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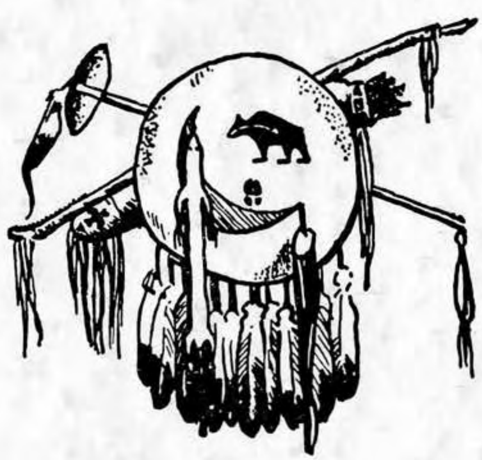
An Introduction to Flintworking

By

Don E. Crabtree



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B. Robert Butler

AN INTRODUCTION TO FLINTWORKING

Part I - An Introduction to the Technology of Stone Tools

by

Don E. Crabtree

Part II - A Glossary of Flintworking Terms

by

Don E. Crabtree

with editorial assistance of

Guy Muto
Christine Lovgren
Earl H. Swanson

and illustrations by

Mary Keeler

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E.H.S.

PART I

AN INTRODUCTION TO THE TECHNOLOGY OF STONE TOOLS

by

Don E. Crabtree

PREFACE

I am indebted to the National Science Foundation for financial support to me and Earl H. Swanson, Jr., through Idaho State University since 1965. The final draft of the original paper was prepared by Helen Millard while the published form was done by Mae Jones. Earl Swanson edited and Lucille Harten copyread the published paper. As always my wife, Evelyn, gave me moral support, knowledgeable comment, and typed the early drafts of the paper which organized it into a coherent whole.

Don E. Crabtree

January, 1972

AN INTRODUCTION TO THE TECHNOLOGY OF STONE TOOLS

By Don E. Crabtree

A study of lithic technology reveals the progress of primitive man for approximately 2,000,000 years of making and using tools and weapons of stone, wood, and bone, which is a predominance of approximately 99.5% of human history. But artifacts made of organic materials are generally perishable and the most enduring identifiable tools of prehistoric man are those made of stone.

The earliest man can be identified as human as much by association with stone tools as by his anatomy. For this reason, the techniques of making stone tools are of great importance in the study of human origins and dispersals. Flake scars on the artifacts are the result of various flintknapping techniques and consequently furnish evidence and diagnostic characteristics of at least the last stage of manufacture. Further, a microscopic study of functional scars on the edges can give some basis for theoretical functional analysis. Reducing the initial mass of lithic material to the finished product requires many stages of manufacture, discarding waste flakes during the process. These debitage flakes are usually more diagnostic than flake scars, for their size, thickness, shape and degree of curvature can reveal several manufacturing steps. They can indicate the technique, for they retain the bulb of applied force (platform area), show the method of platform preparation and innumerable other characteristics which indicate the technique. For this reason, a careful study of the flaking debris is a prime requisite in determining the manufacturing technique.

Flintknapping is one of the earliest industrial arts of man - a process of man's ability to induce and control the fracture of stone to form functional implements. The pebble or cobble culture of Olduvai is the oldest known form of working stone by a simple percussion technique of detaching one or more flakes from a cobble to leave a sharp cutting edge. Certainly man's first attempt at flintknapping was elementary, but as cultures developed in the stone age we see the progress of new and more sophisticated tool types evolve which required new flaking techniques.

Prehistoric lithic technology is the science of systematic knowledge of forming stone into useful cutting, chopping and other functional implements. But lithic technology comprises two factors - the method and the technique. The method is in the mind; the technique in the hands.

Method is the logical manner of systematic and orderly flaking process, or the preconceived plan of chipping action based on rules, mechanics, order and procedure. Method verifies historians' theories that flintknapping was not a haphazard art but, rather, a carefully planned process of making stone tools to suit a specific functional purpose. The shape, length, width, thickness, form and technique of applied force to fashion the tool was predetermined by the toolmaker before the initial fracture of the raw material. He also determined what tools he would use in the process before the initial break of the lithic material.

The technique represents the application of the method by the worker with a suitable fabricator to form the stone into his mental conception; each technique produces distinct flaking character and technological attributes. Manner is part of the technique and is the mode or characteristic style of preparation and application of forces to form the artifact by a definite method. Manner is the determined angle and application of force - whether percussion by the straight line or curved blow, pressure by pressing or snapping, indirect force by percussion or pressure, etc. Technique is the ultimate result of the method applied in a predetermined manner.

A single technique is the simple basic principle of detaching, by percussion or pressure, a sharp usable flake. But each of these manners of delivering force vary with the intention and tool type and consequently we have multiple techniques. Technique variables can also be modified to suit the material, intention or the fabricator.

If the pattern of applied force is consistently repeated, then a more sophisticated tool can be formed by reducing the mass to the desired functional form. The freshly detached flakes serve adequately as cutting implements and if they show functional scars they are utilized flakes. Most techniques are complex. Blademaking, per se, whether by percussion, pressure or indirect percussion is not a single technique. But blades made by simulated conditions, represented by a variety of platform preparation, degrees, kinds and

angles of force, use of rests or anvils, variations of rhythms and muscular motor habits, and use of diversified fabrication tools represent varieties of blademaking techniques.

A complex technique is a combination of multiple individual techniques. For example - the Folsom point merges a percussion technique for preforming, a pressure technique for forming and the fluting technique for detaching the channel flakes (Crabtree 1966). Other methods combine percussion, indirect percussion and pressure to form more sophisticated tools. Most tool types are the end result of a method of independently applying forces in alternate degrees, ways, and at varying angles from the initial to the final stage of fabrication.

A study of technology is pertinent to typology, for careful analysis of the various stages of the manufacturing process can give clues to the technique and the functional need. Technological evaluation is based, in part, on understanding the muscular motor habits and rhythmic removal of flakes. After the rough material has been reduced to a stage where the worker can repetitiously remove a series of flakes from the margin, the mind, eye and muscular responses often develop a rhythmic and subconscious reaction to applying the force. Experience and habit eventually cause the worker's muscles to respond subconsciously to induced forces. The hand holding the piece being worked subconsciously moves or rolls to counteract the force applied by the percussor or compressor. As a result, the subconscious response of maneuvering and manipulation, the holding hand generally becomes more fatigued than the hand applying the force. The direction and amount of force needed to detach a flake of a given dimension becomes intuitive when the worker becomes familiar with the components of the lithic material, can relate the size and weight of the fabricator, and expertly apply the technique.

The finished artifact usually reveals only the final series of flakes so the modern typologist generally relies primarily on theory and morphology to define the technique. Typology based solely on morphology implies function - such as scrapers, wedges, awls, borers, burins, etc. - but tells or verifies nothing of the living habits of the group. Morphology is certainly a part of the method and technique but the technology must be defined to verify the types which emerge from industries. Artifacts may be identical morphologically, but made by entirely different techniques.

There is nothing as potent as experiment for verifying lithic techniques. It allows the worker to record all the stages of manufacture, to study the characteristics of the debitage flakes, and to prove or disprove the theory. The analyst can best verify his theories by experiment. He need not become proficient at flintknapping but even a try will familiarize him with the mechanical and physical problems involved in the manufacture, and emphasize the importance of preparation and the correct angle and proper application of the required amount of force. Different tool types with like characteristics are pertinent to individual assemblages so even the experiment remains empirical until the worker has produced an exact replica of the aboriginal artifact. Experiment is the end result of hypothesis based on theory but not supported by fact even though, in this instance, the aboriginal approach may parallel or vary slightly.

The important factor of both analysis and experiment is to consider the traits of each stage of manufacture and evaluate the technical methods of the work from start to finish. Many techniques have been replicated by the stoneknapping experiments of Francois Bordes, Jacques Tixier, L. S. B. Leakey, Alfred S. Barnes, Leon Coutier, Francis H. W. Knowles, D. F. W. Baden-Powell, Kenneth Oakley and Don Crabtree. Their experiments have defined the intentional from the miscalculation, the novice work, the rejuvenation, the importance of preparation of cores and preforms, grinding and polishing of platforms and edges, the aboriginal use of thermal alteration of lithic materials, the value of debitage analysis, the amount and angles of applied force, the significance of the correct percussor or compressor, the subtle blending of techniques, and many more factors which are technological features.

Limited space prohibits the analysis and classification of the hundreds of prehistoric lithic techniques and their variable attributes which make up the Stone Age. Complete coverage of individual techniques and their pertinent characteristics would fill volumes. Descriptive details would have to be given of each experiment and then related and compared to aboriginal work with the text profusely illustrated. Therefore, descriptions will be condensed to a dictionary version of the basic techniques of percussion, pressure and some indirect percussion.

MATERIALS

The first concern of the toolmaker is obtaining good lithic material (Crabtree 1967a). The shape and functional performance of the tool is governed by the quality of the material and the skill of the worker. Flint, fine-grained basalt, chert, chalcedony, jasper and

the volcanic glasses were widely used aboriginally for they are solids having the properties of a heavy liquid. All have the necessary qualities of elasticity, homogeneity; are cryptocrystalline, isotropic and highly siliceous. Homogeneity allows the worker to fracture the stone in any direction. The material must also be free of flaws, cracks and inclusions; otherwise it would break prematurely or cause step and hinge fractures. Coarse-grained rock will not fracture smoothly but tends to crumble from the applied force. Other materials such as feldspar and slate will fracture only along certain lines and cannot be controlled by the worker. The quality of material has a direct relationship to the applied technique and determines superior or inferior workmanship. Of course, there is always the human factor of finding good work on poor material and poor work on good material, which denotes the skill of the worker.

Flint was widely used and made almost indestructible tools, but when obsidian was available it seemed to be preferred by stone age man. Undoubtedly this is because it is a volcanic glass and leaves an extremely sharp cutting edge. But when obsidian is used, the percussor must be different from that used for harder materials, and the blows lessened or dampened. For digging, boring or scraping tools the worker preferred a tougher material and was not so much concerned with the sharp edge. Stone age man was very selective about his raw material, for his very survival depended on his knowledge of suitable stone for implements of specific function. Certain groups ranged in areas where there was a scarcity or lack of good material and, in this case, they had to make do with what they had. Very often the analyst will refer to work as "crude" whereas the material is poor and only superior skill would permit flaking. So the word "crude" should be qualified according to the material.

Many lithic minerals can be improved for flaking by the aboriginal method of thermal alteration (Crabtree and Butler 1964) which recent archaeological evidence indicates is contemporaneous with the advent of pressure flaking. The stone is buried in sand and slowly heated to moderate temperatures of from 400° to 900° F., depending on the type of material. Then it is left to cool undisturbed for at least twelve hours. This process relieves stresses and strains in the stone and it becomes more elastic without becoming brittle. The alteration makes the stone more vitreous and the worker can make tools with more precision and with much sharper edges. Each material responds differently to heating and one must become familiar with the stone being altered to determine the temperature and allotted time of heating and cooling. The alteration time period depends on the size of the piece being heated, larger pieces requiring more time than flakes. The workability of natural glassy materials, like quartz crystal and obsidian, are improved by heating, but the texture changes are not as noticeable as treated siliceous rocks. Some materials do not require alteration for they respond very well to pressure flaking in their natural state. It is not necessary to treat materials to accomplish pressure work, but the alteration improves the material. It requires less energy to induce fracture, and the worker has greater control over flake removal. When toughness is a prime factor such as that required for diggers, choppers, awls, borers, scrapers, etc. then untreated siliceous material is desirable.

After heating, the natural surface retains its original texture and only the inside part under the cortex will show the change. This makes it difficult to determine alteration on finished tools that have had all the surface removed in the final stage of flaking. But if a facet of the original surface remains on a thermal-treated artifact, the change can be easily noted. Heating also often causes color changes in the material--yellows changing to red and other natural colors altering accordingly. Alteration can be verified on aboriginal flakes if the dorsal side of the flake is coarse-textured and the ventral side is glassy.

THE CONE PRINCIPLE

When a flake is detached from the parent mass, it forms a cone or a part of a cone. The flake is the positive cone part and the scar is the negative cone part. This principle works in much the same way as the cone formed on plate glass when shot with a BB gun. When the pellet strikes the pane at right angles to the flat surface, the force radiates outward in widening circles at an angle tangential to the direction of impact and finally the force exceeds the elastic limit of the glass and a cone is removed from the opposite side of the point of applied force. If the energy of the pellet is insufficient and the force is dissipated, the cone will penetrate only part way--or not at all--and only a cone part will form. If the velocity of the pellet is too great, then the cone will shatter.

The ideal whole cone is formed by percussion--having the ratio of the size, weight and hardness of the projectile proportionate to the force and velocity of the blow. Detachment of a complete cone is generally by percussion and usually used only for perforation. Removal of cone parts is synonymous with both percussion and pressure flaking. When using the pecking technique, the worker removes half cones, quarter cones, overlapping and intersecting cones, or leaves the cone intact with the parent mass.

Flakes are cone parts and the fracture angle of the cone is the ventral side of the flake. The apex of the cone (proximal end of the flake) where the force is applied is called the platform part. Examination of the platform angle and the fracture angle of the cone will determine the direction of applied force. Because of the amorphous nature of most raw material, the worker must constantly calculate the fracture angle of the cone to determine the direction of applied force in order to remove flakes at an angle different from the direction of force by the percussor or compressor. Both the position of the material being worked and the direction of the applied force are constantly changing in the initial stages of manufacture. This enables the worker to select the platform area and determine the correct angle of applied force.

Cone splitting is an exception to the rule of using the fracture angle of the cone. The cone is split by supporting the working piece, thereby setting up opposing forces and causing the cone to shear. In this case, the fracture is quite flat and the positive and negative surfaces have little or no bulbs of force.

FLAKING IMPLEMENTS

The forming of the artifact from the initial break of the raw material to the finished tool usually requires several stages of manufacture and the use of several different kinds of fabricators (Crabtree 1967b). Some tools are made entirely by percussion and some entirely by pressure. Others are initially started by percussion and then finished by pressure. Others are made by the punch (indirect percussion) technique. Each method requires a separate tool kit. But the compressor or percussor (fabricators) must be of material different from the stone being worked.

Quarrying material *in situ* requires a special tool kit including levers, large hammerstones, thick pick-like objects of either flint-like stone or pointed pieces of bone or antler and large broad flat scraping flakes to remove debris. If the rock is surface material the quarrying tools are unnecessary, but the stone must be tested for the necessary flaking quality. The stone is struck with a simple hammer-stone to expose the inner surface to test for fine texture and homogeneity. When the blow produces a ringing sound, it denotes homogeneous material free of cracks, flaws and inclusions. If the blow emits a dull thud--then the worker knows the piece is not homogeneous.

ABRASIVES

Implements and artifacts formed first by flaking or pecking and then ground or polished are usually associated with the Neolithic period. However, abrasive materials and polishing agents are not necessarily affiliated with this period and were used early in time for platform preparation and for removing sharp edges for hafting purposes.

Abrasives serve both to weaken and strengthen the platform area. When the platform is roughly abraded, the surface is weakened, the pressure or percussion tool will not slip, and the amount of force necessary to induce fracture is reduced. If the platform part is rounded, it is strengthened which prevents its crushing, thereby insuring the complete removal of the flake or blade.

Abrasive stones were also used to sharpen the tips of pressure tools and punches. Continual use of the abrasive stone formed grooves of a distinctive pattern which are often mistaken for arrow shaft smoothers. Flakes of coarse granular stone were used as a saw to form implements of bone, antler, wood and soft stone. They were far more efficient than the edge of a vitreous flake or blade.

PERCUSSION

Percussion requires that the fabricator be large and heavy enough to induce sufficient force to exceed the elastic limits of the stone to cause fracture. Percussion tools are hafted or unhafted hammerstones of different hardness, texture and size; billets or rods of wood, antler, bone, ivory and horn; and the worker may even use an anvil for support of the working piece.

The type of hammerstone material and the technique is determined by the quality of material being worked and the stage of manufacture. The hardness or softness of the hammerstone controls the interval of contact between the percussor and the flint-like material, for the time of contact is proportionate to the yield and density of the percussor. If the hammerstone or billet is of sandstone, wood, antler or bone, then the interval of contact is prolonged. If the percussor is of flint, steel or hard wood, then the interval of contact is shortened. If the percussor is soft, it must be large and weighty and the velocity of the blow must be increased; for if the piece being worked is small and a soft percussor delivers a slow blow, the artifact will move with the applied force. The density of the percussor must correspond to the size and type of material being worked, and the applied technique. If the stone being worked is sufficiently inert, the size and weight of the percussor may be increased and the velocity of the blow decreased to the point where the applied force will almost approach pressure. A very hard percussor often will crush or shatter the flake or artifact and so is used for only a few techniques. Relatively soft percussors contact a larger area than hard percussors, causing the cone of force to have a larger truncation and the flakes to have diffused bulbs of percussion.

The wear pattern on percussors can be of diagnostic value in interpreting techniques. The position and depth of the wear pattern, striations, bruising and battering aid in reconstructing the manner in which the percussor was held, the way the blow was delivered and the probable stage of manufacture. Experiments revealed that an elongated cobble with wear pattern on one margin was actually a hammerstone used for blademaking, whereas it had previously been defined as a rubbing stone (Crabtree and Swanson 1968). Scarring can indicate whether the percussor was projected in an arc-like or straight line blow. Battering on one or both ends can indicate that the tool was used as a hammer to section large pieces of lithic material. The wear pattern on some percussors reveals that they were used for pecking rather than for flake removal.

THROWING

The simplest and probably one of the earliest methods of toolmaking was by throwing the raw material with great force against an anvil stone to break or shatter it into usable pieces with sharp edges. These flakes could be used "as is" or the edges sharpened by modification. Observers have noted this technique in recent times among the Australian aborigines (Gould and Tindale, personal communication 1969). However, it is sometimes necessary to use this method to make the first break on spherical material having no flat surface on which to apply the force. Rounded surfaces slant with the direction of the blow, so the force must impart great energy to prohibit the ricochet of the cobble or percussor. Spheroids which are broken by throwing often shatter, splinter, exfoliate or split, depending on the weight of the cobble and the velocity of the throw. Throwing generally detaches planoconvex exfoliated flakes with closely spaced compression rings but no bulbs of force. If the cone shatters, the flakes will be angular and pointed with a flat surface. When angular material is thrown, the results are unpredictable.

HAND-HELD DIRECT PERCUSSION

Using this technique, the worker holds the objective piece in the hand, or hands, and strikes it against an anvil stone. This is a hazardous method, for the flakes fly in the direction of the worker and the fingers between the anvil and the piece being struck are vulnerable. However this technique can be used to make burins from flakes or blades, to remove ends from tranchet cleavers, to detach Levallois flakes from specially prepared cores, to remove blades from cores, and to sever elongated pieces of lithic material by holding both ends and striking the mid-section against the anvil stone. The break is flat and each half is well suited for a blade or flake core.

BI-POLAR

This technique requires placing the objective piece on an anvil stone and striking with a percussor. Small pebbles and cobbles may be fractured in this way, much the same as one would crack a nut. Force is induced from both the anvil and the percussor, causing cones of force to form at both ends of the pebble or cobble, not necessarily leaving cone scars. When the force is in direct opposition, the cones exceed the elastic limit of the material and it shatters. The debris will resemble segments of an orange.

The ideal bi-polar fracture is to form a cone at each end of the material by directing one of the forces slightly off-center which will split or shear the pebble. Shearing radiates the force waves from

one end or the other, usually from the end having the least contact with the percussor or anvil. This technique seldom leaves a positive or negative bulb of force scar. But the bi-polar shearing technique leaves force wave scars at the area of least contact and the opposite end may show signs of crushing.

Archaeological texts often erroneously indicate that blades made by the bi-polar technique have bulbs of percussion at both ends. Experiments contradict this theory. Blades removed from an anvil-supported core must have the leading edge of the core's base free of contact with the anvil which prohibits a bulb at both ends. Also, the force must be directed tangentially rather than perpendicularly to the face of the core, and the detached blade will have one bulb of force at the proximal end. If the bi-polar technique is used for blademaking, the force is in direct opposition from anvil and percussor and the blade will collapse and there will not be bulbs of percussion on both ends. Cores can have blade scars on the same face and bulbar scars at both ends, but this is not true of blades. Anvil-supported cores produce flatter blades than when hand-held or placed on a yielding support. The anvil is useful in many techniques but the force is normally not applied in direct opposition to the anvil. A true bipolar technique is used to shape and to back a flake or blade. It involves detaching crushed flakes from one margin to form a right angle and blunt the edge opposite the cutting part.

