LITHIC INDUSTRIES

INTRODUCTION

The lithic industries of Jammu - the theme of this thesis - are basically the part and parcel of the widespread culture of pebble-tool tradition. Therefore a brief introduction to the problems which students of prehistory face today regarding the industries supposed to belong to this culture should form the background against which the author proposes to build up his analysis and conclusions.

The criteria of classification and description of pebble tools have been shifting from time to time as results of which there are many prevalent systems and methods; each of which has some merit to its credit. Of all the systems, that of Movius (1942) is widely used. But of late it is being found that it does not cover many new forms and techniques that have come to light as results of recent discoveries. In addition there is also some confusion about some of the terms having functional overtones.

In the revised study of the Sohanian by
Paterson & Drummond (1962), classification based on the typo-technological considerations presents an effective way of classification comparatively suitable to the Potwar area. In fact it is only in Paterson's system that we find for the first time some recognition of the basic pebble shapes.

Ramendo's (1962, vide Balout 1967) pattern of classification on the direction of flaking is also very pertinent. In a recent revised study of the Oldowan, M.D. Leakey (1967) has devised a study based on the edge of the tool. This is again a very useful way of data description.

Many of the above systems were devised when, in general, scholars used to believe in a single-line evolution in which the pebble tools played only the sub-stratum role and evolved into more advanced biface family. These 'rudimentary' artifacts if found beyond their sub-stratum level were considered to be survivals which represented a subsidiary branch in the line of evolution.

Therefore in order to tide over this difficulty the author in this work has made efforts to formulate a system which basically aims at synthesising the various dominant attributes like the
nature of the working surface, the edge, the handhold, angle of flaking, and the pebble shape.

In Jammu area no clear stratigraphic evidence is available to separate one clearly obvious group of tools from the other except by means of their typo-technological analysis.

At the outset the whole collection can be divided into pebble tools (28.5%), flakes (56%), residual cores (10%) and functional cores (5.5%).

Our collection which is dominated by pebble tools shows a varied typology, ranging from crude / basic to the elaborate / developed ones. Its leading type is a unifacially flaked pebble usually called a chopper. Flaked either towards the lateral or the end side, its universal occurrence and persistence through the time is amazing. Infact at many places cultures have been named after this type (chopper-chopping tool) and accepted as hallmark of lower palaeolithic pebble cultures.

The Himalayan orogeny resulting in the uplift of the Pir Panjal and the cyclic glacial onsets in the Pleistocene period flooded the river
valleys with the rock debris. This huge debris on 
retreat of ice was cut and largely transported by 
renewed rivers and deposited at the valley outlets. 
Periodic phenomenon of this sort gave rise to three 
major aggradations of gravel each reworked by the 
river to form a number of terraces.

These terraces on which our lithic sites are 
located, are composed of gravels of hard rocks mainly 
quartzite, quartz, chert, volcanics and metamorphics. 
The ultimate source of the trap rock is the Pir 
Panjal. The greyish lime stones come from the 
mesozoic 'Great Limestone' formations. The source 
of cherty material so profusely used in the Tarnab- 
Bun region is the Eocene limestone formation of the 
sub-Himalayas. Most of the quartzite pebbles have 
been derived from the Muth quartzite formation in 
the Himalayas.

Obviously, the fabricator of lithic artifacts 
did not have to hunt and mine for the raw material, 
which was available always beneath his feet. The 
raw material, used by him were-quartzite, chert, 
flint, cherty flint, siliceous quartzite, impure chert,
compact sandstone, volcanics and limestone (rarely). Around the Chenab, Volcanics and quartzite have been used with marked preference while in the Tarnan-Wen region chert, trap and quartzite are the dominant raw material. In all other regions mostly quartzite has been used. The following table gives the proportion of different types of raw material preferred for the preparation of flakes and pebble tools.

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>F. Tools</th>
<th>Flakes</th>
<th>F. Cores</th>
<th>R. Cores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chert</td>
<td>28</td>
<td>64.5</td>
<td>48</td>
<td>63</td>
</tr>
<tr>
<td>Trap</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>etc.</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

The artifacts on chert are usually patinated in shades ranging from white to yellowish orange. The volcanics are found heavily weathered. Excepting an occasional specimen which appears to have undergone heavy rolling, majority of the artifacts display fairly well preserved conditions.
DOMINANT TRAITS OF PEBBLE TOOLS

Dimensions

The histogram* on Pl. 8 shows that the length in the range of 7-9.9 cm. and breadth in the range of 8-9.9 cm. and thickness in the range of 3-5.9 cm. are most conspicuous in pebble tools. The figures of other parameters of the pebble are given below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mode</th>
<th>S.D.</th>
<th>Coeff. of Skewness</th>
<th>Coeff. of Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>9.14</td>
<td>5.68</td>
<td>.22</td>
<td>2.85</td>
</tr>
<tr>
<td>Br.</td>
<td>8.61</td>
<td>4.55</td>
<td>.41</td>
<td>2.87</td>
</tr>
<tr>
<td>Th.</td>
<td>4.00</td>
<td>2.07</td>
<td>.48</td>
<td>5.19</td>
</tr>
</tbody>
</table>

The statistical value of the coeff. of kurtosis of the frequencies are noteworthy. Its value for thickness is highly leptokurtic, that of length is slightly leptokurtic while that of breadth is slightly platikurtic.

The Working Surface

The functional part of the pebble tools is seen to have been flaked from three types of surfaces.

* The histograms show the metrical and statistical study of 284 pebble tools. But for detailed analytical study only 271 well defined specimens have been included.
a. **Plain Surface:**

The plain surface of the pebble may be natural surface of an intentionally split surface. A bun shaped pebble or an ovoid with one of the surfaces abraded are usually the types of pebble preferred in this group. This type of surface is seen in all the flat-based pebble tools.

b. **Cylindrical Surface:**

The edge on Cylindrical Surface is either of a gouge type or incurring subject to the placement of the edges across the longer axis in case of gouge type and parallel to the longer axis in case of incurring type. A prolate type of pebble provides the most suitable surface. The artifacts with Cylindrical Surface generally have their upper face flat giving rise to a plano-convex cross section. Occasionally on such pebbles the edge runs round the entire periphery.

c. **The Hyperbolic Surface:**

It is a very common type which displays a slightly raised beveled edge. Oblates provide this type of the working surface. The edge is usually continuous and runs through the equator.

**The Nature of the Edge.**

The edge types are: Straight, Convex, Constricted, Pointed, Arched, Perinerral or even
concave. In cases where the edge is constricted, it is seen that it is the result of narrowing of an originally larger edge by taking out deep flakes from the two opposite sides. The chisel edge is produced by vertical blows from the edge itself. The pointed edge is the result of repeated flaking of the lateral sides making it converge towards a pole of an oblate pebble. In addition to the pointed edge the lateral flaked sides of such specimen are also functional.

Specimens with bilateral apical edge show five sub-varieties: pointed, napped, conical, over-thrust and angular. The pointed type usually on an oblate pebble, has the potentiality of being used, apart from the pointed end, by the lateral sides which is evident from the extent of flaking carried down from the tip towards the handhold (See pl.25). The pebble tool with a napped edge has generally two deep scars on the two sides of the upper surface which converge to form a cusped edge.

The conical type is flaked out of ovoid pebbles. It is produced by rotating the pebble around the major axis and striking blows towards one of the
ends. The incidence of this type is however very small. A pebble tool with an angular working edge has a small medial point on the working edge.

The arched working edge type is usually obtained by intensive flaking which assumes the shape of half ellipse leaving the base cortexed. An other variety of this type is obtained by using a thick pebble. Such a type shows steep marginal flaking along the three sides.

Specimens with peripherally worked edge show many varieties. One such type shows steep all round flaking. In other type this flaking is less steep while in an other form the working is further inclined and is bifacial. The edge in the last variety is generally elliptical in outline.

The edge may be located towards the lateral or the end side in case of ovoids or along the equator in case of oblates.

The Grip

In most cases the pebble portion left unflaked—the pole, end or lateral margins, opposite
the edge forms the grip or the butt. All such cases have been termed as primary butts. An artifact which has an alternative place for the grip other than this is termed as having a secondary butt. Such secondary butts are obtained either by intentionally severing any part of the pebble other than the edge or by utilizing that unflaked portion of the pebble which is perpendicular to the ventral surface as a natural grip. In such pebble tools which have their edge on the dorsal and the unworked flat lenticule of the ventral used as a grip, another type of butt is seen which can also be termed as secondary butt or grip. Also in the category of secondary grip come those peripherally flaked artifacts with edges around, in which case the exact location of butt is not determinable. But some of such peripherally flaked tools show steeply flaked thick portions which served as grips or butts.

**Flaking Angle**

The angle of incidence varies to different degrees in different types of tools. A random sample of 104 pebble tools show that nearly half of them have
angles between 50-7\(^\circ\) and 60-89 with maximum variation of 29. The next group of artifacts shows angles between 70-86 and 80-90 with maximum variation of 16. The rest of the artifacts show a random variation of angle which fluctuates between 20-38 with maximum variation of 53.

In cases where the flaking is very inclined, an efficient working edge is produced. Usually the pointed artifacts show such flaking. The group of artifacts showing least variation of angle display steep flaking and are found mostly to be flatbased. An unusual tendency in some of steeply flaked artifacts is seen in flaking the margin steeply from two sides on one end, thus traversing or flaking the margin more than required for a single edge as a result of which an inefficient edge is produced.

**Pebble shapes**

Analysis shows that the shape of the raw material (pebbles) is mainly responsible for the ultimate shape of the finished artifact. Therefore special care has been taken to select pebbles of a particular type keeping in view the type of tools intended to be produced. The shapes of such pebbles
primarily belong to either of closed surface variety like prolates, paraboloids, spheriods or to bounded surface variety like oblates etc. Precise forms in any case are rare. Departure from standardised forms are observable in case of pebbles having abraded surfaces forming the flat base of the pebble tool. Another shape is subangular with lateral sides converging to an acute angle (unipolar pebbles). The bladed form is derived both from oblate and prolate varieties and also tabular blocks. After selecting the suitable pebble-form care was taken to select the margin according to the required extent of the working edge and the surface for sticking blows. In some unsuitable types of pebbles or perhaps as required by the fabricator the raw material was split generally along a cleavage plane to form a base or the upper surface.

A fully fashioned pebble tool whether belonging to early or late facies generally assumes the shape which is seldom morphologically far removed from the original pebble shape. It is to be emphasized that the pebble shapes—the substratum of the pebble tool typology, have an apparent privileged effect both on the technique and the final shape of the pebble tool.
In fact more than any other single attribute this gives the pebble tools of the Sohanian its typical visual effect.

With this general discussion on the various facets of the pebble tool morphology we propose to deal with the classification.

**Terminology and Typology of the Pebble Tools**

The tool types have been codified in an expression which sums up the various attributes of a pebble tool—the type of working surface, the placement and type of the edge, the direction of flaking and the type of the butt. To start with, on the basis of type of the working edge the assemblage is divisible into four major categories of the pebble tools—(1) Single edged (2) Pointed edged (3) Arched edged (4) Continuous edged (Peripherals)

1. **Single-Edged**

   The first category of the pebble tools shows a group of artifacts which display a single working edge. The edge may be terminal (transverse
or end) or lateral in placement, straight, convex, constricated and fanshaped in outline and steep, bevel or incurving in profile. For comparison we note that most of the handaxes, Choppers and chopping tools of Movius's terminology (1942), Terminal flat-base, Lateral flat base, some of the Convex Oblates and Unilateral nucleates of Paterson's terminology (1962) and Burin types or Chisel-edged forms in the Oldowan (M. Leakey 1967) come under this type. There are 4 types in this category:

1.1 Transverse edged
1.2 End and Chisel edged
1.3 Lateral edged
1.4 Constricted edged.

The above types may be unifacially flaked or bifacially flaked and may have any type of the working surface. There are 111 artifacts in this group.

1.1 The edge lies transverse to the sub-angular butt. It is either straight, slightly convex or flaring in outline. In the later case the edge is mostly scalloped. The breadth of the artifact from edge to edge is greater than the length from the edge to the butt.
1.2 The edge lies towards one of the poles of an elongated pebble. The breadth of the edge is equal to or less than the breadth of the pebble. The chisel edge is the result of multidirectional vertical blows on one of the poles of an elongated pebble.

1.3 The edge is nearly straight and is lateral in placement.

1.4 It is the result of narrowing down of an originally larger edge by taking out deep flakes from the two opposite sides of the required constricted edge.

2. POINTED EDGED

This class deals with the tools which have a pointed or peaked working edge. For this the use of pebble having closed or bounded surface is seen. There are 5 types in this class of artifacts which has total strength of 47 specimens.

2.1 Angular edged 2.2 Napped edged
2.2 Pointed edged 2.4 Overthrust edged
2.5 Conical edged

2.1 The pebble tool with an angular working edge shows in-cipient medial point on the working
edge. But for this feature the tool could well have been counted in the single edged category. Many of the handazes of the Anyathian with such type of working edge come under this type.

2.2 The pebble tool with napped working edge shows cusped edge which is produced by the intersection of deep converging flake scars. Thick pebbles are used for such types.

2.3 The pebble tool with pointed working edge is prepared either on a lateral side of an oblate or on the end of it with two lateral sides converging to form a pointed or tongue shaped extremity. Pointed oblates of the 'Sohanian' industries come under this type.

2.4 The pebble tool with an 'overthrust' edge has all the peculiarities of an angular edge. But in addition has a large flake scar opposite the medial point on the ventral. Such type also occurs in the Anyathian.

2.5 The conical variety of this tool type shows a conical, pointed working edge. The working edge is formed by rotating the pebble round
the major axis and striking blows, on the successive platforms formed by flaking towards one of the ends. A prolate type of pebble is used for such type. Alternatively if the lateral sides of an elongated pebble, inversely flaked, converge, a constricted pointed edge is formed.

3. ARCHED EDGED

The third category of the pebble tools shows an arched working edge with a straight or nearly straight butt lying across at the base. Out of the 68 specimens belonging to this group the edges of only two have been worked bifacially. In the process of formation of this type of working edge the upper surface may be found split. In fact this is the category which shows maximum number of tools with upper surface split. In few cases the ventral surface is fully cortexed and flat. In no case the butt is pointed, it is always straight. In fact the shifting of the butt from the pole or rounded margin to the lateral or straighter margin is apparent even in the early facies of the pebble tool industries. This shifting has given rise to a number of cases with secondary butt. All the artifacts in this group fall
into the following six types.

3.1 Edge obtained by three directional free flaking.

3.2 Edge obtained by marginal flaking mostly on pebbles with split upper surface.

3.3 Edge obtained by steep marginal flaking on thick unsplit pebbles.

3.4 A derivative of 3.3, working edge is mostly bifacial.

3.5 Pointed arched edge supported generally by a central ridge.

3.6 Edge confined to two sides of the arch.

3.1 Free flaking from three sides forms a uniform arched working edge. The butt is generally found to be perpendicular to the ventral and thus secondary.

3.2 The upper surface in this type is found to be split either obliquely towards the butt or parallel to the ventral. Marginal step flaking on the three sides results in an arched working edge. The butt is secondary.
This type shows steep marginal flaking round the three sides. The profile of the tool is parabolic with upper and lower surfaces opening like a clong. In the Sohan Valley this type first appears in Mid Sohan B and is also found in the subsequent industries. Some of the specimens from S. China found in the younger deposits of Kwangsi cases also resemble this type.

This type is the derivative of the above type. A fully fashioned tool of 3.3 type when severed through the butt in a profile plane provides a secondary butt. The portion of the edge lying transverse to this severed plane (acting as a butt) is sometimes found to be bifacially rotouched.

This type of tool has a pointed arched edge with a 'backed' butt lying perpendicular to the ventral surface. In some cases the apex of the butt joins to the tip of the arch by a conspicuous central ridge formed by the opposing flake scars. But for the butt this variety may have been put in the pointed pebble tools.

This in fact is a two edged pebble tool with all the peculiarities e.g. pebble shape, flaking etc. of an arched pebble tool. If the area
between the two edges left unflaked, had been flaked, an arched pebble tool would have been the result.

4. CONTINUOUS EDGED TYPE

The fourth category of the pebble tools shows peripheral working edge. The artifact may be rounded or oblong in outline. There are 44 artifacts in this group which fall in 5 types.

4.1 Edge obtained by steep marginal flaking.
4.2 Edge obtained by marginal flaking on pebbles with split upper surface.
4.3 Edge obtained by inclined centrally directed flaking forming a circular pyramid.
4.4 Edge obtained by longitudinal and converging flake scars.
4.5 Edge is bifacial and is obtained by alternate or inverse flaking.

4.1 The artifact shows steep marginal flaking all round the periphery with a patch of cortex on the upper surface. The under surface is unworked and flat. Bilateral flat base tools described by Paterson (1962) come under this type.
4.2 This type has split upper surface. The under-surface may be cylindrical or nearly flat; the edge has been obtained by marginal flaking through the periphery.

4.3 This type shows inclined centrally directed unifacial flaking on the flat based pebble. As a result a pyramidal type of rounded artifact is formed.

4.4 This type has an elliptical peripheral working edge. The upper surface might or might have not been split before extensive unifacial flaking on whole of the upper surface. The ventral surface sometimes shows partial flaking. Such types have been called Ortholiths by Graziozi (1964) and Turtle backs by Paterson (1962).

4.5 This type of artifact with peripheral edge shows bifacial flaking done either by alternate, inverse or two stages of unifacial flaking.

In combination with the above attributes the final codification can be synthesized in the
following two tables.

### TABLE I

<table>
<thead>
<tr>
<th></th>
<th>U</th>
<th>B</th>
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<tbody>
<tr>
<td>Surf.</td>
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<tr>
<td>Not split</td>
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<td>E</td>
</tr>
<tr>
<td>Split</td>
<td>F</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>E</td>
</tr>
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<td></td>
<td>H</td>
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### TABLE II

<table>
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<th>S</th>
<th>P</th>
<th>A</th>
<th>C</th>
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<tr>
<td>Grip</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
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Where in Table I:

<table>
<thead>
<tr>
<th>U</th>
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<tr>
<td>B</td>
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Table II:

<table>
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<tr>
<td>S</td>
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</table>

<table>
<thead>
<tr>
<th>p</th>
<th>primary butt</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Single edge</td>
</tr>
<tr>
<td>P</td>
<td>Pointed edge</td>
</tr>
<tr>
<td>A</td>
<td>Arched edge</td>
</tr>
<tr>
<td>C</td>
<td>Continuous edge</td>
</tr>
</tbody>
</table>

EXAMPLES:

A1P1  A unifacially flaked pebble tool with flat base, primary butt and single working edge.

