shelters of various sizes. Some of the caves and the rocks in which they are formed are of enormous size, the largest cave (IIIF-24 or Auditorium cave) being 40 m long, 4 to 12 m broad and 6-15 m high. Possibly because of this factor the caves have become associated, in folk tradition, with Bhima, one of the Pandava heroes, celebrated for his prodigious strength. As well as Bhimbetka and Bhianpur other features in the local geography recalling association with the epic story are the ruins of an old settlement at Pandapura (meaning Pandavapura or the village of Pandavas) and a spring known as Banaganga (the spring created by an arrow).

The top and the northern and western slopes of the Bhimbetka hill contain over two hundred caves and shelters. A second hill to the west of Bhimbetka, known as Lakha juar, and a third to the east, known as Bhaunrewali, are almost equally rich in caves and shelters. Altogether, in a stretch of over 10 km between the villages of Kari Talai in the east and Jondra in the west, the hills contain over 1,000 caves and shelters. The shelters have been divided into seven groups, I, II, III, etc. from east to west. Each of these groups has been further divided into sub-groups named A, B, C, etc., and within each sub-group the shelters have been numbered in Arabic numerals. These three-tiered numbers (example IIIF-23) have been put in black India ink on the walls of the shelters.⁶

Over 700 of the shelters contain paintings on their walls and ceilings, the number of paintings in a single shelter ranging from one or two to well over a hundred. On the basis of superimposition, subject matter, style and correlation with finds from excavations the

paintings are seen to range from Mesolithic to Medieval times. Bhimbetka and its neighbouring hills thus have the largest known concentration of prehistoric paintings in India, and perhaps in the world. A smaller though indeterminate number of shelters also contain on their floors occupation deposits of variable thickness covering the period from Acheulian to late Mesolithic times.

The Bhimbetka region receives an annual rainfall of over 120 cm which is largely concentrated in the three monsoon months of July-September. The hills are thickly covered by deciduous forest vegetation. Though increasing population and consequent growing demand for timber and fuel are taking a heavy toll of vegetation the forest cover on hills away from human settlements is still fairly well preserved. At least thirty species of trees and plants in the forest have edible flowers, fruits and seeds and several plants have edible roots and tubers. Among the former the more important are: Mahua (*Bassia latifolia*), Achar (*Buchanania latifolia*), Tendu (*Diosphyros tomentosa*), Bel (*Aegle marmelos*), Bhandara (*Erytherina indica*), Am (*Mangifera indica*), Jamun (*Eugenia jambolana*), Gular (*Ficus glomerata*), Aonla (*Phyllanthus emblica*), Ber (*Zizyphus jujuba*), Papda (*Gardenis latifolia*), Imli (*Tamarindus indica*), Ghathor (*Zizyphus xylopera*), Khajur (*Phoenix sylvestris*), Sitaphal (*Anona squamosa*), Kakhera or Kankher and Menar. Among tubers the more common are Semal Kand, Safed Musli, Potia Kand, Karhari Kand and Kahlula. Even today the local population for many kilometres around Bhimbetka extensively exploits the forest foods, especially Mahua and Achar. From March to May every year almost the entire population of the region descends on the forest to collect Mahua and Achar. During lean periods many tribal families depend almost exclusively on forest foods to ward off starvation.

Wild life in the forests used to be plentiful within living memory, but clearing of forests and indiscriminate hunting have largely exterminated it. However, even today a number of species are present in small numbers and during our four seasons of camping in the forest we were able to sight several of them. They include Sambar (*Cervus unicolor* Kerr), Chital (*Axis Axis* Erxleben), black buck (*Antelope cervicapra* Linn.), Milgai (*Boselaphus tragocamelus* Pallus), wild boar (*Sus scrofa cristatus* Wagner), Hyena (*Hyaena hyaena* Linn.), leopard (*Panthera pardus* Linn.), wolf (*Canis lupus* Linn.), sloth bear (*Melursus ursinus* Shaw), porcupine (*Hystrix indica* Kerr),

hare (*Lepus nigricolis* F. Cuvier), fox (*Vulpes bengalensis* Shaw), jackal (*Canis aureus* Linn.) and common langur (*Presbytis entellus* Dufresne). However, hunting as a source of food is now practically non-existent. Fish are caught in the streams and ponds by professional castes and sold to other communities. There are several natural perennial springs close to Bhimbetka and these constitute the only source of water for the local human and animal populations. Thus Bhimbetka region is ideally suited ecologically for occupation by hunter-gathering populations. Judging from the thick occupation deposits in numerous caves and shelters spanning the period from Acheulian to late Mesolithic it would appear that this favourable ecological situation has existed all through prehistoric times.

Excavation and Stratigraphy

Excavations at Bhimbetka were begun in 1972 by V.S. Wakankar who dug a trench in both IIF-24 and IIB-33, finding Acheulian material in the former and Mesolithic material in the latter. In subsequent years he found Acheulian materials in two other shelters, IIIA-29 and IIIA-30. During three seasons (Jan-April, 1973; Feb-April, 1974 and Feb-May, 1975) digging took place over a period of 235 days in an area of 52 square metres inside the shelter.

Shelter IIIF-23 is one of the largest and so far has the greatest thickness of habitation deposit on the Bhimbetka hill (Plate Ib). It opens to the south on a level plateau which overlooks an extensive panoramic green valley. The shelter has a broad and high frontage and another small opening at the back which has to some extent been enlarged by rock fall in post-Mesolithic times. An area of about 32 square metres is enclosed by side walls and can be called the cave proper while the massive rocky overhang extends forward and to the left over a further area of nearly 80 square metres (Fig.2). By late Mesolithic times the shelter had been filled to within 1 m of the ceiling and would appear to have been abandoned for occupation only when the movement inside it became all but impossible. Its surface is remarkably even and has a gentle slope toward the outside. Before starting the dig the entire shelter was put under a 1 m² grid. One square metre was excavated at a time. All earth was sieved - in the case of fine and soft Mesolithic debris through 1 mm mesh sieves and in the case of coarse and compact Palaeolithic debris through 2 mm mesh sieves. Every piece that showed human workmanship - whatever its size - was carefully sorted out of the sieved debris, washed

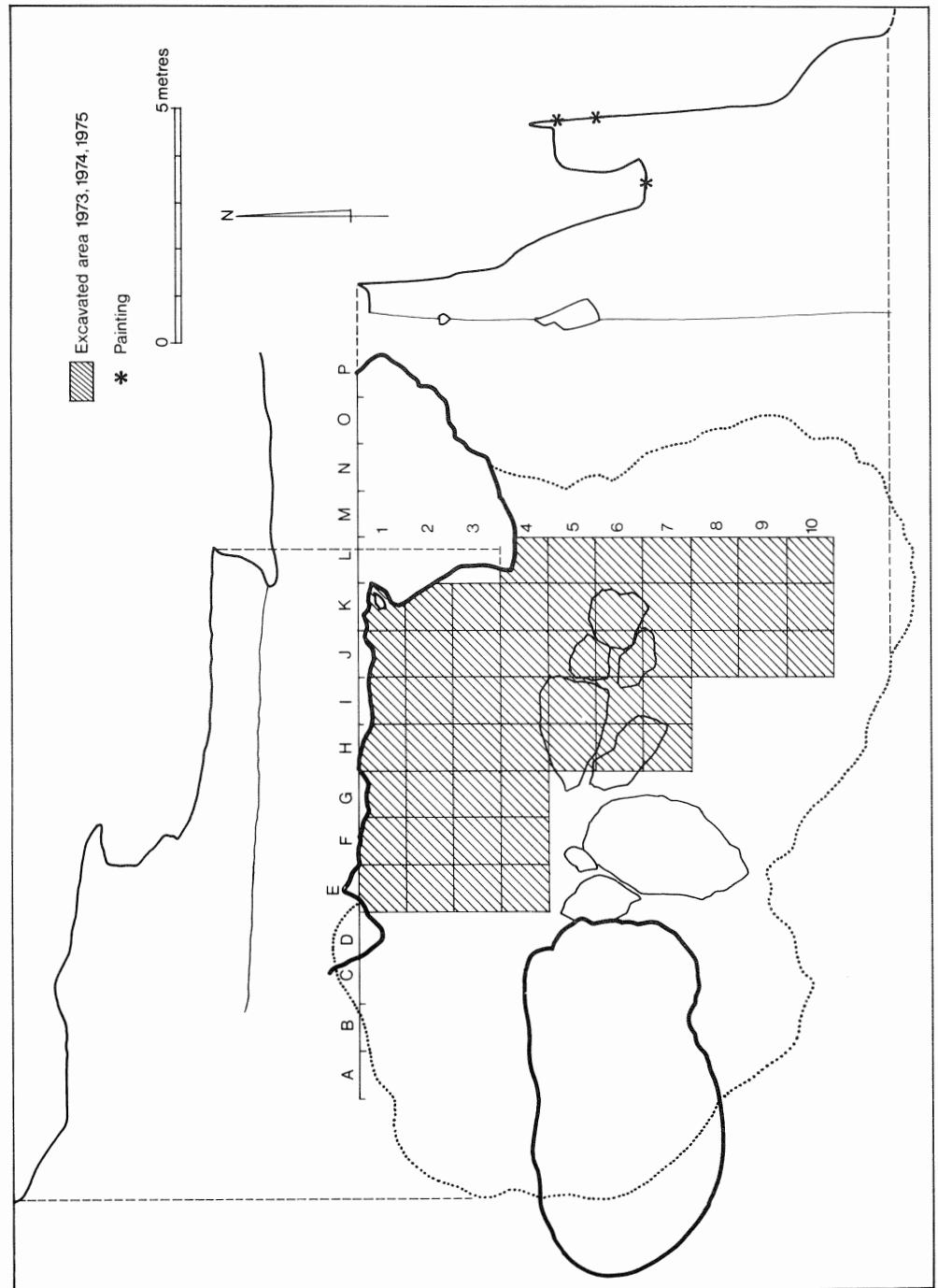


Fig. 2 Plan and elevation of rock shelter III F-23

and recorded immediately on the spot.

The maximum depth of deposit encountered so far is 3.90 m in squares J2-J5. In different squares of trenches G, H and I bedrock was encountered at much less depth - between 1.40 m and 2.85 m (Table 1). The original floor of the shelter was thus very uneven. The high level of the bedrock in squares G3, H3-4 and I3-4 left only narrow channels - a little over 1 m wide - for early Acheulian occupation on the eastern and northern sides of the shelter. More level and broader areas were, however, available on the western and front sides of the shelter.