DIRECT FREEHAND PERCUSSION

This is a technique of holding the objective piece in one hand and striking with a hammerstone or billet to detach flakes or blades. All of the diverse variations of this technique will probably never be known, but it prevailed during the entire Stone Age until metal implements were available. The technique was used to make simple tools by striking vertically to the margin of a lithic cobble with a hard hammerstone to remove rapidly expanding flakes with pronounced bulbs of force and sharp edges. If the process is continued, the worker can remove several flakes from a cobble, making a core chopping tool. If the cobble is turned after each flake is detached and the previous flake scar is used as a striking platform for the next flake removal, the worker can make a bifacial tool such as a simple pointed handax. The handax served as a multi-purpose implement, for cutting, chopping, boring, and digging. Clactonian implements were made with this technique and were thick and strong and able to withstand considerable abuse.

Progressively through time, man improved his percussion methods and developed more diverse and sophisticated techniques of flake removal with greater control of (1) platform, (2) width, (3) length, (4) thickness, (5) curvature, and (6) termination.

(1) A platform area may be a natural or prepared flat surface to receive and withstand the applied force. The platform can be made be removing a flake or flakes, or can be prepared by abrasion, by creating the proper angle by pressure or percussion, or by removing the overhang. (2) The width of the flake or blade is controlled by the surface area of the material. Plane or flat surfaces allow the flake to spread while a ridge, or ridges, will confine the force and allow a long flake or blade to be formed if the angle and degree of force is correct. The natural or prepared angle of the ridge or degree of convexity control the width of the flake or blade. (3) Length is controlled by the surface area. If a ridge is established and continuous force applied, the flake or blade will be longer and will terminate at the end of the ridge. If the surface is plane, the flakes will spread and terminate short. Termination is controlled, in part, by the angle of the applied force. (4) Thickness is primarily controlled by where the force is applied on the platform. Near the edge gives a thin flake or blade and away from the edge gives a thick flake or blade. However, if the platform is made strong by abrasion, the blow may be near the edge and a thick flake detached without the platform collapsing. (5) The straightness of the flake or blade depends on the inertia of the material. Large masses of stone will remain inert because of their size and weight. If the piece is small it can be supported either by a clamp or placed on an anvil. If the working piece is held loosely in the hand and rolls with the blow, the flake or blade will be curved. Another factor is the manner of the blow--an arc-like blow will cause curving while the straight line blow will produce straighter flakes and blades. (6) Flakes or blades may terminate by predetermined techniques--feathering, hinge or step fractures, or by carrying through to detach the opposite end of a core or margin of the artifact (<u>lamés outrepassée</u>, Tixier, 1963). The trait of flake and blade termination is the result of regularity or irregularity of the material surface and the amount and angle of force.

<u>INDIRECT PERCUSSION</u>

Indirect percussion is used for making and finishing tools and requires the use of a punch (indirect tool). The punch is a semi-pointed

or blunt rod-like object of tenacious stone, bone, antler, horn, ivory or hard wood. The selection of the punch type depends on the quality of the material being worked, the technique and the worker's preference. The percussor imparts the force through the punch to the established platform. Indirect percussion allows the worker to accurately place the tip of the punch on the platform and maintain, with precision and control, a constant angle during the percussion. The punch technique is more accurate than direct percussion and detaches straighter and more uniform flakes and blades with small platforms (Bordes and Crabtree, 1969). However, the punch technique does present a problem of holding the preformed material. For good results, two persons are required--one to hold the stone tool or core and the other to hold the punch and deliver the blow; or the worker can hold the working piece between his feet and deliver the blows himself. He may also improvise a vise by lashing two pieces of wood together with sinew and use a stone as a wedge to hold the material inert.

For indirect percussion it is necessary to place the tip of the punch on the edge of a prepared platform of a preformed core or biface, depending on whether blades are to be made or the biface is to be thinned and made regular. The piece may be placed on an anvil of stone, bone or antler. The punch is held at an angle tangential to the proposed flake or blade scar and a blow struck with the percussor in a straight line to the punch. The percussor may be a simple hafted or unhafted hammerstone, billet of hard wood, antler or bone--the weight and size depending on how much force is needed to fracture an area of predetermined size. Characteristics of punch flakes and blades are small platforms and a standardization of size and form. A lip is often present on the ventral side at the proximal end of the flake or blade and they have less undulations than those made by direct percussion.

Another technique of indirect percussion is to place the objective piece at an angle on an anvil or a fixed punch and strike the blow on the artifact. A yielding percussor is used to eliminate bruising and to detach a flake from the part contacting the anvil or punch. A simple burin core may be made by placing the corner of a truncated flake or blade on an anvil and striking the margin of the flake with the percussor to remove a burin blade. The fixed punch can be used to notch large bifacial tools like hoes and large lanceolates. The tip of the punch is seated near the margin on the opposite face. The biface edge is placed horizontally to the vertical fixed punch and a light blow is delivered at a ninety degree angle to the exposed face of the artifact and slightly inward to the fixed punch. After each flake is removed, the biface is turned over and the operation is repeated until the notch has reached the desired depth. The resulting flakes are lunate, resembling the quarter moon.

PRESSURE FLAKING

Pressure flaking tools are of many materials and are of various forms and sizes. They range from a simple elongated pebble or deer antler tine to the more complex composite tools such as the elaborate pressure tools of the Arctic carved from ivory to fit the hand and with replaceable bits. Stone pressure tools are rare. The most commonly used were of organic materials such as bone, ivory, hardwood, horn, shell and whatever materials were available (Crabtree 1970). Rodent teeth and small bits of shell were used for denticulations, notching, barbing and serrating. There are ethnographic accounts of the Australian aborigine using his teeth in a biting motion to sharpen dull stone tools. Pressure tools are used to apply force with accuracy and precision to the edge of the proposed artifact to detach controlled flakes. The pressure technique permits the worker to feel and control individual flake detachment to produce an artifact that is regular in form and with a sharp cutting edge.

Pressure blades can be removed from a core by using a chest or shoulder crutch or a staff held by both hands. When using both hands, the core must be secured in a vise or clamp--two logs lashed together with sinew and a stone used as a wedge to hold the piece firmly in place (Crabtree, 1968).

There are many methods of detaching flakes--random, parallel, diagonal, chevron, collateral, oblique, etc. But, technically, they all have basic methods that involve placing the pressure tool on a prepared or natural platform on the margin of the preform and applying pressing force to detach a flake on the obscure side. The varieties of pressure techniques are infinite and vary with (1) the worker's design of the artifact, (2) combinations of inward and downward pressure, (3) various hand and body positions, (4) many designs of platforms, (5) use of supports such as anvils, hands, etc., (6) varieties of pressure tools, (7) methods of holding, (8) superior and inferior lithic materials, and (9) intended function.

The artifact is held at a right angle on a pad in the cupped palm of the left hand with one end resting on the heavy muscle of the thumb.

The curled fingers apply gentle but firm pressure to keep the artifact in position. The back of the left hand holding the artifact is positioned on the inside of the left thigh, giving additional support. The tip of the pressure tool is firmly seated at a right angle to the long axis of the artifact on the leading edge near the base. The edge has previously been made regular and a platform established by removing small flakes or by abrading to prevent crushing. Inward and downward pressures are applied simultaneously bringing together the knees and applying pressure from the hands, arms, and shoulders. The width of the flake, rather than the length, generally governs the amount of pressing energy. Flakes are detached from the underside (obscure side) of the artifact and the worker must "feel" rather than see his work.

Generally, pressure flakes are small and thin as compared to those made by percussion or indirect percussion. An exception is the pressure technique of detaching burin blades which are relatively thick compared to their width. Contrary to popular belief, flakes detached by the hand-held pressure technique may exceed two inches in length and are often mistaken for percussion flakes. Pressure blades made by using the crutch may be as long as ten inches when the lithic material is vitreous. Unfortunately, the last stage of pressure flaking detaches small flakes which are seldom recovered for analysis. They are also thin and have a tendency to collapse even though they detach and terminate properly. Breakage is due, in part, to support of the artifact by the palm of the hand. Pressure flakes are usually twice the width of the flake scar. When a ridge is used to guide flake removal, the detached flake retains half the previous scar on the dorsal side.

There are two methods of using the cone principle to apply pressure. Pressure force applied in only a downward direction will cause the flake to be removed tangentially to the direction of the applied force, much the same as direct percussion. These flakes are generally short with a feathered termination and have salient bulbs of pressure. The second and most commonly used method is to apply pressure in two directions--pressing inward in the direction of the desired flake and simultaneously pressing away from the margin. This shifts the fracture angle of the cone and when the proximal end of the flake starts detachment, the downward force is stopped but the inward force is continued. If the applied force is guided by ridges or convexities, long, narrow flakes can be removed. Without the ridge control, the flakes will spread regardless of the technique.

Pressure flaking is used for shaping, toolmaking, sharpening, modification, preparation, etc. Special selected flakes can be modified into small tools or projectile points and percussion preforms pressure flakes into bifaces. Also, flakes and blades are straightened by removing pressure flakes from the ventral surface at the proximal and distal ends until the curve is eliminated. Pressure flaking is also used to remove irregularities and make uniform margins on preforms and other implements to be finished by pressure flaking.

When the artifact has been made regular, the worker can rhythmically remove uniform flakes and develop a systematic constant use of muscular motor habits which respond to consistent ratios of inward and downward pressing forces. The tip of the pressure tool is seated in line with a ridge left by the detachment of the previous flake and the worker presses to remove one-half of the previous scar. Correct placing of the pressure tool on the margin demands practice and skill to insure firm contact and prevent slipping as the downward force is applied. "Feel" is developed to coordinate the ratio of the inward and downward forces. Improper ratio of too much downward force will cause the flake to terminate short and make an acute edge on the margin of the artifact. The platform must adhere to the detached flake to leave a sharp edge. A series of such flakes detached from a margin will leave an extremely sharp edge even though slight irregularities may exist. A pressure flaked margin on an artifact, flake or blade can be made either acute or obtuse, depending on the intended function.

Pressure flakes and their corresponding scars are generally more uniform, have better definition and constant elements of character and, therefore, are more diagnostic than those made by percussion. It is often necessary to pressure-flake some artifacts several times before they are sufficiently uniform for the final flaking. Since only the last stage of flake scars remains on the artifact, the analyst may not consider previous stages of pressure work in his analysis.

Early ethnographic accounts of explorers, historians and observers have noted different manufacturing techniques of stone implements (Ellis, 1940) of both the North American Indians and other groups in the world. Comparatively recent work by Ishi, one of the last Indians to flake stone (T. Kroeber, 1964; and personal communications A. L. Kroeber, 1939) and a few Australian aborigines (Gould, Tindale and Birdsell, personal communication, 1969) are our

most dependable sources of information. Of all the accounts of manufacturing flaked implements, the only one to mention thermal alteration is an observation made by J. W. Powell in 1875 and quoted by Lowie (1924) regarding the stone work of the Plateau Shoshoneans.

> "The obsidian or other stone of which the implement is to be made is first selected by breaking up larger masses of the rock and choosing those which exhibit the fracture desired and which are free of flaws; then these pieces are baked or steamed, perhaps I might say annealed, by placing them in damp earth covered with a brisk fire for twenty-four hours. Then, with a sharp blow they are still further broken into flakes approximating the shape and size desired. For the more complete fashioning of the implement, a tool of horn, usually of mountain sheep, but sometimes of the deer or antelope is used. The flake of stone is held in one hand, placed on a little cushion made of untanned skin of some animal, to protect the hand from the flakes which are to be chipped off, and with a sudden pressure of the bone tool, the proper shape is given. They acquire great skill in this, and the art seems to be confined to but few persons who manufacture them and exchange them for other articles."

1. MATERIALS COMMON TO FLAKED STONE TOOLS

(highly silicious mineral compounds)

- Kinds of Stone
  - Obsidian
  - Ignimbrite
  - Basalt
  - Rhyolite
  - Welded tuff
  - Chalcedony
    - Flint and Chert
    - Agate
    - Jasper
    - Silicified sediments
    - Silicified wood and other Pseudomorphs
  - Opal
  - Quartzite
  - Quartz Crystal
- Grade
  - Desirable
    - Isotropic
    - Cryptocrystalline
    - Homogeneous
    - Elastic
    - Vitreous
    - Adequate size
  - Undesirable
    - Cleavage plane
    - Inclusions
    - Non-homogeneous
    - Vesicular
    - Inherent stress or strain
    - Crystal pockets
    - Fissures
    - Checks
    - Molecular unbalance
    - Frozen

- Source
  - Surface
  - Alluvium
  - In situ
    - Quarries
    - Veins
    - Outcrops
    - Ledges
    - Concretions
    - Fault zones
    - Filled voids
- Texture
  - Vitreous
    - Glassy
    - Dull
    - Micro-impurities
  - Granular
    - Fine
    - Medium
    - Coarse
- Color
  - All colors and combinations of colors

2. LITHIC RESIDUE FRACTURED BY:

- Natural elements
  - Natural expansion
  - Natural contraction
  - Diastrophism
  - Rapid temperature changes
  - Internal force
    - Exfoliation
    - Dehydration
    - Expansion
    - Contraction
    - Relieving Internal Pressure
    - Natural Thermal Treatment
      - Natural Plant Cover Fires
      - Vulcanism, Lava Flows, etc.
  - External force
    - Pressures from overburden
    - Unconsolidated lower strata
    - Freezing
    - Ice Movement
    - Water motivation
    - Gravitational adjustment

- Artificial elements
  - Hoofed animals
  - Man
  - Intentional thermal fracture
  - Intentional fracture, producing flakes and cores
  - Intentional thermal treatment
    - Heated
      - More elastic
      - Texture change
        - Relieve stress
        - Sharper edges
      - Color change
    - Unheated
    - Overheated
      - Crazed
      - Heat cracks and checks
      - Potlids
      - Exfoliation
      - No bulbs of force

3. CORES

- Conical
- Cylindrical
- Rectangular
- Unifacial
- Bifacial
- Multifacial
- Bi-polar
- Exhausted
- Utilized
- Nuclei implements
- Lena River core
- Levallois core
- Shirataki core
- Others

4. FLAKES

- Percussion
- Indirect percussion
- Pressure
- Pressure and percussion
- Size
  - Small
  - Medium
  - Large
  - Micro-flakes
    - Minute retouch
    - Notching
    - Serrating
    - Platform preparation
- Length
  - Short: width = length
  - Medium: 2 x width = length
  - Long: 3 x width = length
  - Extra long: 4 or more x width = length
- Width
  - Conchoidal (flat)
  - Circular (bi-convex)
  - Expanding (sub-triangulate)
  - Wide expanding: width several times length
- Thickness
  - Thin
  - Normal or average
  - Thick
- Straight
- Flat
- Curved
- Spiral
- One dorsal ridge
- Two or more dorsal ridges
- Margins
  - Parallel
  - Sub-parallel
  - Ovate
  - Irregular

- Proximal end
  - Size of platform
  - Preparation of platform
    - Flaking
      - Character
      - Order
    - Isolation
    - Abrading
    - Grinding
    - Angle of platform
    - Character of bulb of force
      - Salient
      - Diffuse
  - Force scars
  - Eraillure
  - Marginal striations
  - Direction of dorsal scars
  - Size of cone truncation
  - Platform overhang
- Distal end
  - Compression rings
  - Undulations
  - Shock fracture
  - Feathered termination
  - Hinge fracture
  - Step fracture
  - Reverse hinge
  - Termination removing distal material
- Specialized flakes
  - Blades
    - Prismatic
    - Micro
    - Parallel sides
    - One dorsal ridge
    - Two or more dorsal ridges
    - Burin blades
  - Sidestruck flakes
  - Channel flakes
  - Hinge flakes (dorset knife)
  - Eraillure
  - Reverse hinged flakes
  - Rejuvenation flakes
  - Transient flakes
  - Levallois flakes
  - Shirataki platform flake

5. TECHNOLOGICAL FEATURES (of flaked artifacts, projectiles, knifes, etc.)

- Faces
  - Dorsal and ventral
  - Irregular, random (indiscriminate pressure or percussion)
    - Rough out
    - Blank
    - Preform
  - Regular
    - Wide
    - Medium
    - Narrow
    - Parallel (right angle to margin)
    - Oblique
    - Double oblique
    - Flaked from one edge and one margin
    - Flaked from one edge to opposite margin
    - Sequence of flake removal
    - Indicate direction of force by compression rings
    - Angle of flake removal
    - Thinning technique
    - Termination of flakes
      - Feathering
      - Step
      - Hinge
      - Meet at median
    - Depths of ridges and troughs
    - Character of bulbs of force
    - Unflaked surface
    - Flat flaking
    - Curved flaking
    - Number of flakes per inch

- Edges
  - Angle
  - Irregular
  - Regular
    - Curved
    - Straight
    - Beveled
    - Sharp
    - Dull
    - Sinuous
    - Alternating
    - Detached opposite ridge on other face
    - Abraded (functional)
    - Ground
    - Polished
    - Serrated
      - Shallow
      - Medium
      - Deep
      - Technique
        - One face
        - Both faces
        - Alternate faces
        - Serrated as retouched
        - Crushed
- Basal aspects
  - Thinning
  - Fluting
  - Grinding (one to three flakes from one or both faces)
  - Grinding
  - Polishing
  - Hafting technique
    - Stemmed or shouldered
    - Notched
      - Corner
      - Side
      - Base
        - Straight
        - Concave
        - Convex
        - Recurved
      - Barbing
    - Unstemmed
    - Unnotched
      - Traces of adhesive

- Transverse Section
  - Plano-convex
  - Convex
  - Bi-convex
  - Diamond
  - Rectangular
  - Trapezoidal
  - Beveled
- Tips
  - Transverse
  - Attenuated to blunt
  - Micro-burins on tips
  - Re-pointed
  - Direction of flake scars on points

6. TOOLS FOR MAKING FLAKED STONE ARTIFACTS

- Direct Percussion
  - Quarries
    - Large tenacious hammerstones
      - 20-40 pounds
    - Picks
      - Stone
      - Antler
    - Digging sticks
    - Levers and bars
    - Wedges
      - Stone
      - Wood
      - Antler
    - Hafted and unhafted hammers
      - Stone
  - Quartering
    - Medium size, hard hammerstones
  - Cortex removal
    - Medium hard, medium size, hammerstones

- Blades and flakes
  - Pointed or bi-pointed hard hammerstones
  - Edge of medium size and medium hard hammerstones
  - Medium size, soft hammerstones
    - Glassy materials
  - Anvils or supports
  - Shape of percussor
    - Spherical
    - Round
    - Ovate
    - Bi-convex
    - Cylindrical
    - Discoidal
    - Faceted
    - Consumed or exhausted
    - Percussors conforming to material and size
      - For flakes or blades
- Core preparation
- Cores and core tools
  - Hammerstones of assorted shapes, sizes and hardness
  - Billets
    - Antler, Horn, Wood, Bone and Stone
- Rough outs
- Large flakes
- Blanks
- Preforms
  - Hammerstones
  - Billets
- Thinning
- Finishing, soft hammerstones and billets
- Sharpening
  - Wooden billets

- Indirect percussion
  - Punch and percussor
  - Anvil and percussor
    - Holding device
    - Second person
  - Pressure flaking
    - Antler tines
      - Moose
      - Deer
      - ?Caribou
      - Elk
    - Horn
      - Antelope
      - Goat
      - Sheep
      - Bovines
        - Buffalo
        - Cattle
    - Ivory
      - Mammoth
      - Elephant
      - Walrus
      - Narwhale
      - Whale
    - Bone
      - Mammal ribs and long bones
    - Wood
      - Selected, hard resistant woods
    - Teeth
      - Rodent
      - Exterior enamel
      - Carnivore
    - Metal
      - Copper
      - Iron
    - Shell
      - Mollusca
  - Notching
  - Barbing
  - Serrating
  - Denticulations