A2P1.2 A bifacially flaked pebble tool with flat base, primary butt and a chisel working edge.

The above expression represents the full attributive index of a pebble tool. This is a composite expression which shows both the form of the pebble tool and its type. The form of a pebble is variable and is...
the outcome of the combination and permutation of those selected specific attributes which one thinks to be essential (Tables I & II above). The forms of the pebble tool thus obtained within this large range are in fact self-devised identities which may not all correspond to the standard types. Such identities may be called the category types of a pebble tool. The delineation of recurring traits which make the artifact a standard type is vested in the partial index which not only gives additional knowledge about the techno-morphological aspects and some abstract attributes but also recapitulates and pinpoints only such attributes of the category type formula which are deemed necessary for its identity as a standard type.
The flakes form the largest class of the artifacts. Their percentage in the whole inventory reaches nearly 55. Fine grained quartzite, flint, flinty chert and volcanic media forms the raw material. It has been noticed that the use of siliceous material predominates. The artifacts on the whole, dictated by their own processes of dehydration and other chemical reactions, present different states of physical preservation.

The choice of raw material has a morphological significance. Though all varieties of available material has been used, a judicious and deliberate selection has been made for certain types where secondary details were possible. For example very few types of flakes on impure chert or volcanics display delicate secondary or tertiary retouch. At such sites where suitable fine-grained material is not available, such types of flakes are almost absent.

A sizable number of flakes retain the original cortex towards the distal or lateral side of the flake. Generally the platform is cortical and inclines towards the flake surface. The use of the resolved flaking is too dominant a feature. All artifacts on siliceous
raw material show deep patination ranging from white to orange in colour.

A study of the various morphological features of the flakes is given below in the following order: Dimensions, Primary flaking, Platform, Angle of percussion, Nature and placement of working edge and Retouch.

**DOMINANT TRAITS OF THE FLAKES**

**Dimensions**

The histogram* (Pl. 9) shows that the length of flakes in the range of 5-5.9 cms., breadth in the range of 3-3.9 cms., and thickness in the range of 1-1.9 cms. are most conspicuous in the assemblage. Further statistics of these parameters are given below:

<table>
<thead>
<tr>
<th></th>
<th>Mode</th>
<th>S.D.</th>
<th>Coeff. of Skewness</th>
<th>Coeff. of Kurtosis</th>
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<tr>
<td>L</td>
<td>5.6</td>
<td>2.20</td>
<td>.27</td>
<td>3.21</td>
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<td>Br.</td>
<td>3.3</td>
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<td>Th.</td>
<td>1.4</td>
<td>1.82</td>
<td>.75</td>
<td>2.83</td>
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</table>

* The histograms show the metrical and statistical study of 716 flakes. But detailed analytical study of only 535 flakes, having well defined forms, has been made.
Frequency distribution curves of length, breadth and thickness show that the curves of the last two parameters are more skewed than that of the first parameter. The statistical values of coefficients of kurtosis are also indicating. The value for the length shows a leptokurtic distribution, its value for the breadth shows a platikurtic distribution while that of the thickness shows again a leptokurtic distribution.

The degree of peakedness of these distribution curves expressed in numerical value by calculating the moment coeff. of kurtosis is also noticeable. Its value for the frequency curve of length is 3.21; that for the breadth is 5.71 while that for the thickness curve is 3.83 showing that the peakedness of the thickness curve is the maximum.

**Primary Flaking**

A usual trend of primary flaking is oblique flaking along one side of the longitudinal axis of an elongated pebble executed generally before the detachment of the flakes. As a result, a fairly sharp working edge is produced. A variant of this type of flaking is seen in transverse primary flaking which
results in a sharp, square type of core. The rest of the portion of flake may retain the cortex either on the body or towards the rim.

Flakes showing convergent primary flaking generally show two lateral working margins. In some advanced types resulting from such flaking, the flake is found to be pointed towards the extremity and heavier towards the platform. Usually such flakes are removed from cores showing centrally directed flake scars. A few blade flakes in our collection also show converging or near longitudinal flaking.

In few specimens radial primary flaking is also seen. The flakes with such flaking have generally faceted platforms.

The occurrence of large number of flakes with oblique, vertical or converging primary flaking also suggests that these primary flake scars represent the negative scars of the flakes struck before the detachment of such flakes. But it is possible that this very feature of consecutive flaking was put to use by the fabricator.

In cases the upper surface is devoid of any primary flaking, the working edge is produced by
retouch on the required margin. The following table shows the number of specimens in each type of flaking pattern.

<table>
<thead>
<tr>
<th>Pr. Flaking</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qt.</td>
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<td></td>
</tr>
<tr>
<td>Chest etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Platform

The flakes retaining the cortex on the platform form a % are as high as 77%. In nearly 26% cases it continues either as a rim opposite the working edge or rolls over the body of the flake itself. Usually in such flakes the bulb is located obliquely either towards the edge or towards the rim. On some specimens (8 in all) the platform is seen to be arched or a near semicircle and is joined by a transverse working edge. But the flakes with crescentic and straight platform from the largest % are - as high as 54. Sometimes a superfluous flake seen on the upper face of the flake gives a
concavo-convex or twisted appearance to the plan of the platform. In few other cases the platform is triangular, the vertex of which is formed by the central ridge on the upper face formed by the convergence of opposing flake scars.

Faceted flakes are few, but there are large number of flakes which show a single facet or a scar on the platform. Together they form a stage of 17.34. Such flakes usually show a wide angle of percussion. Intensive retouch and notching is conspicuously seen on such flakes. From the plane-scoured platform has developed the chisel-like type of platform. Sometimes the two facets of the platform meet at an angle as low as 60. Occasionally the platform is found to be very minute. In such cases the flakes were punched out.

A slightly different type of platform is seen on certain other type of flakes. The platform is plain and is found to be made punctiform by vertical primary flaking. The body of the flake is found flaring from the platform to the distal transverse edge. Rarely we come across some flakes with punctiform platform produced
by shattering process.

<table>
<thead>
<tr>
<th>Platform</th>
<th>Cortexed</th>
<th>Scarred</th>
<th>Faceted</th>
<th>Removed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Material</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at.</td>
<td>161</td>
<td>14</td>
<td>8</td>
<td>6</td>
<td>189</td>
</tr>
<tr>
<td>Chert, Trap etc.</td>
<td>222</td>
<td>50</td>
<td>21</td>
<td>43</td>
<td>346</td>
</tr>
<tr>
<td>Total</td>
<td>392</td>
<td>64</td>
<td>29</td>
<td>49</td>
<td>585</td>
</tr>
</tbody>
</table>

A sizable number of flakes (22%) show vertical severance usually through the centrally located bulb. This severance of the flake seems an intentional feature. As is evidenced from their high % age it seems that a technique was mastered to sever the flake while detaching the flake from the core at the same time. (Author's own experiments show that this is possible by using a hammerstone with a pointed pole. As a result of hard blow the platform which is large and slightly crescent-ic breaks in the middle at the point of percussion and gives rise to two vertically severed flakes instead of usual one).

Angle of Percussion

The flakes showing an obtuse angle between 100°-132° from the largest group. Their percentage is as high as
The age of flakes showing angle less than 108° is only 12.4 while that of angle greater than 122° and below 148° is only 2.8.

<table>
<thead>
<tr>
<th>Angle</th>
<th>&lt;99</th>
<th>100-110</th>
<th>111-121</th>
<th>122-132</th>
<th>133-148</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>12.4</td>
<td>31.7</td>
<td>27.9</td>
<td>15.2</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Nature and Placement of Working Edge

Usually one or both the lateral margins serve as the working portions. In few cases the edge is located towards the distal end and lies transverse to the line of percussion. The working area may also be located on the platform itself. The thickness of the flake may also be the required surface, retouched into a working portion.

Usually the working edge is convex or straight. Parallel sided lateral edges or the converging lateral sides also form a small proportion. The flakes with concave working margins are also found in a good number. The flakes with pointed awl like functional edge are also found.

Retouch

Nearly 48% of the flakes show varying amount of retouch. The retouch is usually stepped or scaler and may be unifacial, alternate or inverse.
The unifacial retouch is seen mostly on the flake surface. On some flakes the upper surface shows an inclined cleavage plane which converges with the flake surface and acts as a suitable working platform for the retouch on the flake surface. Such flakes have a parallel in flat-based pebble tools as far as the provision of flat working platform is concerned.

Notch is another feature which is significant. The notch is generally seen towards the tip portion of the flake to give prominence to either a 'burin' edge or a piercing tip.

It may also result in a serrated, denticulated or a nosed working edge.

The retouch on the upper face on the platform is also a common feature. From the manner of the retouch it seems that it has some functional implications. The butt region sometimes shows two dimensional retouch on lateral sides and on the upper surface. This type of retouch not only reduces the thickness of the platform but also constricsts its breadth to make it suitable for hafting.

<table>
<thead>
<tr>
<th>Retouch</th>
<th>R.M.</th>
<th>F.S.</th>
<th>U.S.</th>
<th>Alternate</th>
<th>Inverse</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qt.</td>
<td>33</td>
<td>24</td>
<td>26</td>
<td>-</td>
<td>1</td>
<td>93</td>
</tr>
<tr>
<td>Chert etc.</td>
<td>50</td>
<td>36</td>
<td>22</td>
<td>6</td>
<td>144</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>83</td>
<td>120</td>
<td>48</td>
<td>6</td>
<td>257</td>
<td></td>
</tr>
</tbody>
</table>
It is also interesting to note that the percentage of retouched flakes showing scarred platform is higher than the flakes having other types of platform.

<table>
<thead>
<tr>
<th>Platform</th>
<th>C</th>
<th>S</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>39</td>
<td>54</td>
<td>50</td>
</tr>
</tbody>
</table>

**Flake Types**

On the basis of primary working the flakes can be classified into following groups:

1. Unworked flakes
2. Semi-prepared flakes
3. Prepared flakes
4. Severed flakes

1. These flakes are detached from the outer segment of a pebble without any primary flaking. Such a flake when turned into a tool shows retouch on the desired portion. Though the platform is invariably cortexed, in few cases it is found to be scarred.

2. These flakes show a partial preparation of the upper face in order to bring out a somewhat more efficient working edge. The flake of this class has a sharp edge as a result of -(a) one directional single or repeated strokes dealt obliquely
or transversely over the core before the final detachment; the platform is either cortexed or scarred. The resultant edge is invariably on one side and is the outcome of the primary flake scar of the upper surface intersecting the main flake surface. The flake retains a large patch of cortex. 

(b) Bidirectional flaking from the two opposite sides of the platform before the detachment of the flake. The distal side of the flake retains a large patch of cortex.

2. The flakes of this class show preparation of the upper surface before final detachment from the core. The platform in such flakes may be cortexed, scarred or faceted. The flakes show: a) radial or multiconvergent flaking as a result of which the edge is sharp, b) converging or longitudinal flaking and a conspicuous central ridge. The preparation of such flakes calls for a continuous flaking method which involves the preparation of the face and final detachment simultaneously.

(c) Consecutive vertical flaking as a result of which the upper surface shows a conspicuous negative scar.

4. The flakes of this category show vertical severance through the bulb of percussion. Usually such flakes show converging or oblique
flake-scars. In few cases the flake is unworked. The severed surface generally acts as a backed edge opposite the working edge.

On the nature and placement of the working edge we can get partial index of the flake-class as follows:

1 Distal edge
2 Lateral edge
3 Bilateral edge
4 Convex or continuous edge
5 Angular or linguiform edge
6 Constricted or burin-like edge
7 Thrusting awl-like edge
8 Nosed edge

Thus:
1.1 is the partial index of a flake which is unworked and has a distal working edge.
2.2 is the partial index of a flake which is semi-prepared and has a lateral working edge.
3.5 is the partial index of a flake which is prepared and has an angular working edge.

On the basis of the various traits and the partial index of the flake we have devised the following tables to sum up the attributes in a single expression. This expression represents the full index of the flake.

**TABLE-1**

<table>
<thead>
<tr>
<th>Flt.</th>
<th>Pr.Fl.</th>
<th>No</th>
<th>→</th>
<th>←</th>
<th>↓</th>
<th>←</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td>s</td>
<td>f</td>
<td>r</td>
<td>c</td>
<td>s</td>
<td>f</td>
</tr>
<tr>
<td>s</td>
<td>s</td>
<td>f</td>
<td>r</td>
<td>s</td>
<td>s</td>
<td>f</td>
</tr>
<tr>
<td>f</td>
<td>f</td>
<td>r</td>
<td>r</td>
<td>f</td>
<td>f</td>
<td>r</td>
</tr>
<tr>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
<td>r</td>
</tr>
</tbody>
</table>
Flake | Unworked | Semi-prepared | Prepared | Severed
---|---|---|---|---
Flt. | 1 | 2 | 2 | 4

| Seq. | a | a₁ | | |
| Rim | b | b₁ | | |
| St. | c | c₁ | | |
| Narr. | d | d₁ | | |

Table II

<table>
<thead>
<tr>
<th>where in Table I</th>
<th>&amp; in Table II</th>
</tr>
</thead>
<tbody>
<tr>
<td>c Cortexed</td>
<td>a Segmental</td>
</tr>
<tr>
<td>s Scarred</td>
<td>b Rimmed or Arched</td>
</tr>
<tr>
<td>f Faceted</td>
<td>c Straight or Crescentic</td>
</tr>
<tr>
<td>r Removed</td>
<td>d Punctiform or Narrow</td>
</tr>
</tbody>
</table>

Pr.Fl., Primary flaking

| Flt. | Platform |

Examples:

Type cₐ₁.2 An unworked flake with cortexed, segmental platform; the working edge is lateral.

s₂c₄.1 A severed flake with straight, scarred platform and oblique primary flaking; the working edge is distal.

Residual Cores:

Nearly 10% of the assemblage consists of residual cores. The following types are found:
1. Pebble Core

The cores of this type retain a large patch of cortex on one or both the surfaces. Some of these simulate pebble tools. There are three types:

a. This is on a flat pebble. On the upper surface a conspicuous flake-scar is seen. In some cases the core shows unidirectional multiple flake-scar.

b. This type is on a thick pebble. It shows convergent flake-scar running from a flat or hyperbolic base, along one of the edges. The flake-scar tend to converge towards the upper surface. Due to the thickness of the pebble the scars are prominent on the thickness and not on the upper surface as seen in type 1.a.

c. This is inversely flaked core. The flaking in few cases is consecutive.

2. Unfaceted Segmental Core

The lower surface of the core is rounded like a cabacon. Using the cortexed margin of this lower surface as a platform, the flakes are struck from the opposite surface. The upper surface shows multi-convergent flake-scar.

3. Faceted Segmental Core

The lower surface in this core shows a flaked margin. This margin acts as a continuous platform for the removal of
the flakes from the opposite face. The removal and the preparation of the flakes is simultaneous in these types of cores (Types 2 & 3) due to consecutive flaking.

4. Tortoise Core

The core shows the preparation of the upper face before the removal of a single flake. The platform is either faceted or cortexed.

5. Disc Core

The core shows alternate flaking on the periphery. The scar of one removed flake is used as a platform for the removal of the next flake.

6. Pyramidal Core

From a flat cortexed base, low angled continuous flaking round the margin gives rise to this type of core.

7. Sphenoidal Core

It shows flaking from the base upwards along two converging planes which meet in a line at the vertex. The core sometimes looks like a lenticular wedge. The profile is triangular.

8. Steep Core

Low angled flaking from a platform, along one of the edges of a pebble, gives this type of core. The flaking may be consecutive.
9. **Prismatic Core**

It shows vertical flaking from a platform (or 2 platforms lying parallel to each other), consisting of a flake-scar. Usually stubby flakes are detached from this type of core.

10. **Asymmetrical Core**

The flakes in this type are struck at random without any definite pattern. The resultant core is thus irregular.

**Functional Cores**

A small percentage (5.6) of the assemblage consists of such core tools which do not fit in the regular typology of the pebble tools. Some of the residual cores, subsequently used as functional cores have also been included in this group. The cores are made on pebbles, pebble chunks or nodules. The types of edges are: straight, hollow, peripheral, constricted, burin-like, pointed and conical.

The core - tools showing hollow working edge have a close parallel in the flake - tools having similar working margin. A straight working edge is either lateral or distal in placement. The distal edge is seen on a tranchet, cleaver - like and axelike (rare) artifacts.
In the artifacts showing burin-like working edge, true burins are also found. The chisel or a constricted edge is narrow like a burin-edge but the edge in these types is not rotated. In the artifacts having pointed or tongue-shaped working edge, some of the base-keeled, leaf-shaped specimens are interesting. The specimens with conical edge have close parallel in the corresponding types in the category of pebble tools. The artifacts with small thrusting tip are also found.

As will be seen in the following pages, the functional cores are conspicuous in the later phase of the Jammu industries (C&D).

Before closing this section of the chapter we want to define some terms which have been used occasionally in the following pages:

**Cervical line**

The term has been used to denote the line formed by the limiting flake-scars running from the working edge to the centre of the pebble tool. Or simply it is the line formed by the 'convergence' of the flaked portion and the unflaked portion of the pebble-tool.

**Occlusal view**

It is the view of the top section of the steeply
flaked single -edged pebble tool. The view is more or less parallel to the horizontal section of the pebble tool when the ventral is taken to be lying in the vertical section (The surface of a Pre - Molar or a Molar which comes in contact with the opposite surface while closure or occlusion is called occlusal surface. The view of this surface is occlusal view. The term is useful though there is nothing like occlusion in the pebble tools. However, some of the single - edged pebble tools have close morphological correspondence with a tooth / molar. Compare - the working edge with the incisal edge, the flaked portion with the crown and the butt with the root.).
The Industries:

After analysing the various features of the components of the Jammu lithic industries as a whole it has been found that the entire collection falls into four distinct typo-technological groups which constitute the evolutionary stages of the stone age cultures of Jammu. These groups have been termed as Jammu industries A, B, C and D. Beginning with Jammu A possibly synchronous with the middle Pleistocene these industries, till Jammu D span the rest of the Quaternary period and terminate at the beginning of the Holocene.