In all, eight layers were recognised in the deposit. Their physical and cultural characteristics are briefly as follows :

- Layer 1 5-10 cm thick; dull yellowish brown (10YR 5/3); soft silty sand, poor in clay content; occasional angular stones; geometric microlithic industry made on chalcedonic silica and a small quantity of quartzite flakes, blades and microblades associated with hammers, grinders and querns of basalt, occasional stone beads, small quantities of highly fragmentary sherds of plain red and grey ceramics and a few bone pieces.
- Layer 2 10-25 cm thick; dull yellowish brown; slightly darker in colour than (1) (10YR 4/3); finer in composition than (1); sandy silt and clayey silt; cultural material as in (1) but without pottery and beads; stone industry richer than in (1).
- Layer 3 10-20 cm thick; brown (7.5YR 4/3); more sandy than (2) but not as sandy as (1); sandy silt; a characteristic feature of this layer is the presence of thin weathered stone chips almost all over the excavated area. However, in the inner part of the cave, the colour of the earth becomes lighter and the quantity of stone chips declines. There is a decline in the quantity of microlithic industry.
- Layer 4 15-20 cm thick; dull brown (7.5YR 5/4); more clayey than even (2); silty clay; more rock fragments than in any one of the three upper layers; no microliths; quartzite flakes, blades,

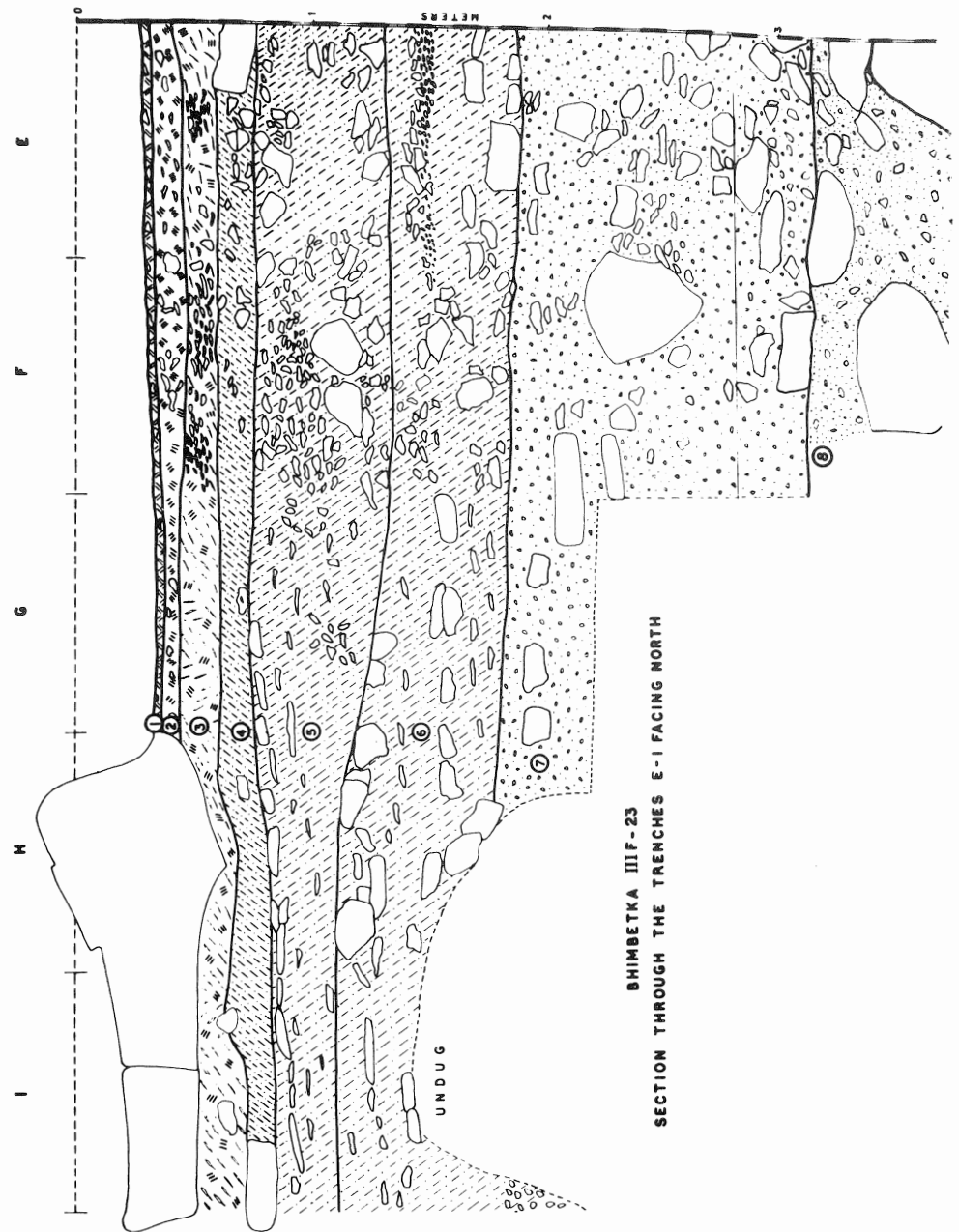


Fig. 3 Section through the trenches E to I facing north

- side scrapers, end scrapers, etc., late Middle Palaeolithic or Upper Palaeolithic industry.
- Layer 5 40-50 cm thick; dull reddish brown (5YR 5/4); more reddish and more compact than (4); the proportion of stone fragments increases; finer sediment is silty sand; moist and sticky when freshly dug; a wide variety of side scrapers, less common but typical end scrapers, Levallois flakes and blades; a few hand axes and cleavers in lower 10-15 cm; many tools made on thin flat natural stone slabs; artifacts have red staining; typical Middle Palaeolithic industry.
- Layer 6 80-90 cm thick; bright reddish brown (5YR 5/6); essentially similar to (5), and visual distinction between the two not very marked; siltier and more compact than (5); size of stone blocks larger; artifacts red stained; late Acheulian industry.
- Layer 7 90-100 cm thick; bright reddish brown (5YR 5/8); more reddish and far more compact than (6); difficult to dig; more deeply weathered, sometimes the core of the stone blocks turning to grey; very moist and sticky when freshly dug; comes out in large lumps; the finer component of the deposit is more silty than in (6); the junction between this layer and (6) is sharply marked; late Acheulian industry.
- Layer 8 80-90 cm thick; orange (5YR 6/6); very little of fine transported sediment; consists essentially of heavily weathered chips and blocks of argillaceous sandstone; mottled colour; no cultural material in the lower 30 cm; late Acheulian industry.

The Acheulian deposit is 2.40 m in thickness, covering layers 6, 7 and 8. Acheulian levels have been reached so far only in the inner part of the shelter in an area of 26 m². However, only the artifactual materials from the 1973 and 1974 digs covering an area of 18 m² in trenches G, H, I, J and K has been analysed, and the present report is based on this material only.

There was no evidence for the use of fire, and no organic remains have survived, probably because of the highly acidic nature of the deposit. However, there are other positive indications that the shelter was used not only for manufacturing tools but also for habitation. During the 1975 season in trenches E and F, covering an area of 8 m², a series of five stone-paved floors, showing intentional

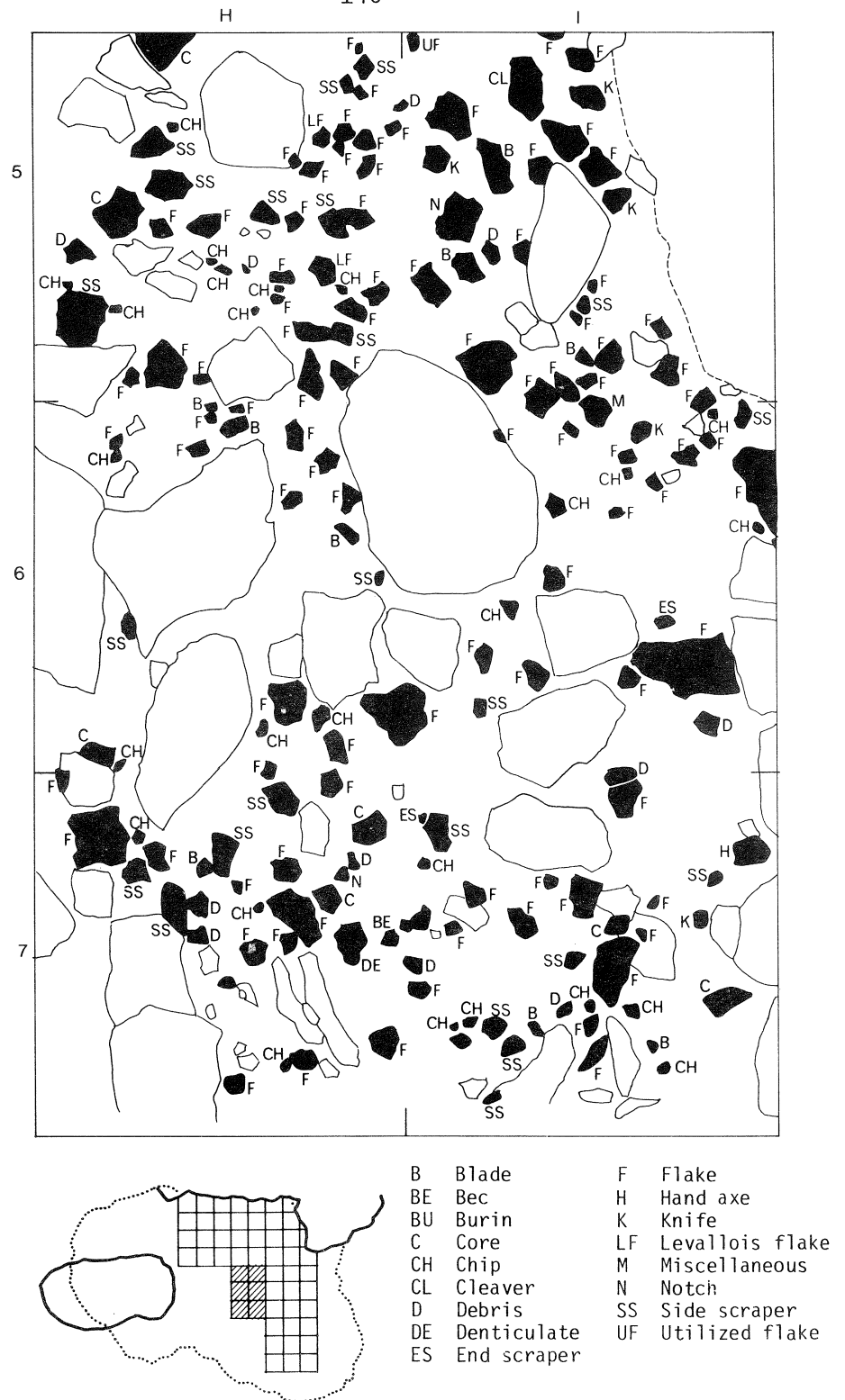


Fig. 4 Plan of Acheulian working floor in trenches H and I at 1.50 m B.D.

structural activity were encountered at different depths. A number of cleavers and hand-axes show clear signs of use in the form of edge damage, and many others survive only as fragments. These must have been used in and near the shelter for broken fragments to have been discarded within the shelter. The main evidence of Acheulian occupation consists of the stone industry alone.

