Photos for Polyhedral Core Paper

Text Page	Photo Number	
51	X	Two large obsidian blades made by a combination of pressure and percussion. Requires two workers - one persons applies the downward and outward pressure on the proximal end of the core and the second person simultaneously strikes a projection on the distal end of the pressure crutch.
	Z	Replica of an Aztec wooden sword to show one use of prismatic blades.
51 43 46	1076	Aboriginal obsidian polyhedral core from the State of Colima, Mexico. (Courtesy of Norman Herrett). One of the largest ever seen by the writer. Note scars the entire surface length of the core indicating perfect blade removal. Platform surface of core was restricted and almost completely utalized. Also note scar showing a step fracture which rendered the core useless.
1	1077	Exhausted aboriginal obsidian core from Puebla, Mexico. Note failure of the worker to successfully remove the last two blades due to the two step fractures caused by improper application of pressure.
1 47	1078	Aboriginal obsidian polyhedral core from Teotihuacan, Valley of Mexico showing unbelievable skill of workmanship. Scars show a standardization of both form and termination of blades. Demonstrates the worker's ultimate control and almost machine-like accuracy of blade removal. Cores of this quality are exceedingly rare.
1 47	1079	Aboriginal obsidian polyhedral core from Taxco, Mexico displaying the same fine workmanship of core 1078. Shows almost perfect detachment and termination of blades.
20 23 30 39	1080 to 1085	Aboriginal obsidian polyhedral cores from Teotihuacan, Mexico. Five cores selected from a group of nineteen to show that the entire perimeter of the core exterior is not always used for blade removal. Cores of this quality are common in Mexico. The three photos show the flaked surface, unflaked surface, and the preparatory grinding of the platform surface.
31	1087	Right of photo. Rectangular core of Harrison County, Indiana flint with beveled top - similar to the Hopewellian core type. Pressure flaked from untreated flint. Note removal of the cortex.
27 45	1095	Right of photo. Obsidian polyhedral core made by hand-held pressure and the aid of a clamp. Showing the character of a short core with the overhang left unmodified after the first series of bladelets was removed.
38	1096	Top of polyhedral core prepared by removing small flakes around the perimeter. These flakes are removed to establish platforms for seating the pressure tool. As each series of blades is removed, a new platform is prepared. This type of preparation appears to predate the grinding technique. (MacNeish, Personal communication)

26	1103	Six obsidian blades made by indirect percussion, using a punch and mallet. Note lack of uniformity, salient bulb and ripples not found on pressure blades.
26	1103	Obsidian core from which above described blades were struck, using the indirect percussion technique. Note unground platform part and excessive overhang.
23 27 31 34	1105	Top of obsidian preform core. Core was designed around a single large flake scar which will provide a surface for platforms.
23	1106	Obsidian core and blades made by the use of indirect percussion and the aid of a clamp. Note the bullet-shape of the core and the curvature of the blades. Blades lack the uniformity of those removed by pressure and also the platforms are larger.
24	1107	Obsidian core made by the use of direct freehand percussion. This technique is fast and conserves material but the blade scars show excessive rippling, lack uniformity, and have different platform characteristics. Such blades are usually modified into projectile points or like tool types, making them unrecognizable as former blades.
12 49 50	1139	Polyhedral core and blades of a thermal treated variety of chalcedony from Battle Mountain, Nevada. The core was malformed and slightly irregular prior to removing the blades by pressure. These imperfections have been magnified and transmitted from one blade to the other. This example is to show the importance of a well-prepared core preform.
48	1140	Broken obsidian polyhedral core illustrating the consistent results of the application of too much downward pressure and not sufficient outward pressure. Both pressures must be in perfect harmony to achieve proper blade termination. Blade forms still retaining the distal ends of the core are not uncommon in aboriginal blade industry sites. They are aberrant blade forms and served little or no purpose.
51	1147	Obsidian core replica and bladelets of one of the Arctic polyhedral forms. Made by the pressure technique with an unhafted long tine of deer antler. No crutch was used, but core was secured in a clamp. Overhang on these bladelets was not removed, a characteristic of Arctic bladelets. (Charles Borden, personal communication)
37 51	1148	Rectangular obsidian core and bladelets. Removed by pressure from only one side of the core. Pressure tool was hand-held, core secured in clamp. Overhang was removed after each series of blade detachment. Unlike the Hopewell blades, platforms are at right angles to the longitudinal axis of the blade.