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PART II

A GLOSSARY OF FLINTWORKING TERMS

BY

Don E. Crabtree

with the editorial assistance of

Guy Muto
Christine Lovgren
Earl H. Swanson

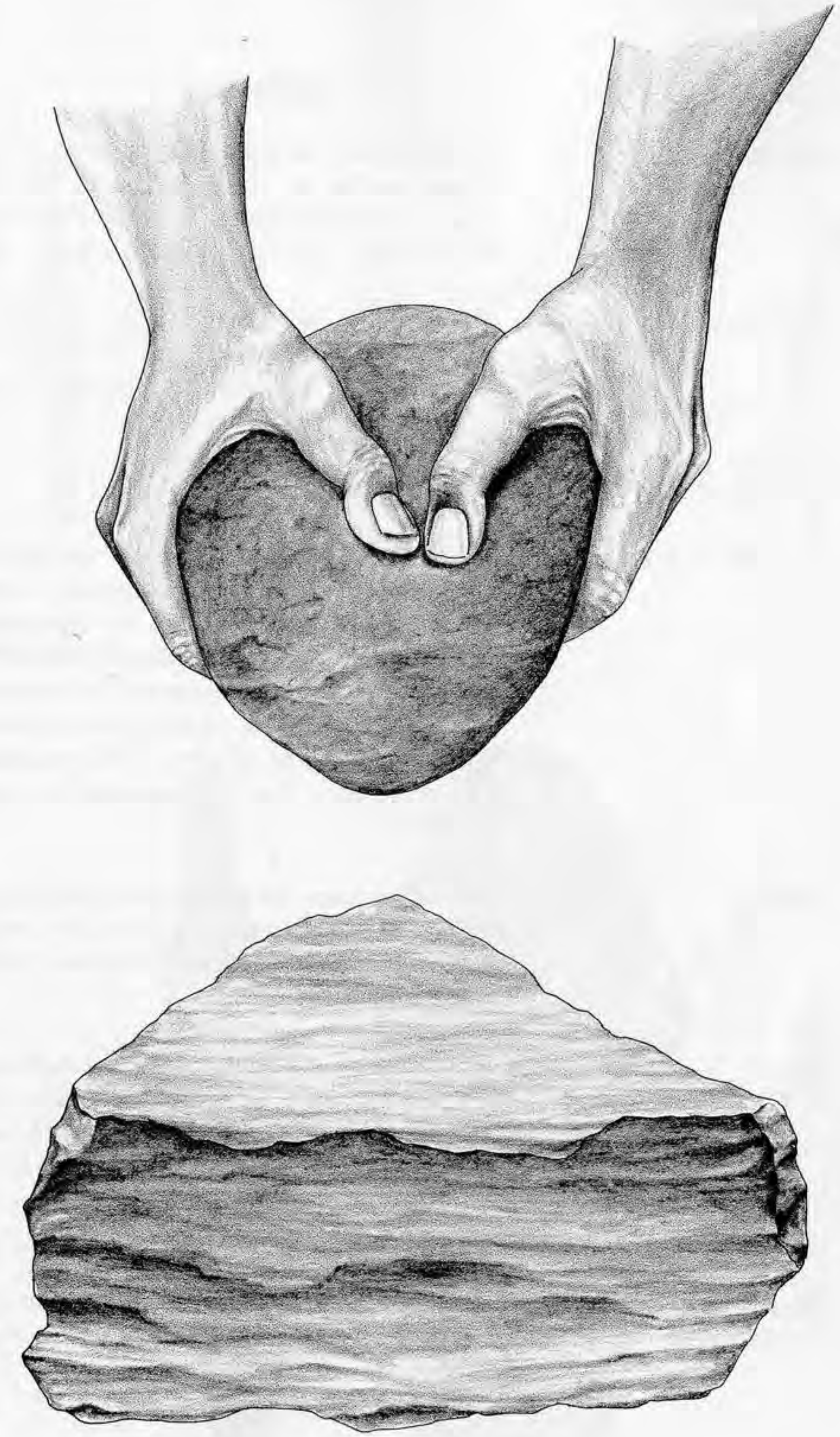
and illustrations by

Mary Keeler

GLOSSARY

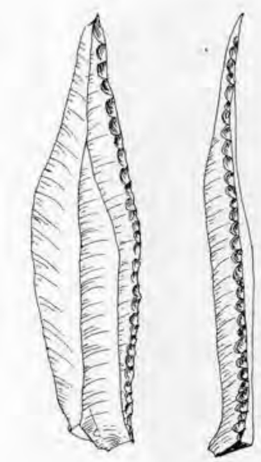
Term	Definition
Aberrant	Deviation from normal. Odd, peculiar. Exhibiting characteristics peculiar to a particular technology or technique.
Aboriginal	Original inhabitant; native inhabitants of a region.
Acuminate	Taper-pointed; tapering gradually to the tip, e. g., perforator, acuminate bulb.
Alternate Flaking	Flakes removed alternately from the same edge from first one face and then the other. Applies to both pressure and percussion techniques.
Amorphous	Denoting an irregular shape. Of no determinate form, without classifiable shape especially with reference to some cores.
Amputated	The severing of a flake, blade, or artifact either by applied force or end shock. Syn.: truncated, severed, (p. 61).
Angle of Force or Angle of Applied Force	The angle at which the force of flaking is applied either by percussion, indirect percussion, pressure or the combination of pressure and percussion. Usually a vector of force representing a straight line. Having both magnitude and direction. An exception is the curved or arc-like path of flight when using a special percussion technique, e. g., billet or baton, cobble edge technique, block on block or anvil.

Term	Definition
Anterior	Top. End opposite the posterior. Example: the platform surface of a core is the anterior portion.
Anvil Technique	Objective piece is projected against a stationary object of sufficient hardness with sufficient force to accomplish fracture. See Block on Block (p. 35).
Applied Force	When the type of force used to fabricate an artifact is unknown, or questionable, the term "applied force" is substituted for pressure or percussion force until the actual technique is verified. Used until the analyst has verified whether the object was made by percussion, indirect percussion, direct pressure, or a natural force.
Arris	See Ridge, Crest.
Artifact	Derived from the Latin word facer, "to make." Primordial objects devised, produced, or modified by man (modification may be either by intent or by function). This text is primarily concerned with lithic artifacts and the fracturing implements needed for their manufacture.
Artificer	Same as flintknapper. See "Flintknapper."
Attenuate	To make thin, made thin in consistency; to lessen, to diminish.
Attribute of Form	Characteristics and peculiarities of shape which show an indication of culture traits. Example: outline.

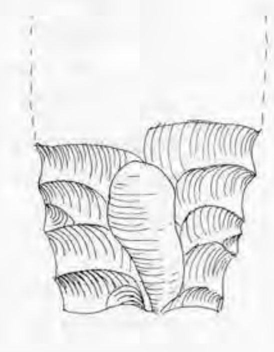


Anvil technique

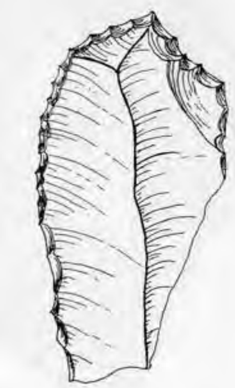
Term	Definition
Attribute of Technology	Techniques having diagnostic values which show modes of manufacture, characteristic traits, and patterns of human behavior. Examples: fluting, eraillures, fissures.
Attrition	Process of being attrited. Removal of material by natural, intentional, unintentional or functional abrasive processes.
Axis of Applied Force	See "Angle of Force."
Backed	The intentional dulling of one margin of a flake or blade by removing a series of flakes from the lateral margin opposite the sharp edge. In some instances, the toolmaker took advantage of natural backing, such as cortex, to serve as the same dulling medium. The method of blunting may be of diagnostic significance. (p. 37).
Barb	A projection on the lateral margins of an artifact - sometimes near the base - which slants in a direction from the distal toward the proximal end.
Basal Grinding	Intentional abrading and smoothing of the proximal margins and end of an artifact to prevent cutting the serving. Accomplished by rubbing the base of the artifact on some type of abrasive material. Presumably done to facilitate hafting.
Basal Thinning	A technique of removing either unifacially or bifacially one or more longitudinal flakes from the proximal end. Presumably done to facilitate hafting. (p 37).
Basal Portion (end)	The proximal end. See "Proximal End."
Basalt	Dark igneous rock with variable textures. Igneous derived from the Latin <u>ignis,</u> "fire." A volcanic origin stone.



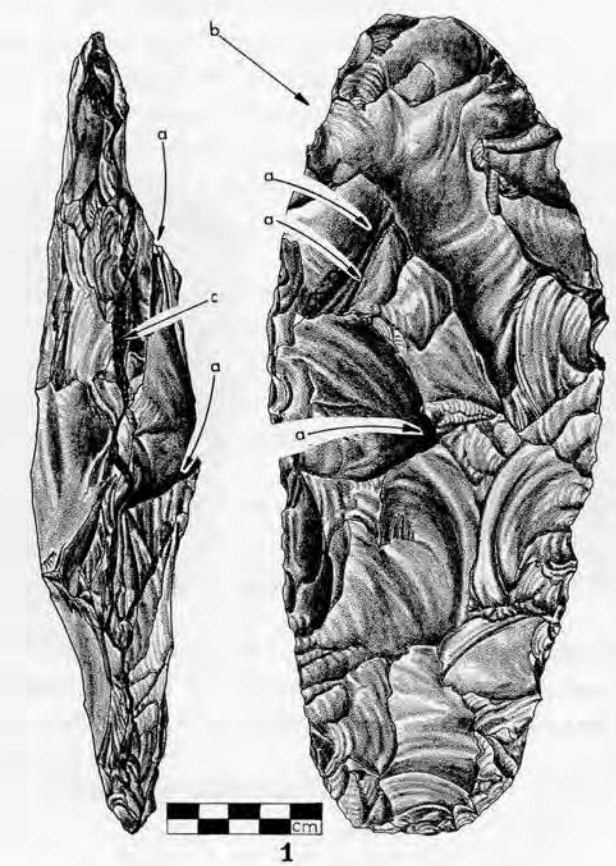
Backed blade



Basal thinning



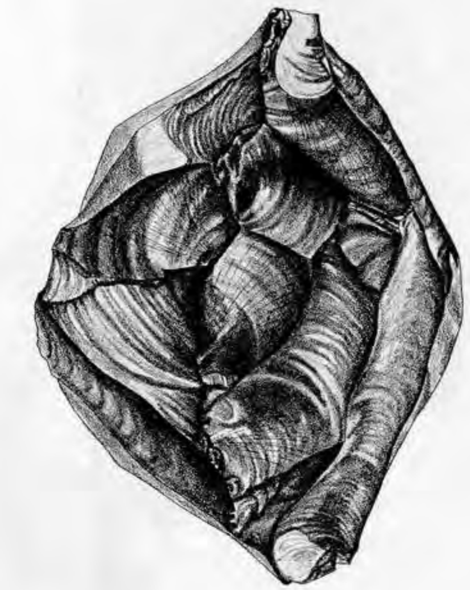
Denticulate tool



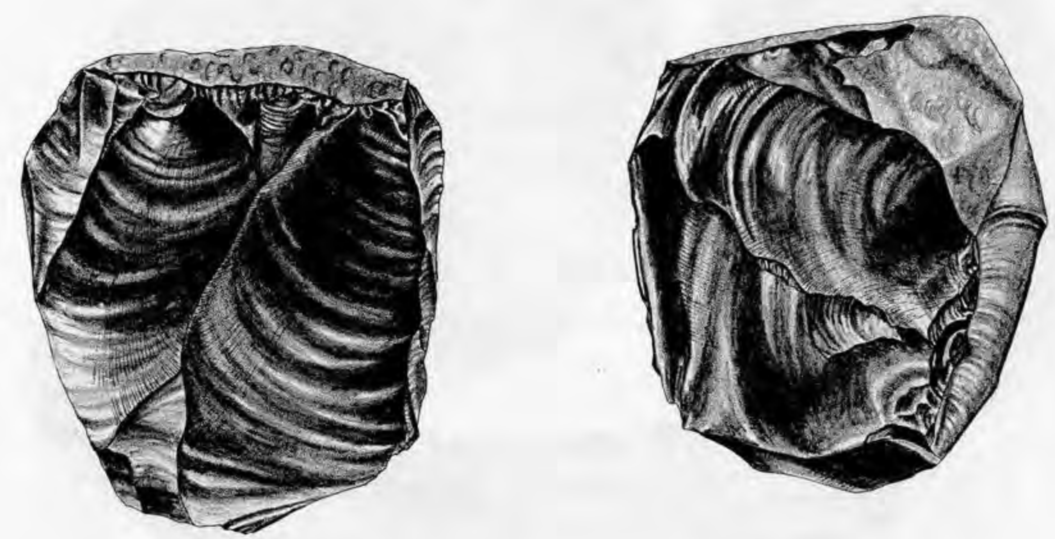
Biface from Rock Creek, Idaho

Term	Definition
Baton or Cylindrical Hammer Technique	The use of a rod-like baton to percuss thin flakes or blades from the mass. The percussor should be of material which will yield when contact is made with the objective piece. Batons may be of antler, horn, bone, or wood. See Billet.
Batter	From French "battre." Bruising of a surface by repetitious blows which can be uniform or irregular.
Beak	A hooked projection made by unifacial flaking. Generally made by the pressure technique. Syn.: spur. Example: A beaked burin.
Bending Flakes	Usually detached by pressure retouch. The flakes have pronounced curves on the plane of fracture. They leave scars on the artifacts which extend from one lateral margin toward the opposite edge and pass the median line. They are commonly diagonal.
Beveled Edge	An edge which has been manufactured to produce the desired edge angle or exposure for the removal of a desired flake or flake series. Also may be for sharpening or strengthening.
Bi-directional Cores	Nuclei which bear scars resulting from flakes or blades having been detached from two directions. (p. 39).
Bi-directional Flake and Blade Scars	Scars on cores or lithic tools which are the result of removing blades or flakes by applying the force from two directions.
Biface	Artifact bearing flake scars on both faces. (p. 37).
Billet	A club-like rod of material, other than stone, used to detach flakes from lithic material. Usually of wood or antler. See Baton.

Bi-directional tabular core



Bi-conical percussion core

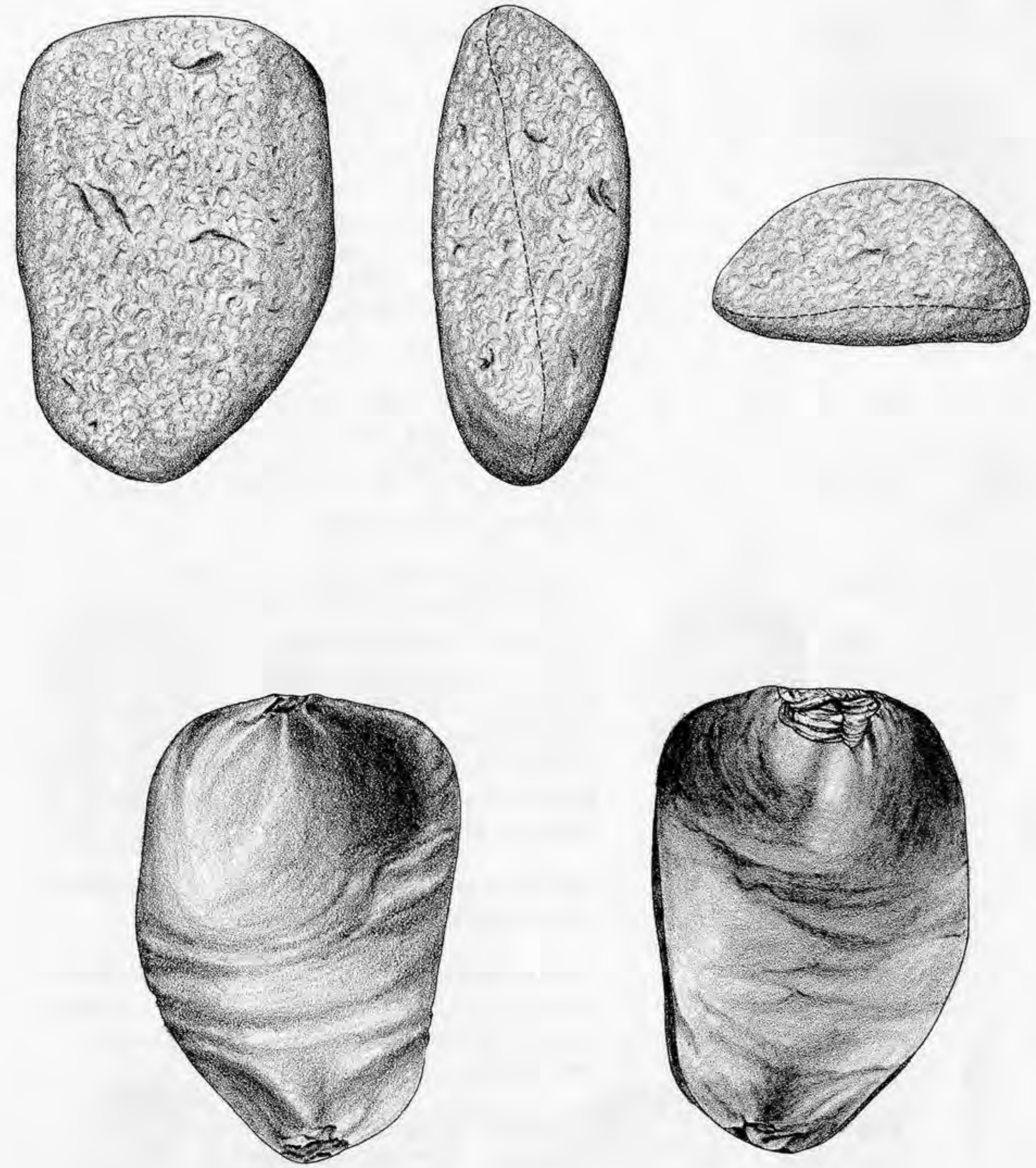


obverse reverse

Bi-directional cylindrical core

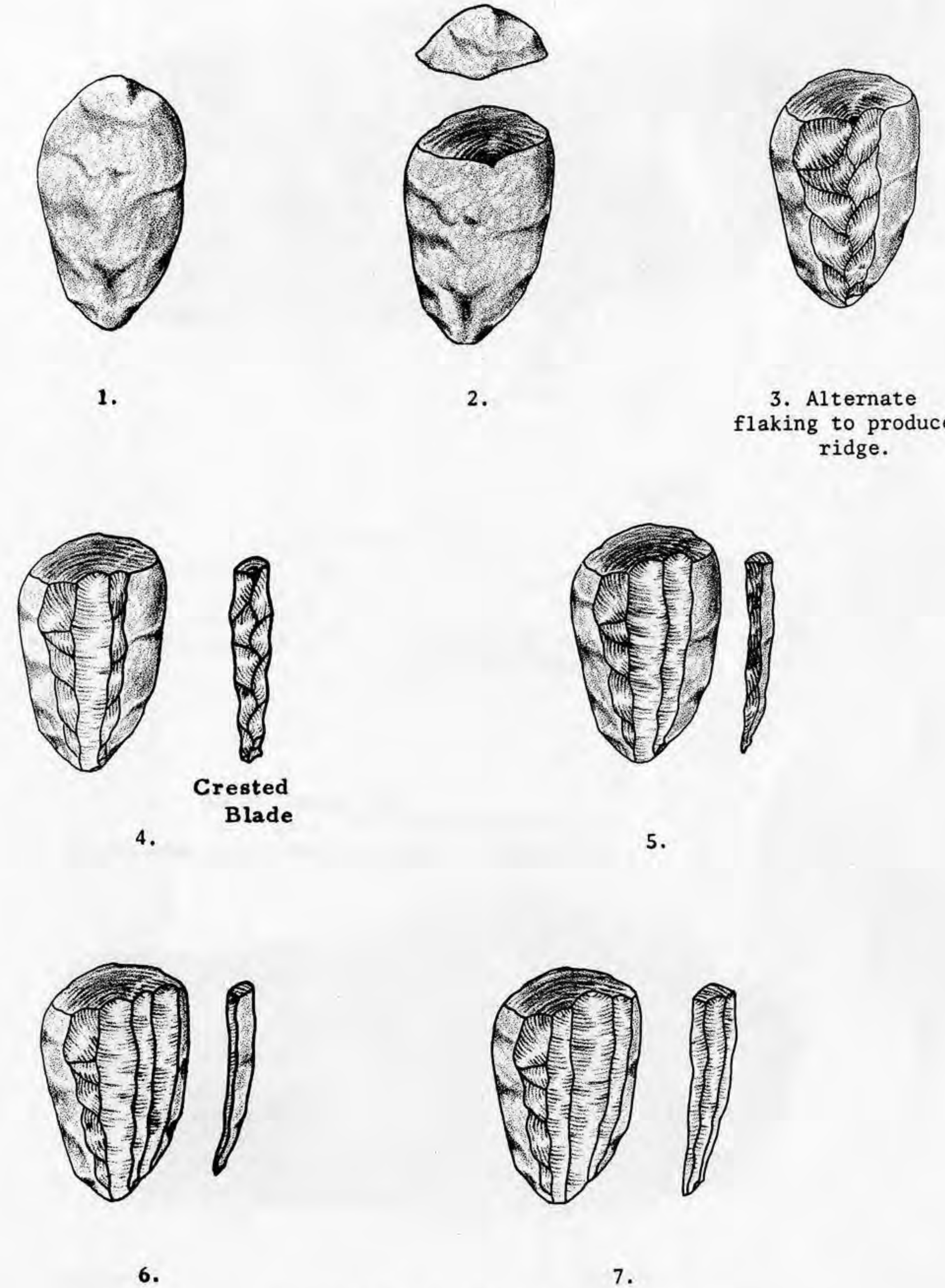
Bi-directional cores

Bi-polar technique

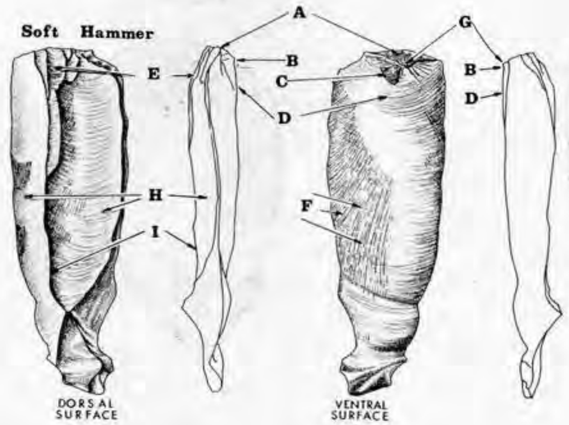


Split Cobble
Technique of resting core on anvil for percussion blow. Bulbs of force are not present at both ends. The cone of force is shattered or severed.