The Acheulian Industry

In most squares of trenches G, H, I and K, bedrock was encountered at fairly high but varying levels. Deep digging was possible only in squares J1-5 and to a less extent in squares G-2, H-2 and I-2 along the back wall of the cave. It is not therefore easy to see a clear trend in the incidence of artifacts according to depth. However, from the limited data available it can be said that below a depth of 2.1 m the incidence of artifacts suffers a sharp decline and this trend persists till the end. In squares G-2, H-2 and I-2 several digs between 1.95 m and 2.45 m produced no artifacts at all. Therefore in this part of the cave occupation in the earlier stages was less intense. The reason for this appears to be the lack of a sufficiently large living area, for in trenches E and F where there was no obstruction there is no decline in the incidence of tools in corresponding levels. No noticeable typological change is seen in the material from the three layers. Therefore all the material is treated as an homogeneous assemblage rather than separating each layer. The method followed for the classification and analysis of non-biface tools is that elaborated by Professor François Bordes for Lower and Middle Palaeolithic tools, and this appears to serve well for the Bhimbetka material. The present analysis is partial only as some of the technological indices remain to be worked out, and metrical analysis of tools, specially of the bifaces, remains to be completed.

The artifact assemblage all through the deposit consists of shaped tools as well as cores, flakes and chips, showing that the tools were manufactured inside the shelter. The raw material used throughout was, with the exception of rare pieces of chalcedony and chert, orthoquartzite - partially metamorphosed sandstone. However, a very clear choice was made in the type of quartzite used for handaxes and cleavers on the one hand, and for the rest of the artifacts on the other. The former, with a few exceptions, are all made of a purple or dark grey quartzite which is richer in iron content, is more intensely metamorphosed and is consequently

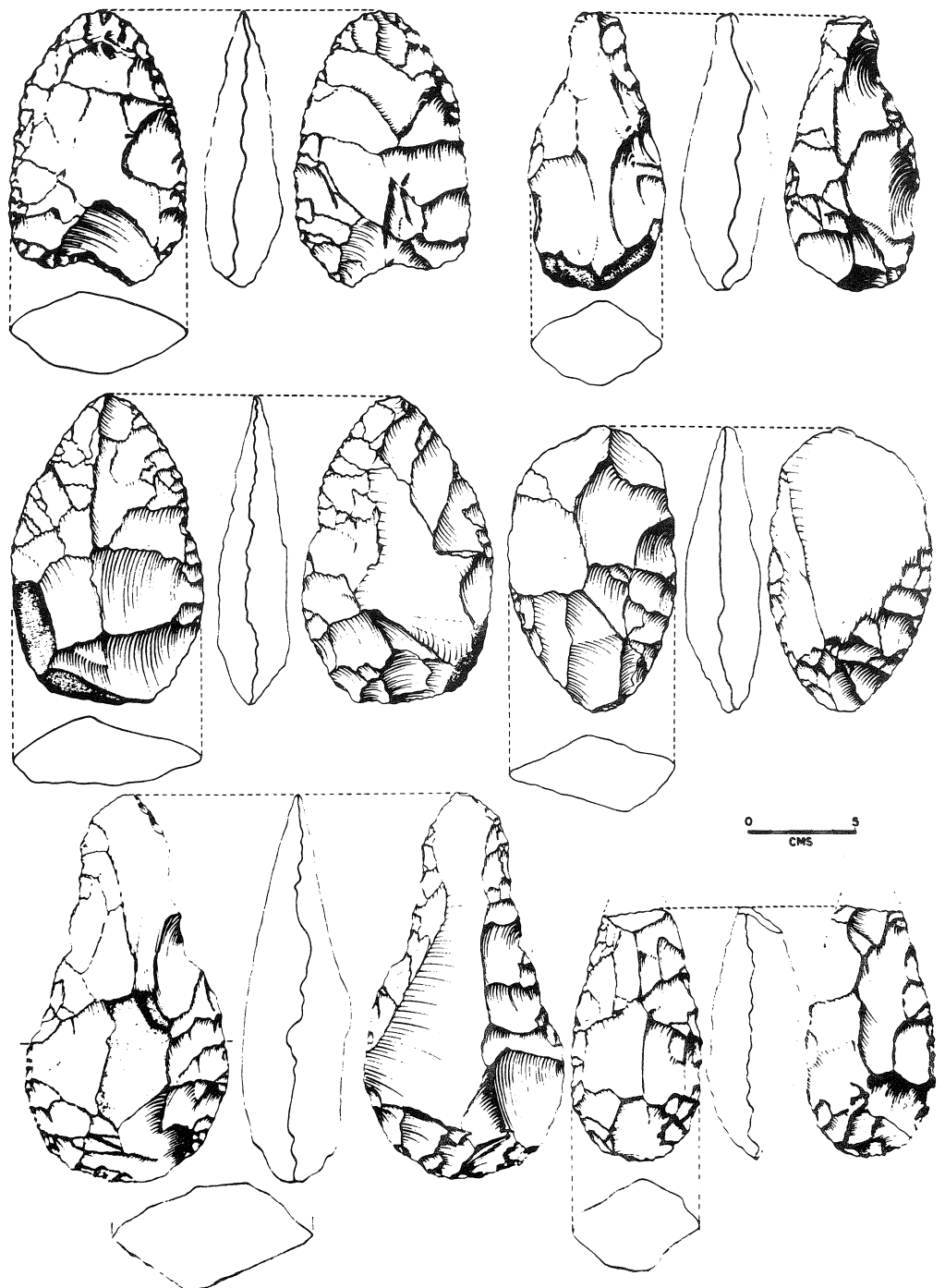
tougher and more resistant to weathering than the light-coloured quartzite. These tools have suffered little weathering even in levels where other tools have been heavily weathered. The rest of the tools are made of a yellowish quartzite which has undergone only moderate metamorphism. These tools have suffered heavy weathering in the lowermost levels and tend to crumble into powder. To a certain extent they have been affected in upper layers as well. Except in layer 8, all tools have a shining mint-fresh look, irrespective of the type of quartzite used.

The yellowish quartzite used for the majority of the tools was available in abundance right in and around the shelter in the form of fallen blocks and thin weathered slabs. The purple-coloured quartzite is less plentiful though veins of it occur in the rocks on the hill. It was apparently quarried from a spot or spots some distance away from the shelter, and the tools were manufactured at or near the source of the raw material. This inference is based on the observation that the ratio of cores and waste flakes to finished tools in purple quartzite is much lower than in the case of artifacts of yellowish quartzite. The tools in the latter material were for the most part manufactured within the shelter as there is plenty of manufacturing debris in this material in the deposit.

The main typological and technological observations on the industry are summarised below:

1. The industry consists of 4737 artifacts. Of these 32.32% (1531 pieces) are tools and 67.68% (3206 pieces) are waste products. The horizontal and vertical distribution of tools in relation to waste materials is fairly uniform, and in this part of the shelter at least no area appears to be specifically marked off for tool manufacture.
2. The very high proportion of flakes (33.88%; 1605 pieces), chips⁷ (26.58%; 1259 pieces), cores (3.36%; 159 pieces) and debris (3.86%; 183 pieces) shows clearly that most of the tool making activity took place inside the shelter.
3. Among flakes and blades⁸ (1605 pieces), 14.26% (228 pieces) are blades, 22.49% (361 pieces) side-struck flakes, 43.68% (701 pieces) end-struck flakes, and 19.63% (315 pieces) indeterminate flakes.
4. Among cores the majority (41.51%; 66 pieces) are amorphous. The next most common types are bifacial

Fig. 6 Handaxes



(28.94%) and discoidal (16.35%; 26 pieces) forms. Levallois cores account for only 6.92% (11 pieces) of the collection. The remaining 6.29% (10 pieces) are of diverse shapes.

5. Side scrapers and other non-bifacial tools account for 27.99% (1326 pieces) of artifacts, and bifaces (handaxes and cleavers, including their fragments) form the remaining 4.33% (205 pieces). The biface element therefore plays a minor role in the Bhimbetka Acheulian industry.
6. Unretouched Levallois flakes (including blades and points) constitute 12.37% (164 pieces) of the assemblage. The Levallois typological element is, therefore, fairly large.⁹
7. Side scrapers constitute the biggest class of tools (27.75%; 368 pieces) and display the total range of types (except one, viz. No. 14) recognized by Bordes in Lower and Middle Palaeolithic assemblages. In this class the most common types are simple convex (7.47%; 99 pieces; Fig.9, No.1), ventrally retouched (4.30%; 57 pieces), simple concave (3.85%; 51 pieces), simple straight (1.73%; 23 pieces; Fig.10, Nos.6-7), abrupt retouched (2.11%; 28 pieces), transverse convex (1.58%; 21 pieces) and déjeté (offset), (1.21%; 16 pieces).
8. End scrapers constitute 8.14% (108 pieces) of the tool assemblage. The high percentage of end scrapers - a type that is characteristic of Upper Palaeolithic - is indicative of an evolutionary late stage of the industry.
9. Prepared back and naturally backed knives account for 12.29% (163 pieces) of the assemblage.
10. Other common tool types are truncated flakes and blades (6.56%; 87 pieces), notches (8.37%; 111 pieces; Fig.9, Nos.3,5) and denticulates (5.88%; 78 pieces; Fig.9, No.2). The presence of these tool types has rarely been noted in Indian Acheulian industries.
11. Intact handaxes constitute only 2.61% (40 pieces) and intact cleavers 6.34% (97 pieces), together accounting for 8.95% (137 pieces) of the finished tool group.¹⁰ Taken together with their fragments (handaxes 15 pieces, cleavers 53 pieces) they constitute 3.59% and 9.80% of the industry, respectively, giving a total percentage for both types of 13.39%. The large proportion of broken