20 45 46	1157 (2 Photos)	Seven obsidian prismatic blades showing both dorsal and ventral surfaces removed from a polyhedral core. Made by pressure with the use of the crutch and a clamp. They have the characteristic dorsal three faceted surface, both edges of the blade being beveled with a flat back. They have a diffused bulb of pressure, are without waves and undulations, with parallel sides and a very small platform which shows evidence of grinding.
27 31	1159	Obsidian tongue-shaped core and blade. Core resembles the end of a bifacial tool. Blade was removed by pressure and is reminiscent of a burin blade. The preformed core was made by the use of direct percussion.
48	1150	Polyhedral glass core made by the pressure technique, showing the effects of excessive downward pressure. To be compared to obsidian core 1140.
24	1163	Polyhedral glass core showing strangulation of the top. Top becomes smaller from repeated overhang removal.
47	1162	Polyhedral glass core illustrating the distal end of the core is smaller than the proximal end due to the core design prior to pressure flaking.
	1161	Rectangular glass core made by pressure to replicate the Hopewell technique. Note the oblique platform surface.
12	1164	(Left of photo (Polyhedral core of Grand Pressigny treated flint made by pressure with the aid of the crutch and a clamp. The heating of this material reduces the toughness, changes the luster and, therefore, it requires considerably less pressure to detach the blades. Flint is "stiffer" than obsidian and, therefore, makes a flatter blade. (Material donated by Dr. Francois Bordes and Dr. Jacques Tixier)
23 45	1166	Middle of photo. Polyhedral obsidian core made by the free hand pressure technique to illustrate the change in form from repeated blade removal. The top of the core becomes increasingly smaller from repeated platform preparation. This example shows the overhang left by the removal of the previous series of blades.
	1167	Aboriginal core of the Hopewell culture made of a heated jasper, with the platform being oblique to the blade scar surface.
24 42	1168	Conical obsidian core (left of photo) made by direct percussion with a small hammerstone. The platform surface is made by removal of a single flat flake and the core then formed around this surface.
23 38	1169	Edge view of a rectangular obsidian core using the natural unflaked surface for platforms.
24	1169	Obsidian multiform core showing both lateral and longitudinal blade removal scars. Flintknapping technique was direct freehand percussion with an antler billet. Occasionally one will fine polyhedral cores showing bi-directional force, indicating that blades were removed from opposite ends. This technique is ~~generally~~ generally a method used to rejuvenate and recover a core which has been

ruined by a step fracture. This is done by applying pressure from the opposite end to remove a blade up to the step fracture.

47 1170 Obsidian polyhedral core showing the results of too much outward pressure and not enough downward pressure. This is a hinge fracture - not a step fracture. Hinge fractures were purposely fabricated by workers of certain Arctic cultures when making a burin core and when they wanted their bladlets to truncate at the 180 degree angle of termination. In this case, the core has been ruined by this fracture.

21 1171A Blade and obsidian core . Core was preformed on one face
27 only by the use of direct freehand percussion. Ridge was
54 established by alternately striking bilaterally on one face of the core. The ridge, or keel, is used to prevent the blade from expanding. The first blade is distinctive because the ridge on the dorsal side bears the bulbar scars of ridge preparation which shows force originated at the apex of the ridge. The first blade removed from a core could easily be mistaken for an artifact, but is merely a discard. Note fissuring on core indicating direction of force.

21 1171B Side view of core 1171A showing single ridged core and
27 first blade removed. Note the character of the percussion flake scars on one surface of the core. Opposite side is much the same.

31 1172 Top view of a two ridged quartzite core.
12

27 1173 Right of photo. Top view of three-ridged obsidian core.
33 The top will be the platform surface. The pressure tool tip will be placed on the corners above the ridges to remove the first three blades.

24 1175A Edge view of an obsidian bifacial conical core made by the billet technique using direct freehand percussion. Note eraillure flake still adhering to the core near the leading edge - shown near the center of the core.

1175B Flake removed from biconical obsidian core 1175A The dorsal side of the flake shows scars left from removal of previous flakes. Flake is expanding because the surface of the core was too flat to restrain the force.