Term	Definition
Bi-polar	Technique of resting core, or lithic implement, on anvil and striking the core with a percussor. Contrary to popular belief, bulbs of force are not present on both ends of bipolar flakes or blades. This technique causes the cone of force to be shattered or severed. Cone confined to on^ end and is sometimes sheared. (p. 40).
Bit	An insert of bone, angler, ivory or metal into one end of a handle, or crutch, to make a composite pressure tool. The tip or forepiece of a composite pressure tool.
Blade	Specialized flake with parallel or sub-parallel lateral edges; the length being equal to, or more than, twice the width. Cross sections are plano-convex, triangulate, sub-triangulate, rectangular, trapezoidal. Some have more than two crests or ridges. Associated with prepared cone and blade technique; not a random flake. (pp. 43, 47 & 55).
Blade Scar	Concave surface. An artifact resulting from blade or flake detachment.
Blade Tools	Tools made from blades detached from a core. E. g., end scraper on a blade, backed blade, burin on a blade, and microliths.
Blank	A usable piece of lithic material of adequate size and form for making a lithic artifact - such as unmodified flakes of a size larger than the proposed artifact, bearing little or no waste material, and suitable for assorted lithic artifact styles. The shape or form of the final product is not disclosed in the blank. A series of objects in the early stages in the manufacturing process before the preform is reached.



Sequence of core and blade manufacture



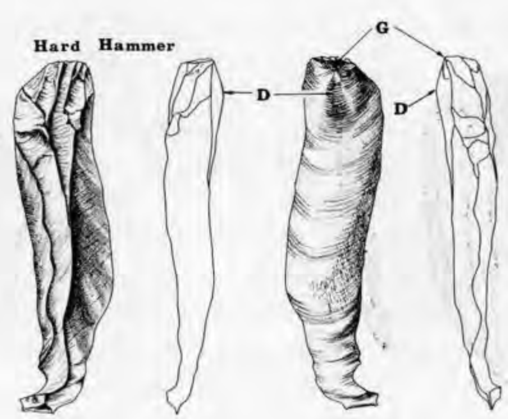
Dorsal Ventral

Soft hammer blade

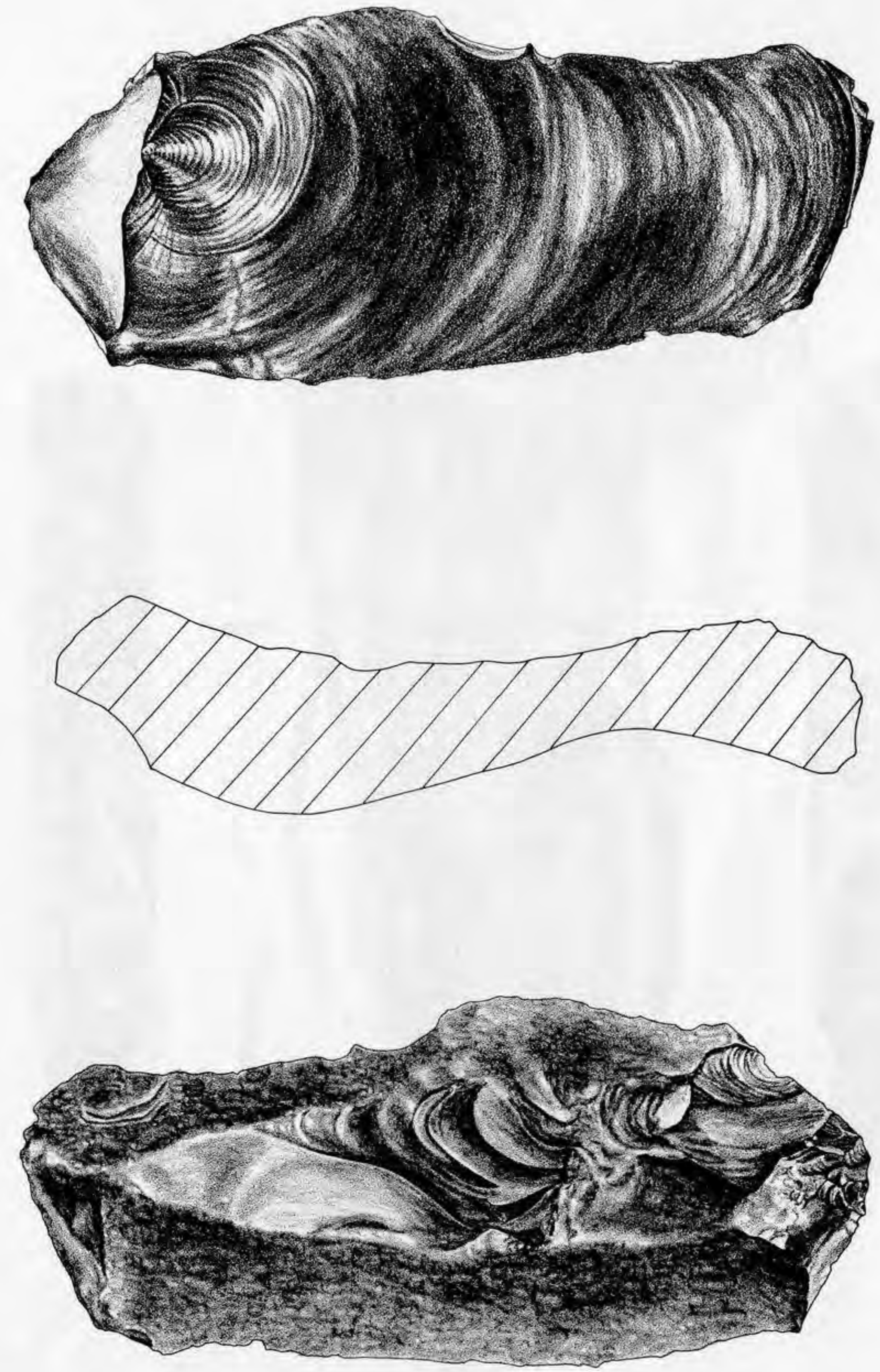
a. Platform
b. Lip
c. Eraillure
d. Diffuse bulb of force
e. Preparation flake scars
f. Fissures or hackles
g. Contact area
h. Previous blade scar
i. Dorsal ridge or arris

Hard hammer blade

d. Pronounced bulb of force
g. Slightly cursherd contact area; absence of lip



Dorsal Ventral

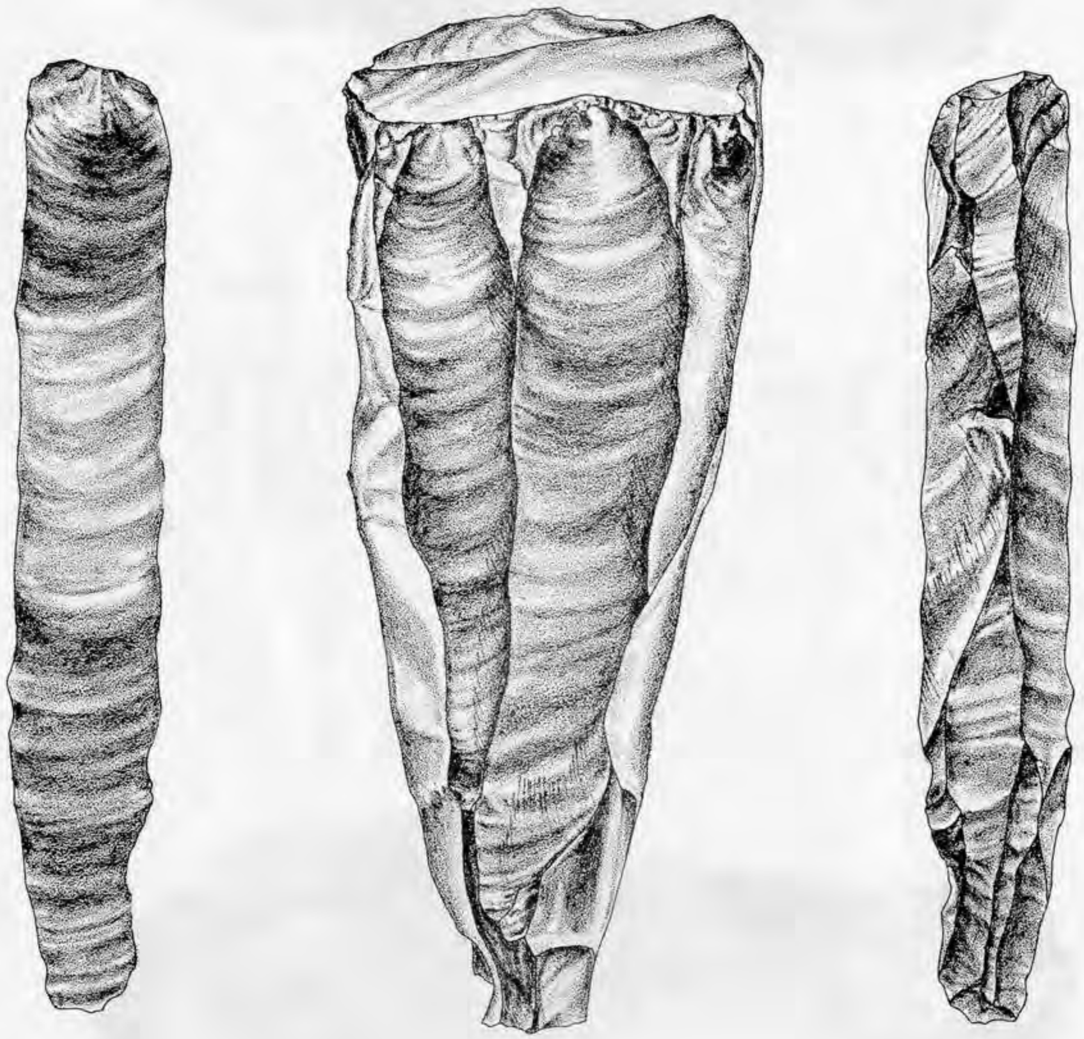


Ventral

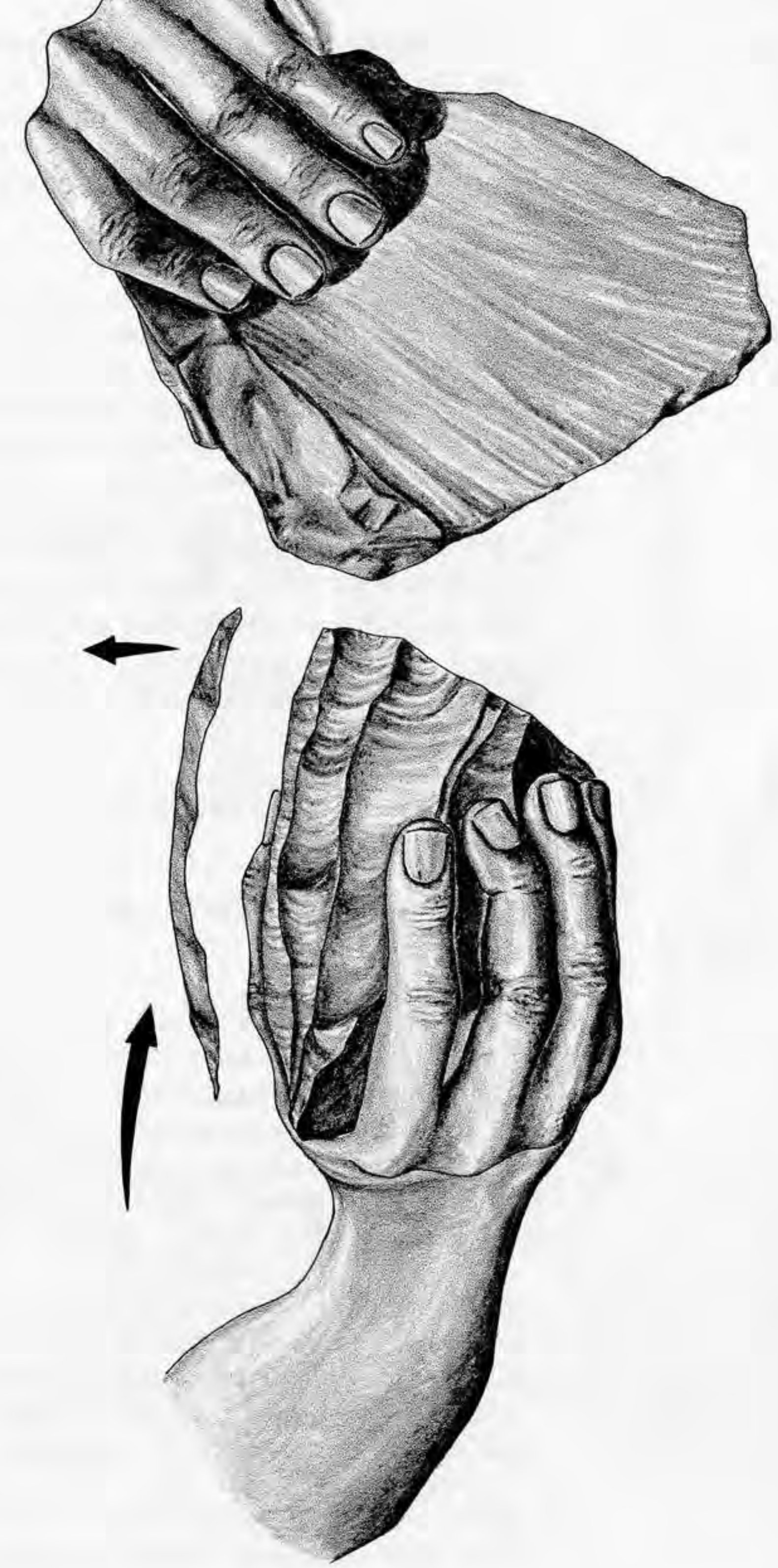
X-section

Dorsal

Hard hammer primary decortication blade

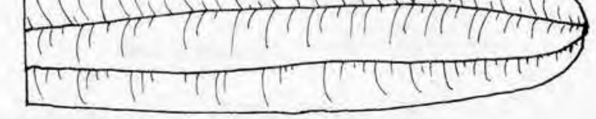


Percussion core and blades



Variant block on block technique for producing blades

Term	Definition
Block on Block	Method of removing flakes by swinging the core against an anvil. See Anvil Technique. May be used to produce large thick flakes as in the Clactonian industry or blades with thin platforms. (pp. 35 & 47).
Bulb of Applied Force	The bulbar part on the ventral side at the proximal end of a flake. The remnant of a cone part, the result of the application of either pressure or percussion force. Commonly called the "bulb of percussion," however, this signifies only one group of specialized techniques. Since the bulb of force is produced by both pressure and percussion, the term "bulb of applied force" should be used until the manufacturing technique is verified. Syn.: Cone of force. (pp. 44 & 53).
Bulb of Percussion	See Bulb of Applied Force,
Bulb of Pressure	See Bulb of Applied Force.
Bulbar Scar	The negative scar found on a core or core tool that results from the bulb of force - either percussion or pressure. It is a mirror surface or mold of the cone part resulting from flake detachment. In this use bulbar scar is not synonymous with Eraillure scar. Syn.: negative bulb force.
Burin	A chisel-like implement derived from a flake or blade; or the modification of other implements by using the burin technique to remove the edges parallel to their long axis and/or transversely or obliquely. Generally forms a right angle edge on one or both margins. The specialized flake removed as a result of the burin break is called a burin blade or spall. (p. 49).



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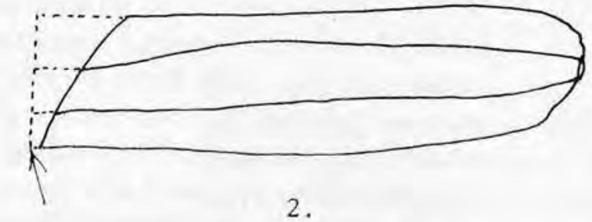

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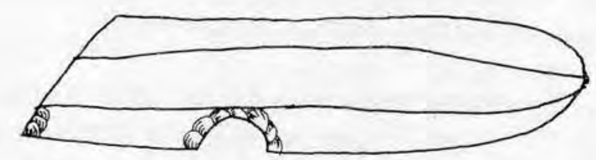
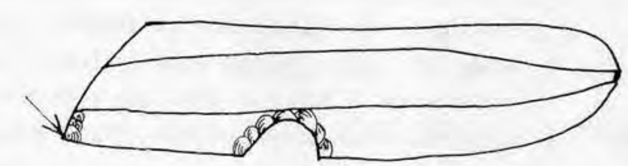
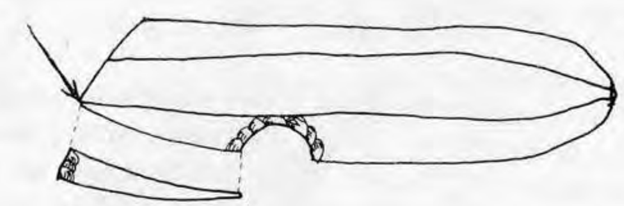


3.
Stop notch and platform preparation



4.
Angle of burin blow



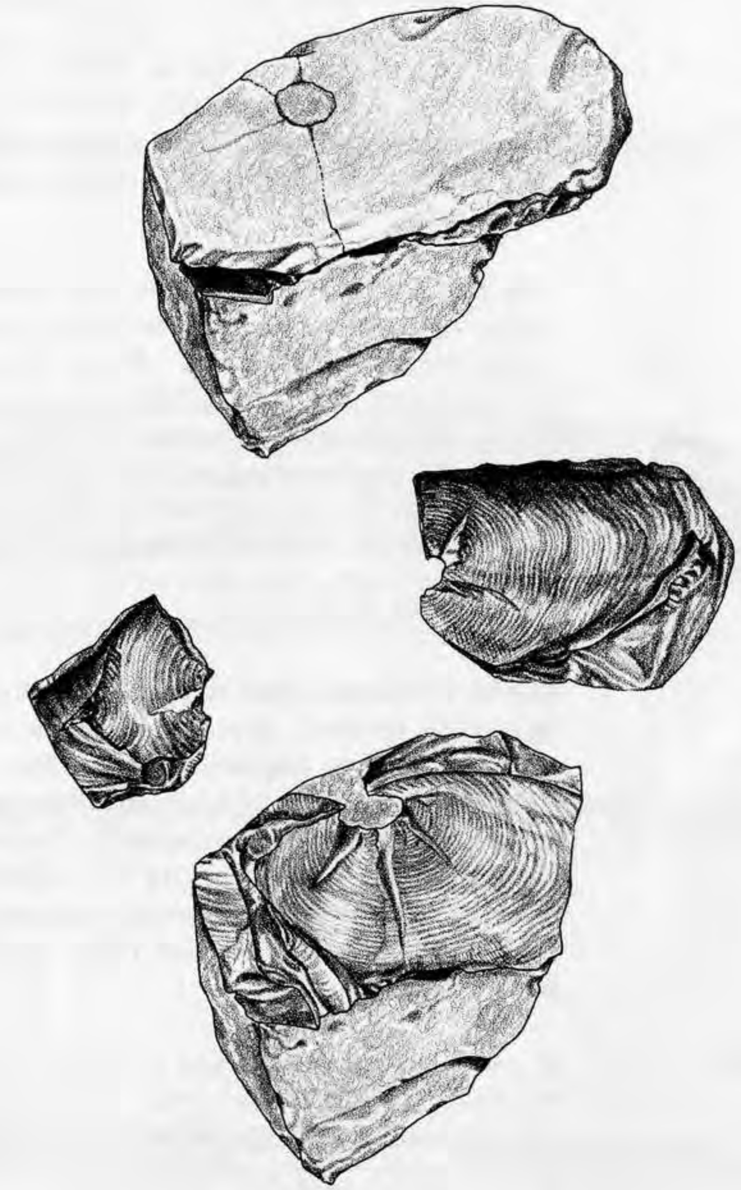
5.
Detached burin spall or burin blade

Sequence of burin manufacture

Term	Definition
Burin Blade	A specialized flake removed from a burin core, generally rectangular in transverse section. The dorsal side of the blade generally shows a single blade scar with lateral margins at right angles. The first burin blade removed from the core may show numerous variants, depending on the type of material used and because it bears scars of the worker's preparation to establish a ridge to guide the first blade. Syn.: burin spall.
Burin Break	Scar left on flake or blade resulting from the removal of a burin spall. The right angle edge or break, severed transversely from force applied to the margin.
Burin Core	A core made from thin, tabular flakes, blades, or lithic implements from which one or more burin spalls have been removed. May serve as a tool or a source of burin blades, or both.
Burin Scar	The negative bulb of force scar found on a core or core tool. Produced by either percussion or pressure. The mold of the cone part resulting from flake detachment. Syn.: burin facet.
Burin Spall	Specialized flake or blade removed from a burin core. Because of the nature of the core, the burin blade must be thick in relation to its length and is usually triangular or rectangular in section. Such a blade has important functional value because its form supplies strength without bulk. Made both by the pressure and percussion techniques.