Fig. 7 Cleavers

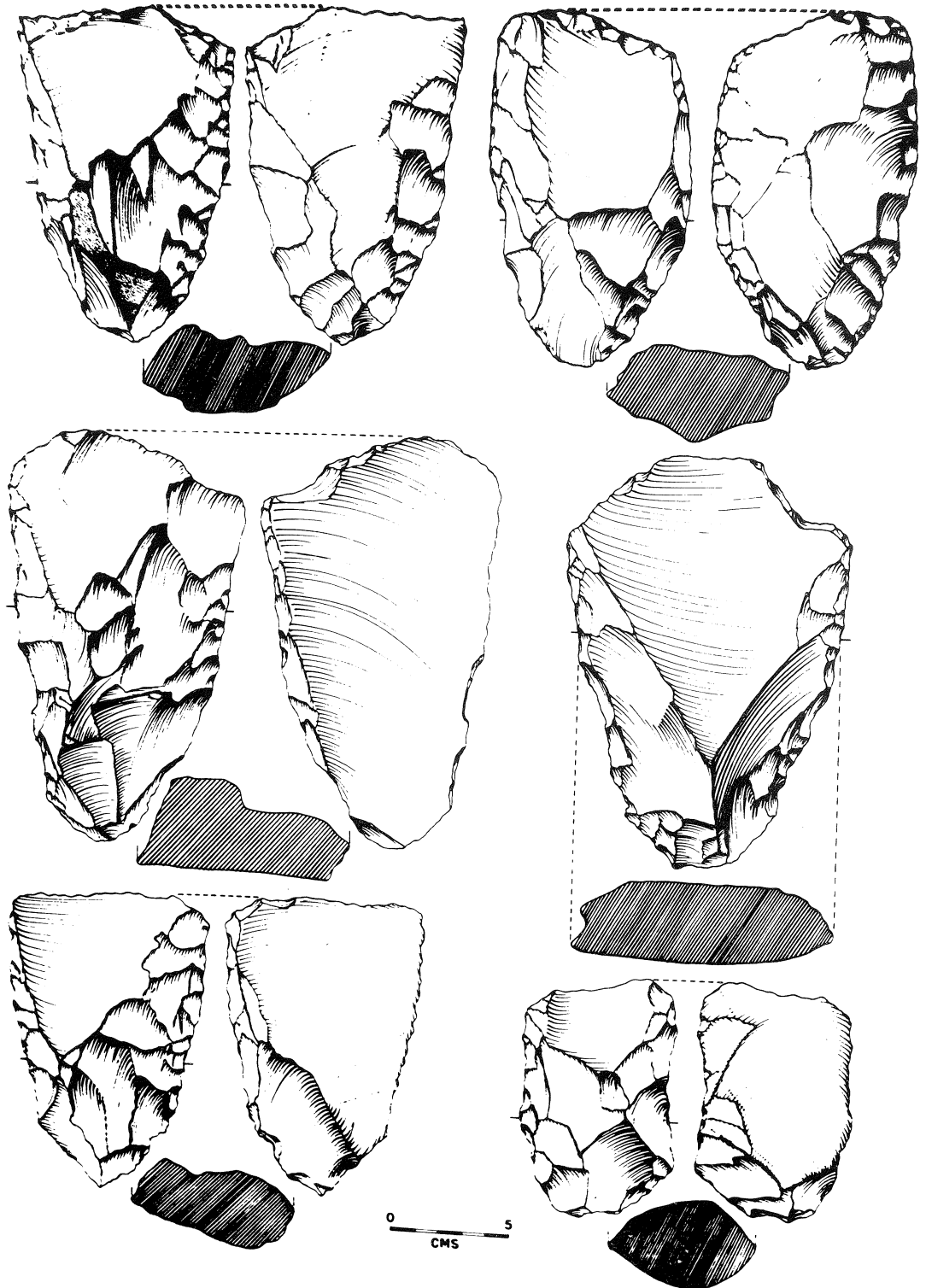
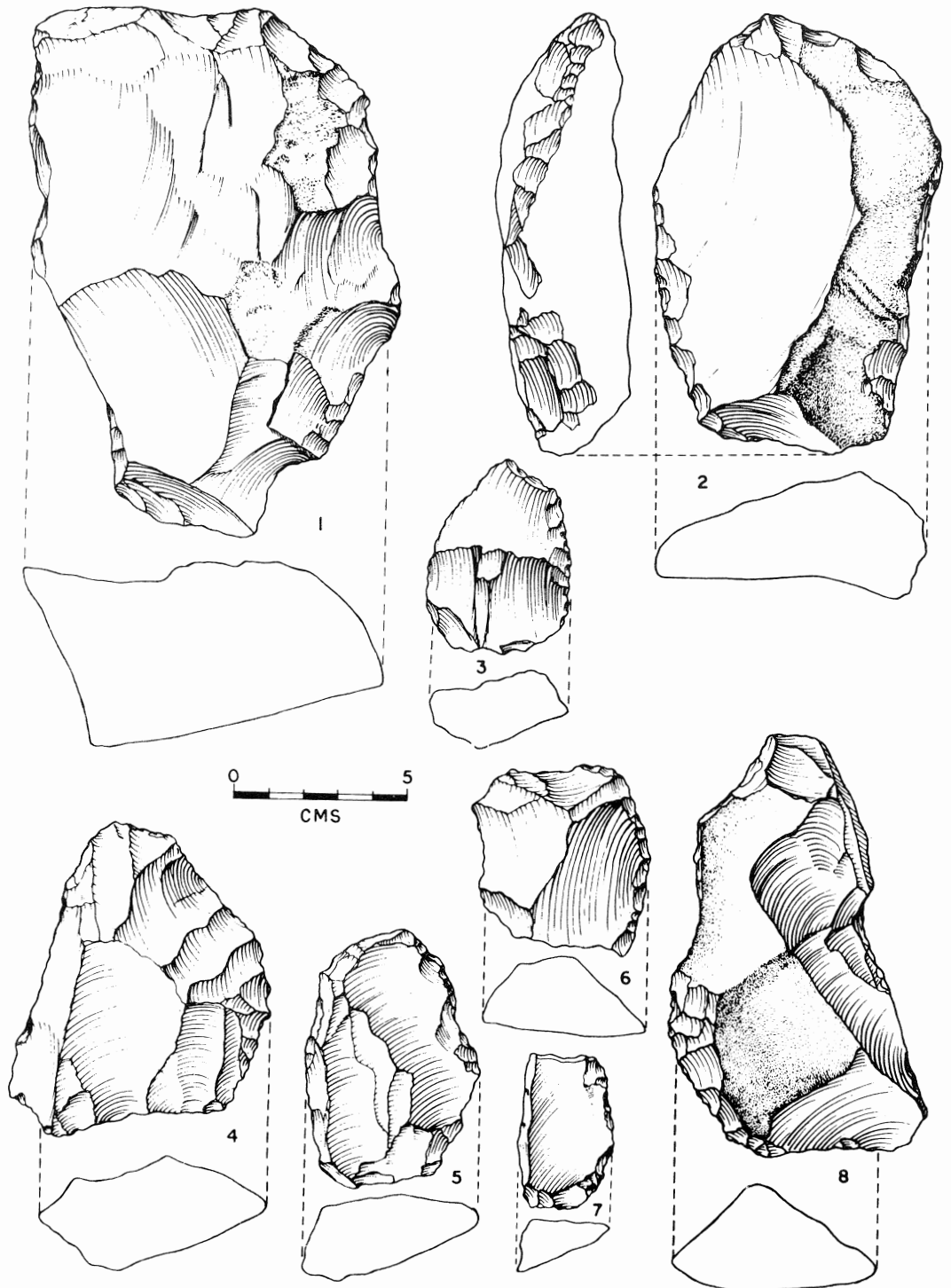


Fig. 8 Convex side scrapers



bifaces, particularly cleavers, shows that these types were used inside and in the close vicinity of the shelter.

12. The proportion of cleavers to handaxes is 3:1. Thus the biface element is clearly characterized by the predominance of cleavers.
13. Being small the handaxe sample (Fig.6) does not lend itself to the perception of any clear typological preference. Nearly half (17 pieces) of the intact specimens belong to cordiform and oval shapes. The rest are of narrow elongated and other shapes. Most of the handaxes are made on flakes, have a symmetrical outline and thin section, and are characterized by shallow, even flake scars.
14. The cleavers (Fig.7) are all made on end flakes. While the upper surface is extensively worked, on the ventral face secondary work is confined to bulbar end and the sides. The most common lateral cross-section is a parallelogram which lends itself ideally to hafting. The cleavers are regularly characterized by a symmetrical form and even surfaces. The most preferred shape has a rounded butt and transverse edge (54 pieces), the next a pointed butt and transverse edge (18 pieces). Other shapes are rounded butt with convex edge, rounded butt with oblique edge, pointed butt with convex edge, and pointed butt with oblique edge.
15. To summarise, the Bhimbetka Acheulian industry is characterized by a very low percentage of bifaces, high proportion of cleavers to handaxes, a remarkably high standard of workmanship in bifaces, especially cleavers, predominance and great diversity of non-biface tools, high percentage of end scrapers and Levallois flakes and complete absence of chopper-chopping tools. All these features show unequivocally the closeness of this industry to the Mousterian of Acheulian tradition. It is to be noted that layer 5 which overlies the Acheulian deposit is stratigraphically and culturally a continuation of the Acheulian culture except for the disappearance of the biface element and a certain decline in the standard of workmanship. Thus there can be no doubt that the Bhimbetka Acheulian industry represents the terminal phase of the Acheulian tradition.

Fig. 9 1 convex side scraper; 2 denticulate; 3, 5 notches; 4 end scraper; 6 transverse side scraper; 7 convex side scraper - Quina type