43 1178 Core and three blades of Iceland obsidian. Removal was by
44 pressure with the aid of the crutch and is to be compared to 1076, an aboriginal core from Colima, Mexico. The blade is as long as, and slightly wider than, the widest blade scar on the Colima core. This is about as large a blade as I can successfully remove which is governed by the workers' weight. My present weight is 170 pounds. (material courtesy of Dr. Junius Bird)

45 1180 Two obsidian blades. Blade at right was detached by pressure
26 1182 and blade at left was removed by the use of indirect percussion. Blade 1180(pressure) is regular in form and without undulations. Blade 1182(percussion) is irregular in form and has accentuated rippleing or undulations.

Photos of Polyhedral Cores

Enlargements printed from 16MM High Speed film for detailed study of individual sequences of blade removal. Material is obsidian from Glass Butte, Oregon.

A-1 The pressure tool is placed vertically and directly above and between the two established ridges mady by removal of three previously detached blades. The overhang left from the detaching of these blades has been removed by pressing off short micro flakes. This is one form of platform isolation. The tip of the pressure crutch must be placed with great care on the edge of the core for the degree of tolerance is infinitesimal. Note two pieces of white pine have been inserted between the jaws of the clamp to prevent slippage and to avoid damage to the core. The core is left exposed both at the top and the face for the seating of the pressure tool and for blade detachment. In this experiment there has been no support used at the distal end of the core.

A-2 First downward pressure is applied then, almost simultaneously, the outward pressure is exerted until the blade is removed. This photo shows the bending of both the shaft and the tip of the pressure tool, a result of the application of outward pressure. If the top of the core has not been roughened, the tip of the pressure tool will slip and damage the core.

A-3 This shows the parting of the blade from the core. The proximal end of the blade has now been detached approximately a third the length of the core. The blade is actually detaching a little at a time, or is literally being peeled from the core. The principle of detachment may be compared to the strong man act of severing a telephone book in two parts by tearing one page at a time. This same principle is characteristic to most pressure flaking.

A-4 The blade has now parted slightly more than half the length of the core and the crack has opened a measurable amount at the top of the core, yet the distal end of the blade is still attached.

A-5 The distal end of the blade is still attached to the core and the proximal end is freed but still remains close to the top of the core. However, the middle of the blade has moved a perceptible distance from the midsection of the core. This feature readily demonstrates the bending and flexing of the blade. The tip of the pressure tool is still in contact with the platform which is adherring to the blade.

A-6 Blade is still attached to the core and this photo shows the amount of bending. This can be measured by calculating the space between the blade and the core approximately one-half way between the top and bottom of the core.

A-7 Blade is now free from the top of the core and because of the material's elastic qualities, the blade has almost regained its straightness and has lost the bow caused by the bending. Notice the tiny eraillure flake at the tip of the pressure tool. The tip of the tool is still almost even with the top of the core while the proximal end of the blade has now moved both downward and outward. The distal end of the blade is curving under the core while the top of the blade moves outward.

A-8 The distance between the core and the blade is now approximately the same width at both ahe distal and proximal parts. The tip of the pressure tool has now started to travel at approximately a forty-five degree angle from the top of the core - then downward and outward. Such an angle represents the angle of a cone. (Described in a separate paper on cones)

A-9 The eraillure flake appears to be static. It's motion is now the result of simple gravity and it can be seen at the top of the core and equal distance between the blade and the core. The blade has parted from the core at the longitudinal midline of the first and third blade scars. The number two blade scar is now the dorsal side (back) of the blade being detached.

A-10 The distal end of the blade is slightly thicker than the proximal end because of an irregularity left by the previous blade scars. The slightest irregularity on the face of the core will cause an imperfection on the blade.

A-11 Showing the termination of the blade may be slightly controlled by holding the pressure crutch a few degrees less than vertical and toward the operator. Such a ahange of angle will cause the blade to leave the core before it has reached the distal end of the core.

A-12 Because of the elasticity of the material, the blade is bounding away from both the core and the tip of the pressure crutch while the position of the eraillure flake appears to be almost stationary.

A-13 Continuation of motion.

A-14 Blade is now parallel to the core and moving both downward and outward.

A-15 Blade is starting to twist slightly, probably due to one side of the blade being a little thicker.

A-25 Blade is moving away from the core at great speed and, therefore, to prevent breakage it must be caught on some soft barrier. The eraillure flake has dropped less than a quarter of an inch while the blade has moved well over an inch.

