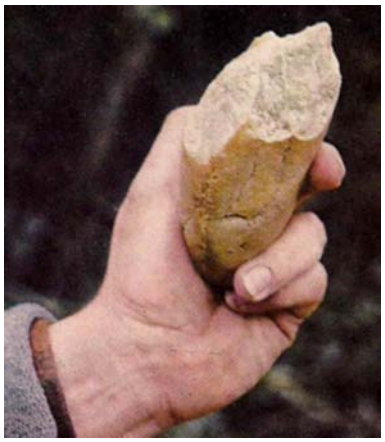
Stone Tool making techniques and their identifying characters

Introduction

Researches on the evolution of man and his culture have proved without doubt that our prehistoric Stone Age ancestors had used stone tools made by them. The likely methods used by them could be inferred, according to Sankalia (1964:18), by studying the stone tool themselves, trying to imitate them today and observing primitive or semi-primitive people making similar tools and using them. Among the scholars who experimented on the prehistoric stone tool techniques we may refer L.S.B. Leakey, Francois Bordes, etc. Leakey(1960) stated that 'Experiment shows that once technique required for making a particular tool type has been fully mastered, the actual making of the implement is very quick process indeed, while the discovery of new technique is often wholly accidental and unexpected, as indeed it must also have been in the past.' And he found in his experiments two basic principles of fracture that 'firstly that the force from a blow does not travel in the direction in which the

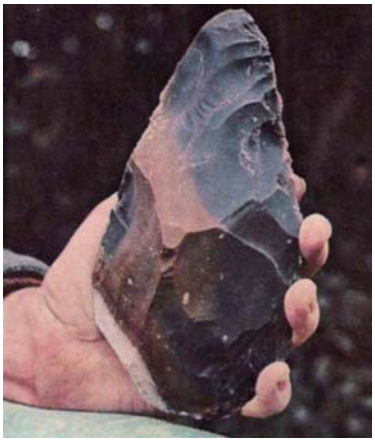
Upper Palaeolithic life

Direct percussion



Chopper

blow was struck, but radiates in the form of a cone, and secondly that the direction of the force along the cone will vary according to the amount of resistance it meets relative to the force of blow.'



Handaxe

Francois Bordes, professor of prehistory also had a number of experiments and he is able to make, within a few minutes, all the known varieties of Palaeolithic implements. In the book – *Early Man*, published by Life Nature Library (1970) there are photographs showing the making of stone tools like chopping tool, Acheulian handaxes and laurel leaf point by Francois Bordes.

Laurel leaf point

Stone tool making techniques:

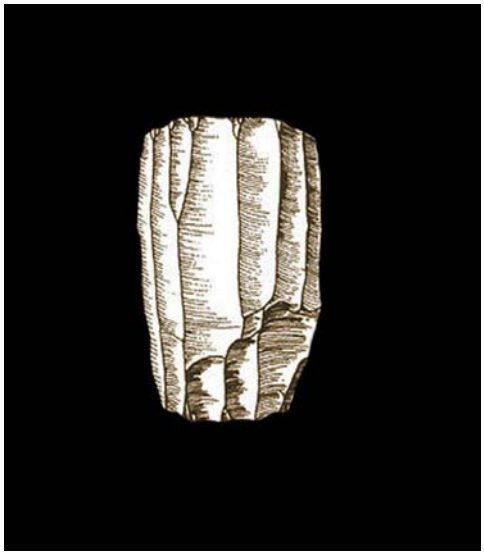
We can broadly group the stone tool making techniques of prehistoric periods into four. They are: 1) Percussion, 2) Blade, B) Grinding and Polishing, and 4) Shattering. Out of these four groups, the percussion group has two sub-groups *viz.,* A) the direct percussion and B) the indirect percussion. The direct percussion sub-group consists of eight techniques. They are discussed under the following heads.

Let us now study some of the techniques and their identifying characters.