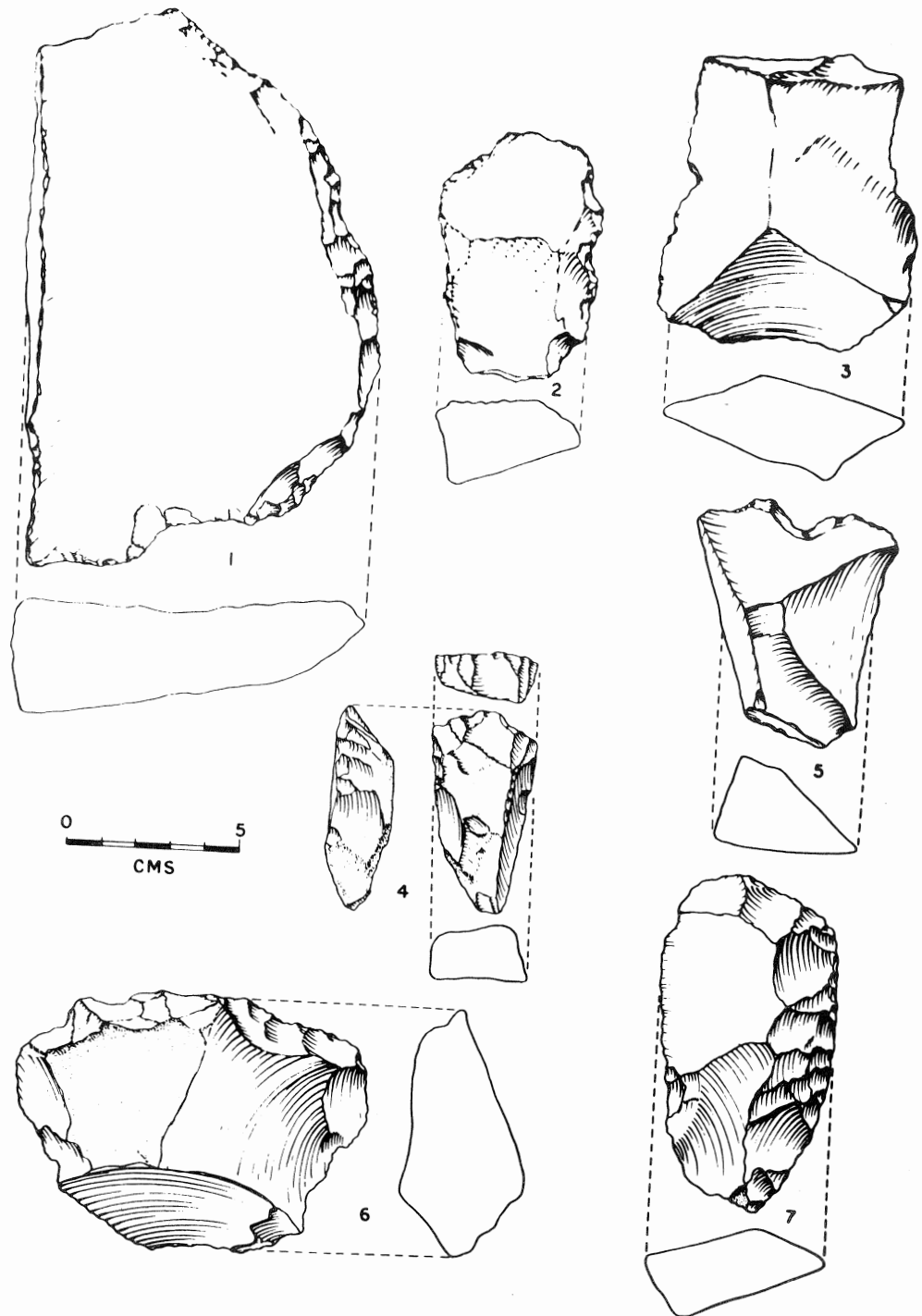
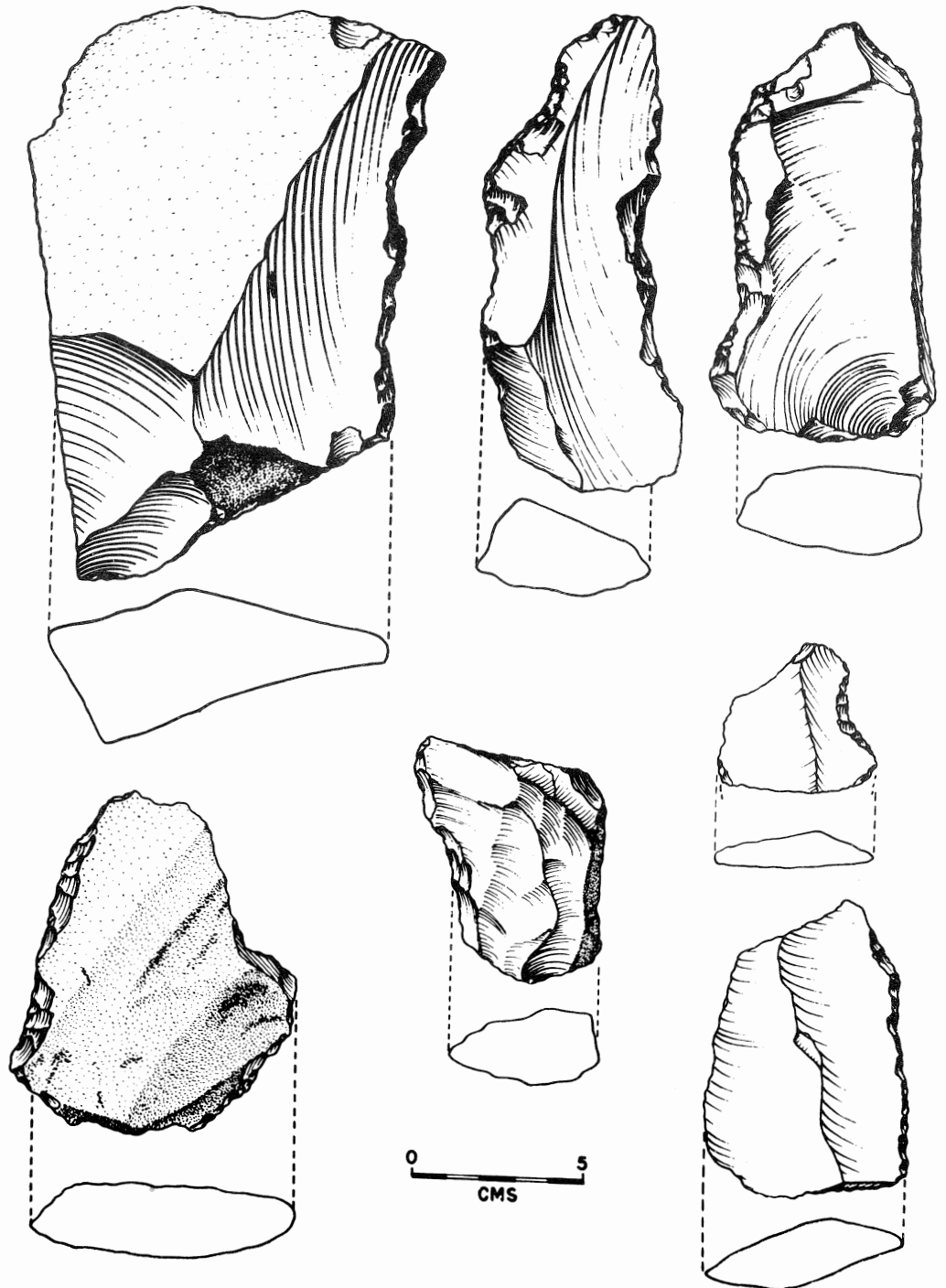


Fig. 10 1-5 concave side scrapers; 6-7 straight side scrapers



The principal typological indices are given below :

Real Typological Indices and Characteristic Groups

Typological Levallois index: 12.38. Scraper index: 27.75. Unifacial Acheulian index: 6.64. Handaxe index: 13.39 (including fragments) and 8.95 (excluding fragments).

Levallois group (I): 12.38. Mousterian group (II): 27.75. Upper Palaeolithic group (III): 23.23. Denticulate group (IV): 5.88

Essential Typological Indices and Characteristic Groups

Typological Levallois index: 0. Scraper index: 35.53. Unifacial Acheulian index: 8.49. Handaxe index: 15.00 (including fragments) and 10.02 (excluding fragments).

Levallois group (I): 0. Mousterian group (II): 35.53. Upper Palaeolithic group (III): 29.73. Denticulate group (IV): 7.53.

Comparisons with Other Sites

With the present evidence it is not possible to date the industry in actual years. It might, however, be instructive to compare the Acheulian industry of rock-shelter IIIF-23 at Bhimbetka with other Acheulian industries in the country known from stratified contexts. So far stratified material is available from only nine other sites. Of these, material from only five sites can be compared; from the remaining four sites cultural material is either too small in quantity or not yet published. The five sites are: Trenches I and II in Cave IIIF-24 at Bhimbetka, Lalitpur in Uttar Pradesh, Chirki (Nevasa) in Maharashtra and Anagawadi in Karanataka. The cultural material from these five sites and Bhimbetka IIIF-23 is presented in Tables 1 and 2. Table 1 lists the frequencies and percentages of main artifact classes from these sites and Table 2 those of principal classes of finished tools.

To achieve comparability, the figures and percentages from Bhimbetka IIIF-23 have been reworked by excluding Levallois flakes and utilized flakes from the finished tool group and by including bifaces. In the following pages I shall give a brief summary of the geographical setting and stratigraphy of each of these sites and then comment on the comparability of cultural material from each of them with that from Bhimbetka IIIF-23.

Bhimbetka IIIF-24

At Bhimbetka Acheulian material has been found in three other sites, all excavated by V.S. Wakankar. These are Cave IIIF-24 (also known as the Auditorium cave) and shelters IIIA-29 and IIIA-30. In the two latter sites, where only a thin Acheulian layer was found, the artifactual material is sparse and not yet published. In cave IIIF-24, located within a few metres of IIIF-23, three trenches have yielded Acheulian material; for Trenches I and II preliminary reports are available.¹¹ Both are primary archaeological contexts, and there is little possibility of any significant disturbance. In Tr. I (3 x 2 m) the topmost level was Mesolithic and below it occurred an industry predominantly of scrapers made on quartzite. The lowest horizon was Acheulian. It is 1.20 m thick and is composed of a very tough breccia which appears to have been formed by the precipitation of calcium carbonate derived from water percolating through the ceiling and walls of the cave. Tools could be extracted only with great difficulty, and they were thickly encrusted with calcium carbonate.

The Acheulian layer yielded a total of 469 artifacts of which four are made of chalcedony and the rest of quartzite. There is evidence that a certain number of tools, especially those of smaller size, were discarded with the debris. The collection consists of 35.82% finished tools and 64.12% cores and flakes. In this respect the difference from Bhimbetka IIIF-23 is not very marked. The percentage of flakes at the two sites is fairly close, but the percentage of cores in Tr. I is appreciably higher. Among the finished tools in Tr. I handaxes and cleavers each account for 39.88%¹², and side scrapers for 17.26%. The remaining 2.98% of tools comprise 1 borer and 4 discoids. Blades and Levallois flakes seem to have been grouped with ordinary flakes for I have seen excellent examples of both these types in the collection. The absence in this trench of other tool types noted in IIIF-23 may be partly due to the different typological system followed by Wakankar, and the preliminary nature of his classification. The other significant difference between the two industries is the very high percentage of bifaces in Tr. I of IIIF-24. Technologically, however, the assemblage from Tr. I displays the same high standard of craftsmanship as seen in IIIF-23.

In Tr. II (3 x 2 m), located at the other end of the cave, some 20 m away from Tr. I, the cultural sequence was broadly similar but there was no brecciation of the Acheulian deposit. Below the Acheulian level there was a 60 cm thick sterile layer, and underneath it in a lateritic deposit Wakankar claims to have found a few highly weathered chopper-like pebble tools. The Acheulian horizon is 1.0 m thick. Though artifacts occurred throughout, on two levels, one near the bottom and the other near the top, they were found scattered over large boulders and are therefore indicative of working floors.

The assemblage from Tr. II is bigger, consisting of 1029 artifacts. They are all made of quartzite and are very fresh in appearance. Finished tools constitute 22.92%. It is surprising that while there are 789 (76.68%) big and small flakes, there are only 4 (0.39%) cores. Among finished tools, bifaces account for 52.12% and side scrapers for the remaining 47.88%. The ratio of cleavers (30.93%) to handaxes (21.19%) is roughly 1.5:1. In this respect the assemblage from Tr. II presents a less marked contrast than Tr. I from that of IIIF-23. The absence of blades, Levallois flakes and non-biface tools (other than side scrapers) in Tr. II is probably due to the same factors as mentioned in the case of Tr. I. In spite of these marked typological differences my limited first hand examination of the material from Tr. II shows it to be technologically fairly similar to that from IIIF-23. There does not appear to be much of a time gap between the Acheulian occupations of the two shelters.