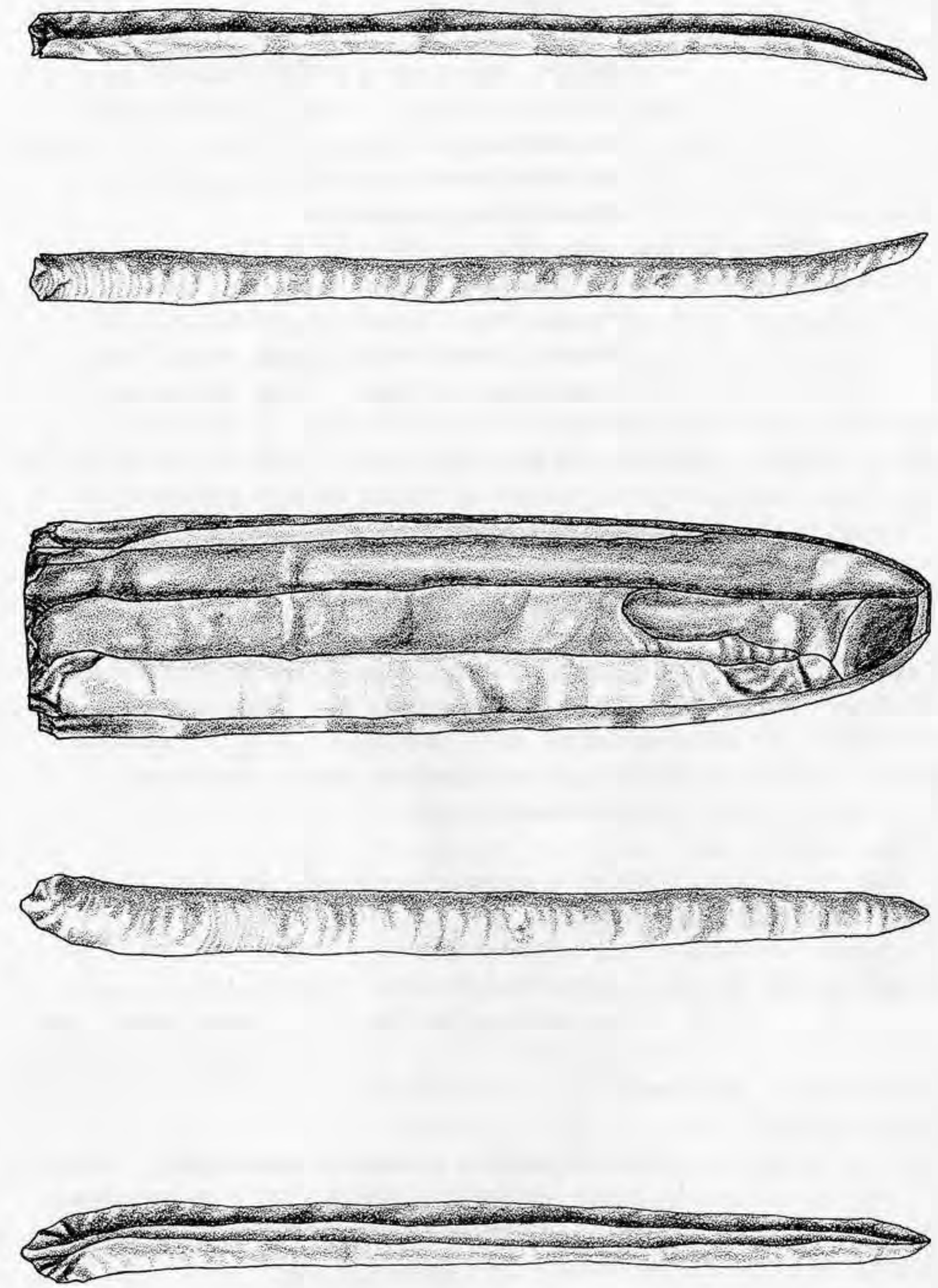
Term	Definition
Cast	Replicas of artifacts prepared in acrylic fiber, epoxy, plaster of paris or other suitable medium. Their types should always be specified, e.g.: acrylic fiber casts by Eichenberger.
Chalcedony	A cryptocrystalline variety of quartz, predominantly silica and having the near luster of paraffin wax. May be transparent or translucent and of various tints. Chalcedony with different colors arranged in strips or layers is called agate. If the strips or layers are horizontal, it is onyx. Chrysoprase is green chalcedony. Carnelian is flesh-red and sard is either greyish-red or brown.
Channel Flake	See Blade
Channel Scar	See Blade Scar
Chert	A fine-grained siliceous rock. Impure variety of chalcedony resembling flint. Generally light colored.
Chevron Flaking	See Double Diagonal Flaking (p. 87).
Chip	See Flake
Chopper	Heavy core tool presumed to be used for chopping. May be uniface or biface.
Cleavage Plane	Planes along which the mineral may be easily split. Tendency of the material to split along either the crystallography, natural structural planes, bedding planes, and/or planes of non-homogeneity. The human-induced fracture may follow or be made to follow a cleavage plane. Flakes step fractured at intersection of cleavage plane. E.g.: quartz crystal, petrified wood.

Term	Definition
Cleaver	A tool approximately U-shaped with one transverse cutting edge. Bifacial cleavers resemble truncated hand axes with straight or oblique edge at the tip.
Tranchet Blow Cleaver	Flake cleavers are made by allowing the "tranchet" (percussion) blow to intersect the primary flake surface to produce a sharp cutting edge.
Collateral Flaking	Expanding flakes removed from the lateral edges of the artifact at right angles to the longitudinal axis. The technique is varied and does not require using ridges, or crests, to guide the flakes. Can be produced by percussion, indirect percussion, or pressure, depending on the desired size of the flakes. (p. 87).
Commingle	To mix or mingle material from two or more sources.
Compression Rings	Ripple rings radiating from the point of force. Can be both positive and negative - positive on the flake and blade; and negative on the core. Can be compared to ripples formed in a pool of still water after the dropping of a pebble. Compression rings are generally more prominent with percussion than with pressure. A wave motion that can be used as an indication of the direction of force.
Compressor	Implement used by the flintknapper to exert pressure to the artifact. Synonymous with "indenter" used in the litho-mechanic literature.



Cone of force (Hertzian Cone)

Term	Definition
Conchoidal Fracture	A diagnostic fracture on a plane surface which resembles and has the characteristics and form of half a bivalve shell. It is the result of definite striking patterns. The striking area would be at the "hinge" part of the bivalve shell and the conchoidal fracture below on the part that was plane.
Cone of Force (Hertzian Cone)	The formation of a cone is the result of force applied to materials which have the property of isotropism. When force is applied vertically to a flat surface, the force will spread causing a cone to form. The apex of the cone will be truncated in proportion to the surface contacted by the agent transferring the force. Each flake is a cone part - or part of the bulb of force. (p. 53).
Cone Shear	Shear of midsection due to cleaving from opposing forces, from inertia or from support. This happens more often with rounded cobbles. There is often minor crushing at cone truncation. The scar is distinctive, being quite flat with bisection of the cone, closely spaced radiating inundations and little or no bulb definition.
Conical Core	A core type resembling a cone, the apex of which is the distal end. Generally associated with specialized blade cores.
Core	Nucleus. A mass of material often preformed by the worker to the desired shape to allow the removal of a definite type of flake or blade. Piece of isotropic material bearing negative flake scars, or scar. Cores can be embryonic - such as a piece of natural, unprepared, raw material



MesoAmerican polyhedral core and blades

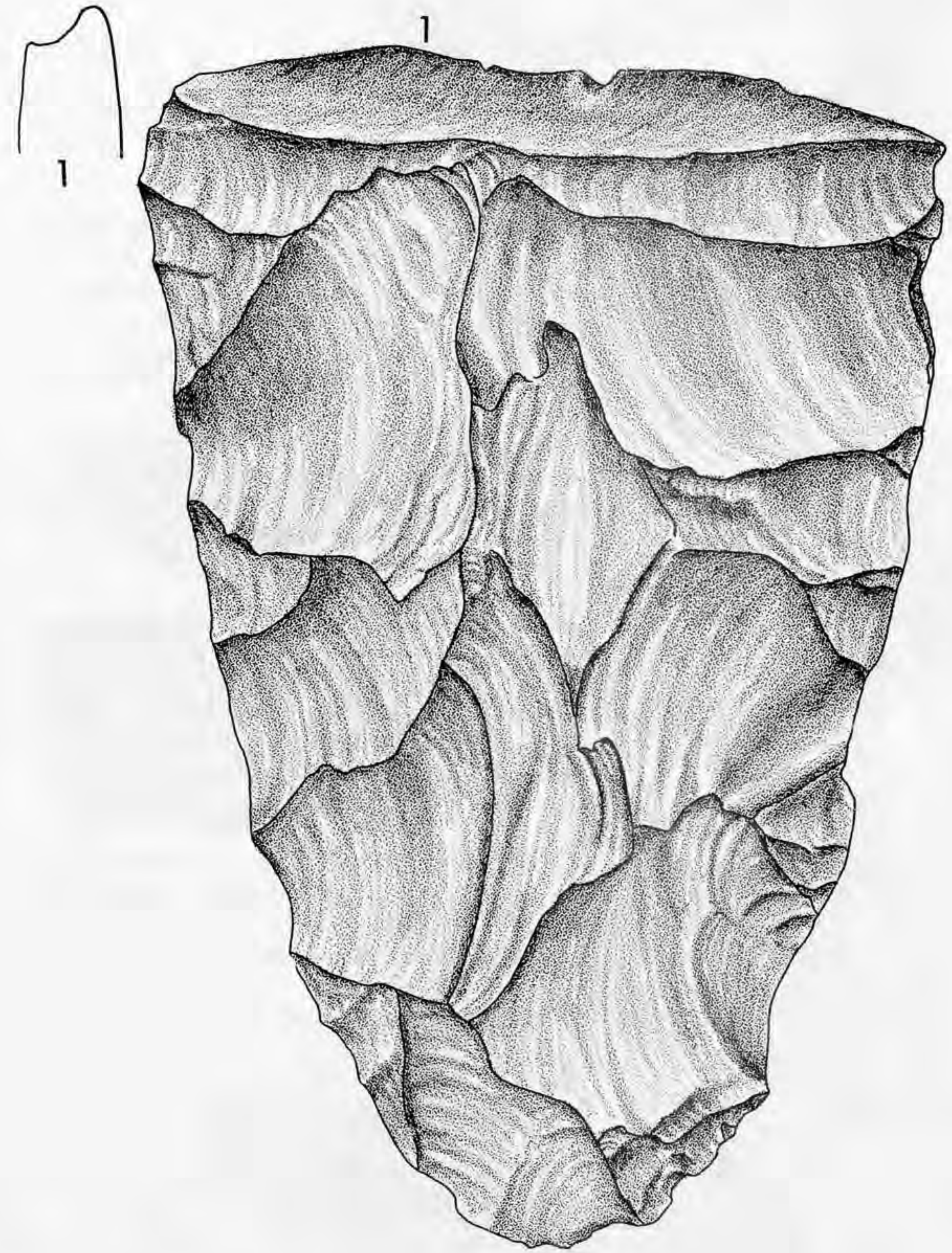
Term	Definition
	with scar, or scars, reflecting the detachment of one or more flakes such as the Mexican polyhedral core. All flaked tool industries are represented by either flakes or cores. (pp. 39, 40, 43, 46, 47 & 55).
Core Tool	Ambiguous term, usually reserved for techniques based on nodular reduction, such as cobble choppers, or Acheulean hand axes. Large flakes serve also as the core for later axes, and in the absence of the original cortex this distinction is futile. Carried to its logical extreme all tools from which flakes are removed are core tools.
Core Type	A core which has a consistency of form and technological traits. (Sometimes indicative of a culture). E.g.: Meso-american polyhedral core, biconical bidirectional core.
Cortex	Natural surface, or rind, on flint-like materials.
Cratering	Multiple intersecting "moon-like" cones on the surface of vitreous rocks resulting from either intentional or natural pounding, tumbling, or bruising.
Crazing	Minute surface cracks - generally cross-hatched - causing the surface to be weak-ened. Common to over-heated siliceous materials.
Crest	Word used to denote both the raised portion on the marginal parts of a flake or blade scar and the ridge between two parallel flake scars. Edges of the concave plane of fracture. The opposite of trough.

Term	Definition
Crested Blade	See Lamé a Crête.
Crude	A word often used - and widely misused - to describe character of workmanship of aboriginal artifacts. The refinement, or lack of refinement of the work must be evaluated and related to the material before the word "crude" is applied. Embryonic, inferior, or bad work found on good material could well be called crude, but at the same time, allowance should be made for the learner or beginner. But the finding of less controlled flaking on poor material may indicate that the worker was, indeed, a skilled fabricator to have accomplished any degree of flaking. Here, it is almost unnecessary to allow for the learner or beginner for it is doubtful they could do work on bad or inferior material. Also to be considered is the intent and ultimate design of the worker - for instance, he may have been designing a preform, drill, or digging tool and, therefore, not wanted, or bothered with, the more refined flaking character. Some analyst may consider the preform work as "crude" whereas the worker was intentionally flaking in this manner to allow for further thinning.
Crutch	A wooden staff of varying dimensions with a chest rest cross-piece at the upper end and a pressure tip inserted at the working end. The shoulder crutch is a small version of the chest crutch. Size and construction de-pends on individual preference and the type of work to be accomplished. Usually used as pressure tool, but can be used in a combina-tion of pressure and percussion.
Cryptocrystalline	A fine-grained crystalline rock but having distinct particles which are unrecognizable without the aid of magnification. The size of the microcrystals determine the texture.

Term	Definition
Curved Flaking	See Bending Flakes.
Dampen	To weaken, abate, diminish. Large pieces being worked are frequently dampened by support on the thigh of the flintworker.
Debitage	Residual lithic material resulting from tool manufacture. Useful to determine techniques and for showing technological traits. Represents intentional and unintentional breakage of artifacts either through manufacture or function. Debitage flakes usually represent the various stages of progress of the raw material from the original form to the finished stage.
Debris	Waste material - such as quarrying or mining waste - having little or no definitive characteristics. See Detritus, Debitage.
Denticulation	Prominences resembling teeth similar to those on a saw. Tooth-like serrating on margins of artifacts. (p. 37).
Detritus	Waste of disintegrated rocks, such as accumulated waste at a natural exposure. Having little or no diagnostic value. See Debitage, Debris.
Diagonal Parallel Flaking	Similar to parallel flaking, except the pressure is directed at an oblique angle from right to left. This is the technique of right-handed persons, but a left-handed worker would direct the pressure at an angle from left to right. The preform is held in the palm of the left hand with a right-handed worker and in the right hand when the knapper is left-handed. When a right-handed person holds the preform in the fingers or the left hand and the pressure is directed away from the knapper, the results will resemble those of a left-handed person. The same as direction of detaching the flakes. (p. 87).

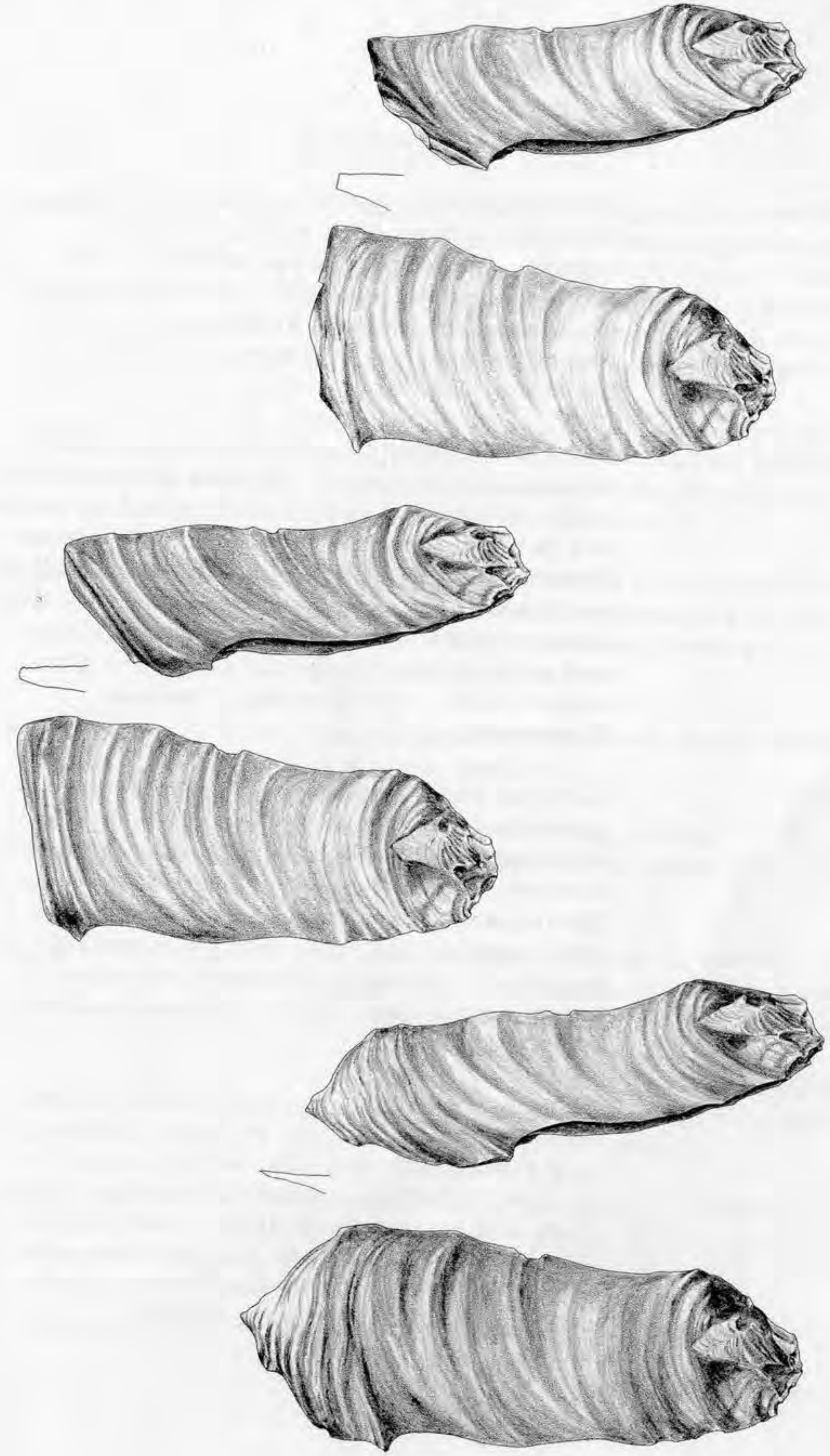
Term	Definition
Diffuse Bulb	A bulb of force which lacks the definition of the cone part. The bulb is disseminated, indicating a broad contact with the pressure or percussion tool. Common to billet technique. Generally lacks an eraillure scar and ripple marks are much subdued. See Truncation. (p. 44).
Direct Freehand Percussion or Pressure	A method of holding the material to be flaked in the unsupported hand and directing the percussion or pressure implement with the other hand to detach flakes or blades.
Direct Rest	A method whereby the objective piece is supported on an anvil during the flaking process.
Discoidal Core	Bi-convex core having flakes or blades removed from the perimeter and usually on both faces. (p. 39).
Dorsal	Outer surface. Keeled part of blade or flake. For instance, the dorsal side of a blade is the face of the core prior to detachment.
Double Diagonal Flaking	Parallel diagonal flakes removed from both lateral margins and terminated along the median line but directed toward the base of the artifact. An herringbone, or Christmas tree pattern results. A most difficult technique because one must either be ambidexterous or must completely reverse both the platform preparation and the direction of force. (p. 87).
Downward and Outward Pressure	Method of coordination of muscular motor habits which allows the worker to push down and out simultaneously in order to start detachment of a flake or blade from a core at the proximal end and, at the

Term	Definition
	same time, follow through to the point of release at the distal end. Ratio of downward and outward pressure is adjusted by the worker to control the character of the flake. See Angle of Force. This term applies primarily to detachment of blades by pressure. See In and Away.
Elasticity	The property of stone to return to its former state after being depressed by application of force. Ideal lithic materials are almost perfectly elastic.
Elastic Limit	The maximum stress a specimen can withstand before fracture occurs.
Elastic Rebound	The inherent property in certain materials allowing the recovery from elastic strain.
End Scraper	Beveled implement made on flake or blade with working edge on one or both convex ends. The bevel is formed by unifacial flaking or by use.
End Shock	Transverse fracture due to the stone exceeding its elastic limits. Failure of the material to rebound and recoil before fracture occurs. (p.61).
End View	Perpendicular view of either proximal or distal end.
Eraillure Flake	An enigmatic flake formed between the bulb of force and the bulbar scar. Usually adheres to the core in the bulbar scar. The eraillure flake, itself, leaves no scar on the core. The dorsal side of the eraillure flake bears no compression rings but the ventral side of the eraillure flake does bear compression rings that match



End shock or amputation

Term	Definition
	the scar left on the bulb of force. The erraillure flake is convex, concave. Example: Meniscus lens.
Exhausted	Used up. Consumed, either from function wear or by the flintknapper. Adjective applied most often to cores. Exhaustion may occur for the following reasons: steps and hinges, reduction of platform size or angle, lack of material, too small.
Exhausted Tools	Artifacts which have been rendered useless because of resharpening which produces an angle inadequate for further retouch. Cores consumed from flake and blade removal or from rejuvenation.
Experimental Flintworking	The experimental approach to replicating aboriginal stone work. This initially involves replication of flake and flake scar attributes of technology, after which those techniques which produce the least satisfactory results are eliminated and the other techniques refined.
Fabricator	Any of the tools used to apply force to the objective piece in the knapping process. Includes: hammerstones, billets, batons, pressure and notching tools, punches, etc.
Face	The dorsal or ventral surface of the artifact.
Facet	Either a natural or artifical plane surface. If artifical, facet is produced by intentional grinding. The word "facet" should not be used when describing parts of flake scars.
Fatigue	Undetected strains induced in lithic material causing molecular stress and weakness. Generally due to improper recovery of elasticity.