A) Direct percussion flaking technique: Flaking by striking directly with a hammer is known as direct percussion flaking technique. This flaking technique includes many flaking techniques, such as:

i) Anvil technique or Block-on-Block technique,
ii) Stone hammer technique or Direct percussion technique,
iii) Cylinder hammer or Hollow hammer or bone/antler/hard wood hammer technique,
iv) Bipolar technique,
v) Step or Resolved or Controlled flaking technique,
vi) Clactonian technique,
vii) Levalloisian technique, and
viii) Discoid core or Mousterian technique.

Anvil/Block-on-Block technique – In this technique a lump of stone to be flaked is held in one or both hands and strikes directly against a projected edge of a fixed huge block of stone or anvil. This results to the detachment of a large massive flake from the stone lump in hand with a prominent bulb of percussion. Such large primary flakes could be used in making of tools like some of the handaxes and cleavers. Thus the block-on-block or anvil technique produces thick flakes as in the case of the course direct stone hammer technique.



Fluted core

Anvil/Block-on-Block flaking technique

Stone hammer technique – A suitable shaped stone is used as hammer and strikes at an inclined angle on the surface of a lump of stone and that result t

positive bulb of percussion. On the core there is a hollow or concave surface corresponding to the shape and size of the detached flake. This concave surface is called negative bulb of percussion.

Positive blub of percussion by stone hammer technique

Negative blub of percurssion by stone hammer technique

Cylinder hammer technique –

Cylinder hammer technique

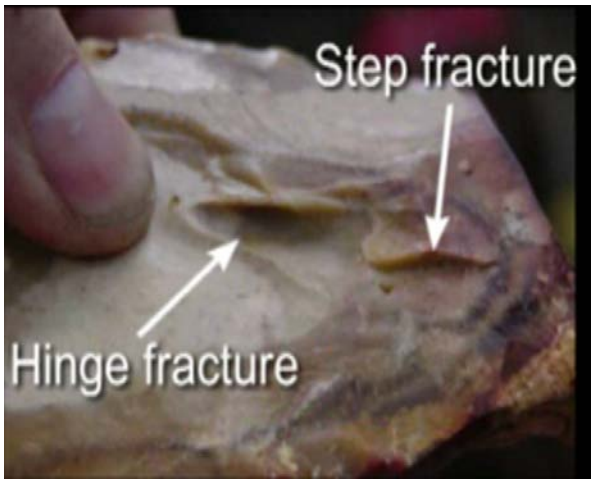
The advanced tool making technology developed in the early palaeolithic times is the soft hammer or cylinder hammer technique. In this case, the hammer is of a cylindrical bone or antler or hard wood; soft stone might be used. Tools of the Acheulian stage of the Lower Palaeolithic Culture show a very flat bulb of applied force. Experiments made by M. Coutier and Leakey (1960:42) have suggested that a cylinder hammer of soft stone, bone, or wood was used in detaching such flat flakes. Leakey (ibid) states '…… very flat flaking is achieved, partly because the blow is struck with a soft curved edge and not with a point, and partly because when using such a hammer it is impossible to strike a blow except at the very edge of the block which is

to be trimmed.' It is most likely that initial shaping was done with the stone hammer technique and the cylinder hammer technique was used for the finishing process.

Bipolar technique – This technique of flaking is less common; but it is considered economical in the sense that with a single blow two flakes could be detached simultaneously. For this, the core is placed upon another hard rock and strikes with the hammer on the upper free end of the core. Due to the rebound of the force from the underlying rock and the force of the hammer blow on the upper end two flakes one from each opposite end have been removed on the same face of the core (Fig. p.168). The presence of radiating fissures on the same face at the opposite ends of the core is the character of the bipolar technique.

Bipolar technique

Stepped or Resolved/controlled flaking technique – Stepped or resolved or controlled flaking technique is a further advanced secondary flaking technology developed during the early palaeolithic cultural phase. In this case the hammer does not strike at an inclined angle to the surface but inward the core with a controlled blow or force, so that the penetrating



Hinge fracture by Stepped or resolved/controlled flaking technique

force does not pass through but ends inside the core to snap off a flake abruptly leaving a step on the core. Step flaking results in general short flakes, and mainly employed in secondary flaking.