Lalitpur

The site of Lalitpur (78°25'E: 24°42'N) is located in open plain ground about 1.5 m northwest of Lalitpur railway station in Uttar Pradesh. In 1962 R. Singh carried out a small dig in an area of 6 x 3 m (20 x 10 ft) on the edge of a cultivated field about 200 m south of a small stream known as Biana nala¹³. Gully erosion of the field had earlier exposed Acheulian tools in the section. Commercial lime quarries nearby had revealed that the tool bearing layer was covered by a 15 cm thick deposit of brown earth. In the excavated area, however, this layer had been completely washed away. The archaeological layer was 30 to 45 cm thick and was composed of "a large number of angular fragments of quartz, small quartzite pebbles, factory

debris, flakes and tools in extremely fresh condition."¹⁴ This layer rested on a slightly sloping granite rock. Quartz fragments, small quartzite pebbles and many chips were discarded from the excavated debris. Despite this, over 80% of the collection is flakes of various sizes. This, taken together with the freshness of the artifacts, suggests the site to be a real working floor and eliminates the possibility of any significant disturbance of the original deposit.

In a collection of 1048 artifacts 40 (3.82%) are made on quartzite pebbles and the remainder on granite and quartz blocks quarried from exposed rocks. Finished tools account for less than 12% of the collection. Among the finished tools, 91% are bifaces, while scrapers constitute less than 2%. The ratio of hand-axes to cleavers is 4:1. From the description it appears that most of the handaxes and cleavers are made on end-struck flakes. Of the 88 handaxes, 36 are worked only on one face. Cleavers are rarely worked on the ventral face. The near absence of retouched flake tools is probably due to some extent to the difficulty of executing retouch on coarse-grained rocks like granite and quartz. Among 497 large flakes, 47 (9.46%) are described as prepared flakes for hand-axes and 51 (10.26%) as prepared flakes for cleavers.

The Lalitpur industry presents a marked contrast to Bhimbetka IIIIF-23 industry. In the latter bifaces account for only 14.68% of the finished tools against 90.91% in Lalitpur and scrapers and other non-biface tools account for 85.32% against 9.09 in Lalitpur. The ratio of handaxes to cleavers at Bhimbetka is 1:3 against 4:1 at Lalitpur. The complete absence of Levallois flakes, blades, end scrapers, knives, denticulates, notches and truncated flakes at Lalitpur is another significant feature. The Lalitpur industry therefore represents a typologically and technologically different and much earlier stage of Acheulian tradition than the Bhimbetka industry.

Chirki - Nevasa

The site of Chirki is part of the larger site of Nevasa (74°50'E: 19°30'N) in Ahmednagar District, Maharashtra, well-known for over two decades for its wealth of Palaeolithic and palaeontological remains¹⁵. The site is located on the confluence of a small nullah, Chirki, with the Pravara river, 3 km downstream from Nevasa. Excavations were carried out here for three

seasons (1966-1968) by G. Corvinus¹⁶. Though a number of trenches were dug, the main evidence for Acheulian was found only in one trench, No. VII. This trench (its precise size is not clear from the descriptions) is located close to the southern bank of the Pravara river. The topography of the area consists of alluvial badlands. The rocky land surface, now buried beneath thick alluvial badlands, slopes from the south towards the river. Acheulian artifacts were found on and within a colluvial bouldery rubble deposit of 20 to 40 cm thickness. This bouldery rubble, formed of grey and red basalts, provided the raw material to the Acheulian man for manufacturing his tools. Fine-grained dolerite used for the best tools was probably brought from trap dykes exposed some kilometres away from the site. Chalcedony and quartz were also used to a limited extent.

Many tools are angular and sharp, and this shows "that no transport could have taken place".¹⁷ Other artifacts are, however, rounded in varying degrees, but this rounding is said to be due to exposure and not to transport and rolling. The sharpness and abundance of the tools, as well as the presence of many unfinished tools, flakes and cores suggest that Tr. VII represents a workshop or factory of Acheulian man.

The bouldery rubble is filled in and sealed by an alluvial gravel which in places reaches a thickness of 8 m. This alluvial gravel is believed to have sealed the bouldery rubble horizon soon after the Acheulian occupation as there is no hiatus between the two deposits. Occasional Acheulian tools are found in the alluvial gravel as well, but the more common industry in the gravel consists of scrapers, borers and points made on chalcedony, jasper, etc. This assemblage was recognized long ago by Sankalia as an independent and post-Acheulian industry, termed initially as Series II and later as Nevasian¹⁸. While Corvinus had earlier accepted this position¹⁹, in her more recent publication she is inclined to view the Nevasian as a component of the Acheulian, "a light duty industry made of jasper and other siliceous material, accompanying a heavy duty industry made of basalt".²⁰

The assemblage from the workshop (presumably entirely from Tr. VII) consists of 2407 artifacts.

Of this 62.73% are finished tools, 3.95% cores and 33.32% flakes of various sizes²¹. Among the flakes 18.85% (444 pieces) are large waste, 9.89% (238 pieces) small basalt flakes, and 4.96% (120 pieces) small silica flakes, the last being found in the gravel sealing the Acheulian layer. Corvinus concedes that the "great difference in the percentage of tools to waste, specially to the small waste ... would be very unusual for an undisturbed workshop".²² She rationalises the anomaly by saying that "the occupation floor must have been disturbed in its original context. The water of the rising river, which brought the alluvial gravel sealing, must have washed away most of the smaller components of the factory site, leaving all the larger artifacts and only a small percentage of the smaller ones. Many of the light duty flakes seem to have been washed into the river and got subsequently deposited into the gravels in the downstream vicinity of Chirki".²³

This explanation leaves two questions unanswered. First, in so far as silica flakes are more numerous in the gravel, the floods must have acted selectively in removing more of the silica flakes and less of the small basalt flakes. Secondly, why should the action of river waters start only from the workshop and not from the higher ground beyond? Elsewhere Corvinus says, "No trace has been found of a camp site. It might be possible that the strong erosional forces have destroyed everything which might have been present on the valley flats. These flats, now barren and rocky in many places and covered in other places with a thin black soil on which millet grows, must have carried at the time of Early Man an extensive, though thin forest. The findings of calcified wood, and a few tree trunks and branches, which had been washed into the alluvium, proves the existence of such a forest even at the time of the sealing of the occupational level".²⁴ Surely the floods that transported tree trunks and branches would have been capable of transporting stone artifacts as well, and subsequently depositing them in the depressions at the margin of the sloping landscape. The conclusion seems inescapable that erosional forces contributed to the disturbance of the "workshop" not only by removing material from it but also by adding material to it.

Leaving aside the question of the extent of the disturbance of the Acheulian deposit at Chirki, the differences between the Chirki and Bhimbetka Acheulian industries are very marked indeed and are not confined to the highly contrasting ratios of tools to waste. Of the 1510 finished tools at Chirki as many as 876 (58.00%) are made on pebbles, 330 (37.67%) being handaxes and 546 (62.33%) choppers, chopping tools, polyhedrons, etc. This latter group of tools is entirely absent at Bhimbetka, and handaxes there are nearly all made on flakes. Again handaxes and cleavers together account for 59.47% of the tools at Chirki as against only 14.68% at Bhimbetka and the ratio of cleavers to handaxes is 1:1.4 at Chirki as against 3:1 at Bhimbetka. Among handaxes at Chirki there are many pick-like forms - a type completely absent at Bhimbetka. Though data on the relative thickness of handaxes are not available, my personal observations on the Chirki material suggest the relative thickness of handaxes there to be far greater than that of Bhimbetka. Further, the percentage of scrapers and other flake tools at Chirki is only 4.37 whereas at Bhimbetka it is over 80. Thus, altogether the Chirki industry represents a much earlier technological stage than Bhimbetka industry, and is probably the most primitive and possibly the earliest of all the Acheulian industries known so far.

Anagawadi

The site of Anagawadi (75°40'E: 16°15'N) is in a nullah bed joining the Ghataprabha river, some 13 km northwest of the town of Bagalkot in Bijapur District of Karnafaka. The implementiferous deposit consists of a well cemented pebbly gravel exposed in the bed and on the sides of the nullah. The gravel has a thickness of 45 to 60 cm, and it rests over a 1.0 m - 1.50 m thick layer of detrital laterite. In the nullah cliffs the gravel is covered by a dark brown silt of up to 3.0 m thickness. In the nullah bed the pebbly gravel is exposed over an area of 85 x 35 m. In 1965 R.S. Pappu dug ten trenches, each of 1.50 x 1.50 m in the gravel.²⁵ The artifacts occurred all through the 50 cm thickness but were more frequent in its upper part. The gravel is made up of rounded to sub-rounded pebbles of quartzite and occasionally of chert. The context of the tools here is essentially geological.

The dig yielded 213 artifacts. Of these 94 (44.13%) are tools and 119 (55.87%) waste. Of the tools 35.11% are choppers, 28.72% handaxes, 13.83% cleavers, and 12.77% scrapers. The Anagawadi assemblage is thus considerably close to the Chirki industry, and has very little in common with Bhimbetka industry.

Four other excavated Acheulian sites deserve mention even though no detailed comparison between them and Bhimbetka is possible. These sites are Adamgarh and Mahadeo Piparia in M.P., Kuliana in Orissa and Hunsgi in Karnataka.

Adamgarh

The site of Adamgarh is located on a low, isolated quartzite hill in the midst of an alluvial plain about 2 km south of Hoshangabad (77°43'E: 22°45'N) and some 30 km south of Bhimbetka. Though today the alluvial plain is completely cultivated and presents a treeless aspect, in Pleistocene times it must have been covered with thick vegetation. The Narmada river which must have flown nearby, as it does today, was a perennial source of water. There are a number of rock shelters on the hill which contain Mesolithic and later paintings and in several caves there are habitation deposits of Mesolithic and, less frequently, Palaeolithic periods.

As early as 1935 de Terra had found Palaeolithic implements on the hill in lateritic soil 1.0 m to 1.25 m below the surface²⁶. In 1964 R.V. Joshi and M.D. Khare excavated a number of trenches on the hill within and outside the shelters. Acheulian material was found in several trenches but figures of artifacts found are available for only two trenches, namely ADG-6 and ADG-7²⁷. The Acheulian artifacts occur in a fragmentary talus or debris which rests on, and is partly enclosed in a sticky red clay. In the upper part of the talus, artifacts of a post-Acheulian flake industry are found. The talus is covered by a thin layer of red silty clay which yields microliths. The sticky red clay layer rests on a lateritic gravel of detrital origin which, in turn, lies on the Vindhyan sandstone.

The archaeological deposit in the two trenches was 1.80 m thick. Within this, Acheulian artifacts occurred in Tr. ADG-6 in the lower 1.20 m thickness and in ADG-7 in the lower 1.0 m thickness. The main horizon in ADG-6 was between 1.0 m and 1.60 m and in

ADG-7 between 0.80 m and 1.20 m. The number of Acheulian artifacts found in two trenches is only 93; of these 70 were found in ADG-6 and 23 in ADG-7. The frequencies of different artifact types in the two trenches are given below.