A-45 A blade such as this has a supberb cutting edge on both parallel sides.

A-55 The distal end of the blade is moving faster than the proximal end and is probably caused by the elastic action of the blade as it springs back. This is comparable to the flexing of an arrow as it leaves a bow.

A-65 Shows the next sequence of blade action and the travel path of the pressure instrument.

A-75 Blade has been successfully removed and has the characteristics of a prismatic blade from a Polyhedral core of the Valley of Mexico.

This series of photos (B-1 to B-15 and B-25 to B-100) are enlargements printed from high speed film and the action was photographed at 5,000 frames per second. It shows a failure in blade removal.

B-1 In this experiment, the material is thick plate glass salvaged from an old bank door. Glass has proven to be an excellent material for blade removal for it is generally constant and unvaried; and, due to its transperancy, imperfections may be detected readily. Manufactured glass does, however, lack contrast necessary for photography. Natural volcanic glass (obsidian) is, by nature, lacking in consistency and undetectible flaws may be present.

B-2 The tip of the pressure tool has been placed too close to the edge of the core and the leading edge has not been sufficiently trimmed. The vertical angle of the pressure tool is less than 90 degrees, making it difficult to apply the proper amount of downward and outward pressure.

B-3 The proximal end of the blade is being detached and has parted approximately a third the length of the core. By measuring the space now showing between the proximal end of the blade and the core and comparing this with the series of photos of the same experiment in obsidian, we find that glass is slightly more elastic than obsidian.

B-4 Note the amount of bending of the blade - considerably greater than a like blade of obsidian. The blade has now parted from the core beyond the mid part but is still attached to the core at the distal end.

B-5 The tip of the pressure tool has now lost contact with the platform of the blade and the blade is springing back against the core in a whipping action. Blade is released from the core. Flexing of the blade was too great and a step fracture is appearing in the mid part of the blade.

B-6 Flexing of the blade was too exaggerated in the mid section and break is now obvious. Blade is now entirely free from the core.

B-7 Top half of the broken blade acted as an intermediary pressure tool between the tip of the regular pressure tool and the distal half of the broken blade and, therefore, transmitted the force to the distal end of the core.

B-8 Luckily, the blade was entirely freed from the core for if the distal end of the blade had adherred to the core, it would then become an obstruction which would ruin the core. When this happens, no additional blades can be removed and the core must be abandoned.

B-9= Because the proximal end of the blade is moving toward the core, the eraillure flake is undetectible. Note the definition of the overhang created by the bulb of pressure.

B-10 When a blade is successfully detached from a core without any breakage, it vibrates as it leaves the core making a sonorous ringing which indicates success. Such was not the case when this blade was removed. There was no resonant sound but one that is singular to this type of fracture. To the worker, sounds can indicate success or failure.

B-11 The broken parts of the blade are turning in opposite directions causing them to move in a spiraling motion. This appears to be due to improper alignment of the pressure tool with the ridges which are used to guide the blades.

B-12 The tip of the pressure tool is moving at what appears to be the correct angle as it leaves the top of the core.

B-13 The slightest miscalculation of judgement of the factors involved in removing a blade can cause failure. Yet practice and full command of muscular control will permit repititious removal of blades.

B-14 Note that a small flake is airborn just between the break in the blade. This tiny flake is peculiar for it bears no bulb of force. However, upon inspection, it showed ripple marks from the center of the flake outward indicating force started at the midpart of the flake and radiated in two directions from the center. The truncations of both blade parts will bear the negative scars on the ventral side. The rippling will be directed toward both the proximal and distal ends of the blade.

B-15 Continued motion of the broken blade parts.

B-25 Both blade parts have now turned to a degree almost directly facing the camera.

B-35 The distal part of the blade has been projected out of the picture while the proximal part is simply falling.

B-45 When these pictures are shown in motion, one can observe the staff of the pressure tool quivering and vibrating.

B-55 The face of the core shows an imperfection that resulted from the blade being broken.

B-65 Note scar on the core from a previously removed blade. Scar shows numerous undulations caused by blade vibrations as it was removed from the core.

B-75 The proximal blade part is falling but in order to more fully understand the physical properties of isotropic materials and their reaction to applied force, this photo is useful for time studies and for comparison to other film strips.

B-100 A study of the action film is impossible without the aid of a projector, but the stills are very useful in combination with the action for many features are not revealed until both are compared.