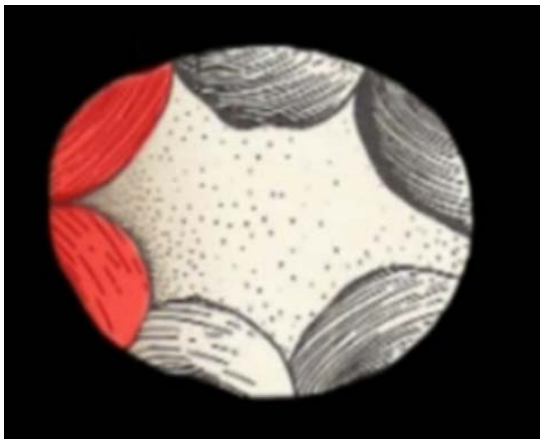
Sometimes the snap off flakes curl over at the end furthest from the bulb. This is known as hinge fracture. According to Leakey (1960:40), such fracture is difficult to produce at will. A hinge fracture is distinguishable from step fracture by its smooth surface.

Clactonian technique – The clactonian technique coined after the type site at Clacton-on-sea, England was a technique used by the Lower Palaeolithic people for obtaining a flake. In short it is a technique of detaching a large flake for making flake tools. Clactonian flakes could also be obtained by using the anvil or stone hammer technique. In this case a naturally flattened surface is used as striking platform of the hammer; such flakes will have a prominent bulb of percussion on the main flake surface near the striking platform, and the angle between the main flake surface and the striking platform is always greater than 90 degree or roughly 120 degree.

Levalloisian technique – This is also a further advanced technique of obtaining a flake to make tools. The main characteristic of this technique is the extensive preparation of the core and the striking platform (faceted striking platform) by using stone hammer. Only one flake could be obtained from such a prepared core and the flake resembles the form of the tortoise shell. It is so known as tortoise core technique. The flake has very sharp margin, due to the truncation of the previously prepared flake scars on the dorsal with the main flake surface, and could be used as tool without further working. The angle between the main flake surface and the striking platform is almost near to 90 degree. Thus Levalloisian

technique is an artistic and skillful method of preparing flakes and cores that was first noticed from Levallois Perret, Paris.

Discoid core /Mousterian technique – This is also a prepared core technique for obtaining a flake. In this case the prepared core resembles a circular or disc shape. Any one of the flake scars on the core serves as striking platform and a flake with 2 to 4 truncated flake scars on the dorsal surface could be detached by striking with a stone hammer. The flake scar left on the core after detaching the first flake could also be served as striking platform for detaching another flake, thus several flakes could be obtained from a single discoid core. Hence, Discoid core or Mousterian technique is considered to be more economical than the Levalloisian technique

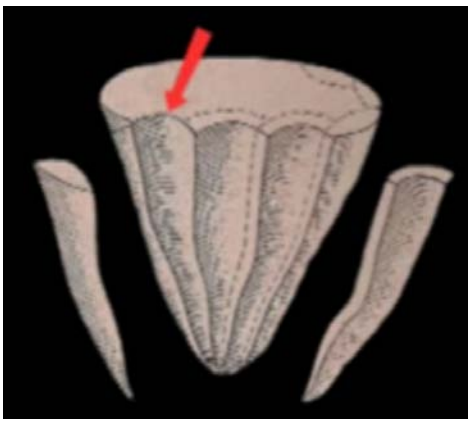


Discoid core/Mousterian technique

B) **Indirect percussion technique** – It is one of the methods of obtaining a blade by the prehistoric man. In this case, the prepared cylindrical core is not struck directly by the hammer but through a punch. The pointed end of the punch is fixed on the striking platform of the core and then hammered on the other end of the punch. This resulted to the removal of a thin blade that exhibits numerous closely placed prominent ripples on the main flake surface.