TABLE 3: FREQUENCIES OF ARTIFACT TYPES IN TRENCHES ADG-6 AND ADG-7 AT ADAMGARH, MADHYA PRADESH

Artifact type	Tr. ADG-6		Tr. ADG-7	
	No.	No.	No.	Total
Handaxes	8	-	-	8
Cleavers	6	-	-	6
Scrapers	1	3	-	4
Points	3	2	-	5
Choppers	22	10	-	32
Discoids	8	4	-	12
Flakes	21	4	-	25
Cores	1	-	-	1
Total	70	23	-	93

Nearly all these tools are made on quartzite or fine-grained sandstone, which were obtained in the forms of blocks and chunks of rocks from the talus, or from well jointed rocks exposed on the hill, or as pebbles derived from the river bed. Nearly half of the assemblage consists of choppers. Handaxes and cleavers were completely absent in ADG-7. The paucity of artifacts shows that the site was only occasionally frequented by Acheulian hunters, while the very low proportion of flakes and cores shows that most of the tools were made outside these trenches.

Mahadeo Piparia

Mahadeo Piparia (79°16'E: 23°06'N) is a small village on the left bank of the Narmada river in Narsimhapur District of Madhya Pradesh. The alluvial deposits of the Narmada in Narsimhapur District have been known to be rich in mammalian fossils and Palaeolithic implements for several decades. S.G. Supekar carried out two small digs near Mahadeo Piparia in 1963 and 1965²⁸. In 1963 a trench 10 x 10 ft (3 x 3 m) was dug in the cemented bouldery

gravel midway between the cliff section on the left bank and the present river channel. Below the depth of 7 ft (2.15 m) the trench was narrowed to an area of 2 x 2 ft (0.60 x 0.60 m) to cope with the increasing quantity of sub-soil water, and digging had to be closed at a depth of 10.6 ft (3.20 m) without reaching the bottom of the gravel. The gravel was pebbly and bouldery, well-cemented and devoid of any fine sediment and stratification. Except for the last two digs which were of 21" (52 cm) each, all other digs were of 6" (15 cm) each. The distribution of artifacts in various digs was fairly uniform.

A total of 1025 artifacts were found in the gravel. Following the prevailing ideas at that time about the nature of Lower Palaeolithic and Middle Palaeolithic assemblages, Supekar divided the material into two groups: Lower Palaeolithic (802 artifacts) and Middle Palaeolithic (223 artifacts). Artifacts of both these cultures were represented in all the digs. Because earlier explorations had indicated that the bouldery gravels were the basal deposit in river sections and the horizon of Early Palaeolithic industries, Supekar's observation from his excavation came as a disappointment. To check the cultural and chronological position of the bouldery gravel Supekar decided to dig into this gravel where it was buried under a thick alluvium in the cliff section. Accordingly in 1965 he dug two trenches into the cliff - one of 10 x 10 ft (3 x 3 m) and the other of 2 x 2 ft (0.60 x 0.60 m) at right angles to the first. The stratigraphy revealed by the dig was as follows :

- | | |
|--|--------|
| 1. Yellow brown sandy silt | 0.75 m |
| 2. Pebbly sandy gravel, at times cross-bedded with lenses of sand and silt | 5.65 m |
| 3. Red brown silty sand with a lenticular pocket of pebbly gravel | 3.0 m |
| 4. Yellow brown silt | 3.0 m |
| 5. Boulder conglomerate | 1.20 m |

The boulder conglomerate was dug to a depth of 1.20 m, without reaching the bottom. It yielded 173 artifacts. This collection was taken to be mixed also and divided into Lower Palaeolithic (36 artifacts) and Middle Palaeolithic (137 artifacts).

While it is certain that the bouldery gravel, being an unsorted fluvial deposit of immense thickness and extent, must have been laid down by powerful stream currents and must contain archaeological assemblages of different temporal and spatial locations, the division of the collection into lower and Middle Palaeolithic on the basis of assumed typology, size and raw material is arbitrary and unwarranted. Whatever the extent of disturbance we consider it more advisable to treat the collections as single entities.

The 1963 dig (river bed gravel) yielded 1025 artifacts. The vast majority of them are made of quartzite (94.44%; 968 pieces) the remainder being made of chert (3.51%; 36 pieces), quartzitic chert (1.46%; 15 pieces) and chalcedony (0.58%; 6 pieces). As regards the state of preservation, 45.85% (470) of the artifacts are rolled in varying degrees and 54.15% (550 pieces) are fresh. Finished tools account for 32.78% of the collection and cores, flakes, etc., for the remaining 67.22%. The two major classes of finished tools are choppers (49.11%) and side scrapers (37.50%). Handaxes (5.06%) and cleavers (4.17%) occur in small proportions.

The 1965 dig (cliff gravel) yielded only 173 artifacts. These were made of chert (60.12%; 104 pieces), quartzite (29.48%; 51 pieces), chalcedony (4.62%; 8 pieces) and quartzitic chert (2.31%; 4 pieces), the material of six artifacts remained unspecified. Ninety-one (52.60%) artifacts are more or less rolled and 82 (47.40%) fresh. The collection comprises 39.89% finished tools, 45.35% flakes, 2.89% cores and 13.87% chunks. Among finished tools the most common class is that of side scrapers (39.13%) followed by end scrapers (17.39%) and points (17.39%). Handaxes and cleavers account for only 4.35% and 2.90% of the assemblage, respectively.

Even though the assemblages from the two excavations come from the same geological horizon, there are very marked differences among them. To begin with, while the vertical distribution of artifacts in the river bed gravel was fairly uniform, in the cliff gravel as many as 60.69% (105) of the artifacts occurred in the first dig (top 30 cm) and only 39.31% (68 pieces) in the next two digs (60 cm). Secondly, the proportion of tools made on chert is much higher in the cliff gravel (60.12%) than in the river bed gravel (3.51%).

TABLE 4: FREQUENCIES OF ARTIFACTS IN THE TWO EXCAVATIONS
AT MAHADEO PIPARIA, MADHYA PRADESH

Artifact Type	1963 Excavation		1965 Excavation	
	No.	%	No.	%
Finished tools	336	32.78	69	39.89
Flakes	589	57.47	75	43.35
Cores	89	8.68	5	2.89
Chunks	11	1.07	24	13.87
Total	1025	100.00	173	100.00

TABLE 5: FREQUENCIES OF FINISHED TOOL TYPES IN THE TWO
EXCAVATIONS AT MAHADEO PIPARIA, MADHYA PRADESH

Tool Type	1963 Excavation		1965 Excavation	
	No.	%	No.	%
Handaxes	17	5.06	3	4.35
Cleavers	14	4.17	2	2.90
Side scrapers	126	37.50	27	39.13
End scrapers	4	1.19	12	17.39
Points	7	2.08	12	17.39
Borers	2	0.59	3	4.35
Burins	-	-	2	2.90
Knives	1	0.30	-	-
Choppers	165	49.11	8	11.59
Total	336	100.00	69	100.00

Thirdly, the composition of finished tools differs very markedly in the two collections. For example, in the river bed gravel the proportion of pebble tools is as high as 49.11% while in the cliff gravel it is only 11.59%. Again, in the former end scrapers and points account for 1.19% and 2.08% respectively, while in the latter they account for 17.39% each. Finally, the proportion of tools made on flakes is far higher in the cliff gravel. One possible explanation for these differences is that the cliff gravel, after it was sealed by overlying alluvium, remained undisturbed, while the river bed gravel, being exposed, is likely to have been repeatedly reworked and the archaeological material became more and more mixed. Whatever the explanation, it is clear that the two assemblages are unlikely to be contemporaneous. The cliff gravel assemblages has a late Acheulian character and several features in common with Bhimbetka. However, in view of the very small sample of the Mahadeo Piparia assemblage the comparison cannot be closely pressed. The river bed gravel assemblage has little in common with Bhimbetka.

Kuliana

The site of Kuliana ($86^{\circ}39'E$: $22^{\circ}04'N$) is located in Mayurbhanj District of Orissa. Here palaeoliths were known to occur on the surface and in the sections of road metal quarries and tanks dug in laterite deposits. N.K. Bose and D. Sen of Calcutta University dug several pits (of unspecified size) on the margins of two existing tanks and one quarry in the late thirties and early forties of this century³⁰. The stratigraphy of these pits consisted of a layer of yellowish earth (up to 55 cm thick) at the top and pisolithic laterite below. The upper part of laterite (30 to 90 cm in thickness) was less compact and yielded stone artifacts. Unfortunately, the actual figures and the classification of artifacts are not available; only selected implements have been described and illustrated. This precludes any comparison of the Kuliana material with Bhimbetka. The artifact bearing laterite is of detrital origin and the tools may have undergone a certain amount of dislocation. The assemblages consist of choppers, handaxes, cleavers, knives, scrapers and flakes. The excavators are inclined to see a succession from choppers through irregularly worked handaxes to neatly worked handaxes and rather crude cleavers. Unfortunately, in the absence of adequate primary data nothing more

can be made of the Kuliana industry.

Hunsgi

The site of Hunsgi ($76^{\circ}31'E$: $16^{\circ}27'N$) is in the Gulbarga District of Karnataka. It is located on the edge of a narrow seasonal stream known as Hunsgi nullah which joins the Krishna river about 35 km downstream. The stream has a width of about 35 m and has cut to a depth of 2 to 3 m in the sub-recent alluvium. The stratigraphy of the alluvium is as follows : (a) black soil with a maximum thickness of 30 cm; (b) loose secondary gravel with a thickness of up to 70 cm and resting on and held together by disintegrated whitish granite; (c) Acheulian floor 10-35 cm thick; (d) granite bedrock. Acheulian artifacts occur sparsely on the eroded surface of the gravel as also in the gravel itself. Several trial digs in the gravel by K. Paddayya eventually led to the discovery, at its base, of a thick concentration of Acheulian artifacts which from its characteristics can be described as an Acheulian working floor.³¹

The floor was exposed over an area of 22.75 m^2 in 1975 and was enlarged to an area of 40 m^2 in 1976. It has a thickness of 20 to 35 cm and is made up of sub-angular to sub-rounded limestone pebbles, cobbles and rubble. While the pebbles and cobbles were laid down by the ancient stream, the angular blocks must have been brought by man from the plateaux 2 to 3 km away. Strewn amidst the gravel are numerous granite blocks measuring from 5 to 30 cm and occasionally up to 1.0 m in length. These blocks when viewed in relation to others in the unexcavated vicinity of the trench suggest an oval structural feature covering an area of about 40 sq m. The Acheulian man occupied the boulder strewn gravelly surface. In contrast to the overlying gravel the Acheulian layer is very well consolidated and could be excavated only with the aid of heavy picks and chisels.

The floor yielded 291 artifacts, during the first season's excavation. Limestone is the principal raw material used for the tools. It was obtained in the form of pebbles from the gravel bed and as angular blocks from the plateaux. The artifacts retain sharp

edges and show no traces of rolling. Neither pebbles nor artifacts show any specific orientation. The amount of waste is nearly twice that of the finished tools. There are several rounded limestone and granite pieces with battered surfaces, suggesting their use as hammerstones. All these characteristics point to the archaeological horizon having been an Acheulian working floor. Other activities that might have been carried out by the tool makers cannot at present be visualized in the absence of organic remains and other materials.