The evolution of the industries vested in the 'continuous cycle of cumulative growth and renewal', constitutes an interesting study of the various traits appearing and disappearing along with the advancement of the culture. Thus in Jammu A we see a few basic tool types both in pebble tools and the flake tools which take definite and variegated forms in the succeeding industries. The pebble tools in Jammu A belonging to only two classes viz, Single edged and Pointed edged represent those tool types in these classes which are basic and fundamental in the reticulated pattern of cultural format. This is also true for the flakes belonging to this industry.
Jammu B is the outcome of flowering of basic techniques and types present in Jammu A. The collection is also larger. The pebble tools in this industry represent the same classes—Single edged and Pointed—but display a larger number of types made generally by bidirectional and in few cases by the multidirectional flaking. In the flakes we see dominance of such flakes which have been called semi-prepared in the preceding pages, showing an advance over the cortexed, segmental flakes of Jammu A.

Both in Jammu A and B, the flaking is bold and free. But in Jammu C we see for the first time the dominance of step-flaking in all categories of its tools. Artifacts with multidirectional flaking which have only a small number in Jammu B, multiply in this industry.

The pebble tools belonging to Jammu C, in addition to the types found in the preceding industries, display for the first time the tool types belonging to two other classes—Arched and Continuous edged. Of special interest are those pointed pebble tools which show elaborate marginal retouch and a tapering profile. The continuous edge-ed or peripherals are oval in outline and are unifacially flaked. Fully prepared flakes are the most notable feature of this industry. Such flakes due to sharp edges are generally devoid of any retouch. A large number of flakes are found to be on Trap.
It seems that the authors of this industry were in a hunt for a raw material which was easy to work and prone to sustain delicate retouch. It was only in Jammu D that Chert or Flinty Chert was used with preference which fulfilled all the requirements of the fabricator.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Qt.</th>
<th>Trap.</th>
<th>Chert etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jammu A</td>
<td>69</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>Jammu B</td>
<td>56</td>
<td>39</td>
<td>5</td>
</tr>
<tr>
<td>Jammu C</td>
<td>49</td>
<td>42</td>
<td>9</td>
</tr>
<tr>
<td>Jammu D</td>
<td>37</td>
<td>15</td>
<td>48</td>
</tr>
</tbody>
</table>

Jammu D has in general all the elements of the previous industries. The pebble tools belonging to the Arched and the Continuous -edged types which appear fully in the previous industry show further advancement of the types belonging to those classes. The appearance of a number of diminutive pebble tools forming a distinct micro-facies of the pebble tools is another feature which is seen for the first time in this industry. All the regular tool types are found in this facies. The flake tools in this industry show many new features—sudden increase in the use of chert as raw material, influx of finely retouched flakes, emergence of micro flakes and flake blades in the later stages of this industry.
To sum up, a regular-evolution in the technique and types is seen in the industries. The pebble tools in Jammu A & B are dominated by the Single-edged and Pointed-edged classes. Their percentage decreases in the succeeding two industries.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>S</th>
<th>P</th>
<th>A</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jammu A</td>
<td>62</td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jammu B</td>
<td>57</td>
<td>32</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>Jammu C</td>
<td>27</td>
<td>16</td>
<td>33</td>
<td>14</td>
</tr>
<tr>
<td>Jammu D</td>
<td>38</td>
<td>12.5</td>
<td>28</td>
<td>21.5</td>
</tr>
</tbody>
</table>

It is interesting to note that such traits of the pebble tools as secondary butt, occurrence of split upper face, and total number of types found in a particular industry, increase as we go from Jammu A to D. This increase is accompanied by a corresponding decrease in the tool types which are flat based and those which are bifacially flaked.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Flat Based</th>
<th>Bifacially flaked</th>
<th>Flat up, Sec. Surface</th>
<th>Tool Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jammu A</td>
<td>25</td>
<td>25</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Jammu B</td>
<td>23</td>
<td>25</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Jammu C</td>
<td>14</td>
<td>17</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Jammu D</td>
<td>12</td>
<td>7</td>
<td>30</td>
<td>44</td>
</tr>
</tbody>
</table>
An identical evolution in the flakes can also be glanced. In early stages the flakes show varying amount of working on the upper face which indicate varying amount of preparation prior to the detachment. There is an increasing tendency towards a gradually elaborating preparation of the core. The preparation of the face which leads to the 'evacuation' of the platform from the 'body' of the flake, is accompanied by technical advancement of the platform type in each industry as given in the following table:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>C</th>
<th>S</th>
<th>F</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jammu A</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Jammu B</td>
<td>87</td>
<td>8</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Jammu C</td>
<td>84</td>
<td>9</td>
<td>2.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Jammu D</td>
<td>87</td>
<td>17</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>

Decrease in the percentage of cortexed platform and the corresponding rise in scarred, faceted and removed or suppressed platforms indicate an increasing tendency towards the preparation of the core. It is interesting to note that there is also an evolution in the shapes of the platforms in each industry.
In view of the evolution seen in various parameters of the flakes, and from the study of the primary flaking pattern, we note that the percentage of flakes showing a prepared upper surface slowly increases in the later industries.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Jammu A</th>
<th>Jammu B</th>
<th>Jammu C</th>
<th>Jammu D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>-</td>
<td>12</td>
<td>30</td>
<td>35</td>
</tr>
</tbody>
</table>

In the process of the advancement of the industries an obvious tendency towards neater and smaller forms is seen. In case of pebble tools nearly 25% in Jammu D are of diminutive size. The flakes also show an identical development.
<table>
<thead>
<tr>
<th>Tools Average</th>
<th>L</th>
<th>Br</th>
<th>Th.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jammu A</td>
<td>10.17</td>
<td>11.31</td>
<td>6.00</td>
</tr>
<tr>
<td>Jammu B</td>
<td>10.25</td>
<td>11.15</td>
<td>5.75</td>
</tr>
<tr>
<td>Jammu C</td>
<td>9.25</td>
<td>9.95</td>
<td>5.16</td>
</tr>
<tr>
<td>Jammu D</td>
<td>6.89</td>
<td>6.80</td>
<td>4.87</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flakes Average</th>
<th>L</th>
<th>Br</th>
<th>Th.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jammu A</td>
<td>7.87</td>
<td>10.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Jammu B</td>
<td>8.27</td>
<td>7.14</td>
<td>5.44</td>
</tr>
<tr>
<td>Jammu CC</td>
<td>6.87</td>
<td>5.91</td>
<td>2.04</td>
</tr>
<tr>
<td>Jammu D</td>
<td>5.15</td>
<td>4.19</td>
<td>1.72</td>
</tr>
</tbody>
</table>

The following table shows the variability of the various components of the assemblage. It will be seen that though there is progressive decrease in the percentage of the pebble tools and a corresponding increase in the percentage of the flakes, the percentage of the pebble tools is fairly commanding even in the final industry-Jammu D.
### Relative Chronology of Jammu Industries

<table>
<thead>
<tr>
<th>Terraces</th>
<th>Cliff-Sections</th>
<th>Age</th>
<th>Industry</th>
<th>Locality</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Lower Gravel</td>
<td>2nd Intl.</td>
<td>Jammu A 1 (Derived)</td>
<td>Kurro, Dyalachak, Gudapatan,</td>
</tr>
<tr>
<td>T2</td>
<td>Loam Erosion</td>
<td>3rd Gl.</td>
<td>Jammu B</td>
<td>Kurro, Mah, Jagatpur, Rajabagh, Dyalachak, Bannu-chak, Kuta, Nagrota, Gudapatan-Nanjan, Daskal, Ambran,</td>
</tr>
<tr>
<td>T3</td>
<td>Upper Gravel</td>
<td>3rd Intl.</td>
<td>Jammu C</td>
<td>Kurro, Mah, Jagatpur, Rajabagh, Dyalachak, Bannu-chak, Kuta, Khatriyan-di-chhan, Lrui, Nagrota, Gudapatan-Nanjan, Daskal, Ambran, Dagah,</td>
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<td>T4</td>
<td>Loam &amp; Cutting</td>
<td>4th Gl.</td>
<td>Jammu D</td>
<td>Mah, Jagatpur, Dyalachak, Bannuchak-Salan-Delli, Kuta, Khatriyan-di-chhen, Bariyan, Thalori, Nagrota, Gudapatan, Ambran, Dagah,</td>
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<th>Percentage</th>
<th>P. Tools</th>
<th>Fl.</th>
<th>R. Cores</th>
<th>F. Cores</th>
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<td>Jammu A</td>
<td>71</td>
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<td>Jammu B</td>
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<td>Jammu C</td>
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<td>Jammu D</td>
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In this industry we have 14 artifacts recovered from Kurro, Dyalachak, and Gudapatan. The most notable peculiarity of the artifacts is that almost all of them show considerable wear and tear, rolling and weathering. As seen above the industry has been dated to 2nd Interglacial. Out of the 14 specimens belonging to this industry 10 are pebble tools and 4 are flakes. The pebble tools mostly display unidirectional flaking which covers 25-40% area of the artifact. All of them show primary butts and are made from unsplit pebbles.

The pebble tools belong to two classes only viz-single-edged and pointed edged. Of these two classes, the former dominates.

The pebble tools of the single-edged variety show a straight or slightly convex working edge which is either lateral or transverse in placement. The artifacts generally show repeated unidirectional flaking from a hyperbolic or a cylindrical working edge.

C1Pl.1: BC1 (63x111x50mm)
Greyish quartzite; rolled; a unifacially flaked pebble tool with hyperbolic base, and a nearly straight working edge; the edge lies transverse to the pointed primary butt. (pl.10 Fig. 1).
Co?! t_: KUR 230 (105x129x66 mm.).
Reddish brown fine grained quartzite; a bifacially flaked pebble tool with hyperbolic base and a nearly straight working edge; the edge lies transverse to the primary butt; the retouch on the basal side is only partial. (Pl. II Fig. 1 ).

A2Pl.1: RNJ 165 (108x121x60 mm.).
Greyish green volcanic; rolled, a bifacially flaked pebble tool with flat base and a convex working edge; the edge is twisted due to alternate flaking; primary butt. (Pl. II Fig. 2 ).

The pebble tools of the pointed class belong to the angular and napped types. Advanced type of pointed pebble tools requiring multidirectional flaking are not found in this industry.

A1P2.2: DCK (275x128x45 mm.).
Greyish chert patinated and weathered; rolled; a unifacially flaked pebble tool with a nearly flat base and napped working edge; the edge has been formed by taking out deep scarred flakes from the lateral sides; the dorsal shows few flake scars of an earlier period; primary butt. (Pl. IO Fig. 2 )
C. P. 248 (95 x 102 x 69 mm.).

Violet quartzite; a unifacial pebble tool with hyperbolic base and bifaced upper surface; the flaked portion shows two conspicuous flake scars which meet in a central ridge to form an angular working edge; pointed primary butt. (Pl. 12 Fig. 1).

The flakes though few in number form a definite class and are not merely the byproducts of pebble flaking. Mostly struck from the outer segment of a pebble a few of them retain the original cortex. Retouch is seen on one of them. It seems that a rounded or a lateral working edge was required by the fabricator. As the number of flakes is small no particular trend can be explained.

C. 0a. 1.4  RNJ. 200 (90 x 65 x 35 mm.).

Fine grained whitish quartzite; a round flake struck from the outer segment of a big pebble; slightly retouched from the flake surface; the outer surface is cortexed except for a few crude flake scars on one side. (Pl. 12 Fig. 2).
RCH 407 (61x27x44 mm)

Medium grained brown spotted quartzite

Slightly, rolled; no primary flaking;

Shows marks of use on one of the lateral sides.

There are no functional cores or residual cores ascribable to this industry, in the collection.
The industry records almost all the types of the earlier industry A in addition to the many new forms displaying refinement of technique and variety of typology. It is represented at almost all the sites. There are 35 artifacts out of which 37 are pebble tools, 40 are flakes 2 functional cores and 6 residual cores. The artifacts are generally large in size and are much weathered. The implementiferous sites are: Kurro, Mah, Jagatpur, Rajabagh, Dyalchak, Banuchak, Ruta, Nagrota, Budapatan-Ranjan, Daskal & Ambran.

Pebble Tools:

Out of 37 pebble tools only 9 are bifacially flaked. Secondary butts are seen on a few of them (7). There are 8 specimens which show flat ventral surfaces. The predominant technique is unidirectional and bidirectional; multi-directional technique is seen on only a few specimen. The pebble tools mostly belong to the same classes to which the pebble tools of the previous industry belonged viz., - single edged and pointed edged. As shown below only a few belong to the other 2 classes.

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The pebble tools belonging to the single-edged type show all the types found in this class. Apart from the types found in Jammu-A other types found in this industry are those which show: a fan shaped working edge, a constricted working edge and a chisel working edge:

**E₂P₁.4**  NCR 216 (106x142x67mm.)
whitish brown medium grained quartzite; a massive bifacial pebble tool with cylindrical base; fan shaped working edge has been made on the lateral side; the upper surface shows deeply executed converging flake scars; the edge has been made bifacial by shallow retouch; primary butt. (Pl.13 Fig.1)

**C₁P₁.4**  GPN 168 (87x101x42mm.)
Light green volcanic; a unifacial pebble tool made on an oblate; the working edge has been constricted oblique bidirectional flaking; the edge is slightly incurving in profile; cusped cervical line; primary butt. (Pl.13 Fig.2)

**B₁P₁.4**  DCK 6 (94x15x68mm.)
Greyish volcanic; slightly rolled; a unifacial pebble tool with a nearly flat base; the actual working area of the edge has been constricted
by deep scared flakes directed from the 2
sides of the edge; due to the intersections
of the flake scars a knot has been formed
at the point of convergence on the upper
surface; obliquely situated primary butt.
(C Pl.13 Fig.3)

B2P1.2:  GPN 175(127x102x80mm).
Greyish green quartzite; a massive pebble
tool made on a prolate like pebble; one of the
polar ends has been bifacially flaked to
achieve a burin like straight working edge;
at least 2 longitudinal flake scars on the upper
and a single large flake scar on the lower
surface converge to form this edge; the edge
has been further constricted by striking
vertical flakes on the profile of the pebble;
the working edge shows the marks of use;
primary butt. (C Pl.14)

C1P1.1:  DCK 5(87x92x55mm).
Reddish brown quartzite with greyish core;
a unifacial pebble tool with cylindrical base;
the edge which is slightly convex has been
prepared by bidirectional flaking; it seems
that the edge was originally napped but
intentionally turned into its present shape;
the edge which is scooping in profile lies
transverse to the pointed primary edge; elliptic
C1P1.1  DSK 202 (96x102x49 mm.).
Sandy quartzite dark grey; a unifacial pebble tool made on the end side of an oblate; the upper surface shows two prominent flake scars which gently meet in a central ridge to form an incipiently napped edge; primary butt. (Pl. 15 Fig. 2).

A1P1.1  NGR 222 (95x99x71 mm.).
Brownish grey quartzite; a unifacial pebble tool with a flat base; the edge which is nearly straight has been prepared by steep unidirectional flaking (76°- 81°); the ventral shows smooth surface which is the outcome of the sliding motion while in use; highly convex dorsal; obliquely situated pointed primary butt. (Pl. 15 Fig. 3).

The pebble tools showing pointed edge display a variety of forms. The angular working edge seen in Jammu-A shows a typological evolution displaying an incipiently napped working edge. Fully fashioned napped edged types appear only in this industry and are not found in the succeeding industries.
Another type of tool showing pointed working edge displays low angled bidirectional flaking on the upper face. Such types are made on oblate and anticipate similar types found in Jammub showing elaborate flaking. The edge shows a notch to give prominence to the pointed edge. The pebble tool showing an 'overthrust' working edge also appears for the first time in this industry.

B2P.2:  LQt. 2 (68x109x60 mm).
Treyish quartzite; a unifacial pebble tool with a cylindrical base; the edge which is napped is the result of bidirectional flaking; as a result of the convergence of the flake scars a knot has been produced on the flaked surface; pointed primary butt (or polar butt); ovoid cross-section. (Pl.16 Fig. 1).

C2P.2:  LQt. 240 (128x128x74 mm).
Light brown quartzite; a unifacial pebble tool with a near hyperbolic base and highly convex upper surface; the upper surface shows bidirectional conspicuous flake scars resulting in a highly napped working edge; the edge has been guided and strengthened by the central ridge formed by the convergence of the flake scars; shallow longitudinal retouch on the tip region; primary butt. (Pl.16 Fig. 2).
**B2P2.4**

Greenish volcanic weathered grey; a bifacial pebble tool with a cylindrical base and convex upper edge; the napped edge has been produced by bidirectional step flaking on the upper surface; the edge has been made bifacial by the removal of large flake scars from the ventral on the tip region; this type of edge has been called "Overthrust" by Movius in connection with the finds from Burma; primary butt. (C Pl.16 Fig.3)

**C2P2.5**

Dark violet quartzite; a bifacial tool made on an oblate; it has been flaked from two opposite margins to form an incipiently napped working edge; the right side shows deep scar beds; the left side has been made bifacial by secondary retouch; the cervical line is cusped; primary butt. (C Pl.17 Fig.1)

**C1P2.6**

Dark brown quartzite slightly rolled; a unifacial pebble tool made on the end side of an oblate; low angled flaking from the two opposite margins has resulted in a pointed working edge; the pointed edge has been further given prominence by a deep notch to its right.
The pebble tools of the types belonging to other 2 classes are more characteristic in the succeeding industries.

**Flakes**

The majority of the flakes are massive and display a high angled platform. Though the usual pattern of flaking is oblique, there are nearly 85% of the flakes which show converging primary flake scars. Generally, a portion of cortex is seen towards the further end or towards the lateral side. Out of the 40 flakes, 36 are cortexed, 3 scarred, 1 crudely faceted and 1 shows suppression. Retouch is seen on 35% of the flakes. Though fully prepared flakes are mostly found in the succeeding industry, a small number of flakes show prefabrication of the upper surface.