Step

Hinge

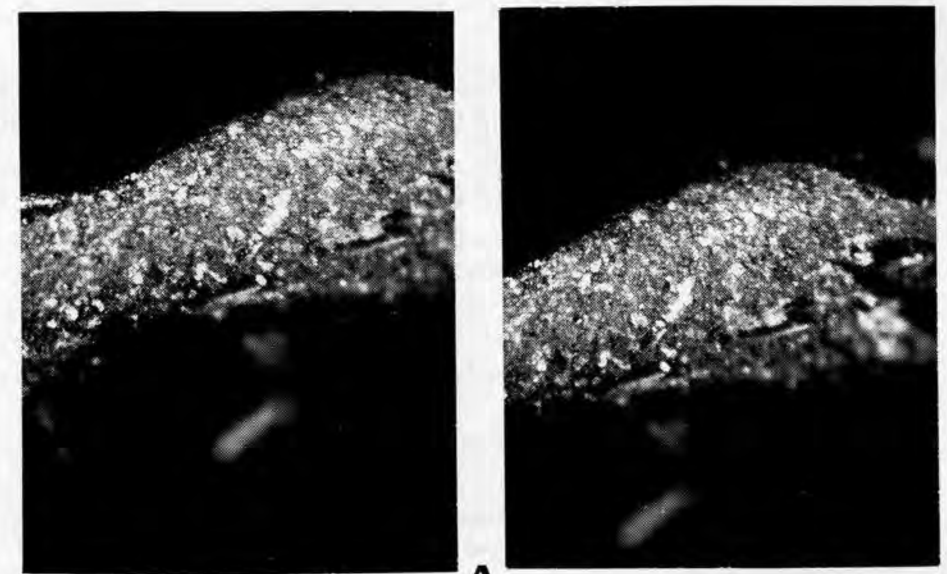
Feather

Terminations

Term	Definition
Feathering	A technique which produces a flake which terminates in an edge with a minimal margin. Produces blades or flakes with edges and distal ends which are very sharp. Feathered edge leaves slight ridges on the objective piece, a characteristic of precision collateral flaking. (p. 63).
Fire Checks	Distinctive minute cracks in stone, usually rectangular in shape. Appears in chalcedonic rocks which have been either heated or cooled too rapidly. May be associated with planned thermal treatment or merely be the result of accidental heat contact. Excessive heat will cause rocks to become granular and scaly and will usually change the color to a porcelain white. See Crazing, Thermal Treatment.
Fissures	Lines of radii usually originating at the margins of the flakes on ventral face and directed toward the point of force. Fissures are not cracks, but are crests and troughs. The appearance of fissures on the bulb of force usually indicates that a percussion technique was used. Fissures are also known as hackles. Syn.: Grooved shatter lines.
Flake	Any piece of stone removed from a larger mass by the application of force - either intentional, accidentally, or by nature. A portion of isotropic material having a platform and bulb of force at the proximal end. The flake may be of any size or dimension, depending on which technique was used for detachment. See Thinning Flakes. (p. 96).

Term	Definition
Flaker	A pressure implement used to remove flakes during the process of forming or sharpening. Same as compressor. The word "flaker" relates to pressure flaking whereas the implement used for percussion work is referred to as a "percussor" or hammer.
Flaking	Process of removing small pieces of material from objective piece by pressure, percussion, indirect percussion or the combination of pressure and percussion.
Flake Type	Groups of flakes which bear technological attributes showing rhythms and prototypes of their mode of removal from a core. See Thinning Flake.
Flat Flaking	Technique which removes flakes resulting in a plane surface.
Flexibility	The amount of bending without breaking exhibited by some lithic materials. Not elasticity.
Flint	A siliceous material ideally suited for flaked implement manufacture. Responds well to the application of force, either percussion or pressure. Usually a fine-grained rock of the darker shades. Occurs as nodes or nodules in limestones and chalks, and as rounded or irregular masses.
Flints	A general term denoting all flaked artifacts made of stone. Associated, probably, with pieces of flint used in flintlock rifles.
Flintknapper	One who forms stone implements by controlling the fracture of the material. An artificer. A stoneworker using material exhibiting a conchoidal fracture.

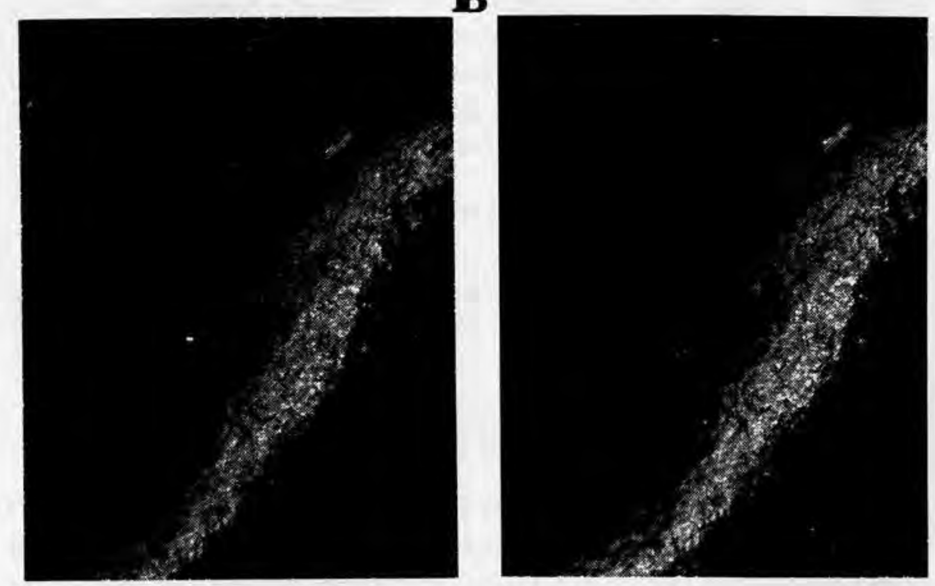
Term	Definition
Flintlike	Used to refer to any lithic material which reacts like flint when subjected to force. Material having the properties of isotropism and somewhat cryptocrystalline and homogeneous.
Flute	A negative semi-concave flake scar having parallel sides. The result of force applied to the objective piece which has previously had special preparation of the surface and platform area to accomplish fluting. A concave trough on the artifact from the proximal toward the distal end. Generally related to blademaking and basal thinning of projectile points. Produced to allow special hafting. The act of removing a channel flake the vertical length of the artifact. Syn.: Channel flake scar.
Fluted Point	A projectile point bearing one or two longitudinal channel flake scars from base toward the tip on one or both faces of the artifact. Cross section is bi-concave if both sides are fluted. If only one side is fluted, the transverse section is then concave-convex, or plano-convex. The scar is convex in section and is normally produced by pressure or indirect. Ordinarily applied to Folsom points. (p. 85).
Foliate	Applied either to willow leaf or laurel leaf type points.
Geometric Microliths	Small geometric tools with either pointed or various shaped sharp edges. Usually made by severing blades into transverse sections. Some common forms are called rectangular, triangular, lunate. Probably used for the manufacture of composite tools. (p. 75).



A

A. Grinding

B

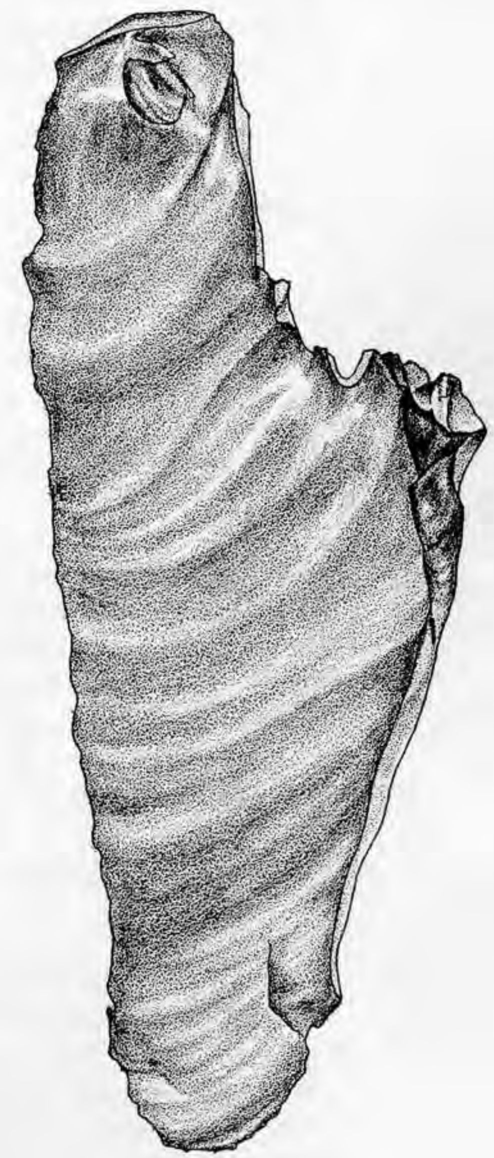


B. Polishing

Grinding and polishing
(mag. 32.5 x)

Term	Definition
Graver	A stone implement generally made by pressure flaking and intentionally designed to have a functional point or points. It is generally assumed that gravers are used to incise or form organic materials and soft stone.
Gravitational Center	Causing to gravitate or tend toward a center or where the weight media is greatest.
Grinding	A dual-purpose preparation technique. Weakens a plane surface and strengthens a rounded surface. Accomplished by grinding the platform, core top, or margins of artifacts with an abrasive stone. (p. 67).
Grindstone	Abrasive stone composed of bonded granules of rock. Abrasive stones with granules of various sizes and different bonding agents. Type of abrasive stone is selected to conform to the lithic material being formed or sharpened. Generally, the harder the material being worked, the softer the grindstone.
Hackles	See Fissures
Hand-held	Manner of holding the objective piece in the left hand while force is exerted by the right hand through the percussor or compressor. Free-hand rest: objective held in rested hand.
Hinge Fracture	A fracture at the distal end of a flake or blade which prevents detachment of the flake at its proposed terminal point. A hinge fracture terminates the flake at right angles to the longitudinal axis and the break is usually rounded or blunt. Not to be confused with a step fracture. (p. 69).

Dorsal



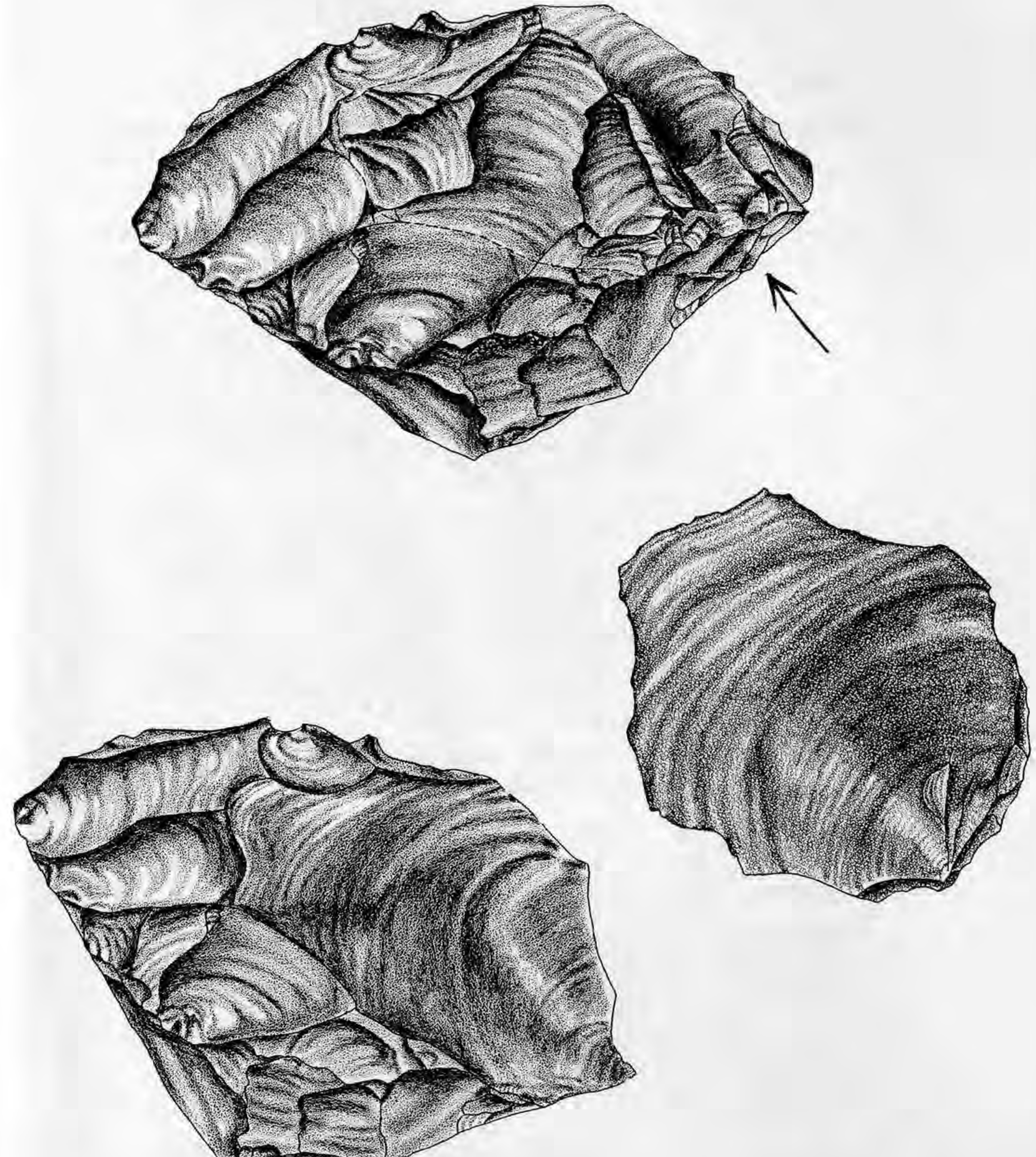
Ventral

Secondary decortication and hinge fracture recovery blade.

Term	Definition
Homogeneous	Of the same structure, nature or kind throughout. Of like substance. In selecting material for replication one of the major criteria is homogeneity. A homogeneous material can be worked with consistency because it has no planes of weakness or included material that would impair the conchoidal fracture process. See Inclusion.
Igneous Rock	Rock formed by solidification of molten volcanic material such as rhyolite, basalt, obsidian.
Ignimbrite	A silicic volcanic rock formed in thick, massive compact, lava-like sheets. Usually deposited over a wide area. The rock is chiefly a fine-grained rhyolite tuff formed mainly of glass particles welded by incandescent volcanic cloud. Often confused with obsidian.
Impact Scars	Scars resulting from using a hard percussor to deliver the force to the material, causing radiating fissures on the bulb of force.
In and Away	Usually applied to pressure flaking of hand-held specimens in which pressure is applied in from a platform on the edge or margin in line with a previously established ridge on the face of the specimen. Pressure is applied down or away only after it has been applied in from the edge.
In and Down	See Downward and Outward Pressure, In and Away.
Inclusion	An impurity or foreign body in stone which deters the homogeneity of the lithic material and causes problems for the flintworker. See Homogeneous.

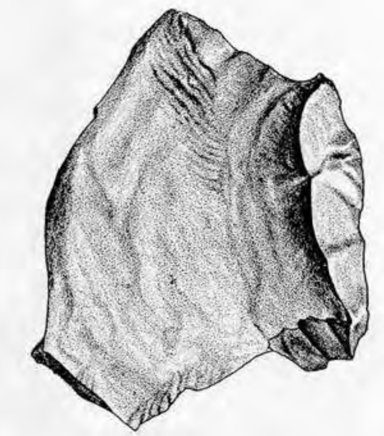
Term	Definition
Indirect Freehand	A percussion technique which involves striking a punch-like object with a percussor. The punch is held in the fingers of the left hand with its tip rested on the platform of the artifact which is held in the unsupported palm of the same hand. Normally requires the services of a second person.
In Situ	Natural undisturbed position of an object or material. Where first formed or deposited.
Intermediate Tool	A punch-like object of antler, bone, wood, stone, or metal on which the percussion blow is delivered to impart force to a predetermined area on either a core or stone tool. Worker strikes the base of the punch with a percussor. See Punch Technique. (p. 88).
Interval of Contact	Factor of contact time between the percussor and the objective piece. The hard percussor has a short interval of contact for it delivers instantaneous concentrated force. The softer percussor has a longer interval of contact because it is more yielding and, therefore, allows the force to be imparted more slowly.
Interval of Spacing	The spacing distance between the marginal flake scars.
Isolated Platform	A platform which has been freed from the mass by the removal of flakes to isolate or cause the platform part to protrude or become prominent. Example: the platform (nib) on the base of a Folsom point on which the fabricating tool is seated prior to fluting. Same as Promontory.
Isotropic	Material having the same properties in all directions. Typical of amorphous substances

Term	Definition
	and of crystals of the isometric system. In an isotropic elastic medium, the velocities of propagation of elastic waves are independent of direction.
Jade	A metamorphic rock of varied colors. Gem variety is apple-green and waxy-white. A material of extraordinary toughness but only six and one-half on the Mohs scale of hardness. Must be formed by grinding, not flaking.
Jasper	An impure variety of chalcedony formed in various opaque colors. Adaptable for flaking and forming stone artifacts.
Keel	Ridge formed by a feathering termination of flakes at the median line. Can also be a single ridge on the dorsal side of a blade generally on the median line resulting from a previously detached blade.
Knapper	One who works stone by flaking, i.e., flint-knapper or artificer. Old World term possibly derived from the knapping hammer used by stone masons.
Knapping	Process of fracturing stone. Formerly indicated a percussion technique but now includes the pressure technique as well.
Lamé a Crête	First blade removed from a core. Bears bi-directional flake scars on the dorsal surface, the result of the worker preparing a ridge to guide the blade.
Lanceolate	Lance or spearlike.
Lateral Margins	Margins of flakes, blades and other stone tools on either or both sides of the longitudinal axis.