The principal tool types in the collection are cleavers (26.17%), handaxes (16.82%), scrapers (14.01%), knives (13.08%), polyhedrons (9.35%), choppers (8.41%), and picks (7.48%). Comparing this assemblage with other Acheulian industries Paddayya says "The frequent employment of stone hammer technique for making handaxes and other heavy-duty tools (as reflected in the irregular outlines and thick cross-sections) and the occurrence of choppers, picks, polyhedrons and knives in fairly large numbers impart an Early Acheulian character to the industry. On the whole it compares quite well with the industries from Chirki (Corvinus 1970: 1973) and Anagwadi (Pappu 1974). As opposed to this group, sites like Gangapur (Sankalia 1952; IAR 1965-6; 30-1), Bhimbetka (Misra 1974) and those on the Rallkalava river in Andhra Pradesh (Murty 1966) seem to represent an evolved stage within the Acheulian".³²

Acheulian assemblages have also been found in the excavations of open air sites at Gudiyam in Trivellore Taluk³³ and at Attirambakkam³⁴, both in Chingleput District of Tamil Nadu, and at Gupteshwar near Gwalior in Madhya Pradesh.³⁵ However, adequate details of these have not yet been published.

Conclusion

This brief review of excavated Acheulian sites highlights the scanty nature of the material available for finding out the typological and technological variability among the Acheulian industries and for building up a relative chronology of them. Outside the caves and rock shelters, which are few and far between, all material comes from sites located in or along the stream channels where it must have been affected by flowing water in varying degrees. Also, excavated assemblages are sometimes too small to present

a reliable picture of the industry and for comparison with other industries. And finally, a standardised typological framework and analytical procedures have to be applied to all of them to make any comparative study significant.

However, even with these limitations we can see that the Acheulian industries known from excavated sites reveal a considerable diversity and must encompass a long period of time. At least two clear phases can at present be recognized. To the first and earlier phase we can assign the industries from Lalitpur, Adamgarh, Kuliana, Mahadeo Piparia (river bed gravel), Chirki-Nevasa, Anagawadi and Hunsgi. These are characterized by all or most of the following features: high percentage of chopper-chopping tools and bifaces, low percentage of non-biface tools made on flakes, high ratio of handaxes to cleavers, low incidence of blades and Levallois flakes and predominance of stone hammer flaking technique. Among these industries themselves there no doubt exist considerable typological and technological variability and temporal differences, but the data available at present are not sufficient, both in quantity and quality to show these differences clearly. To the second and later phase can be assigned the industries from rock-shelters IIIF-23 and IIIF-24 at Bhimbetka and from the cliff gravel at Mahadeo Piparia. These, especially the industry from Bhimbetka IIIF-23, are characterized by the absence of chopper-chopping tools, low percentage of bifaces, high ratio of cleavers to handaxes, very high percentage of, and great diversity among non-biface flake tools, high incidence of blades and Levallois flakes and greater use of the soft hammer technique.

Now that there is a welcome shift of emphasis in Palaeolithic research to the excavation of sites, especially primary sites, we can reasonably hope that in the coming years there will be a considerable improvement and addition to our knowledge of the Acheulian cultures in India.

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APPENDIX: Palaeoenvironment

In the absence of fossilized biological remains in the rubble deposits of the rockshelter, one has to take into consideration the physical, chemical and mineralogical properties of sediments to obtain some information about the environment of early man. Preliminary sedimentological studies of S.N. Rajaguru, R.S. Pappu and S.C. Nanda, and the clay mineralogical analyses kindly supplied by J.M. Bowler of the Department of Biogeography and Geomorphology, A.N.U., Canberra, help to throw some light on the Palaeoenvironment.

The finer (<0.002 mm) component of the rubble was studied. It is assumed that this fraction is partly autochthonous and partly allochthonous and has not suffered great diagenetic changes after its deposition on the floor of the rockshelter. Therefore the mineral composition of the finer fraction reflects a pedogenic environment and, indirectly, the climatic conditions during early human occupation.

The palaeolithic rubble is distinctly acidic, non-calcareous and red to reddish brown in colour. It is predominated by the kaolinite group of minerals and also contains traces of gibbsite, hematite and highly altered feldspars. The silica sesquioxide ratio is between 2 to 3. All these mineral characteristics suggest that the environment during palaeolithic occupation was favourable for lateritic soil formation in the area. Therefore the climate was tropical monsoonic with an annual rainfall of not less than 1200 to 1500 mm.

Owing to good, assured rainfall the Bhimbetka plateau appears to have been covered by thick deciduous forest. Though no organic remains have survived in the palaeolithic levels of Bhimbetka, the contemporary late pleistocene alluvial deposits of the Central Narmada river to the south are very rich in fossil fauna. This fauna includes *Bos namadicus*, *Elephas namadicus*, *Elephas maximus*, *Hexaprotodon namadicus*, *Bubalus palaeindicus*, *Equus namadicus*, *Sus* sp. and *Cervus* sp. The fauna on the whole also suggest favourable ecological conditions during the palaeolithic occupation in the area.

In comparison with the palaeolithic rubble, the mesolithic occupation debris is less acidic, finer and distinctly brown to dark brown in colour. The

presence of carbonate pellets and absence of hematite suggest poor leaching conditions due to impeded drainage. A similar type of pedocalic brown soil (popularly known as 'black cotton soil') is found today on the alluvial flats developed in a small valley draining the Bhimbetka plateau. The exact significance of the dark brown colour and the finer texture of the mesolithic rubble is not fully understood at this stage and hence no attempt has been made to interpret the palaeoenvironment.

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Notes and References

1. Professor H.D. Sankalia who first conceived the idea of excavation at the site has all along provided encouragement and valuable guidance. Dr V.S. Wakankar who discovered the site in 1958 readily welcomed the idea of joint excavation at the site. During the three seasons of digging at Bhimbetka I have been assisted, at various stages, by Shri P.K. Tewari, Shri P.K. Thomas, Shri S.C. Nanda, Shri S. Prasad, Shri Y. Mathpal, Shri D.P. Sharma, Km. N. Boga, Shri O.K. Sing, Shri P.M.C. Forbes Irving, Shri S.K. Kulkarni, Shri P.R. Kulkarni, Shri C.G. Padval, Shri R.B. Sapre, Shri V.K. Nagpure¹, Shri S.R. Prabhu, Shri J.S. Jairaj and Shrimati S. Nayak. Shri M.D. Khare, Superintending Archaeologist, Archaeological Survey of India, was helpful in many ways. In the analysis of the cultural material I have received valuable help from Dr D.K. Bhattacharya, Shri P.K. Thomas and Shri S.C. Nanda. Dr S.N. Rajaguru who is studying the palaeo-environment of Bhimbetka, helped me in the sedimentological and colour identification of the stratigraphy at the site. Drawings have been prepared by Shri C.G. Padval. To all these persons I express my warm thanks. Financial support for the excavations has been received from Poona University, Deccan College, University Grants Commission and the Archaeological Survey of India.
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3. For a very comprehensive treatment and extensive bibliography, see H.D. Sankalia, *Prehistory and Protohistory of India and Pakistan* (Poona, 1974).
4. N.K. Bose and D. Sen, *Excavations in Mayurbhanj* (Calcutta, 1948).
5. O.H.K. Spate and A.T.E. Learmonth, *India and Pakistan: Land, People and Economy* (London, 1967), pp. 22-23.
6. The classification and numbering of the shelters has been done by Dr V.S. Wakankar with the help of Dr S.K. Arya, Shri Narayan Vyas, Km. Daljeet Kaur Gill, Shri J.C. Joshi and Shri N. Bhati. Shri Y. Mathpal has numbered many shelters which were missed in the earlier counting.
7. All flakes that appear to be too small, thin and irregular for any possible use have been classified as chips. They generally do not exceed 3 cm in length.
8. This figure does not include Levallois flakes and blades.
9. The percentages under items 6-10 are worked out of the total of non-biface tools (1322 pieces; see Table 5).
10. These percentages are calculated out of the total of biface and non-biface tools (1501 pieces; see Tables 4 and 5).
11. V.S. Wakankar, 'Shim-Betka Excavations', *Journal of Indian History*, Vol. LI, Pt. 1 (1973), pp. 23-33.
12. I have included Wakankar's 'points or lanceolates' (9.52%) among handaxes because during discussions with him in the field I found that he uses this term for pointed handaxes.
13. R. Singh, *Palaeolithic Industries of Northern Bundelkhand*, PhD Thesis, 1965 (unpublished), Deccan College Library, Poona, pp. 66-79.
14. *Ibid.*, p. 67.
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 19. Corvinus, *op. cit.* (1970), p. 17.
 20. Corvinus, *op. cit.* (1973), pp. 22-23.
 21. These figures are compiled from Corvinus, *op. cit.*, 1970 and 1973.
 22. Corvinus, *op. cit.* (1973), p. 23.
 23. *Ibid.*, p. 23.
 24. Corvinus, *op. cit.* (1970), p. 16.
 25. R.S. Pappu, *Pleistocene Studies in the Upper Krishna Basin* (Poona, 1974), pp. 32-33 and 56.
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 29. Following the terminology then current Supekar had used the terms 'Early Stone Age' and 'Middle Stone Age' for 'Lower Palaeolithic' and 'Middle Palaeolithic', respectively.
 30. N.K. Bose and D. Sen, *op. cit.*
 31. K. Paddayya, 'Acheulian occupation site at Hunsgi, Gulbarga District, Karnataka - a preliminary report', *Bulletin of the Deccan College Research Institute*, Vol. 35 (1975), pp. 87-93.
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 33. *Indian Archaeology* - a Review - 1963-64, p. 19.
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Post-script

This paper is a slightly modified version of my paper to be published in *Puratattva* (Journal of the Indian Archaeological Society), No. 8. As the publication of *Puratattva* has been delayed now for three years, the editor and I thought the inclusion of this paper in *IPPA Bulletin* will make it available to the readers at an earlier date. In the present paper the figures and percentages of artifacts from Bhimbetka IIIIF-23 have been slightly revised due to the recovery and inclusion of 32 artifacts that were earlier missing. The plates and some tables have been excluded since *IPPA Bulletin* cannot print them, but a small note on palaeoenvironment has been added.

V.N. Misra

ANNETTE LAMING-EMPERAIRE, 1917-1977

There seems to be a deplorable tendency in Australia and other parts of the Indo-Pacific world to ignore even important scholars interested in this area who happen to live elsewhere and to publish in languages other than English.

Annette Laming-Emperaire was such an important and, what is more, open-minded and lovable scholar. When I met her last in late 1976 in Paris, she was looking forward tremendously to her first visit to Australia, which we thought to be imminent, hoping that it would give her the key to the understanding of many problems of Pacific prehistory she was working on. She was also full of enthusiasm about her forthcoming archaeological mission to Brazil, a country she knew well, having worked there for many years to train a whole generation of Brazilian prehistorians. It was there, at Curitiba, that she died last year of a stupid accident (apparently asphyxiated in her bathroom).