In the category of unworked and semiprepared flakes, a chisel-like distal end is the most prominent feature. The upper surface of this working edge is generally found to be cortexed. This feature is paralleled in such pebble tools of this industry which have constricted working edge.
Fine-grained brown quartzite; cortexed platform continuing on the upper surface which shows a longitudinal cleavage plane on one of the lateral sides; the surface below this cleavage surface has been retouched; the combination of flat surface below and retouch on the opposite face using it as a platform gives a very efficient working edge. (Pl. 18 Fig. 1).

Medium-grained dark grey quartzite; a deep flake-scar directed obliquely on the upper surface; the flake surface has been retouched from the distal edge which converges and forms an efficient chisel-edge with the cortical patch on the upper surface. (Pl. 18 Fig. 2).

Flakes showing unidirectional oblique flake scars are most dominant in this industry. A slightly advanced type is seen in such specimen which show double oblique or converging primary flaking. Usually a patch of cortex is seen towards this distal portion of the flake. The working margins in the above type of flakes is lateral.

Medium-grained violet-brown quartzite; oblique and longitudinal free and step flaking directed
from the platform has resulted in an efficient lateral edge; the platform continues as a body cortex towards the sides and the bottom; the flake surface shows retouch; the artifact looks pointed when diagonally held. (Pl.18 Fig. 3).

**Ccp.2**

**Lok. 136 (13x87x22mm.)**

Chert, yellowish white due to weathering; a massive flake which shows oblique primary flaking pattern and bears a patch of cortex all along its left margin; it has been further retouched towards the working edge; the flake shows marks of use. (Pl.19 Fig.1).

**c2c2.2**

**DCL 153 (95x91x54mm.)**

Chert, weathered grey; strong oblique blow on the upper surface has resulted in a nearly straight working edge which shows the marks of use; the platform portion behind the bulb shows another flake scar partly along a cleavage plane which has resulted in a strong ribbed pointed edge near the upper portion; a prominent cone of percussion; the working edge is excellent for cleaving. (Pl.19 Fig.2).

**c4c.8**

**KUR 676 (105x33x26mm.)**

Medium grained whitish quartzite; a large flake showing large converging flake scars directed
from the two opposite corners of the platform; the distal portion shows a cusped notch resulting in a nosed distal edge; this nosed edge has been retouched bifacially. (Pl.20 Fig.1).

GPN 1502 (8.3x3.8x1.8 mm).
Trap, heavily weathered and reddish brown patination; large converging flake scars with a patch of cortex towards the distal end; on the upper face; one of the lateral edges shows retouch; due to these large flake scars the platform has been narrowed. (Pl.20 Fig.2).

SCK 164 (85x83x26 mm).
Banded chert weathered to a greyish tinge; a near rounded flake with converging primary flaking on the upper face and a patch of cortex towards distal portion; extensive retouch on the upper half margins; the flake surface shows some irregular retouch; the platform which has been constricted due to the primary flaking makes an angle of 130°. (Pl.20 Fig.3).

Kur 679 (72x80x18 mm).
Fine grained drab grey quartzite; the flake flares out from the platform which has been
constricted by convergent longitudinal flaking on the upper surface; the flake surface shows a prominent bulb and a bulbar scar; platform is scored. (Pl. 20, Fig. 4).

**r6322**

**ECR 462 (106x76x25mm).**

Chert, heavily patinated; an oblique deep scored blow on the upper surface has produced a concave working edge; the bulb and the platform have been removed in this operation. (Pl. 21, Fig. 1).

Flakes showing elaborate retouch are few in this industry. The following specimen is the representative of such types.

**s2124**

**AUL 765 (106x76x25mm).**

Medium grained reddish brown tizite; a near rectangular flake with a slightly constricted amoeboidal platform and flaring lateral edges which end up in a distal chisel edge. The upper surface is cortical except for a cleavage plane towards the distal end and a longitudinal scar on the left margin; the flake surface has been extensively retouched along a lateral and the distal edges; the platform forms an angle of 12° with the flake surface. (Pl. 21, Fig. 2).
Massive flakes are not unknown in Jamu industries but the following specimen is very conspicuous due to its unusual proportions. It is the only one of its kind in this industry (weight: 1400 gms.) Measurements:

\[ \text{[PI. 15A(144x137 mm)]} \]

trap heavily weathered to a greyish tinge; a massive flake showing deep scarred facetting on the platform and partial radial primary flaking on the upper face; extensive retouch along one of the margins on the negative surface has resulted in tough lateral working edge which converges with the other margin to form a strong pointed tip; in potentiality this artifact can be matched with a massive pebble tool; a very prominent bulb. (Pl. 21 Fig. 3).

Prepared flakes are few in this industry. Such flakes are more conspicuous in the succeeding industries.

\[ \text{[PI. 56A(134x23x13 mm.)]} \]

Medium grained brown quartzite; a prepared flake showing radial flake; platform is cortexed. (Pl. 21 Fig. 4).

\[ \text{[PI. 165A(30x30x13 mm.)]} \]

Greyish quartzite; slightly rolled; a flake showing converging flake scars on the upper surface; platform is cortexed. (Pl. 21 Fig. 5).
Residual Cores

Due to the small number of cores ascribable to this industry, all the types corresponding to the flakes occurring in this industry are not represented. The predominant type is pebble core. The only specimen of the other type is an unfaceted segmental core.

Type 1.a  **BCK 1002 (106x87x59 mm)**

Dark grey quartzite; a residual core showing conspicuous flake-scar on the upper surface; the platform is cortexed. (Pl. 22 Fig. 1)

Type 2  **GPN 193 (108x98x60 mm)**

Trap, deeply weathered; a residual core with a rounded base; the upper surface shows centrally directed peripheral flake-scars. (Pl. 22 Fig. 2)

Functional Cores

Only two specimens have been found in this industry. Both the specimens have peripheral working margins. It may be noted that functional cores are more common in the succeeding industries.

**Kur 222 (186x92x39 mm)**

Brownish white quartzite; the upper surface shows a conspicuous cleavage plane; the lower surface consists of a flake-surface; the platform and the bulb have been removed to reduce the thickness of this part of the artifact; partial alternate retouch on the periphery. (Pl. 22 Fig. 3)
The industry is based on much larger collection of artifacts. There is proliferation of the tool types in all the components of the industry. The size of the artifacts is normal but towards the last stage of the industry there appear some artifacts which are below the normal range and thus foreshadow a trend which is most apparent in the succeeding industry. Out of 295 artifacts 91 are pebble tools, 167 flakes, 21 cores and 16 functional cores. The industry occurs at: Kurro, Mah, Jagatpur, Rajabagh, Dyalachak, Benuchak, Kuta, Khatriyan-di-chhan, Drui, Nagrota, Gudapatan-Ranjan, Daskal, Ambran & Dagah.

**Pebble Tools:**

Of the whole range of pebble tool types, 75% are found in this industry. Most notable types are those which belong to the pointed edged, Arched edged and the Continuous edged classes of the pebble tools. Free flaking giving rise to large deep flake scars, evidenced in Jammu A and B is found to be replaced by step and controlled flaking in this industry.

The pebble tools of the Arched and Continuous edged varieties appear in full-fledged forms for the first time in industry. The specimens belonging to the pointed class also show a great typological exuberance.

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The pebble tools of the single edged class are best represented by the transverse types. Other types of this group of artifacts also occur but there is complete absence of constricted-edged types which are found in Jammu B.

**E₃**  
**JST 241 (91x105x71mm).**  
Reddish green quartzite; made on a paraboloid pebble, the tool has been unifacially flaked; the base is cylindrical while the upper surface is flat; steep unidirectional flaking has resulted a nearly straight, scooping edge; pointed primary butt. (Pl.23 Fig.1).

**A₁**  
**KTA 135 (102x119x80mm).**  
Yellowish white quartzite; a unifacial pebble tool with a flat base and bifaced upper surface; the artifact has been steeply flaked by free flaking; the edge is slightly carinated; sub-angular primary butt. (Pl.23 Fig.2).

**A₁**  
**DCK 34 (82x109x67mm).**  
Greyish quartzite; a unifacial pebble tool with a nearly flat base and convex upper body; the functional area has been steeply flaked by step flaking; scalloped edge; incipient hook seen towards left side of the edge; pointed primary butt. (Pl.23 Fig.3).
D21.2  RNJ 191 (106x92x76mm).
Bluish grey quartzite; a bifacial pebble tool with flat ventral and a nearly flat dorsal; the edge is nearly straight and shows alternate flaking; thick secondary butt. (Pl.23 Fig.4).

A1F1.1  GPN 186 (83x101x44mm).
Greyish quartzite; a unifacial pebble tool with a flat base; the oblique edge is scalloped and has resulted from deep scarred step flaking; pointed primary butt. (Pl.23 Fig.5).

A1P1.1  KTA 114 (78x98x50mm).
Greyish green trap; a pebble tool made on the lateral side of a convexoblate; slightly convex working edge has been flaked unifacially by step flaking; primary butt. (Pl.23 Fig.6).

B1P1.1  DCK 33 (66x81x47mm).
Cherty, greyish weathering; a unifacial pebble tool with a cylindrical base and convex upper surface; the edge is slightly convex and has been produced by steep shallow flaking; a prominent flakescar on the left side of the tool has been given a tipped extremity to the working edge; primary butt. (Pl.24 Fig.1).
C P RJB 250 (134x98x51 mm).
Dark grey quartzite; a unilateral pebble tool made on an oblate; the convex edge is nearly pronged and has been produced by free flaking with a pointed hammer; primary butt. (Pl. 24Fig. 2).

C P KTA 116 (85x125x80 mm).
Dark violet quartzite; a composite bifacial pebble tool with bifacial working edges both on the lateral side and an end side; the bifacial lateral edge is wavy and shows secondary retouch; the edge on the smaller axis is pointed and has been produced by vertical resolved flaking on the upper surface; the pointed edge has been further notched on 2 sides to give paromince to the tip; the end lying opposite this pointed edge shows 'overthrust' edge; primary butt. (Pl. 28Fig. 3).

B S RNJ 171 (103x105x62 mm).
Greenish grey quartzite; a unifacial pebble tool with a flaring edge; nearly whole of the upper surface is flaked with two types of flaking pattern—while the body of the artifact shows transverse scar beds, the edge shows steep unidirectional flaking nearly at right angle to the transverse flakescars; secondary butt. (Pl. 24Fig. 3).
BP 2.4

KTA 15 (75x100x53).

Bluish grey quartzite; a bifacial pebble tool with 'overthrust' working edge; made on a paraboloid type of pebble, the upper surface shows bidirectional step flaking; it can be presumed that due to convergence of these flake scars a pointed edge was formed which was later turned into the 'overthrust' type by a scar on the ventral surface; as a result an incurving beaked edge has been formed; primary butt. (Pl.24Fig.4).

C1 P1.1

AMB 209 (103x112x42mm).

Dark grey sandy quartzite; a unifacial pebble tool made on an oblate; the upper surface shows steep marginal flaking on nearly more than half the periphery; primary butt. (Pl.24Fig.5).

The pebble tool with a pointed edge- the most notable type of its class appears for the first time in this industry. This type requires elaborate marginal retouch and sometimes prefabrication of the pebble which leads to the thinning of the profile of the tool. Conical edged pebble tool, another variety of this class is found for the first time in this industry. As described before this type of artifact is made on one of the ends of an
prolate type of pebble and requires constant rotation of the artifact round the major axis while striking blows. A variant of such type is also produced by inverse flaking. The pebble tool showing 'overthrust edge' first seen in Jammu B is also found in this industry.

A 1 P 2.1 KTA 136 (70x77x50mm).
Dark grey quartzite; a pointed unifacial pebble tool on a flat based pebble; steep marginal flaking from the two opposite sides has been concentrated on the polar region; a conspicuous ridge formed as a result of converging flakescar, leads to the angular working edge, primary butt; plano-convex crosssection. (Pl. 25 Fig. 1).

C 1 P 2.2 BCK 12 (140x118x50mm).
Dark grey quartzite; a pointed unifacial pebble tool made on the end side of an oblate; a conspicuous flake scar on the upper surface has reduced the thickness of the pebble; the lateral margins worked nearly 3/4 of their lengths converge to form a pointed working edge which is tapering both in profile and outline; the step flaking on the margins has been done by a pointed hammerstone; the lateral margins are as effective
as the tip itself; primary butt; this is the most finished specimen of its type.

(Pl. 25 Fig. 2).

DCK 15 (154x114x50 mm).
Greyish quartzite; a pointed pebble tool made on an elongated oblate and unifacially flaked; the lateral margins have been retouched by step flaking by gradually decreasing the angle of incidence as we go from mid margins to the tip region; this has not only resulted in excellent working margins but has also reduced the thickness of the pointed region; the butt shows some inverse flaking on the ventral surface; primary butt.

(Pl. 25 Fig. 3).

DCK 18 (171x88x41 mm).
Light brownish grey trap with cavities of iron; a unifacial pointed pebble tool made on an elongated prolate; first, the upper surface was split along a cleavage plane then from the tip region one large flake was struck from the left margin of the pebble to reduce the thickness; the opposing lateral margin was next steeply flaked by step flaking; the other margin bears only shallow retouch; a notch near the tip has made
it slightly inclining; an inverse resolved flake through an imperfect cleavage on the upper surface has made the butt more suitable for handling; secondary butt; the specimen is longest in the pebble tool collection. (Pl. 25 Fig. 4).

**BCK 14 (98x112x41mm)**

Dark grey sandy quartzite; a pointed unifacial pebble tool made on the lateral side of an oblate; the upper surface shows conspicuous step flaking on the margins which converge to make a pointed working edge; primary butt. (Pl. 26 Fig. 1).

**BCK 56 (98x83x35mm)**

Whitish quartzite; a pointed pebble tool unifacially flaked; the upper surface was cleaved before bidirectional step flaking from the two opposite margins which converge to form a pointed end slightly broader on the tip; the flaking which is steeper (63°) near the base becomes inclined (25°) near the tip region; the ventral shows partial retouch on one of the margins; primary butt. (Pl. 26 Fig. 2).

**BCK 21 (104x74x44mm)**

Greyish quartzite; a pebble tool with a conical working edge; the edge has been produced by
striking blows near one of the polar regions while rotating the pebble round the major axis; the pointed region has been further retouched by vertical spalls; pointed primary butt; elliptic cross section. (Pl. 26 Fig. 3).

A P RJB 25 (470x87x77mm).

Brownish quartzite; a beaked bifacial pebble tool made on an elongated prolate with a flat base; the lateral margins show steep (88°) inverse flaking all along the lateral margins; this type of flaking is achieved by rotating the pebble round the major axis and striking blows on the opposite faces turn by turn; as a result the flaked margins converge to form a constricted beaked working edge; the edge has been further retouched on the tip, however, the lateral margins also make efficient working margins; primary butt. (Pl. 26 Fig. 4).

The pebble tools with the Arched working edge appear fully for the first time, with nearly all the leading types in this industry. With the appearance of this type of pebble tool, the incidence of secondary butts increases. The authors of this industry obviously selected such type of pebbles which had 'beaked' butts perpendicular to the ventral. Such type of butts give better hold of the artifact.
Most noticeable type of Arched pebble tool showing such a butt shows intensive flaking on the upper face with almost no cervical-line.

CɹSɹ2 KTA 141(92x115x46mm).
Reddish white quartzite; a unifacial pebble tool with an arched working edge; the upper surface shows conspicuous shallow flakescrafs; secondary butt. (Pl.27Fig.1).

Another type of this class represents a more finished and effective artifact and shows a cleavage of the dorsal before the working on the edge. The split surface is either parallel to the ventral or converges towards the butt. In Jammu D this type has many morphological derivations.

FɹPɹ2 KTA 124(92x115x46mm).
Dark grey sandy quartzite; a unifacial pebble tool with arched working edge; the pebble was split from the upper surface before retouch on the margin which is concentrated on the right half of the artifact; primary butt. (Pl.28Fig.1).

DɹSɹ2 NGR 228(95x110x45mm).
Dark grey sandy quartzite; an arched pebble tool on a tabular bloc with split ventral and
dorsal surfaces; step flaking on the arched working edge; the flaking is steeper on the right margin of the artifact; secondary flat butt. (Pl.28 Fig.2).

**F.S.2.2**

**RNE.179 (104x142x55mm).**
Bluish grey quartzite; a unifacial pebble tool with an arched edge 'described' on the flat butt; the pebble was obliquely split prior to the flaking on the edge; the edge shows beautiful step retouch; secondary butt. (Pl.27 Fig.2).

**F.P.1.2.2**

**DSK.202 (88x165x51mm).**
Coarse grained greyish quartzite; a unifacial arched pebble tool made on an oblate, the upper surface was split before working on the margins; a pointed striker was used; primary butt. (Pl.27 Fig.3).

**F.S.2.2**

**AMB.1509 (63x89x41mm).**
Bluish grey quartzite; a unifacial pebble tool with arched working edge and a flat butt; the pebble was split before the flaking round the edge; flat secondary butt. (Pl.27 Fig.4).
A different type of Arched tool showing steep marginal flaking on 3 sides and having a parabolic profile is again a type which appears for the first time in this industry. This type has also many derived forms which appear in Jammu D.

**L.P.3.5**  
**RNJ.187(91x89x68mm).**  
Dark green spotted volcanic; a unifacial pebble tool of the arched variety; the selection of the pebble is peculiar in such type- the upper and the lower surfaces converge towards the butt at a high angle and give an open elong type profile with maximum thickness towards the apex opposite the butt; steep marginal flaking on the 3 sides; primary butt. (Pl.29Fig.1 ).

**C1P.3.8**  
**NGR.224(91x12x82mm).**  
Light brown quartzite; a unifacial pebble tool of the arched variety; the base is hyperbolic or nearly straight while the upper surface is highly convex the long-itudinal profile is flaring like a parabula; steep, step flaking on the 3 sides; the thickness of the pebble gives a prominent occlusal view of the flaked surface; primary butt; a small flake scar on the edge on the ventral has made the edge a little plunging. (Pl.29Fig.2 ).
**C₃S₄.4** KTA 143 (114x101x84mm).
Whitish quartzite; derivative of the type described above; steep free flaking on the two sides of the edge while the 3rd side has been severed through the butt by an inverse blow struck from the ventral surface; this severed plane which lies on the profile section of the tool acts as an excellent secondary butt. (Pl.29Fig.3).