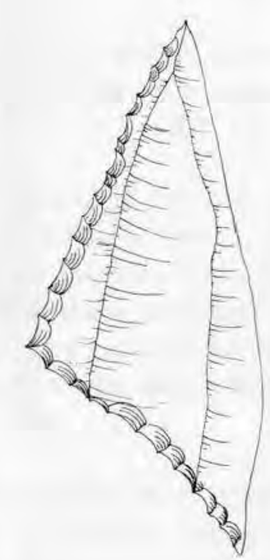
Levallois core technique

Term	Definition
Leading Edge	Working part of either the stone implement or core which is nearest the knapper. Edge of the objective piece facing the knapper.
Levallois Technique	A special core preparation technique which allows the percussion removal of flake implements requiring little or no modification. The Levallois tool is plano-convex and is characterized by intersecting flake scars on the dorsal side. Generally, only one or two usable flakes are detached before the core is discarded. This technique encompasses several methods of flake removal. (P. 73).
Lip	1) Projection found on core or artifact which results from the bulbar scar. A concavity causing an overhang usually found on the leading edge. 2) Projection found on the proximal ventral surface of some flakes, believed to be associated with soft hammer percussion or pressure. (pp. 44 & 75).
Lithic	Derived from the Greek work <u>lithos</u>-"stone." Pertaining to stone.
Longitudinal Lateral Section	The area of the artifact bounded by the proximal and distal ends and both lateral margins.
Longitudinal Transverse Section	The thickness of the artifact between the dorsal and ventral side and bounded by the proximal and distal ends.
Margin	Edge or edges
Marginal Fissures	See Fissures
Marginal Grinding	Process of smoothing margins prior to flaking to make them stronger and more regular and to facilitate hafting.

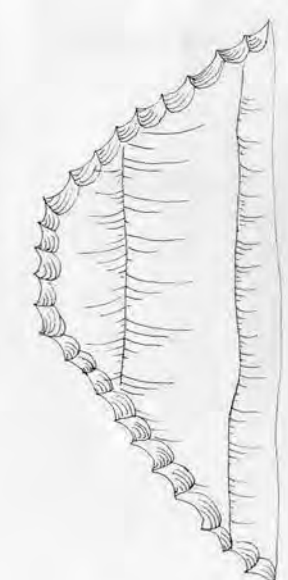


Flake showing pronounced lip

Geometric microliths

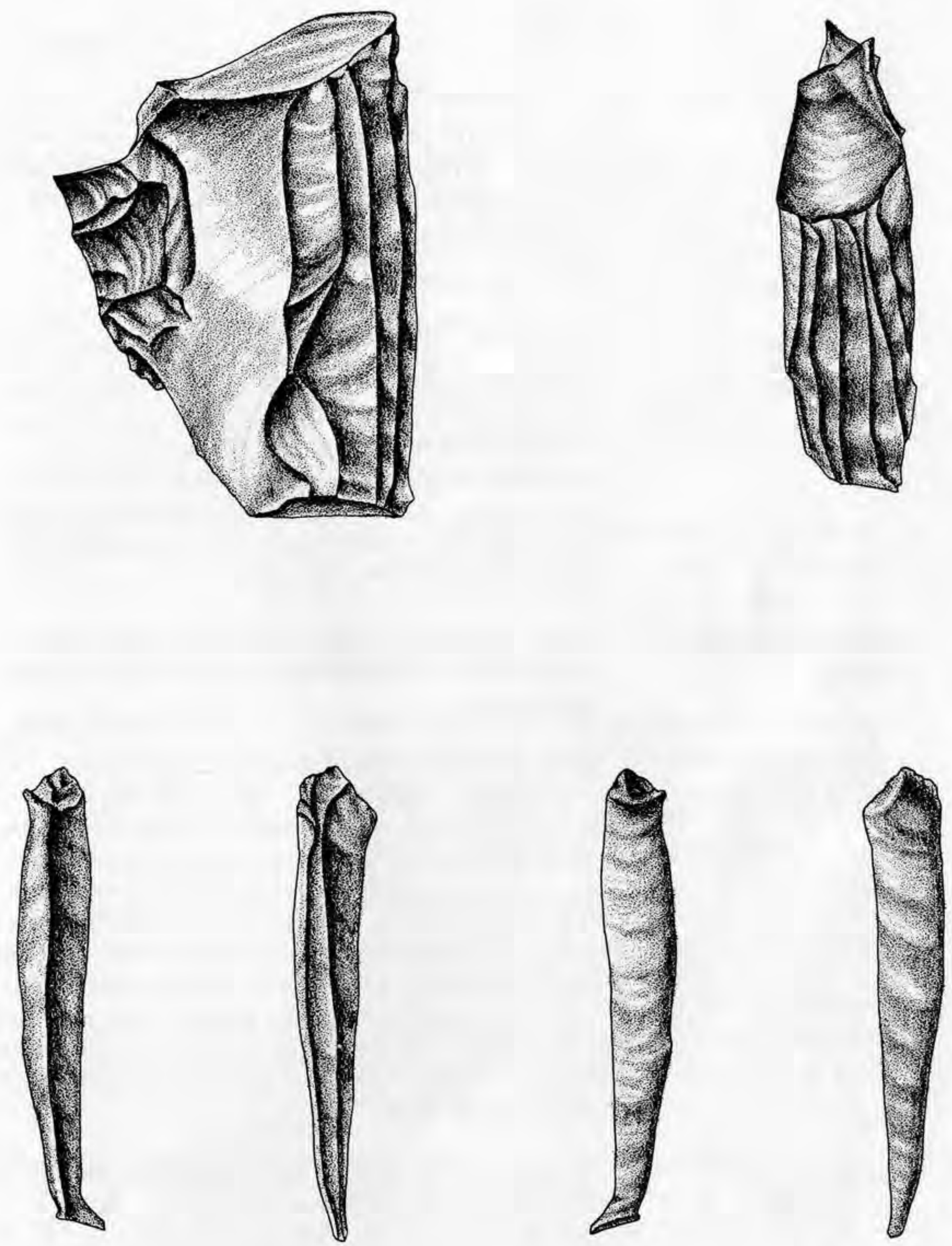


Triangular



Trapezoidal

Term	Definition
Mass	A quantity of matter forming a body.
Mechanics of Fracture	The principles of motion and force applied to isotropic material to accomplish a planned and preconceived fracture.
Median Line	An imaginary line pertaining to the middle part of the artifact from the proximal to the distal end. Can be on either face.
Meniscus	Concave on one side and convex on the other. See Eraillure Flake.
Mental Template	The visualization, in the mind of the maker, of the ideal type of implement to be made. It is this which makes "types" such as Folsom, Clovis, etc., identifiable.
Method	That part of the fabrication process wholly in the mind of the flintworker, mental template, knowledge of possible techniques to employ, familiarity of style and response of the stone being worked. A characteristic mode or manner of procedure.
Microblades	Diminutive blade generally made by pressure technique. Common to some Arctic cultures. See Blade. (p. 77).
Microburin	Waste product not intended for function. Usually the proximal or distal end of a blade. Residue of geometrical microlith industries. Not to be confused with either a diminutive burin spall or burin core. Can be made by a special technique or severing prismatic blades.
Microburin Technique	Method of severing blades to make geometrical microliths. Technique requires first weakening the blade by marginal notching and then breaking it at the notch.

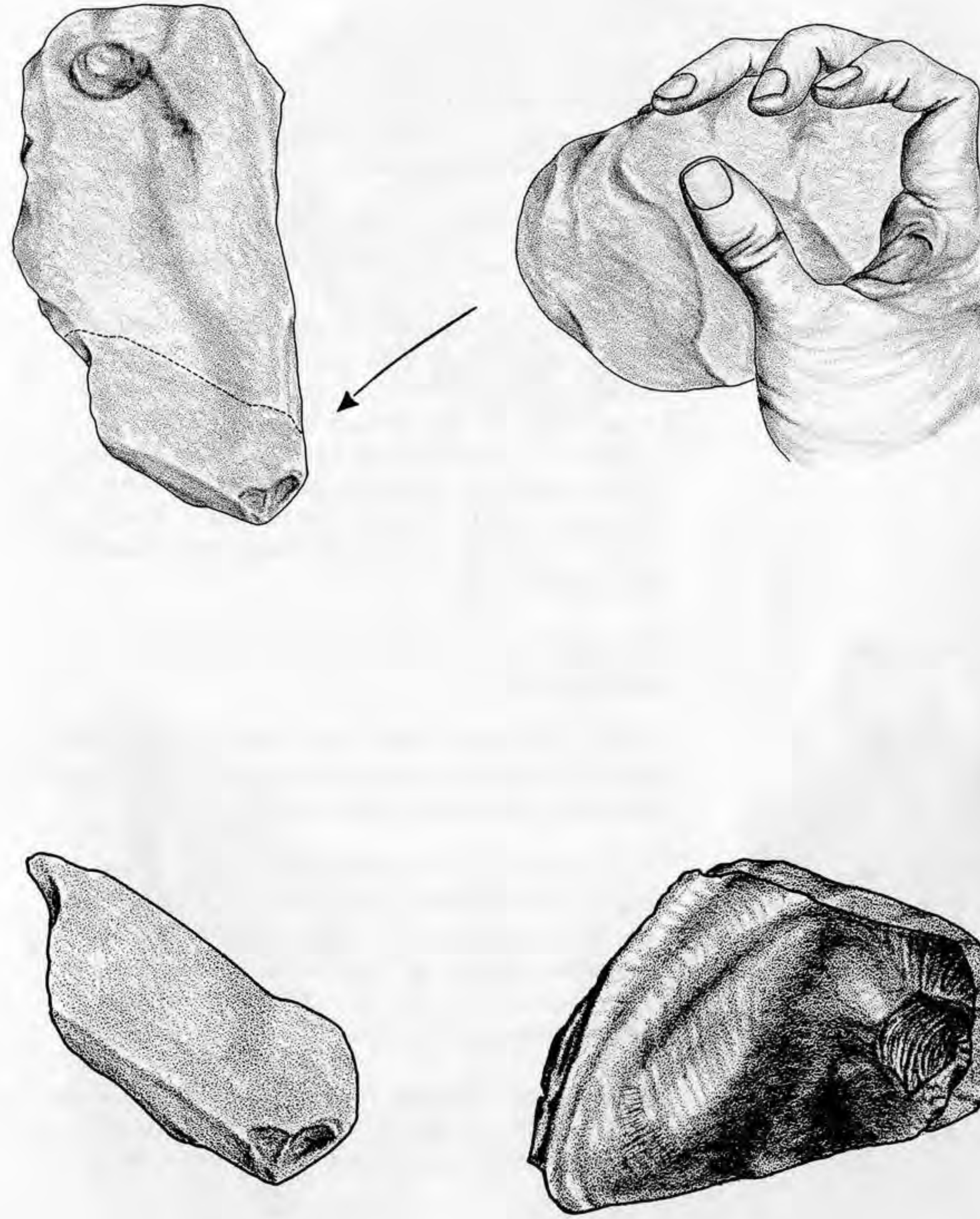


Micro-core and blades

Term	Definition
Microliths	Very small geometric-form tools commonly used in composite tools. Formed from prismatic blades, using the sharp unmodified lateral edges as the cutting edge. (p.75).
Mingle	To mix or mingle material from one source.
Morphological Typology	An unreliable method of typing stone tools according to form alone. This can be misleading, for tools having the same form may well have been produced by different techniques, have different technological attributes, and could have been intended for different functional purposes.
Multidirectional Core	Core bearing scars which show that flakes or blades were removed in more than one direction.
Naturefacts (Pseudo-tools)	Pseudo-artifacts caused by natural soil movement, glaciation, wave action, high velocity water movement, gravity (such as alluvial fans or steep inclines), rapid temperature changes, internal pressure (such as starch fractures and pot lids), exfoliation, tectonic movements, diastrophism, solifluction, foot trampling and other unintentional activity caused by nature rather than by man. These conditions can detach flakes from the mass in such a manner that the piece may resemble an embryonic tool.
Negative Bulb of Force	A mirror surface of the cone part always on the objective piece and not on the flake or blade. See Bulbar Scar.
Non-undulated	Flakes and flake scars showing the absence of compression rings on the plane of fracture. Related to material and special techniques.

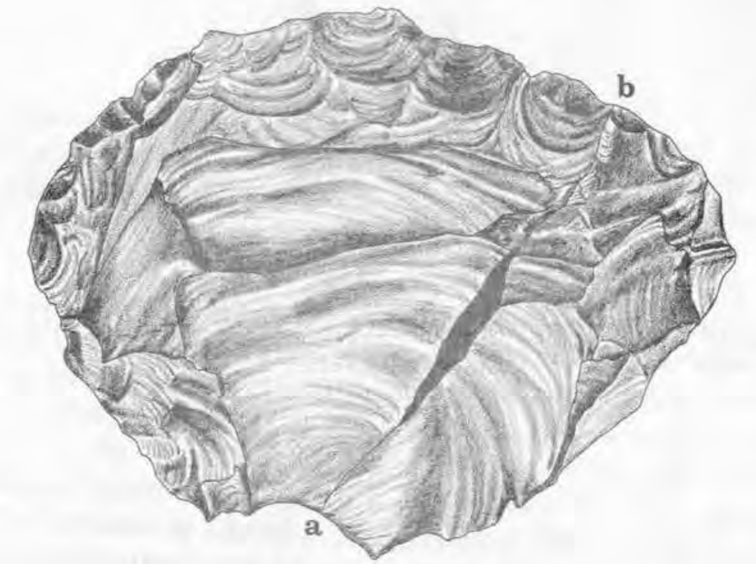
Term	Definition
Notch	Basal indentations to facilitate hafting.
Notching	Technique of indenting the base of a projectile point or knife to facilitate hafting. Usually by the pressure technique. Several traits may be identified. Deep serrations are a style of notching.
Nucleus	The core. A central mass or a kernel. The part remaining after removal of excess material, or after flakes or blades have been detached. A core tool could be a nuclear artifact.
Objective Piece	Lithic material being worked or formed by various techniques. Can be nodule, flake, blade, blank, preform, core uniface, biface or a permutation of object to completed form.
Oblique Flaking	Flakes removed diagonally to the long axis of the artifact. Parallel flaking directed diagonally across the surface of the artifact. Generally done by the pressure technique. See Diagonal Flaking. (p. 87).
Obsidian	Igneous glass, volcanic rock. Generally black although some deposits are red, green or brown. Is often banded and of different degrees of transparency. Well suited for flaked implement manufacture for it produces a very sharp cutting edge.
Obscure Side	Term used to denote the underside, or unexposed face of an artifact. Used to help explain the holding method during pressure flaking. For example, during the pressure flaking process, the artifact is generally held flat in the hand and flakes pressed off the face resting on the palm.

Term	Definition
	This face is not visible to the worker and, therefore, it is called the "obscure side."
Outrepassé	Over and beyond the opposite margin. (See Tixier 1963, Typologie De L'Epipaleolithique Du Maghreb.)
Ovates	Long oval implements. Can be blanks or preforms. Elliptical. Bifacial or unifacial.
Overhang	See Lip. (p. 44 & 75).
Parallel Flaking	Flake scars are parallel to each other, uniform or graduated in size, and leave a sharp straight edge. This technique was applied to direct the flakes across the face of the artifact, making it stronger and more regular. This type of flaking is accomplished by the serial removal of blades continuously across the face of the surface worked. The flake platform is placed in line with a ridge with the greatest force applied directly perpendicular to margin with pressure tip. The tool must be kept in line with ridge during detachment. (p. 87).
Patina	An alteration of the surface by molecular or chemical change and not to be confused with sand blasting.
Pecking	The percussion technique used to form overlapping superimposed cones, usually with the direction of force being applied to the surface of the material in a perpendicular direction. Commonly used in grooving and the shaping of hammerstones.
Permutation	Interchange. To change one thing for another.
Percussion Flaking	A method of striking with a percussor to detach flakes or blades from a core or mass.



Direct percussion flaking

Term	Definition
	Percussion flaking includes varied techniques to remove flakes by either impact, collision or concussion. (p. 81).
Percussor	An implement used for striking. Includes hammers, hammerstones or billets.
Perverse Fracture	A helical, spiral or twisting break initiated at the edge of an objective piece. Natural flaws, excessive force and mass to be removed add to the possibility of perverse fracture. Production errors such as step fractures may produce more mass than platforming and force can overcome. Energy is then deflected into and through the mass of the object. (p. 83).
Phylogeny	The line or lines of direct descent in a given group.
Pick	Long, narrow, thick core tool. Prominent keel on dorsal side and plano on ventral side. Pointed on one or both ends.
Plane of Cleavage	The splitting or tendency to split, along planes determined by crystal structure, or by bedding planes in sedimentary rocks. Parallel planes of weakness within the structure which destroy the homogeneity of the lithic material.
Plane of Fracture	The surface on the ventral side of the flake bearing the positive scar of the bulb of force; the negative scar being on the core or stone tool.
Plano-convex	Flat on ventral surface - curved on dorsal surface. Common to unifacial artifacts.
Platform Angle	The angle of the platform measured from the dorsal to the ventral side. At right



This segment rotated backward and tilted up.

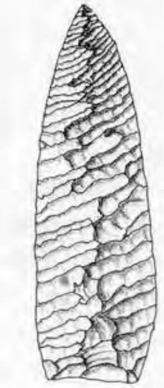
Perverse fracture

Term	Definition
	angles, or less to the longitudinal axis. Angle of platform on flake or blade corresponding with parental platform angle of core.
Platform	The table or surface area receiving the force necessary to detach a flake or blade. Can be either natural or prepared. The truncation of the cone part.
Platform Preparation	The grinding, polishing, faceting, beveling of that part of the platform to receive the applied force. Usually done to strengthen the platform in order to carry off a larger flake. See also Turned Edge, Grinding, Polishing, Facet, Beveled Edge.
Point of Contact	Platform part or cone truncation. Area of the forceful meeting of percussor or compressor and the objective piece.
Polishing	To make smooth by rubbing with fine abrasive material. Strengthens the platform. Can also be the result of function. See Grinding. (p. 67).
Polyhedral Core	Core bearing multiple blade scars. Generally cylindrical (p. 55).
Positive Bulb of Force	Rounded (onion-shaped) protuberance found on the ventral side of a flake or blade at the proximal end. Bulb is part of the cone of force.
Posterior	Bottom. Base. Opposite of anterior.
Pot Lid	A plano-convex flake leaving a concave scar. Pot lids are the result of differential expansion and contraction of isotropic material but are minus the compression rings of force lines usually associated with these conditions.

Term	Definition
	Generally they are a natural occurrence rather than intentional results of man-made flakes.
Precision Thinning	A precision method of thinning by which the worker controls the direction and termination of the flakes at the median line of the artifact by applying either the parallel or collateral flaking technique. Flakes are intentionally terminated in a hinge or step fracture at the median line to allow flakes detached from the opposite margin to meet and intersect these hinge fractures.
Preform	Preforming denotes the first shaping. Preform is an unfinished, unused form of the proposed artifact. It is larger than, and without the refinement of, the completed tool. It is thick, with deep bulbar scars, has irregular edges, and no means of hafting. Generally made by direct percussion. Not to be confused with a "blank."
Prehistoric Lithic Technology	The science of knowledge of forming stone into useful cutting, chopping, and other functional implements, comprised of two factors - the methods and the technique. See Method and Technique.
Pressure Flaking	Process of forming and sharpening stone by removing surplus material - in the form of flakes - from the artifact by a pressing force rather than by percussion. There are various individual techniques of pressure flaking.
Primary Retouch	Removal of irregularities on the artifact by the pressure technique to make the piece ready for the second retouch.

Term	Definition
Primitive	Pertaining to the beginning or origin or to early times. Original, first, primary, primordial.
Prismatic Blade	Long narrow specialized flake with parallel sides. Generally triangulate or trapezoidal in section and bearing two or three prism-like facets on the dorsal side. Associated with blades removed from a polyhedral core.
Projectile Point	Spear point, dart point or arrowpoint. An arrowhead may be unpointed or transverse. (p. 87).
Promontory	See Isolated Platform.
Pseudoburin	Flake fragment exhibiting right angle edge, similar to those produced by the removal of burin spalls, but not presenting the typical burin concavity, or the negative bulb force.
Pseudotools	See Naturefacts.
Punch	An intermediate tool of antler, bone, wood, metal or stone used in the percussion technique. The punch is placed on the objective piece and receives the blow from the percussor.
Punch Technique	A method of applying percussion force to an intermediate tool (punch). (p. 88).
Random Flaking	Multi-directional, multiform and without order for making the artifact regular in form. Used without further refinement or a stage of primary retouch prior to precision flaking. (p. 87).
Recoil	Rebound. Recovery from the shock due to the sudden application of force. Does not exceed elastic limit of material.