Indirect percussion technique

Blade technique – This is the technique known to man for the first time during the Middle Palaeolithic. By this method long, narrow, thin and parallel sided flakes have been produced in different parts of the world (during the Palaeolithic period). But this technique has been regularly and extensively used during the Upper Palaeolithic, Mesolithic and later periods.



Blade technique

A blade is a narrow flake with nearly parallel sides and mostly thin and flat ventral surface. The dorsal surface is represented by at least two parallel flake scars. The length of the blade exceeds twice its breadth. The cross-section is somewhat triangular. By this definition all flakes cannot become blades though all blades are flakes.

Some of the advanced techniques which were frequently used by prehistoric men to procure blades are briefly described below :

I. Pressure flaking technique/Blade by pressure

II. Fluting technique and /Blade by percussion

III. Baking or blunting

I. Pressure technique – Pressure flaking technique is another advanced flaking technique developed during the Upper Palaeolithic culture to prepare beautiful tools like the laurel-leaf and willow leaf points. On the other hand it is a technique used by the prehistoric man in secondary flaking or obtaining a

Pressure technique

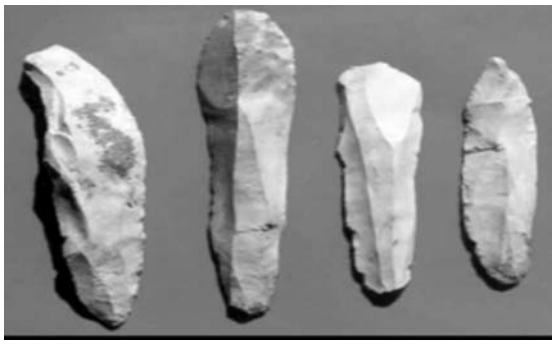
blade. In this case also an intermediary implement served as punch is used to exert force on the core by applying pressure, but not by hammering. Very thin and small waste flakes or chips, known also as fish scale, could be removed for finishing the tools like leaf-shaped points during the Upper Palaeolithic Culture. Long blades could also be obtained by this technique. It is often difficult to distinguished indirect percussion from pressure flaking; both the methods are in fact a form of indirect pressure.

II. Fluting technique: It was used for making blade tools. In this technique, starting with suitably prepared cylindrical nodules, a series of uniformly thin parallel sided blades were detached in rapid succession by applying vertical pressures on edges. The blades could be flat as well as crested the blades produced by fluting were, however, crested with multiple flake scars transversely across the crest. It was pointed out by Sir John Evans that these scars were taken out from the surface of a natural module in order to form a corner along the length of the otherwise spherical surface of the material. Thus a blow delivered on the top of this ridge or corner would detach a blade with the marks of transverse flaking retain on it. It has been argued that besides forming a hold for the application of vertical pressure these transverse flaking were also used to guide the length of these blades, so that on application of the vertical pressure a blade of only that length would be produced up to which the crest had been prepared. Therefore, such blades have been called crest-guiding blades.

Fluting technique

On the other hand some scholars prefer to call this technique as punching technique. In short, in this technique a rough surface is made on the core, thereafter a small platform is prepared at one end. Against this is placed a short wood punch and a tap is given with the help of a mallet.

III. Backing or blunting:



Blade tools

Blades manufactured by fluting technique were further retouched to form specific tools. Since every blade had two readymade sharp edges, retouching in these blades were mainly done to blunt any specific area out of the two already present borders. The area chosen and the manner of blunting depended on the requirement of the marker. These blunting were done mainly to afford a firm hafting of the blades on handles. A blunted edge is placed inside the groove of the handle when a force was applied to cut anything with the other sharp edge of the blade. Thus it is significant to note that while secondary working on core and flake tools was mainly aimed to impart sharpness. In blade tools they were done to blunt an already sharp edge.

3. Grinding and Polishing – This technique is the characteristic feature of making the Neolithic tools. Though the Neolithic stone tools are shaped by applying various methods of percussion flaking and pecking, the rough flaking or pecking surfaces are further worked by grinding and polishing technique to produce smooth and polished surfaces.