**A₂S₄.4** Kur 221 (87x76x48mm).
Dark grey sandy quartzite; another derivative on the above type; the artifact shows conspicuous flake scars on the upper surface and on inverse flake scar on the ventral; upon this flake scar vertical flaking from the dorsal has resulted in a chisel like secondary working edge; secondary butt. (Pl.29Fig.4).

The pebble tools with peripheral working edge are found in many types but the most dominant type is represented by the type which has been called Turtle Back and Ortholith by some authors. The upper face of this tool type is fully flaked while the ventral is wholly cortexed or only partly flaked.

**A₄S₄.4** NGR 227 (127x136x51mm).
Whitish quartzite; slightly rolled; a massive pebble tool with peripheral working edge; the
upper surface has been wholly flaked out by free flaking, marks of use seen on the edge; secondary butt. (Pl.30Fig.1).

**C_{1S}^{4,4} RNJ 198 (87x76x25mm)**. Dark green quartzite; a unifacial pebble tool with a hyperbolic base; the working edge is peripheral; the edge has been prepared by bidirectional flaking on the upper surface; secondary butt. (Pl.30Fig.2).

Some of the peripherally flaked pebble tools look like ovates or hand-axes. The upper surface of such artifacts is wholly flaked while the dorsal is either cortexed or only partly flaked.

**B_{1S}^{4,4} JCK 26 (86x66x28mm)**. Bluish grey quartzite; a unifacial pebble tool resembling an ovate; the upper surface has been entirely flaked by multidirectional flaking; the flaking on the left lateral margin of the artifact is steeper (85°) than that on the other margin (70°); the tip region has been further thinned by flaking at a low angle (45°); the ventral shows retouch on one of the margins;
marks of use all along the periphery; secondary butt. (Pl. 30 Fig. 3).

C234.4

Light green volcanic an oval shaped pebble tool with working perimeter all along the periphery; the upper surface has been entirely flaked by multidirectional flaking; partial retouch on the ventral; the base is broken; the artifact has been fashioned in an achuelian manner; secondary butt. (Pl. 30 Fig. 4).

Another type of peripherally worked pebble tool shows very characteristic features. It shows cylindrical base and has split upper surface. This type is also found in Jammu D.

L15.2

Dark grey quartzite; a unifacial pebble tool with a cylindrical base; the working edge lies all round the periphery; the pebble was split before the marginal step flaking; secondary butt. (Pl. 30 Fig. 5).

Flakes

Though the percentage of flakes with cortexed platform is as high as 84, that of scarred and faceted platform is
significant (11.5). Study of the primary flaking pattern shows that 40% of flakes in the industry show convergent and radial flaking; the percentage of the later pattern being 10. Thus we see that the intensification of the prepared core technique is one of the most significant features of this industry.

1. Flakes showing cortexed upper surface though less in number are usually struck at a low angle. The following specimens make an interesting study.

$a_{1.2}$

**44B 744 (111 x 42 x 23mm)**

Medium grained greyish quartzite; slightly rolled; a longish pointed flake displaying central longitudinal ridge on the cortexed upper face; one of the lateral margin has been retouched by alternate flaking. (Pl. 31 Fig. 1).

$b_{1.4}$

**ECK 333 (75 x 33 x 25 mm)**

Dark grey quartzite; the flake has been detached from the outer segment of a pebble; the upper surface is entirely cortexed except a flake scar on one side; the flake surface is beautifully retouched; the platform shows a plane scar. (Pl. 31 Fig. 2).

2. Semi-prepared flakes showing unidirectional single or repeated flake scars show a usual type of lateral edge. A few specimens in this type have been retouched to form a constricted chisel like working edge.
**MB 701 (91x84x26mm.)**

Fine grained quartzite; oblique conspicuous flake scar on the upper surface; retouch on the lateral edge. (Pl. 31 Fig. 3).

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**DSK 711 (71x60x25mm.)**

Medium grained vitreous quartzite; the whole of the upper surface has been traversed by a single oblique flake scar; the resultant edge has been bifacially retouched; the edge has been intentionally constricted from the upper and the lower sides by severing and knapping respectively; the bulb has been partly removed by severing process. (Pl. 31 Fig. 4).

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**DCK 109 (75x56x17mm.)**

Fine grained greyish brown quartzite; the upper surface is covered by three converging flake scars; while the scar on the body of the flake has thinned the flake as a whole, the one of the margins has resulted in a fine knife edge which is partly retouched from both the surfaces; the platform continues as a rim opposite the working margin to serve as a backed edge; the rim is also partly retouched; diffused bulb. (Pl. 31 Fig. 5).

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**KH.CH.906 (75x55x29mm.)**

Medium grained bluish quartzite; diagonally struck flake scars on the upper surface converge to form an efficient working edge with the flake surface; this edge has been bifacially retouched; the flake surface shows a deep inverse flake scar the lateral margins of which have been
deeply notched on the upper face to form another working portion in the form of a small chisel edge which has been ingeniously strengthened by a diagonal ridge formed as a result of converging flake scars of the upper face; the platform which continues as a rim opposite the working edge forms an excellent backed edge; (Pl. 31 Fig. 6).

**c**4b<sup>3</sup>.<br><br>**EXK. 41 (6923894).**<br>Fine-grained dark grey quartzite; the flake is nearly discoidal in shape; the upper surface shows oblique flake scars directed from opposite directions; the working edge has been retouched on the flake surface; the platform shows retouch on the upper surface to reduce the thickness. (Pl. 31 Fig. 7.)

In this class of semi-prepared flakes some of the specimens show beautiful marginal step flaking. As a result a fairly sharp working edge is produced. A gradual elaboration of the upper face is seen in the following specimens.

**c**2<sup>3</sup>.<br><br>**EXK. 161 (692382044).**
Trap, weathered and patinated, slightly rolled; except for a deep flake scar on the upper portion the whole of the upper surface retains the original cortex; the left margin shows a concave working edge; the portion of the flake opposite this working edge has been constricted by retouch on the platform & on the bottom edge; the flake has been punched out. (Pl. 32 Fig. 1.)
**c₂a₂.2 DCK 151 (69x51x26mm).**
Fine grained drab brown quartzite; fresh; the flake has been taken out from the outer segment of a pebble, the lateral edge was prepared before the detachment of the flake by step flaking; small cone of percussion. (Pl.32Fig.2)

**c₂a₂.2 DCK 80 (32x55x21mm).**
Greyish trap the upper surface has been beautifully prepared by longitudinal step flaking; the resultant edge is fairly sharp; the platform has been as a result thinned down and continues as body cortex; the cone is slightly raised. (Pl.32Fig.3).

**c₄b₂.2 DCK 6 (66x46x22mm).**
Chert yellowish white weathering; converging flake scars rendered in step technique have resulted a concave working edge, the flake scars resulting in edge being much deeper; the marks of use are seen on the edge; the rippled bulb is prominent. (Pl.32Fig.4).

**c₄b₂.2 DCK 90 (76x49x18mm).**
Tran weathered to greyish brown; unidirectional step flaking covers the entire upper surface; a deep hinged flake taken out from the right edge has deeply notched the margin and has given prominence to the distal working edge; flake scars running from the platform have reduced its thickness. (Pl.32Fig.5).
Brownish shale; the upper surface shows big scars; near the platform a notched retouch has given a slight concavity to the edge and slight retouch on the platform has reduced its thickness; the further end has been retouched from two sides to make a pointed arrow like end; minute retouch on the flake surface seen; punch has been used; (Pl. 32 Fig. 6).

3. Flakes showing double oblique and radial flaking are very conspicuous in this industry. In fact for the first time we see proliferation of flakes which are fully prepared. The edges of such flakes are generally sharp and require no retouch. The following specimens show a gradual elaboration of the technique.

Brownish shale; the upper surface shows big scars; near the platform a notched retouch has given a slight concavity to the edge and slight retouch on the platform has reduced its thickness; the further end has been retouched from two sides to make a pointed arrow like end; minute retouch on the flake surface seen; punch has been used; (Pl. 32 Fig. 6).

Flakes showing double oblique and radial flaking are very conspicuous in this industry. In fact for the first time we see proliferation of flakes which are fully prepared. The edges of such flakes are generally sharp and require no retouch. The following specimens show a gradual elaboration of the technique.

Fine grained jaspery quartzite; the upper portion shows three prominent flake scars which converge to form a triaxial ridge; one of the flake scars has reduced the thickness of the flake; the bulb is well developed. (Pl. 33 Fig. 1).

Flint, whitish brown patination; a prepared flake showing conspicuous converging flake scars on the upper surface and extensive retouch near the platform; the flake surface shows retouch on its margins but is much later than the flake itself. (Pl. 33 Fig. 2).
MAH 683 (66x66x25 mm).
Fine grained dark grey quartzite; an irregular flake showing radial step flaking on the upper surface; the platform has been further retouched to reduce the thickness; the edges have been sporadically retouched; the flake has a maximum thickness in the center; diffused bulb. (Pl. 33 Fig. 3).

KUR 672 (66x23x23 mm).
Medium grained dark grey quartzite; a prepared flake with upper surface showing radial preparation; the platform which has been constricted and thinned down by flaking on the upper portion is scarred; sporadic retouch on the flake surface; the flake was struck obliquely and shows a rippled flake surface; the distal edge is chisel shaped. (Pl. 33 Fig. 5).

KUR 674 (60x60x60 mm).
Fine grained drab grey quartzite; a crudely faceted flake showing radial preparation on the upper surface by step technique; slightly raised bulb located in the center of the dihedral platform edges out a sharp fan like working edge; the profile which shows maximum thickness towards the platform gently tapers towards the edges. (Pl. 33 Fig. 4).

BCK 270 (88x60x23 mm).
Reddish brown quartzite; the upper surface shows radial preparation by step technique; while one of the lateral
sides shows repeated step flaking; the other shows a long preparatory flake scar; though the retouch is seen on the both the surfaces, one of the edges has been retouched almost all through its length; the platform shows dihedral faceting; the flake was punched out and shows a prominent bulbar scar. (Pl.33 Fig.6). 

**DSC 715 (61 x 50 x 16 mm).**

Medium grained bluish vitreous quartz; a small flake showing dihedral faceting on the platform; the upper surface shows convergent flake scars one of which is prominent; the flake has been retouched from both the surfaces; very prominent bulbar. (Pl.33 Fig.7). Some of the prepared flakes on trap show longitudinal flake scars. As a result the flakes are longer and have a pointed or tongue-shaped extremity. In few cases the distal edge is spatuliform. 

**DSC 711 (112 x 62 x 21 mm).**

Chert, weathered and patinated grey; a longish pointed flake with maximum thickness in the centre; the upper face shows oblique and inverse flake scars which converge to form a pointed tip; the upper half retains a patch of cortex which inclines towards the platform which has been thinned down by a retouch. (Pl.34 Fig.1). 

**DSC 7 (63 x 51 x 19 mm).**

Trap, weathered yellowish white; a longish flake showing flake showing radial preparation on the upper face; no
retouch except near the left corner of the platform which has given it a triangular section. (Pl.34 Fig. 2).

s₄d₂.₅ 3PN 1506 (112x85x21 mm).
Trap weathered and rolled; a longish flake showing longitudinal flake scars on the upper surface; the further spatulate end which was originally pointed is found to be broken; scarred platform. (Pl.34 Fig. 3).

c₄d₂.₅ BCK 106 (62x55x32 mm).
Trap weathered and stained; a flake with constricted platform and flaring working edges which converge towards the further end; the upper surface shows unidirectional oblique flaking executed freely; partly through longitudinal severing on both the lateral sides and partly through the primary flaking; the platform has been purposely constricted for hafting; when seen in conjunction with the lower portion; the flake looks like an arrow head; the protruding bulb has been partly removed in severing operation. (Pl.34 Fig. 4).

c₄d₂.₅ BCK 107 (69x65x24 mm).
Trap weathered and patinated; the upper surface shows converging flake scars which cover almost whole of the flake; retouch on the right margin has cut through the platform; nearly triangular section of the platform with sharp apex; since it is prominent and has not been removed it may have some functional implications. (Pl.34 Fig. 5).
Greyish trap the upper surface of the flake shows radial preparation; the flake is thick in the middle and tapers towards the platform which shows a triangular crosssection, the apex of which runs as a limb of multiarmed ridge formed by convergence of the primary flakecarps; diffused bulb. (Pl. 34 Fig. 6).

Greyish chert; a pointed flake displaying radial flaking on the upper face; the further end has been made pointed by knapping one of the converging sides and retouch near the tip; diffused bulb. (Pl. 34 Fig. 7).

In some side-struck flakes, cleaver-like lateral or bilateral edges are seen. The edge in few cases is the result of either convergent or vertical flaking. In other cases it is produced by a blow which is transverse to the line of percussion. The shape of the platform in few cases enhances the functional potentiality of the artifact. One of the following specimens with a horse-shoe shaped platform gives some idea of such an artifact.

Trap weathered light greyish green; a rectangular flake showing shallow radial primary flaking on the upper face and retouch on the lateral margins which are at right angle to the transverse distal edge; the platform inclines towards the flake surface at an angle of 115°; a diffused bulb of percussion. (Pl. 35 Fig. 1)
c4c2.3  **YHA. 71(52X30X17mm).**
Bluish quartzite; a rectangular flake retaining a patch of cortex on the distal edge; the upper surface shows a prominent flake scar which may represent the scar of a previously struck flake; the scar converges to form an efficient straight edge with the flake surface; the edge shows a notch on the flake surface; prominent bulb. (Pl. 35 Fig. 2).

c1c5.8  **YHA. 8(50X30X18mm).**
Breyish banded chert; a deep near transverse preparatory blow on the upper face has resulted in a gouge shaped sharp working edge; the adjoining and the opposite edges have been crudely knapped to obtain a subsidiary working area; prominent bulb of percussion. (Pl. 35 Fig. 3).

c5c1.2  **YHA. 98(50X25X18mm).**
Breyish trap the working edge of the flake has been formed by a transverse blow in a Valt technique; the portion opposite the edge has been retouched and intentionally constricted by an inverse flake scar running along the bottom of the flake; the edge however is crudely retouched. (Pl. 35 Fig. 4).

c3br.9  **YHA. 44(31X24X16mm).**
Trap weathered grey; the upper surface shows a large oblique flake scar; the platform continues towards one of the lateral sides while the other lateral edge has been turned into the working portion by retouch. (Pl. 35 Fig. 5).
c₄b₃.₂ BCK 349(70x75x13 mm.)
Trap, greyish weathering; a thin flake showing conspicuous flakescars on the upper surface; the lateral edge is retouched and lies across the arched rim. (PL. 35 Fig. 6)

Flakes with arched or straight platform and distal working edge also appear in this industry. In most of the cases the edge is the result of the side blow running across the line of percussion. This kind of blow is also seen on the tranchets.

c₅c₃.₁ BCK 186(71x54x21 mm.)
Greyish green chert; a rectangular flake showing radial primary flaking; a transverse flakescar covering the lower portion of the flake intersects with the flake surface to form an efficient cleaving edge; platform forms an angle of 128° with the flake surface; the artifact is longitudinally severed. (PL. 36 Fig. 1)

c₃b₃.₁ BCK 114(56x82x15 mm.)
Trap; an onlique blow from the arched platform intersects with an inverse preparatory scar towards the bottom as a result of which a transverse straight working edge has been formed; a deep flake scar displaying retouch on the platform has functional implications; the retouch has reduced the thickness of the platform at the place which suggests its purpose for thumb grip or the use of platform itself for spoke-shaving etc. apart from other functions of the artifact. (PL. 36 Fig. 2).
Reddish brown quartzite flake showing nearly straight working edge opposite are arched platform; the upper surface shows transverse flake scars. (Pl. 36 Fig. 3 ). Some of the prepared flakes have crescentic platforms. The lateral margins of such flakes converge towards the extremity to form an angular working edge.

Fine grained bluish quartzite—slightly rolled; a near triangular flake showing convergent flaking; a deep notch near the platform and a subsequent retouch on it has given a concavity to the working edge; diffused bulb. (Pl. 36 Fig. 4 ).

Greyish green quartzite; a triangular flake with crescentic platform leaning obtusely over the flake-surface; the upper surface shows a near radial flaking; one of the edges has been retouched on the upper surface; vertical flaking on the platform has reduced the thickness of the platform; the bulb has been removed. (Pl. 36 Fig. 5 ).

Greyish quartzite; a triangular flake showing oblique severance; the upper surface shows triangular flake scars. (Pl. 36 Fig. 6 ).

The occurrence of flakes which show severance through the bulb along the line of percussion were first noticed in the
preceding industry. In the present phase such tools multiply which shows that this feature was not accidental. As shown in the previous pages such flakes are easily struck when proper technique is used, we have illustrated some of the flakes which make it clear that they formed blanks for a variety of tool types.

**c4b4.6**

*DCK 477 (104x72x26mm)*

Medium grained greyish quartzite longitudinally severed; a flake showing an oblique flake scar on the upper face and a deep scarred notch on the platform which turns the portion intercepted between this notch and the severed plan an efficient chisel edge. (Pl. 37 Fig. 1).

**c0b4.8**

*DCK 250 (77x46x36mm)*

Fine grained greyish brown quartzite; a flake showing longitudinal severance through the platform; the upper face shows a single flake scar and a retouch towards the distal portion which has resulted in a constricted chisel edge. (Pl. 37 Fig. 2).