1. Very regular parallel



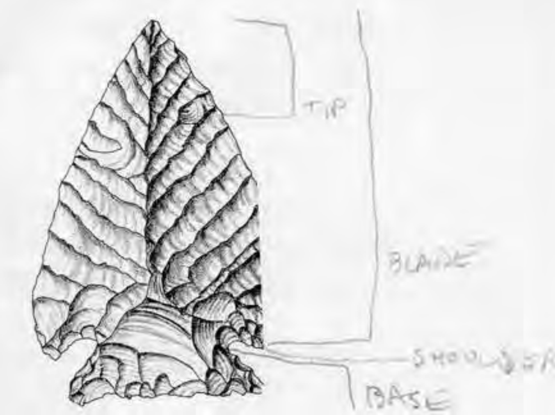
2. Diagonal parallel or oblique

3. Less regular parallel

4. Collateral

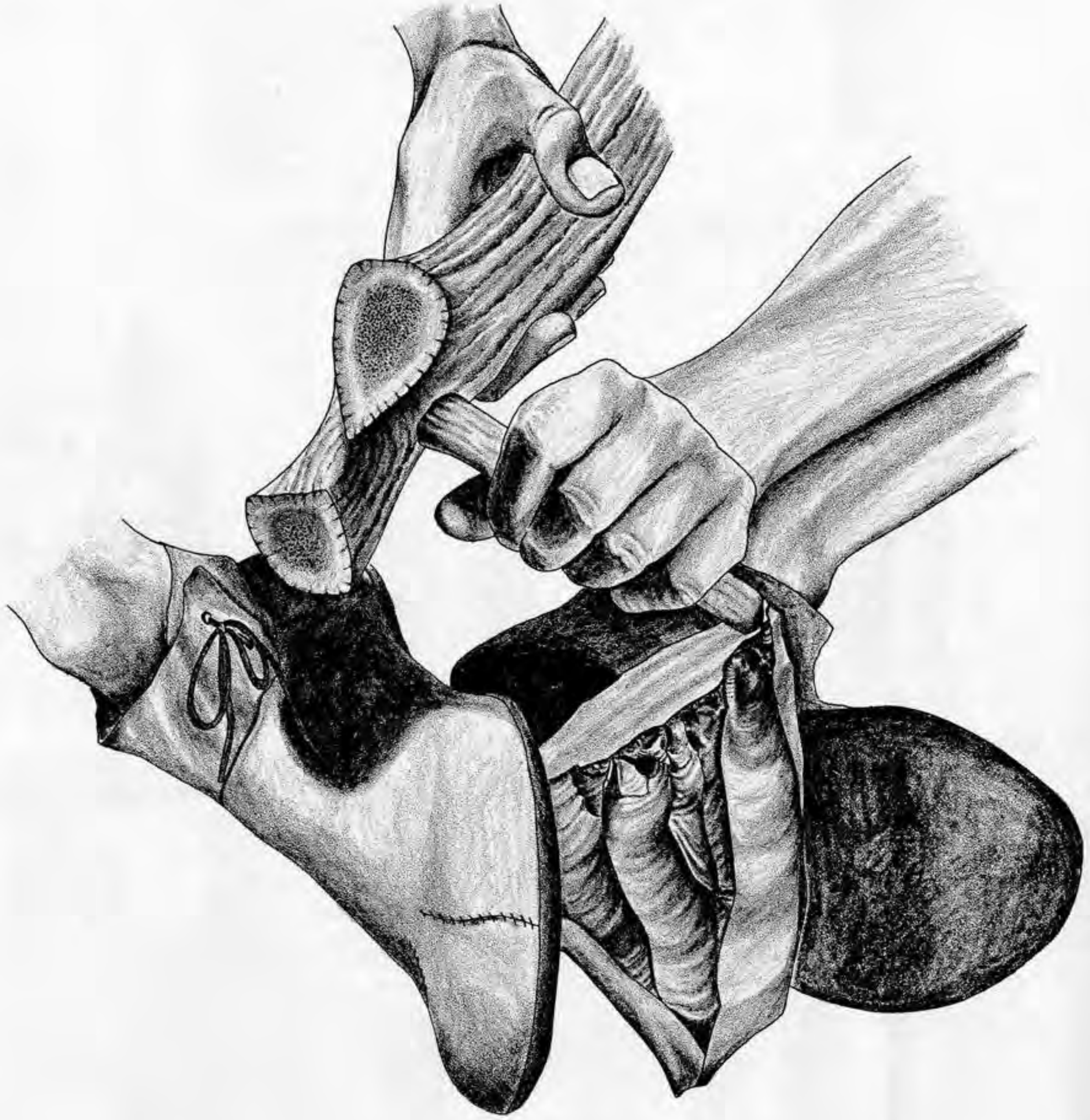
5. Random or non-patterned

6. Flute or channel flake scar



7. Double diagonal or chevron

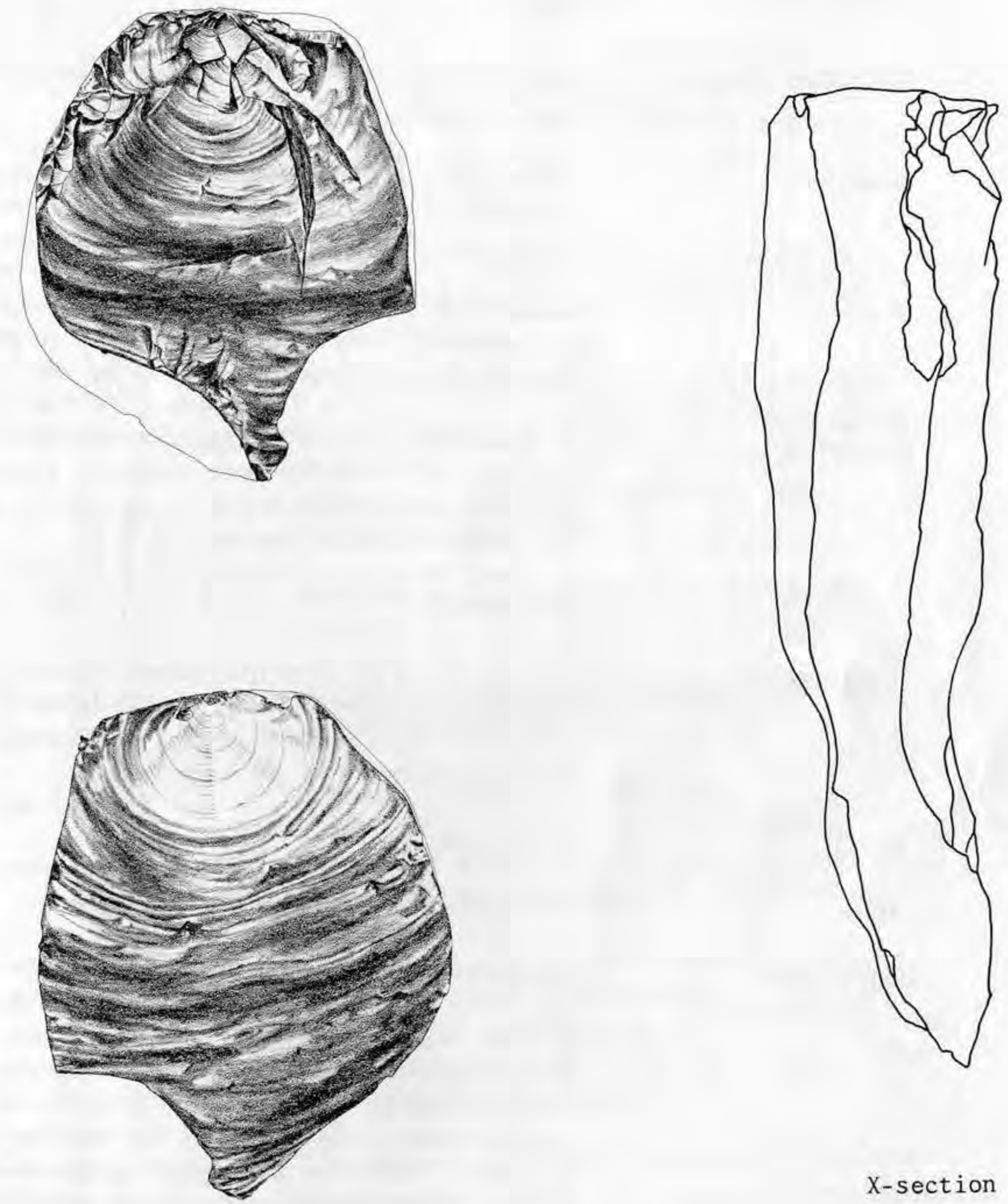
Idealized projectile points showing varieties of pressure flaking



Punch technique or intermediate tool

Term	Definition
Rejuvenate	To renovate, renew, restore, re-create, or re-establish. An example would be blade core platform rejuvenation: a process by which the exhausted or ruined platform would be removed as a tabular flake thereby establishing a new platform.
Residual Core	An amorphous core without definite form, having the platform area exhausted. Bears scars denoting the removal of flakes or blades.
Retouching	A technique used to thin, straighten, sharpen, smooth and make the artifact more regular in form. Generally involves the use of pressure in one or more stages. Retouching usually follows percussion preforming. Before precision pressure work may be accomplished, one must first remove all irregularities on the objective piece by a primary retouch and then do a secondary retouch.
Ridge	A projection. The intersection of two surfaces forming a salient angle. The median longitudinal lines of an artifact which is rhomboidal in transverse section. Long crest, or spine, either natural or formed by unifacial or bifacial flaking. Generally used to guide the blade from the core.
Ripple	Waves appearing on the plane of fracture. Compression rings. Characteristic of solids which have the properties of viscous liquid.
Salient Bulb	A bulb of force having good definition of the cone part. Indicating a confined contact force. (p. 44, 45 & 53).
Sandstone	A sedimentary rock composed of sand and bonding mineral. Generally used for grinding and polishing. Very compact and homogeneous

Term	Definition
	varieties can be formed into various artifacts by percussion flaking.
Scalar Flaking	A technique which produced irregular expanding, overlapping flake scars which resemble scales. May be the result of pressure or percussion.
Seriation	Gradation from early forms to later forms in lithic manufacture.
Serrating	Indenting the edges by alternating the removal of flakes; or the repeating of notches at regular intervals. See Denticulation.
Shatter	Reduce into pieces having little or no regularity. Without consistent form.
Shearing	Technique of turning the edge by wiping a rod-like pressure tool along the margin while pressing inward. Rapid method of platform preparation prior to pressure flaking.
Shearing of Cone	See Split Cone Technique. (p. 91).
Shear Stress	To sever from opposing forces.
Shock	See Addenda
Side View	The lateral edge or margin of the artifact when it is held horizontal to the viewer.
Side Scraper	Implement with beveling on one or more margins of a flake or blade to obtain a strong cutting edge.
Silex	A term commonly used to define Old World rocks of a siliceous or chalcedonic nature. Possibly derived from the French word silex -"flint." Not to be confused with a trade name of a manufactured glass.
Siliceous	Of or pertaining to silica. High silica content.



X-section

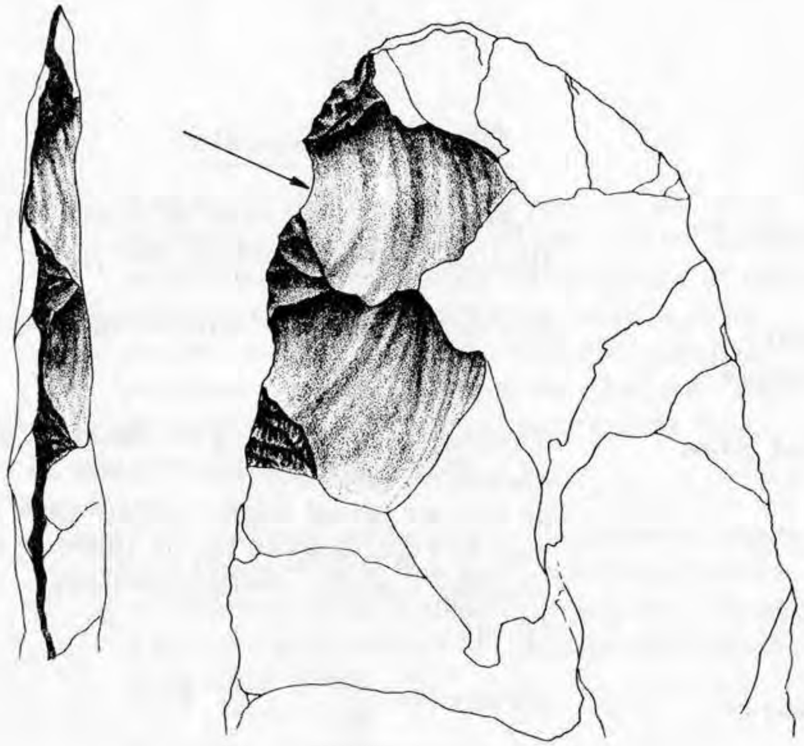
Sheared cone and X-section

Term	Definition
Silicification	The introduction of or replacement by silica.
Silicified Slate	Slate with a high silica content causing it to be much harder than normal.
Sinuous	Snake-like, alternating or wavy. Margins of artifacts are made sinuous by removing flakes alternately from the lateral edges.
Slate	Metamorphosed fine-grained sediments with well-defined cleavage. Artifacts are usually formed by grinding rather than by flaking.
Snapping	1) A method of producing a transverse fracture to sever flakes or blades. Pressure or percussion force is applied from the ventral toward the dorsal side. 2) May also be accomplished by finger pressure.
Solifluction	The process of slow movement of water-saturated ground masses from higher to lower levels. Movements of earth may cause "naturefacts" to be formed.
Spall	See Flake.
Split	See Addenda.
Split Cone Technique	At present, the technique is enigmatic but has been observed on artifacts found in cobble implement industries which have had large exterior flakes removed from the cobble's surface. These flakes have no visible bulb of force, the result of the worker using the anvil technique and splitting the cone of force. This technique has been noted by Charles Borden on the Fraser River artifacts and by others. (p. 41 & 91).
Spur	See Beak.

Term	Definition
Step Fracture	A flake or flake scar that terminates abruptly in a right angle break at the point of truncation. Caused by a dissipation of force or the collapse of the flake. (p. 63).
Strangled Flake or Blade	Intentional flaking directly opposite on both margins to make a constriction or narrowing.
Strengthened Platform	A platform which has been strengthened by providing a greater area to receive the applied force, or made stronger by polishing an isolated platform. See Platform Preparation.
Summit	Protuberance. High point. Apex. See Crest.
Tabular Core	Core type resembling a tablet, generally bi-directional. (p. 39).
Tang	A basal projection. See Barb.
Taxonomy	Science of systematics. Arrangement and classification according to relationship.
Technological Attributes	Techniques which have diagnostic value showing modes of manufacture, characteristic traits, and patterns of human behavior. e.g., grinding or percussion flaking. See Attribute of Technology.
Technique	The word "technique" applied to stone tool manufacture denotes the method, execution, performance or manipulation of a definite practice of forming lithic material but reflecting distinct flaking character and patterns and displaying technological attributes. The making, fabrication or preparation of stone tools under certain identifiable conditions.

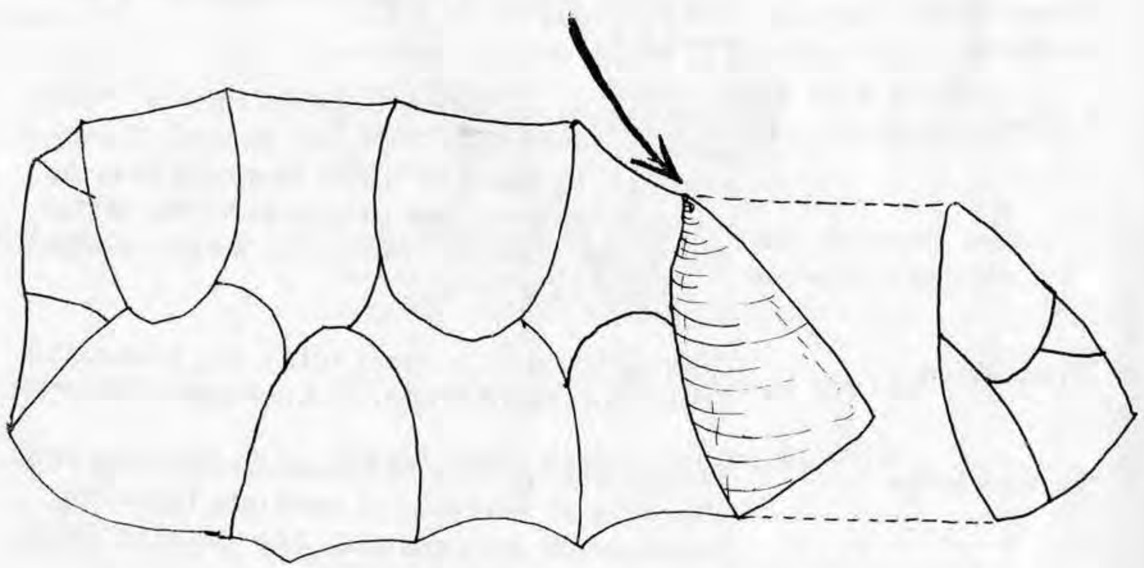
Term	Definition
	Example: blademaking, per se, is not a technique. But blades made by simulated conditions represented by varieties of platform preparation, degrees and kinds of force, angles of force, rests or anvils, rhythms and muscular motor habits, and diversified fabrication implements will represent a technique.
Technology	The study of techniques. Science of studying and interpreting the combined or distinct attributes of individual techniques. Implies a systematic control of minute and distinguishable detail.
Tenacity	Resistance to fracture. Example: jade.
Thermal Treatment	Method of altering siliceous materials by exposure to controlled heat. This treatment makes the stone more vitreous.
Thickness	Measurement of the deneness between the dorsal and ventral sides.
Thinning Flakes	Flakes removed from a preform either by pressure or percussion to thin the piece for artifact manufacture. Thinning flakes are also removed to thin a biface or a uniface. Usually shows special platform preparation. (p. 96).
Tipping	The technique of making a tip or point on the distal end of an artifact. Several methods may be used to accomplish this.
Top of Core	Proximal or platform part of the core.
Tradition	Established custom. Historic style.

Term	Definition
Trajectory of Force	Curve or straightness at which force is applied to the objective piece.
Trajectory of Fracture	Curve or flatness of flake and flake scar.
Tranchet Blow	Technique of striking to sharpen or resharpen cleavers and handaxes. Blow is struck obliquely to the marginal edge to remove a flake crosswise and at right angles to the main axis of the tool, leaving a sharp transverse edge. (p. 96).
Transverse	Crosswise.
Transverse Flaking	Parallel flaking directed horizontally to the long axis of the artifact and meeting at the median line. (p. 87).
Transverse Projectiles	Old World points made from a section of blade with the lateral margin serving as the tip of the projectile or arrowhead. When employed, they cause profuse hemorrhaging.
Transverse Section	The area bounded by and between the lateral margins.
Trough	Depression or hollow between crests. Low point between flake or blade scars. Channel scar left by flake or blade removal leaving a concavity from the proximal to the distal end of the plane of fracture. Single trough is known as a flute.
Truncation	Cutting short or cutting off; i.e., truncated cone, truncated blade, transverse truncation.
Turned Edge	Marginal edge that has been beveled by shearing or removal of multiple flakes by pressure or percussion. See Beveled Edge.



Thinning flake scars

Tranchet blow cleaver



Term	Definition
Typology	Science of classifying stone tools by form, techniques and technological traits. Must include duplication of the technique by first observing the intentional form, then reconstructing or replicating the tool in the exact order of the aboriginal workman. Shows elements of culture. Typology cannot be based on function.
Undulations	Similar to compression rings and rippling. Common to blades when the downward and outward forces are not equalized.
Unidirectional Core	Core showing that flakes or blades were removed from one platform surface and in only one direction. (p. 55).
Unidirectional Flake or Blade Scar	Scar on a core denoting that force was applied in one direction only. The lateral margins of these scars intersect previously removed flake or blade scars.
Uniface	Artifact flaked on one surface only.
Unifacial	Objective piece bearing flake or blade scars on one surface only.
Unilateral Parallel Flaking	A type of diagonal flaking made by bending the bladelets from one edge to the other and terminating them by feathering before they reach the opposite edge. May be made by either palm or finger holding of the objective piece.
Unpatterned Flaking	See Random Flaking. (p. 87).
Ventral	Plano side or inner surface of flake or blade. The under surface.

Term	Definition
Vertex	The top, turning point, zenith, or highest point.
Visible Side	The apparent face of the artifact. The upward, visible face.
Vitreous	Having the near luster and texture of glass.
Waste Flakes	Discarded flakes not suitable for function. Usually resulting from platform preparation, trimming, removing of cortex, and discarded non-homogeneous parts. See Debris.
Wave	See Addenda

ADDENDA

Force	The quantity of energy or power exerted by a moving body; power exerted; compulsory power; energy exerted to move another body from a state of inertia.
	The worker can alter the character of levering force by slowing or accelerating the action but this does not alter the amount of force for the more intense the force the slower and more limited its action.
Fracture	Irregular surface produced by breaking a mineral across as distinguished from splitting it along the planes of cleavage.
Shock	A condition established in the lithic material to counteract the stresses and strains induced by the applied force.
Split	To divide longitudinally or otherwise; to cleave, to separate or part by force.
Wave	An undulation on the surface resulting from the component particles of the lithic material being disturbed by force; to raise irregularities of the surface.

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