Neolithic culture is characterized by the making of smoothed surface stone tools generally known as celts. These smooth surface

tools are produced by grinding and polishing method/technique. This technique has four stages like chipping, pecking, grinding and finally polishing. Thus after the selection of a suitable piece of stone, it has been shaped by flaking with a hammer, then ground on a coarse stone slab by adding sand and water often to smoothen the surfaces. To prepare the cutting edge it is further ground bifacially or unifacially to get the medial or lateral edge.

Pecking is also another stage of this technique adopted by the Neolithic man in making the celt out of very hard and tough rock that is difficult in flaking. In this method, the maker used a very narrow ended hammer (like the prism edge of the quartz) to peck all over the surfaces of the stone, probably shaped pebble. Then ground all over the surfaces. The ground tools (shaped either by flaking or chipping or pecking) are then polished to make the smooth surfaces glaze.

There are various types of celts. Of them rectilinear shouldered celt possesses a tenon. Such tenon of the celt is supposed to be made by sawing technique. The sawing was believed to have been done with a sharp edged sliver, might be of bamboo or shell, by adding sand and water to serve as abrasive action.

During the Neolithic cultural period, there was also another tool type known as ring stone. It was meant to use as weight of the digging stick or head of mace. Drilling technique was used in making the hole of the ring stones or mace heads. For this drilling technique, a suitably sized pebble was selected and a depression was made on both the surfaces at the centre by pecking with another stone hammer. Thereafter, drilling on the depression was done first from the upper surface with bamboo tube rotating between the palms, and often-adding sand and water for abrasive action; when it drills about halfway it upturns

and repeat the same process of drilling, and in this way the hole was made.

4) Shattering technique: This type of tool making technique is very simple. In this technique, the manufacturer holds the suitable stone with his hands (both) and rises to a certain height and then releases the same so as the rock breaks into pieces when it hits the ground. The flakes/rock pieces thus produced do not possess either negative or positive bulb of percussion. From such flakes any required size can be selected and trimmed further by using either grinding or stone hammering. This tool making technique is confined to Southeast Asia.

Above all, there are two more flaking techniques. They are the primary flaking techniques and secondary flaking technique based on the nature of the flake scars as well as its workmanship. Such flaking can be done by using any one of the percussion or blade technique. Now let us see how these techniques work.

Primary flaking technique – After selecting a suitable piece of rock, the prehistoric man will start flaking to get the conceptualized form of the tool. All such flakes detached for getting the desire shape and size of tools are primary flakes. However, the characters of the flakes detached exhibit differently according to the particular technique and hammer used. For example, the flakes removed by the anvil technique and direct stone percussion technique with heavy hammer will produce massif flakes with prominent bulb of percussion, while smaller and flatter flakes can be obtained by using cylinder hammer technique. The main purpose of the primary flaking is to get the desired shape and size of the tool.

Secondary flaking technique – Secondary flaking are those further flaking, after obtaining the desired shape and size, for producing sharp working edge and the suitable handholding place of the tools. The

massif primary flakes could also be used for making many tools of the Stone Age by detaching further smaller flakes from the surfaces. The secondary flaking could be done by the direct percussion technique with smaller stone hammer or cylinder hammer technique and pressure flaking. Step flaking is also evident in the secondary flaking; the flakes removed in step flaking are generally small and has a blunt end due to the sudden break of the force in the core material. The size of the secondary flake is generally small and known as waste flake or chip.

Conclusion

Stone tools are the only preserved archaeological remains of prehistoric man while many of their handiworks are lost in course of time. These stone tools are the implements made by those early men to meet their needs. They acquired through experience certain skills to make the different groups of stone implements called artifacts Archaeologists coined some terms to study the tool making skills of the prehistoric people. These different techniques are anvil/block-on-block technique, stone hammer, cylinder hammer, bipolar, step flaking, Clactonian flaking, Levalloisian flaking, discoid core Mousterian flaking, pressure flaking, fluting, backing or blunting, peeking, sawing, grinding and polishing, and shattering techniques.

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