**s4c8.7**

*GN 686 (100x56x28mm)*

Trap weathered greyish green; an obliquely struck flake with an obtuse angled monohedral platform; the upper surface shows converging flake scars towards upper half while the lower half has been turned into a pointed working edge by a notch towards one side and a burin struck towards the other. (Pl. 37 Fig. 3).
c2b4.6 LCK 209 (66x61x17mm).
Trap weathered and patinated; flake showing a prominent negative scar on the upper surface; the platform has been severed through the seat of the bulb; the lower end of the platform displays a prominent notch on the flake surface which has given rise to a burin-like working edge. (Pl. 37 Fig. 4).

s4c4.6 BCK 541 (76x88x27mm).
Trap greenish grey weathering; a flake showing vertical severing through the bulb; the upper portion shows deep flake scars formed as result of consecutive flaking; this primary flaking has resulted in a transverse ridge which forms the back-bone of the chisel-like working edge formed by extensive retouch on the flake surface. (Pl. 37 Fig. 5).

c5d4.1 LCH 1505 (35x50x27mm).
Coarse grained bluish quartzite; a prepared flake showing partial longitudinal severance; retouch on the distal edge. (Pl. 37 Fig. 6).

c2d4.2 JTT 1508 (74x40x16mm).
Trap weathered and patinated; a longish flake showing severance through the bulb; convex lateral margin. (Pl. 37 Fig. 7).
Cherty, weathered and rippled flake with obliquely located bulb; the upper surface shows converging flake scars giving rise to sharp lateral working edges one of which is retouched; the platform has been constricted due to primary flaking. (Pl. 37 Fig. 8).

Bluish quartzite; a flake with flaring body showing convergent flake scars on the upper face; the flake has been narrowed towards the platform partly by a vertical severance through the platform in a profile section of the flake and partly by step working on the upper surface on its left margin. (Pl. 37 Fig. 9).

Residual Cores

The majority of the cores are pebble cores. Next in frequency are the cores of the segmental and tortoise types. The discoidal, sphenoidal and pyramidal varieties also appear in this industry.

Type 1.a  KTA 1005 (119x108x56mm).
Reddish brown quartzite; a flattish core showing a conspicuous flake scar on the upper surface. (Pl. 38 Fig. 1).

Type 1.b  KTA 151 (118x165x76mm).
Reddish brown quartzite; an arch-shaped pebble core showing bold converging scars on the upper surface; the core simulates a pebble-tool. (Pl. 38 Fig. 2).
Tyne 3 BOH.524 (97x80x55 mm)

Reddish brown quartzite; a humped core showing conspicuous flake-scars around the periphery; the flaking is continuous which has resulted in the preparation and removal of the flake simultaneously; the lower surface shows conspicuous flake-scars. (Pl.38 Fig. 3).

Tyne 2 AVB 1027 (85x97x61 mm)

Brownish yellow quartzite; the lower surface shows faceted margin used as a platform for the removal of the flakes; the upper surface shows conspicuous flake-scars. (Pl.38 Fig.4).

Tyne 4 DCK 1010 (73x27x41 mm)

Drab yellow quartzite; a residual core of the tortoise type; the platform is cortexed. (Pl.38 Fig.5).

Tyne 5 Mah 258 (77x67x28 mm)

Volcanic; greyish weathering; a disc-core showing alternate flaking on the periphery; the core might have been used secondarily. (Pl.38 Fig.6).

Tyne 6 Mah 1026 (86x70x75 mm)

Greyish quartzite; from the flat-base continuous centrally directed flaking at a low angle; the base is cortexed. (Pl.38 Fig.7).

Tyne 7 AMB 1025 (68x60x60 mm)

Dark brown quartzite; a residual core of the sphenoidal variety; the profile is triangular. (Pl.38 Fig.8).
Functional Cores

In Jammu C leaf-shaped double-pointed artifacts and those having burin-like working margin draw particular notice. The pointed 'foliate' artifacts are base keeled. As remarked earlier, the functional cores are prominent only in Jammu C&D.

**CPN 182 (98x77x37mm).**
Brownish red quartzite; a functional core showing a burin working edge; the core was split before retouch on the margins. (Pl. 39 Fig. 1).

**CPN 1526 (67x46x27mm).**
Whitish quartzite, patinated; an artifact showing burin working edge; the edge shows a single burin stroke. (Pl. 39 Fig. 2).

**CPN 1527 (82x59x21mm).**
Trap, deeply weathered; a leaf-shaped double-pointed artifact with extensive retouch on the margins; the lower surface is keeled. (Pl. 39 Fig. 3).

**BCK 1076 (117x43x22mm).**
Bluish quartzite; an elongated double-pointed artifact with retouch on one of the margins; the lower surface shows a longitudinal ridge formed by a severed plane. (Pl. 39 Fig. 4).

The following specimen shows an efficient cleaving edge:
RJB 661 (108x50x26mm).

Trap, weathered grey; an artifact with a distal cleaving edge; the edge is the result of the convergence of the flake surface with the cortexed upper surface; the bulb has been removed.

(Fig. 5).
This industry representing the final phase of the pebble-tool tradition of Jammu is found from a number of sites. Though more or less the technique remains the same, it is distinct from the preceding industry on the following grounds:

1. appearance of diminutive tool types,
2. wide use of a new raw material,
3. extensive use of secondary flaking and retouch,
4. emergence of new forms.

The persistence of some of the leading tool types of the previous industries is one of the interesting features of this industry. A number of artifacts show retouch on the working margins. It seems that the functional portion of the artifact was given more consideration. From the strength of the collection we can conclude that this area was a scene of intensive activity in the culminating period of the lithic traditions of Jammu. Out of 557 artifacts 133 are pebble tools, 324 flakes, 28 residual cores and 32 functional cores. The sites of the industry are: Mah, Jagatpur, Dyalachak, Banuchak Salan, Dalli, Kuta, Khatriyan-di-Chhan, Bariyan, Thalori, Nagrota, Gudapatan, Ambran & Dagah.

pebble Tools:

Though nearly all the pebble tools types are present, it is significant to note that the tools belonging to the Arched edged and the Continuous edged classes display a variety of forms. Most of the artifacts show refined step flaking.
Towards the later phase of this industry, there appear some pebble tools of the diminutive size. Almost all the regular pebble tool types are present in this micro-facies. For better understanding we have described them separately.

In the pebble tools belonging to the Single-edged class the transverse edged type shows the maximum number and is followed by the type having edge on the end side of the artifact.

B.P. 11.1  KTA 118 (73x91x61 mm.)
Reddish violet quartzite; a unifacial pebble tool with a cylindrical base; nearly convex edge has been prepared by shallow free flaking; pointed hammer was used; primary butt. (Pl.40Fig.1)

B.P. 11.2  BCK 50 (118x102x55 mm.)
Reddish jasper; a unifacial pebble tool with a cylindrical base; the upper surface bears conspicuous flake scars which cover more than half of the artifact; the edge has been further retouched; subangular primary butt. (Pl.40Fig.2)

B.P. 11.1  BCK 46 (75x82x42 mm.)
Light greyish green trap; a unifacial pebble tool with a cylindrical base; the flaked portion shows multidirectional ribs caused by receding step flaking; the scooping edge is slightly convex; subangular primary butt. (Pl.40Fig.3)
A\textsubscript{1}P\textsubscript{1}\textsubscript{1} \textsuperscript{1} ATA 122\textsuperscript{(85x107x50\text{mm})}.

Yellowish white quartzite; a unifacial pebble tool with a flat base; steep free flaking has resulted in a straight working edge; primary butt. (Pl.40 Fig. 4).

D\textsubscript{1}P\textsubscript{1}\textsubscript{1} \textsuperscript{1} RJA 220\textsuperscript{(96x108x67\text{mm})}.

Coarse grained greyish quartzite; a bifacial pebble tool with flat upper and lower surfaces converging towards the butt; the upper surface shows conspicuous free flaking; a part of the edge has been bifacially retouched to achieve a diagonal working edge; primary butt. (Pl.40 Fig. 5).

C\textsubscript{1}P\textsubscript{1}\textsubscript{1} \textsuperscript{1} BCK 42\textsuperscript{(54x88x84\text{mm})}.

Volcanic; greyish weathering; a unifacial pebble tool showing unidirectional flaking; the flaking is steep and has been extended in such a way that the edge has assumed the form of a 'hood'; primary butt. (Pl.40 Fig. 6).

The pebble tools belonging to the pointed-edged class are mostly of the angular edged type. But unlike the specimens of this type found in the earlier industries the artifacts of this type in this industry show extensive two directional flaking on the upper surface. As a result of opposing flake scars a number of oblique ribs are formed due to the step flaking. One of such ribs leads to the pointed edge.

C\textsubscript{1}P\textsubscript{2}\textsubscript{1} \textsuperscript{1} NGR 226\textsuperscript{(77x82x28\text{mm})}.

Dark grey sandy quartzite; a unifacial pebble tool made on a small oblate; the edge has been made angular by steep flaking on one side and nearly notched flaking on the other side primary butt. (Pl.41 Fig. 1).
DCK 43 (84x112x59mm).
Dark grey quartzite; a unifacial pebble tool with an angular working edge; the flaked portion shows bidirectional obliquely directed step flaking; primary butt. (Pl. 4| Fig. 2 ).

DCK 45 (83x88x30mm).
Drab grey quartzite; a unifacial pebble tool with angular working edge; the edge is multipronged and has been produced by receding step flaking; as a result the flaked portion shows troubled topography like that of the ridged hills running in irregular direction with ranges rising one behind the other; a pointed hammer was used; primary butt. (Pl. 4| Fig. 3 ).

HJB 254 (64x93x48mm).
Drab brown quartzite; a unifacial pebble tool with a pseudo-angular edge; the flaked portion shows steep bidirectional step flaking; towards one end of the edge a deep notch has given rise to a sharp 'hook'; primary butt. (Pl. 4| Fig. 4 ).

The pebble tools belonging to the Arched class also show a variety of forms. Some of the types are found to be derived from the types found in the previous industry. Few others though typologically similar are smaller and neater than those found in Jammu C.
Reddish brown micaceous quartzite; a unifacial arched pebble tool made on an oblate; the pebble was split before the step retouch on the edge; a pointed hammer was used; primary butt. (Pl.42 Fig.1).

Volcanic, weathered grey; an other variety of the unfacial pebble tool with an arched working edge; regular shallow step flaking at an angle of nearly 72 has resulted in a convex, scooping working edge; the portion where usually the butt is situated shows an oblique inverse flakescar making an angle of 57 with the ventral secondary butt. (Pl.42 Fig.2).

Trap weathered grey; a pebble tool with a cylindrical base; receding step retouch on the three sides has given rise to a an arched working edge which is scooping and highly incurving in profile; secondary butt. (Pl.42 Fig.3).

Chert weathered grey; an other variety of the arched pebble tool; the upper surface was cleaved before flaking on the margins; conspicuous flakescars from the opposing lateral margins have resulted in a central ridge which diverges near the further end to enclose a chisel like working edge in addition to the lateral working margins;
the chisel like edge has been further retouched; secondary butt. (Pl. 42 Fig. 4).

Dck 301 (62 x 72 x 46 mm).

Light brown banded quartzite; a unifacial pebble tool with an arched working edge; from the ventral, which is a flake surface steep flaking round the three sides has given rise to an efficient working edge; secondary butt. (Pl. 43 Fig. 1).

Kta 144 (102 x 94 x 57 mm).

Whitish quartzite; a derivative of the pebble tool of arched type; the upper surface shows steep unidirectional flaking; the right side of the artifact has been severed through the butt; the portion of the edge lying opposite this severed plane has been turned into a bifacial edge; this severed plane acts as a secondary butt. (Pl. 43 Fig. 2).

In this class of arched pebble tools special mention may be made of such types which appear for the first time in this industry only. One of such type shows a pointed arch generally guided by a central ridge. The other type shows edges only on the two sides of the arch.

Dck 30 (61 x 100 x 30 mm).

Greyish sandy quartzite; a unifacial pebble tool of the arched variety; the upper surface was split before free flaking on the margins; flat base; secondary butt. (Pl. 43 Fig. 3).
### A1S_5

**NIR 225 (97x99x59mm)**

Light brown coarse grained quartzite; a pebble tool showing a pointed arch and 'backed' secondary butt nearly perpendicular to the ventral; the apex of the butt runs as a central ridge over the upper surface and joins the tip of the arch. (Pl. 43 Fig. 4).

### B1P_6

**GPN 189 (91x81x56mm)**

Light green trap; a derivative of the arched type of unifacial pebble tool; the working edges lie on both the end sides of the pebble; like a human torso one edge is broader than the other; a retouch on the 3rd side would turn this artifact into an arched type; primary butt. (Pl. 43 Fig. 5).

### B1P_6

**KTA 148 (67x54x49mm)**

Draib grey quartzite; another variety of the above type but on a thick pebble; the edges show steep flaking; fresh; primary butt. (Pl. 43 Fig. 6).

Pebble tools belonging to the Continuous edged class also form a characteristic feature of Jambud V. Of the five types found in this class as many as four are fully represented for the first time in this industry. The following specimens show a regular typological evolution.

### B1S_4

**KTA 157 (90x76x24mm)**

Dark grey sandy quartzite; a unifacial discoid showing steep marginal flaking (88-78) all along the periphery; secondary butt. (Pl. 44 Fig. 1).
**F₁S₄.1 NGR 266 (93x92x36 mm)**

Drab grey sandy quartzite; a unifacial disc with flat base; the upper surface shows marginal flaking at nearly 60° on its periphery except at the base and the left margin which have been steeply flaked at an angle of nearly 70°; secondary butt. (Pl. 44 Fig. 2).

**A₁S₄.1 DCK 64 (125x109x55 mm)**

Greyish sandstone; a massive unifacial pebble tool with a peripheral working edge; from the flat ventral crude marginal flaking has been directed at a steep angle (80°-86°); secondary butt. (Pl. 44 Fig. 3).

**A₁S₄.2 DCK 61 (69x60x35 mm)**

Dark grey quartzite; a unifacial with peripheral working edge; the pebble was first split before flaking on the margin; the angle of flaking varies from 57° to 77°; secondary butt. (Pl. 45 Fig. 1).

**F₁S₄.2 GPN 182 (79x81x34 mm)**

Light grey quartzite; a unifacial pebble tool with peripheral working edge; the pebble was split on the upper surface before marginal flaking directed at an angle of 60°; the base has been steeply flaked as if to 'back' the edge; the ventral shows a deep flakescar near the base; secondary butt. (Pl. 45 Fig. 2).
A1S4.3  NLR 220 (72x76x34mm).
Greyish quartzite; a unifacial with a peripheral working edge; a pyramidal variety of the discoid with angle of incidence varying between 60°-65°; steep-step flaking towards the base (65°); the flaking angle goes on decreasing as we go towards the top (30°); a patch of cortex on the upper surface; secondary butt. (Pl.45 Fig. 3).

B1S4.3  D3K 206 (74x82x42mm).
Drab brown quartzite; a unifacial pebble tool with a peripheral working edge; a fully flaked 'pyramidal disc'; on the upper three sides the flaking is nearly at 60° while towards the base the flaking is steeper 65°; the flake scars converge towards the middle which is the thickest part of the artifact; secondary butt. (Pl.45 Fig. 4).

C1S4.3  AMR 212 (35x36x34mm).
Bluish grey quartzite; a form allied to the above type; the peripheral edge has been restricted in its outline by 2 severed plains which converge towards the base; the base has been further reduced in thickness by an inverse flake scar; secondary butt. (Pl.45 Fig. 5).

D1S4.1  KTA 166 (78x75x32mm).
Greyish quartzite; a unifacial pebble tool with a peripheral working edge; the retouch on the margin has been carried through 3/4 of the periphery at an angle of nearly 65°; the remaining periphery shows inverse flaking on the ventral; secondary butt. (Pl.45 Fig. 6).
As noted in the foregoing pages, the micro-facies of the pebble tools represents almost all the leading types of the pebble tools. Below are described some of the specimens belonging to this group. Though there is no typological justification for their separate treatment yet it has been done to highlight their presence in this industry.

\[\text{Pi 2 BSK 20 5 (91x77x42mm.)} \]
Greyish brown quartzite; a regular convex working edge has been produced by unidirectional shallow flake scars of the cylinder hammer; the working edge is sharp and fairly fresh; primary butt. (PI. 46 Fig. 1).

\[\text{Ci P 1 BCK 96 (74x79x11mm.)} \]
Drab grey quartzite; a unifacial pebble tool made on the end side of small and thin oblate; the working edge shows 3 and 4 small flake scars struck at an angle between 60-65; slightly convex edge; primary butt. (PI. 46 Fig. 2).

\[\text{C1 Pi 1 KTA 161 (52x81x38mm.)} \]
Trap light grey weathering; a miniature variety of a unifacial pebble tool made on the lateral side of a small pebble; the working edge is convex and shows elegant shallow flake scars which converge near the cusp of the cervical line; primary butt. (PI. 46 Fig. 3).
B.1.1 DCK 106 (47x64x41 mm.).
Chert, light grey patination; a micro pebble tool unifacially flaked; the upper surface shows beautiful facets near the cervical line and step retouch on the working edge at an angle of nearly 60°; scalloped edge; primary butt. (Pl. 46 Fig. 6 ).

B.1.1 DCK 104 (47x70x55 mm.).
Chert showing bluish grey weathering; a microvariety of a unifacial pebble tool made on the flake surface; the flaked region shows shallow bidirectional flake-scars; the edge is sharp and slightly concave; primary butt. (Pl. 46 Fig. 5 ).

A.1.1 DCK 101 (51x64x31 mm.).
Drab grey quartzite; an other specimen of the micro pebble tool showing a pointed butt and a transverse nearly straight working edge; the pebble was split before the working on the edge; primary butt. (Pl. 46 Fig. 4 ).

B.1.2 DCK 105 (76x65x30 mm.).
Chert, weathered and patinated; unifacial pebble tool with a convex working edge; the upper surface is a flake surface; secondary butt. (Pl. 46 Fig. 7 ).
D₁S₂₂ KTa 1518 (65x14x20mm).
Chert showing grey weathering; the upper surface shows a conspicuous ridge formed by the convergence of opposing flake scars; near the upper portion this ridge diverges to enclose an edge which has been retouched to make it chisel like; secondary butt; the ventralis cortexed. (Pl.46 Fig. 8).

C₁P₂₂ ECK 98 (55x55x50mm).
Drab grey sandy quartzite; a micro variety of a unifacial pebble tool with an incipiently napped edge; the upper surface shows only 2 flakescars which converge to form a ridge which leads to the napped edge; slight retouch on the left margin of the edge; primary butt. (Pl.46 Fig. 9).

F₁S₂₂ ECK 62 (57x59x30mm).
Chert weathered grey; the upper surface was obliquely cleaved before the working on the edge; the edge shows beautiful step flaking; the butt region shows an oblique inverse flake scar; secondary butt. (Pl.46 Fig. 10).

B₁S₂₂ KTa 164 (61x76x50mm).
Reddish brown quartzite; a simplified variety of the above type; the edge shows only 3 flakescar struck at an angle of 75°; the portion opposite the edge shows an inverse flake scar at an angle of 58°; prominent ridge due to the convergence of the flake scars; one of the ends of the ridge is pointed and may have some functional implication; secondary butt. (Pl.46 Fig. 11).
Dark grey quartzite, a miniature variety of the peripherally flaked artifact; fully flaked upper surface; retouch on the rounded margin. (Fig. 12).

Flakes

Flakes showing extensive retouch on the working margins figure prominently in this industry. In most of the cases the original flake is semiprepared and shows a high-angled scarred platform. In few cases the specimens are inversely flaked. It is interesting to note that increase in the frequency of the retouched flakes coincides with the introduction of chert as a regular raw material. A number of specimens show suppression and removal of the platform.

The frequency of prepared flakes also increases in this industry. Usually such flakes show convergent primary flaking, and are devoid of retouch. Radial flaking common in preceding industry is seen on only a few specimens.

There is an obvious trend towards diminution of the flake size as the industry advances. In its later phase their presence is more conspicuous. On the whole the average flake size in this industry is less than that in the preceding industries.

Artifacts showing steep marginal retouch directed from a flat working platform appear fully formed in this industry. In most of the cases the 'main' flake surface forms such a platform.
The working edge is either concave or fan shaped. It seems that such artifacts were meant for planning and smoothing purposes. The following specimens show an interesting typological evolution.

\( c_{a1.1} \) **DCX 182 (73 x 84 x 36 mm)**

Fine grained greenish grey quartzite; a thick flake with only a flat flake scar on the upper surface; this upper surface has been partly used as a platform for extensive retouch on the flake surface; slightly raised cone of percussion. (Pl. 47 Fig. 1).

\( c_{b2.1} \) **DCX 1 (90 x 60 x 28 mm)**

Chert weathered and patinated; a wedge shaped flake with a semi-arched thick platform and a convex working edge retouched on the upper surface; the upper surface shows an inverse flake scar; the flake surface is perfectly plane with a diffused bulb. (Pl. 47 Fig. 2).

\( c_{b2.1} \) **DCX 361 (79 x 70 x 23 mm)**

Chert weathered greyish green; a steeply flaked artifact with basal platform for retouch on the upper face; the upper face which has been retouched with free and step flaking shows ridges rising in echeloned manner and converging at the vertex; the vertex again falls like an inverse fault in a plane which is transversely struck from the platform situated obliquely near the base and meets basal platform in an obtuse angle; the artifact with flaring fan like working edge when rested on the ground gives the impression of an animal's paw. (Pl. 47 Fig. 3).
C5d2.1 **DCK 202 (65x63x21 mm)**.

Chert weathered grey; the main working edge has been made on the flake surface with a single inverse flake scar further retouched to form a concave working edge; a flat surface to rest this edge for working purpose has been provided by a transverse flake scar on the upper surface; the rest of the upper face has been given semi-radial retouch; the main area of retouch being the platform; the purpose of this retouch is not only to reduce the thickness of the platform probably for hafting but also to raise it above the level of the basal flake scar; (Pl. 47 Fig. 4).

C5e2.2 **KUR 573 (45x36x18 mm)**.

Fine grained grey quartzite; one of the lateral sides shows transverse preparatory scar which has resulted in a nearly straight working edge; the edge has been further retouched; a shallow bladish flake scar struck has been struck transversely from the opposite side of the working edge; this side has been given prominence by a notch near the platform and a transverse truncation near the bottom to form a burin like working edge; (Pl. 47 Fig. 5).

C0a1.1 **SLN 2 (55x68x87 mm)**.

Chert, white patination; with main flake surface as its base the upper surface has been steeply retouched by step flaking on the margin located opposite the bulb; another flake struck perpendicular to the main flake surface facilitates easy handling of the tool. (Pl. 47 Fig. 6).
The provision of a flat platform for the working on the upper surface was the underlying feature in the above artifacts. An evolution of this idea led to the fabrication of inversely flaked specimens with working platforms on each surface of the flake.

**c2^2.5** BCK 227 (61x36x14mm)
Chert, shows white weathering; a pointed flake with extensive step retouch on both the lateral sides on the diagonally opposite surfaces; the retouched margin converge to form a pointed tip; defused bulb of percussion. (Pl. 47 Fig. 7).

**s5^2.8** KTA 509 (47x32x17mm)
Chert, whitish patination the upper surface shows oblong flake scars and steeply retouched left margin; the flake surface has also been retouched on the diagonally opposite margin; the further end shows a deep notch. (Pl. 47 Fig. 8).

**s5^2.4** BCK 22 (42x42x19mm)
Chert, showing yellowish brown weathering an extensively retouched flake with an oblique basal plan formed by primary flaking on the upper face serving as a platform for extensive step retouch on the flake surface; the platform which is scarred and highly inclining serves as another surface for similar retouch on the upper face; the retouch is nearly inverse and has given a double efficiency to the artifact. (Pl. 47 Fig. 9).

**c4^2.1** KTA 505 (29x40x16mm)
Chert, weathered white; the working edge has been made by step retouch on the flake surface and has been provided
a working platform prepared by primary flaking on the upper face; the upper face shows extensive retouch near the platform. (Pl. 47 Fig. 10).

2. In the preceding industries, the semi-prepared flakes figured prominently. In this industry too their presence is marked by a number of specimens. The platform is either cortexed, scarred or even faceted. The upper surface shows varying amount of primary flaking.

**c_{2b2} BCK 14 (47x26x16mm)**

Banded chert, patinated white; the upper surface shows at least two oblique flake scars one of which is a hinge fracture resulting in a bulge on the edge the bulb which is very diffused is obliquely located opposite the edge between the two arms of the platform; when the flake is held along the line of percussion it shows an arrow like pointed tip. (Pl. 48 Fig. 1).

**c_{2b2} BCK 26 (45x40x12mm)**

Chert yellowish white weathering; the working edge has resulted with the convergence of an oblique flake scars on the upper face; the flake surface shows slightly raised bulb and a minute bulbar scar. (Pl. 48 Fig. 2).

**c_{2b2} BCK 51 (45x31x15 mm)**

Chert weathered and stained; a side struck flake with a slightly convex working edge lying across the bulb of percussion; the upper surface shows oblong flake scars. (Pl. 48 Fig. 3).
Cobo o KTA 521 (49x21x17mm).
Chert, bluish patination; the prominent vertical scar on the upper surface is the outcome of successive flaking of the core for the flakes; the flake struck before the present flake was also found in the field; the working edge is sharp; the distal end is pointed. (Pl. 48 Fig. 4).

CCK 469 (52x41x26mm).
Fine-grained bluish quartzite; detached from outer segment of a small pebble; the upper surface shows only one flake scar directed from the platform which meets the undersurface to form a straight working edge; the edge has been detached in a curious way—first a deep scarred cavity was made on the core and then with a punch placed on this cavity, the flake was detached by giving a blow (Pl. 48 Fig. 5).

BCK 312 (59x44x25mm).
Chert, lightly patinated; the upper face shows multidirectional flake scars one of which near the right edge is very deep; the flake surface has been deeply retouched; the bulb which is located obliquely is diffused. (Pl. 48 Fig. 6).

BCK 36 (76x36x15mm).
Greyish green trap; a longish flake showing oblique flake scars covering nearly half of the upper face; diffused bulb. (Pl. 48 Fig. 7).
Greyish chert; rolled; a leaf shaped thin flake showing prominent flake scars on the upper surface; the platform which is battered makes an angle of 105° with the flake surface; no retouch due to sharp edges; (Pl.48 Fig. 8).

Chert, yellowish brown weathering an obliquely struck flake with faceted platform; the upper surface shows multidirectional flaking; the edge has been bifacially retouched; the faceted platform continues opposite the edge and serves as a 'backed' edge. (Pl.48 Fig. 9).

Reddish brown quartzite; slightly rolled; a bladish flake with scarred platform and twisted flake surface; the upper shows an oblique flake scar which has been retouched from the margin. (Pl.48 Fig. 10).

Medium grained greyish quartzite; the upper surface shows an oblique flake scar; the edge formed by the convergence of this flake scar has been given a small notch on the flake surface; dihedral faceting on the platform. (Pl.48 Fig. 11).

As noticed in the foregoing pages, most of the retouched flakes are semi-prepared. Usually the platform is found to be plane scarred and obtuse angled. In such types the main purpose of the fabricator was to get an efficient working margin. The
The original flake, however in few cases, is found to be fully prepared. Such retouched flakes are the most characteristic feature of this industry.

\[ s_{2d2} \]  KTA 501 (55x58x13mm).
Chert yellowish brown patination; an obliquely struck flake with a mono-faceted platform, constricted by by an oblique flake scar on the upper face; the edge formed as a result has been retouched to form a concave working edge. (Pl.49 Fig.1).

\[ s_{2d2} \]  KTA 502 (55x51x17mm).
Chert; greyish white weathering; oblique situation of the bulb and unidirectional primary flaking on the upper face has given a peculiar inverted triangle shape to the platform which shows a plane scar; the right margin has been bifacially retouched to form a straight working edge; the rest of the upper surface retains the cortex. (Pl.49 Fig.2).

\[ f_{3c2} \]  KTA 502 (55x28x12mm).
Chert, brownish white patination; a small flake showing dihedral faceting on the platform; the upper surface shows an inverse flake scar which converges with the oblique flaking aimed to thin down the right side edge which has been further retouched to form a slightly concave working edge; slightly raised bulb. (Pl.49 Fig.3).
KTA 516 (48 x 40 x 14 mm). Chert, greyish white weathering; a rectangular flake with a faceted platform; the upper surface shows converging flake scars; the lateral sides have been retouched to form nearly straight working edges one of which is steep. (Pl. 49 Fig. 4).

KTA 518 (54 x 24 x 14 mm). Chert yellowish white patination; a slug shaped flake showing radial flaking on the upper face; both margins have been retouched to form a convex and a concave working edge respectively; diffused bulb; bulbar scar seen. (Pl. 49 Fig. 5).

KTA 507 (55 x 35 x 15 mm). Chert, yellowish white patination; a pointed flake with longitudinal flake scars on the upper surface; one of margins has been steeply retouched but the retouch has been specially concentrated on the platform itself; as a result a concave working edge has been produced; much of the upper surface is covered by original cortex; the platform is scared; the cone is well developed, bulb scar is seen. (Pl. 49 Fig. 6).

KTA 508 (55 x 20 x 10 mm). Chert showing yellowish orange brown patination; a small pointed flake showing convergent flake scars on the upper face; the platform has been retouched; a minute bulbar scar is seen. (Pl. 49 Fig. 7).
KTA 510 (41x26x14mm).
Chert, light brown weathering; a rounded flake showing oblique flake scars on the upper face; retouch has been concentrated on the platform; the platform is scarred. (Pl. 49Fig. 8).

KTA 512 (26x31x7mm).
Chert, yellowish brown weathering; a small flake showing a conspicuous flake scar on the upper face and step retouch on the right margin; the retouch near the platform is also noticeable; a small bulbar scar seen. (Pl. 49Fig. 9).

KTA 511 (39x28x9mm).
Chert, whitish weathering; a flake showing minute scared platform and a small "ereleur" on the bulb; the upper surface shows a near radial flaking against a natural cleavage plane situated to the left of the upper surface. (Pl. 49Fig. 10).

KTA 513 (49x42x21mm).
Chert showing white patination; a triangular flake with trifaced upper surface; from the apex of which the surfaces slope down towards three sides; the upper portion shows a conspicuous ridge formed by the convergence of two flake scars which bifurcates near the apex due to the cortex of the third face; retouch is given to the basal edge; pronounced bulb of percussion with bulbar scar. (Pl. 49Fig. 11).
c_{4c}^{2.1} \quad \text{DK. 310 (40x23x28mm).}

Chert, weathered yellowish brown a rectilinear flake with upper surface showing multidirectional flaking; the flake surface shows retouch on the distal transverse edge. (Pl. 49 Fig. 12).

Specimens showing suppression or removal of the platform though also occur in the earlier industries, are more conspicuous in Jammu D. This type of phenomenon is due to the extensive retouch mostly concentrated over the platform itself.

r_{4d}^{2.5} \quad \text{DK. 28 (54x26x12mm).}

Chert, whitish yellow patination; an elongated flake with central ridge formed by the convergence of two prominent flake scars running from tip to base; one of the margins has been retouched; a notch near the tip has given prominence to the constricted edge. (Pl. 50 Fig. 1).

r_{4a}^{2.2} \quad \text{KTA. 604 (45x33x17mm).}

Chert yellowish white patination; a flake showing a nosed working edge towards the upper portion and a concave working edge on the right margin of the upper surface; in the process of retouch the bulb has been removed. (Pl. 50 Fig. 2).

r_{4d}^{2.2} \quad \text{DK. 21 (61x38x14mm).}

Chert, yellowish brown weathering; a prominent longitudinal flake scar on the upper face has been used as a platform for beautiful step retouch on the flake surface;
retouch is also seen on the upper left of this surface; the edge is nearly carinated. (Pl.50Fig. 3).

KTA 503(62x26x13mm). Chert showing yellowish brown patination; the upper surface shows a longitudinal flake scar running through the length of the flake; the left margin of the flake has been given a shallow nibbled retouch to form a nearly straight working edge; the bulb has been removed; retouch is also seen on the upper portion of the flake surface. (Pl.50Fig. 4).

KTA 514(62x40x14mm). Chert showing whitish patination; a rectangular flake with bulb removed by peripheral retouch on the upper face; the marginal retouch is steep; the upper portion has been turned into a pointed tip partly by lateral retouch and partly by knapping the top edge; the flake surface is strongly rippled. (Pl.50Fig. 5).

The following specimens showing removal of the platform also show some other interesting features. One of the artifact shows steep marginal flaking on the distal edge to form a flaring working edge. In the other specimen steep marginal flaking has been carried down to the base to form an incipient tang. This is the only specimen of its type in the flake-tools.

Though constriction of the platform has been achieved in a number of ways in different specimens, but an obvious bidirectional retouch aimed to get such a working portion is altogether a new feature.
r_{0a_{1.5}} \text{ KTA-54 (5x4.4x14mm).} \\
Light green banded chert; a flake with a pointed working 
tip formed by the convergence of lateral margins which 
bear shallow retouch. (Pl.50 Fig. 6 ).

r_{4G_{2.1}} \text{ KTA-51 (36x7x17mm).} \\
Chert, yellowish brown weathering; a beautiful flake 
with minute platform and flaring distal end which has 
been steeply retouched by shallow nearly-fluted flake 
scars; the upper portion of the flake shows converging 
flake scars which have rendered a trihedral pyramidal 
aspect to the upper surface. (Pl.50 Fig. 7 ).

r_{0a_{1.2}} \text{ KTA-57 (7x7x12mm).} \\
Chert, deep yellowish brown weathering; an artifact 
with plane undersurface and beautiful retouch along the 
lateral margin on the upper surface; bidirectional 
retouch on the base has produced an incipient tang; 
rest of the upper surface retains the original cortex; 
the incipient tang is a singular phenomenon unseen on 
the other artifacts; (Pl.50 Fig. 8 ).

r_{G_{0.4}} \text{ BCK-430 (75x34x22mm).} \\
Banded chert, violet grey weathering; a rounded flake 
with peripheral scooping retouch; the upper surface 
is marked by a conspicuous flake scar and a patch of 
cortex on the further end and shallow skimming retouch 
on the margins; but flake surface is the main area 
which bears the marks of extensive retouch, in the process 
of which the platform has been removed. (Pl.50 Fig. 9 ).
Flakes showing prefabricated upper surface form a distinct entity. Due to the efficiency of the convergent flaking, a tendency towards progressive decrease in the thickness is seen. Generally in such flakes a medial ridge is seen as a result of which the flake is either triangular or elongated in outline. Though in few cases the platform is centered, in most of the cases it is either faceted or plane scarred. Mostly the flakes are unretouched.

Yellowish grey chert; a nearly triangular flake with constricted platform and flaring lateral margins; the upper surface is marked by convergent flaking scars; the edge opposite the platform has been bifacially retouched to form an efficient working edge; twisted flake surface. (Pl. 51 Fig. 1).

Chert, yellowish brown patination; a pointed flake prepared by longitudinal flaking; the further end retains the cortex; the right upper side shows nibbled retouch on the edge; the longitudinal flake on the left side has been taken out in such a way it has severed the flake along the major axis near the bulb. (Pl. 51 Fig. 2).

Light green chert; a pointed flake prepared by longitudinal flaking; the convergence of the flake scars has resulted in a pointed tip; the upper portion near the
platform has been retouched to reduce the thickness; the under surface has been partly severed along the bulb to reduce the breadth; the flake surface is slightly twisted. (Pl. 51 Fig. 3)

**f₄e₅**

**PCA 517 (74x49x12mm)**

Chert, white patination; the upper surface shows converging flake scars; the platform shows dihedral faceting; the bulb is situated obliquely on one of the facets and is very prominent; hinge flake. (Pl. 51 Fig. 4).

**f₄e₃**

**DCK 714 (87x42x17mm)**

Greyish white quartzite; fresh; a blade broken across the longer axis; the upper surface shows a central ridge formed by the convergence of two longitudinal flake scars; faceted platform is crescentic in outline; sharp working edges. (Pl. 51 Fig. 5).

**c₄e₅**

**DCK 108 (59x30x15mm)**

Greyish chert; a bladish flake with flake surface showing retouch on both the margins; the edges have been further retouched to further the sharpness; the upper surface shows longitudinal flake scars and retouch on the platform. (Pl. 51 Fig. 6).

**c₄e₅**

**DCK 315 (50x27x12mm)**

Fine grained dark grey quartzite; a lingui-form flake showing oblique preparatory flake scars directed from the two sides of the platform; while one of the edges is steep the other shows a fine knife edge and has been
partly retouched; a longitudinal flakescar in the middle has reduced the thickness of the platform and in a way has done away with the conspicuous central ridge. (Pl. 51 Fig. 7).

\[c4c5.3\] BCK 102 (61x60x21 mm).

Greyish green trap slightly rolled; the upper surface has been prepared by longitudinal bidirectional flaking; slight retouch is seen on the distal end; diffused bulb. (Pl. 51 Fig. 8).

\[c4c5.5\] BCK 102 (Yellowish grey medium grained quartzite; fresh a triangular flake showing convergent flakescars on the upper surface; a central ridge prominently runs through the length of the flake; sharp unretouched edges; diffused bulb. (Pl. 51 Fig. 9). (58x50x21 mm.)

\[c4c5.5\] BCK 101 (44x66x22 mm).

Fine grained greenish grey quartzite; a triangular flake showing convergent flakescars running from the two opposite corners of the platform; a medial ridge runs unto the distal tip; the edges which are sharp are spordically retouched; the punch has been used to detach the flake. (Pl. 51 Fig. 10).

In some of the flakes only a single flakescar traverses the upper surface. In few other specimens the working edge is opposed by an arched platform.
f2c2g DCK 28 (37x36x18mm).
Chert, white patination, rolled; a flake with faceted platform nearly at right angle to the flake surface; a deep notch on the right side of the flake has resulted in a chisel like edge near the platform; the edge on the left side has been retouched from both the surfaces. (Pl. 52 Fig. 1).

f2c2h DCK 232 (36x50x14mm).
Greyish chert, slightly rolled; a flake with faceted platform displaying retouch on the working edge on both the surfaces; diffused bulb. (Pl. 52 Fig. 2).

c1b2l DCK 221 (38x55x16mm).
Light green chert; a flake with curved platform enclosing a convex working edge steeply retouched on the upper surface; rest of the upper surface shows an oblique flake scar; diffused cone. (Pl. 52 Fig. 3).

c1b2k DCK 22 (56x41x14mm).
Chert, white patination; a flake with semi-arched platform which is opposed by an irregular convex working edge notched and retouched; the upper face shows converging flake scars; minute retouch on the flake surface is later. (Pl. 52 Fig. 4).

Prepared flakes showing radial flaking are more conspicuous in the preceding industry. In Jammu D only a few specimens show such flaking. In the same way triangular flakes with crescentic platform found first in the preceding industry are represented by only a few specimens.
Chert light brown patination, a radially prepared flake with faceted platform; retouch on both the surfaces; the bulb is twisted. (Pl. 52 Fig. 5).

Chert, yellowish brown patination; a rounded, radially prepared flake, the platform has been removed; no retouch. (Pl. 52 Fig. 6).

Chert showing weathering; a triangular flake with a prominent bulb of percussion; the flake has been retouched on one of the margins while the other side has been steeply knapped; the upper surface shows prominent oblong flake scars struck consecutively. (Pl. 52 Fig. 7).

Greyish chert; a triangular flake with slightly crescentic platform and a pronounced bulb of percussion; both the margins of the flake have been irregularly retouched; the upper face shows at least four flake scars one of which near the platform is deep and has resulted in reducing the thickness of the platform; the retouch is later. (Pl. 52 Fig. 8).

Flakes showing longitudinal severance through the bulb of percussion are also found in a large number in this industry. As remarked earlier, such flakes were blanks for a variety of tool types. Sometimes the severance is only partial and results in the reduction of the thickness of the platform. One of the
following specimens shows a noosed working edge towards the further end. It is an unusual feature not seen in other specimens. In most of the cases the edge is either lateral or distal in placement.

**sac4.8 bah. 656 (65x25x15mm)**

Fine grained drab grey quartzite; a bladish flake partly severed longitudinally; the upper surface shows two longitudinal preparatory flake scars and prominent inverse flake scar on the distal end; this end has been finely retouched by nibbled retouch to form a noosed working edge; twisted flake surface due to incomplete severing. (Pl. 53 Fig. 1 ).

**sac4.8 Bck. 110 (65x21x18mm)**

Bluish chert; a bladish flake; severed along the major axis; the upper surface shows a plane flake scar with further end retouched; the constricted working edge thus formed has been further retouched; the platform also shows retouch to reduce the thickness. (Pl. 53 Fig. 2 ).

**sac4.8 Kta. 551 (62x41x18mm)**

Fine grained jaspery quartzite; a flake showing longitudinal severance and displaying longitudinal scars on the upper surface; a large flake scar truncated on the upper portion by a cleavage plane has thinned down the body of the flake; the convex working edge has been further retouched; (Pl. 53 Fig. 3 ).
Chert, bluish white patination; a bladed flake showing severance along the longer axis; the convergence of this severed plane and the original upper surface form a ridge which has been retouched to make it crested. (Pl. 53 Fig. 4).

Chert weathered and patinated; a bladed flake showing severance through the bulb; distal edge is retouched. (Pl. 53 Fig. 5).

Brownish sandy quartzite; an obtuse angled flake showing a severance along the longer axis; the edge opposite this surface has been deeply notched by taking out a single flake; thus the whole of the working edge has been produced; however the flaring edge opposite the bulb has been partly retouched. (Pl. 53 Fig. 6).

Chert patinated yellowish white; a pointed flake with blade like flake scars on the upper face the flake surface shows prominent bulb of percussion; the flake shows severance along the major axis. (Pl. 53 Fig. 7).

Breyish chert; a pointed flake displaying a conspicuous scar on the upper face; slight retouch seen on one of the margins. (Pl. 53 Fig. 8).
c_{4c}.1  *LCr 202 (52x56x17mm.)*  
Chert weathered grey; rolled; a longitudinally severed flake with upper surface showing a prominent oblique flake scar; the right margin of the flake has been intentionally knapped from 3 sides to get a constricted edge at the further end; the edge has been retouched on the flake surface. (Pl. 54 Fig. 1).

c_{3c}.1  *KTA 611 (46x36x40mm.)*  
Chert, yellowish white patination a flake severed along the major axis through the bulb; the upper surface shows a prominent vertical scar; the further end has been retouched to form a constricted working edge. (Pl. 54 Fig. 2).

c_{2d}.1  *ECl 25C (60x30x16mm.)*  
Greyish quartzite; a longitudinally severed flake; the lateral sides flare from the butt to the further end to enclose a distal working edge. (Pl. 54 Fig. 3).

c_{p}.1  *KTA 530 (41x22x16mm.)*  
Tray; light green a flake severed along its length; the flake surface has been retouched to form a straight working edge. (Pl. 54 Fig. 4).

c_{4b}.1  *BCK 11 (57x48x17mm.)*
Chert, showing greyish weathering; a triangular flake showing severance along the major axis and a partly faceted platform; the severed plane and the platform join at the apex and flare out towards the base to enclose
a straight working edge crudely retouched; the face shows oblong step flake scars towards the apex and a transverse conspicuous flake scar towards the base. (Pl. 54 Fig. 5).

In some of the specimens the platform is punctiform. This is due to vertical flaking on the platform. The flake as a result flares from the butt to the distal end.

Chert, yellowish white patination; a thin flake with a narrow platform and a flaring further and; platform has been narrowed by parallel vertical flaking on the upper face; no retouch. (Pl. 54 Fig. 6).

Some of the specimens in this category of flakes show a narrow burin like working edge. One of the following specimens shows a true 'burin stroke'.

Greyish quartzite; a longitudinally severed flake showing converging flake-scars on the upper surface; on the thickness provided by the severed plane, burin like edge has been produced by a burin stroke. (Pl. 54 Fig. 7).

Chert showing whitish weathering; a severed flake showing a narrow burin like working edge; the edge has been further retouched. (Pl. 54 Fig. 8).
Chert lightly weathered; a flake showing severance along both the lateral sides which converge at the further end to form a burin like working edge; the edge has been further retouched by notch below the tip and retouch on margins; the upper face shows a deep scar at the base and shallow retouch on the body; the edge shows the marks of use. (Pl. 54 Fig. 9).

As noticed earlier, there is an obvious tendency towards the diminution of the flake size as the industry advances. The reduction in the size is accompanied by a profound thickness of the flakes. A sizable number of such flakes show faceting and convergent primary flaking. Notched and retouched specimens occur in good proportion.

Chert, light patination; a side struck flake with extensive retouch on more than half the periphery on the upper surface; the flake surface shows a deep notch on the side lying opposite the retouched edge. (Pl. 55 Fig. 1).

Greyish chert; the upper surface shows oblique primary flake scars; the working margins is very sharp; the cortexed platform continues as a rim opposite the edge. (Pl. 55 Fig. 2).
DCK 15 (59x10x8mm.)
Chert, light patination; a thin bladed flake showing radial flake on the upper surface; an inverse longitudinal scar on the right margin intersects with the under surface to form a sharp knife edge; the side opposite this edge has been intentionally knapped to "back" the flake; the flake surface is twisted. (Pl.55 Fig. 3).

DCK 24 (44x45x14mm.)
Chert, whitish patination; a prepared flake showing converging flake scars on the upper surface the platform is multifaceted and shows a slight hump in the centre; slightly raised bulb is obliquely situated on one of the facets; fairly sharp edges requiring no retouch. (Pl.55 Fig. 4).

KTA 522 (31x46x11mm.)
Chert, light patination; a prepared flake showing oblique flake scars on the upper surface; the bulb is located obliquely on one of the facets; the other facet shows a notch towards the extremity to form a burin like working edge; however the main working edge is also sharp and is usable without any retouch. (Pl.55 Fig. 5).

DCK 316 (40x33x12mm.)
Fine grained dark grey quartzite; a small rounded flake with upper surface showing a clean flake scar; apart from the rounded edge which has been knapped and
speculatively retouched the major area of retouch is the platform itself which shows extensive retouch on the upper surface; most noticeable feature of this retouch is a notch which has been executed on the flake surface and has given rise to a small burin like working edge; the use of punch is attested. (Pl. 55 Fig. 6).

**Kta 577 (62x47x14mm).**
Dark grey sandy quartzite; slightly rolled.
the upper surface shows shallow flake scars; the flake surface has been notched in such away so as to give a small cusped working edge. (Pl. 55 Fig. 7).

**DCI 10 (60x55x15mm).**
Chert lightly patinated; a prepared flake showing multidirectional flaking on the upper face; the bottom edge has been severed for backing; the working edge has been notched to give a carination on the edge; minute platform; the retouch on the under surface is later. (Pl. 55 Fig. 8).

**DCI 46 (30x50x13mm).**
Banded chert showing orange yellow patination; a rectangular flake showing bidirectional flaking on the upper face; the flake surface shows burin stroke at one of the bottom ends as a result of which a protruding working edge has been produced. (Pl. 55 Fig. 9).
Banded chert, lightly patinated; a small rectangular flake showing convergent flaking on the upper surface; the platform is partly prepared. (Pl. 55 Fig. 10).

Some of the flakes show suppression and severance of the platform. In few cases the further end has been converted into an efficient awl-like working edge by careful preparation. To give prominence to the thrusting edge a notch is generally given below the tip of the edge.

Spotted chert; a prepared flake with trihedral faceting on the platform; the upper surface shows a "burin" retouch to form an inclined piercing working tip; below the tip a notch has been given to give prominence to the working edge. (Pl. 55 Fig. 11).

Chert weathered grey; a bladish flake with a central ridge running through its length; the further end has been given a notch to form a pointed working tip which has been strengthened by the medial ridge. (Pl. 55 Fig. 12).

Chert, white patination; an obliquely struck pointed flake showing convergent flake scars on the upper surface; the upper left margin shows a deep scar. (Pl. 55 Fig. 13).
Greyish chert; a triangular flake showing severance along the line of percussion; the convergence of this severed plane and the lateral edge has made the flake pointed; the upper surface shows a longitudinal flake scar. (Pl.55 Fig.14).

Chert; yellowish brown patination; a small flake showing convergent primary flaking; the converging margins converge once again towards the platform as a result of extensive retouch to render the flake pointed; the platform has been entirely removed during the retouch. (Pl.55 Fig.15).

Chert, yellowish white patination; a small prepared flake with faceted platform; the upper surface shows convergent flake scars; minute retouch is seen near the platform. (Pl.55 Fig.16).

Some of the thin flakes have notched working margins.

The following specimens show nearly carinated edges.

Chert, yellowish white patination; a thin hinge flake showing longitudinal flaking on the upper face; one of the margins has been retouched to form a carinated working edge; the platform has been retouched further to reduce its thickness. (Pl.55 Fig.17).
Chert yellowish patination; a thin flake with upper portion removed; the left margin of the flake surface has been retouched to form carination. (Pl. 55 Fig. 18).

Flint greyish patination; an irregularly pointed flake showing convergent flake scars on the upper face; one of the margins shows a notch; very sharp edge; twisted flake surface. (Pl. 55 Fig. 19).

The following specimens are among the smallest in the category of the flakes. Some of them even approach the size of a thumb-nail. Shallow nibbled retouch is seen on the lateral margins.

Chert light patination; a small flake showing convergent flake scar on the upper surface; the lateral margins have been retouched to form efficient working edges. (Pl. 55 Fig. 20).

Chert, yellowish white patination; a stubby hinge flake showing radial flake scars on the upper surface; one of the sides shows extensive retouch. (Pl. 55 Fig. 21).

Dark grey quartzite; a longitudinally severed flake showing retouch on the lateral margin; cortexed platform. (Pl. 55 Fig. 22).
Chert, bluish white patination; a transversally broken blade retouched towards the upper portion; the upper surface shows a central ridge which goes up to slightly tipped further end; rippled flake surface. (Pl.55 Fig.23)

Chert, light violet patination; a part of a blade showing central ridge; retouched margins; the flake surface is clean. (Pl.55 Fig.24)

Residual Cores

Almost all the types of the preceding industry are found in Jammu D. More than 50% of the cores are on chert. These are smaller in size than quartzite cores. Towards the end of this industry prismatic cores also appear.

Type 1.6 KTA 1014(78x71x44mm).
Bluish quartzite; a core showing converging flake scars; the lower surface is nearly flat. (Pl.56 Fig.1).

Type 4 DCK 1042(60x55x16mm).
Trap, weathered white; a flattish unfaceted core of the tortoise type. (Pl.56 Fig.2).

Type 4 KTA 1043(55x46x25mm).
Weathered trap; a core of the tortoise type; the platform is faceted. (Pl.56 Fig.3).
Type 6  **BCK 1039(57x58x5mm.).**  
Chert; weathered and patinated; a core of the pyramidal type showing steep flaking from the base; the base consists of a flake-scar. (Pl.56 Fig.4 ).

Type 7  **BCK 1045(42x44x19mm.).**  
Chert, weathered white; a small core showing flake-scars running from two opposite lateral sides. (Pl.56 Fig.5 ).

Type 8  **KTA 1525(60x49x17mm.).**  
Chert, weathered and patinated; a humped core showing blade like scars on the upper surface; the lower surface shows deep flake-scars. (Pl.56 Fig.6 ).

Type 9  **BCK 1049(44x48x40mm.).**  
Chert, greyish weathering; a prismatic core showing vertical flaking; the platform consists of a flake-scar. (Pl.56 Fig.7 ).

Type 9  **KTA 1050(57x55x29mm.).**  
Chert, greyish weathering; a prismatic core showing a scarred platform; from this platform stubby flakes have been removed by vertical flaking. (Pl.56 Fig.8 ).

Type 9  **BCK 75(64x74x46mm.).**  
Chert, light patination; a pebble core showing vertical step-flaking as seen in the above specimen. (Pl.56 Fig.9 ).
Type 10 DCK 1048 (80x68x48 mm).
Chert, weathered and patinated; a thick core showing multidirectional flake-scars on the upper surface; the lower surface is cortexed. (Pl. 56 Fig. 10).

Functional Cores

In this industry artifacts showing conical, hollow and burin-like working edges occur prominently. Specimens showing distal working edge as seen on tranchets etc. also appear in this industry.

Mah 685 (66x56x23 mm).
Drab grey quartzite; a wedge-shaped artifact with a hollow working edge; the edge is the result of the convergence of a deep flake-scar on the upper surface and a negative scar on the lower surface. (Pl. 57 Fig. 1).

NCR 1513 (63x57x24 mm).
Greyish compact sandstone; an artifact showing a hollow working edge; the edge is retouched. (Pl. 57 Fig. 2).

DSK 1070 (60x57x21 mm).
Drab brown chert, weathered and patinated; a linguiform artifact showing flaking on the upper surface; the butt is steeply retouched. (Pl. 57 Fig. 3).

GPN 1516 (62x30x17 mm).
Chert, whitish weathering; an artifact pointed towards one extremity; while the left margin of the artifact is
Knapped, the right margin is retouched to achieve the pointed edge. (Pl. 57 Fig. 4).

GPN 1515 (50x22x26mm).
Flint, white weathering; an artifact with a burin edge; the edge shows bidirectional burin strokes. (Pl. 57 Fig. 5).

BCK 330 (49x27x15mm).
Chert, weathered and patinated; an artifact showing constricted burin like working edge; the lateral sides have been retouched to give prominence to this edge. (Pl. 57 Fig. 6).

KTA 640 (65x40x24mm).
Greyish quartzite; a functional core showing chisel like working edge; the margin of the artifact has been notched to give prominence to the edge; the edge bears secondary retouch. (Pl. 57 Fig. 7).

Kh, Ch. I067 (44x36x26mm).
Trap, weathered greyish green; the apex shows a conical thrusting edge; a notch is seen towards the top on one of the converging sides. (Pl. 57 Fig. 8).

BCK 1087 (32x24x14mm).
Chert; a small core showing peripheral working margins; extensive retouch on the edge. (Pl. 57 Fig. 9).

DCK 1077 (96x43x26mm).
Chert, weathered and patinated; a tranchet like artifact showing distal working edge; the edge is the result of a side blow. (Pl. 57 Fig. 10).
Chert; an axe-like artifact with a narrow butt and flaring lateral sides; the working edge lies across the longer axis; the lateral sides have been longitudinally severed to narrow the butt. (Pl. 57 Fig. 11).