NEGATIVE REEL 1

Herb: SCENE 1 CORE PREPARATION - A brief description of core preparation.

Don: The core can be prepared in several different ways. The materials we are using for these experiments are obsidian and glass. This is an ideal material because it produces a very sharp edge and allows a uniform breakage. The more granular the material - the coarser the edges and the more tenacious the stone. In order to prepare a platform one must first establish a series of ridges which will guide the initial flakes. The example shown here depicts a series of flakes removal to establish ridges, or facets, along the vertical axis of the core. In establishing these ridges, the outward corners, or angles, have been prepared to the vertical axis in order to guide the initial flake, thereby establishing two ridges for removal of the next two flakes. If the core is rectangular, one will remove a flake from each of the four corners until ridges have been established so that blades can be removed around the entire perimeter of the core and work can be continued until the core has been utilized. When it reaches the point of entire utilization, the core assumes a polyhedral or cylindrical shape.

Herb: Don, will you describe what you are doing and the type of tool you are using and why you have the core in a vice of this type?

Don: The core must be affixed firmly by some manner. There may be multiple types of devices for holding the polyhedral core. If the core is not affixed and stabilized, the worker cannot break the cohesion between the core and the blades. One of the most important steps is the placement of the tip of the tool on the platform and the angle at which the tool is held. It must be held in a vertical position in order to press both downward and outward and to equalize these forces. There has to be pressure exerted from the knees against the hands and a simultaneous pressing down with the chest. The chest pressure against the platform is applied first and at the same time, the hands and knees slowly apply the outward pressure until the flake is dislodged from the core. In order to keep the

tip of the tool from slipping, the surface of the platform has previously been ground. Initially, when I first started making these cores, I would flake a platform to seat the tip of the tool, but I got slippage and, sometimes, the edge of the platform would be crushed thereby ruining the core. I then tried scratching the surface of the platform to prevent the tip of the pressure tool from slipping. I find now that by grinding the surface of the platform, I can prevent the tool from slipping and this grinding also weakens the area where pressure is applied and this allows easier blade removal. This method was used by the aboriginals and they obtained a surface on the proximal end of the core much like ground glass. This prevented the tool from slipping, and it also eliminated re-preparing the platform each time a blade was to be removed. This also eliminated the removal of a rejuvenation flake at the proximal end of the core.

Herb: Don, in this first scene then the important thing actually (and we want to insert that this is a cover shot at 24 frames a second standard speed) is for us to watch for the action of your knees against your hands and the pressure coming down from your chest on this tool that you have created to force this blade off. Are those two of the things in this particular first frame picture that we have in stopped motion, should we look for your knees pressing against your hands and the tool being pressed down from your chest giving you this double motion that you've discussed? Is this what we are looking at?

Don: Yes, and it is also important that the position of the tool be a few degrees back from the edge of the core. This is done in order to get the blade to feather out at the end of the core, otherwise, the blade would snip off the end of the core during detachment. The proper axis of the vertical angle of the tool is between the distal end of the flake and the chest. As pressure is being applied, one actually feels the flake dislodging, yet according to the highspeed photography, there isn't enough time for a brain reaction to control the muscles. But, by feel and practice, one can pre-program their muscular reactions and the pressures and either stop the flake short or carry it through to the distal end of the core.

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Herb: In scene 1, the first scene the core slipped. Scene 2 is a follow up on that it is just a continuation.
SCENE 2.

Don: There wasn't enough downward pressure on the first stroke to keep the tool from slipping. The placement of the tool on the edge has to do with the thickness of the flake. The nearer it is placed to the edge of the core, the thinner the flake. If it is placed farther away from the core, the flake will be thicker.

Herb: SCENE 2 of reel one - Don, what are you preparing here?

Don: Scene 2 shows the operator is in a sitting position with a leather pad on the left thigh and the block of stone is held by the left hand and is firmly pressed against the left thigh and this is the method of holding the core for making blades by percussion. Percussion technique is evident in the film. The removed blades can then be worked into different types of artifacts. Notice the angle at which the force is being applied by the tool in the right hand which is a billet of elk antler. The elk antler prevents bruising and also it helps eliminate the shock to the core and to the blades. This allows the blade to be detached without fracturing in the center as a result of the end shock.

Herb: Don, would you explain a little more about what you mean by bruising?

Don: At the platform, or at the point of impact, as the tool strikes, sometimes a hard tool will cause a crushing of the edge, and if the edge has been crushed, then one must strike further in on the face of the core and he must remove a thicker flake in order to eliminate this bruising. It will make the flake excessively thick if one strikes too far back on the base of the core.

Herb: Okay we will go on, what has happened here, Don?

Don: This shows the distal end of the blade binding against the pad and this lack of clearance and the shock caused the flake to fracture. The entire flake was removed from the surface of the core, but there was too much end shock and it

caused the flake to break. A projection or ridge on the core is selected to receive the impact of force, in order to guide the flake for the force will follow the projecting mass. The material being used is obsidian, which is a little more friable than flint. It is easier to remove a long blade from flint and some of the cryptocrystalline quartzes than with obsidian. Greater care must be exercised when using obsidian in order to remove a long blade from the core.

Herb: SCENE 3 is a continuation of the same action.

Don: You will notice there are several lighter strokes taken before the final stroke and this is to trim off the overhang left by the bulb of force, or the bulb of percussion a result of the removal of prior flakes. There are additional strokes taken. Here I move the core with each stroke so I have no overhang to remove. As I take off additional flakes, I establish a ridge for the next flake and I move along the line following each separate ridge. If one removes another series of flakes on top of the other flake, then the overhang must be eliminated.

Herb: Don, in this particular scene you pick up a flake or is that a flake you're putting back your picking up a flake showing where it goes back on the original core? Will you work with this flake in any way?

Don: Yes. The flake will be utilized for artifacts. Sometimes, if they are too long, they can be severed in the center, if one wants a standardized projectile point. Then, using percussion work to eliminate the curve of the flake and remove the bulb of force, the flake can be shaped by the pressure technique into an artifact. This will be shown in another film. This shows the ridges and how the flake follows the ridges; the angle of impact from the tool as it is striking and the follow through with a certain type of motion. The worker actually feels the flake pull free of the surface. This is a close-up shot showing the surface of the core.

Herb: SCENE 4 - A Close up shot.

Don: If the core has a natural cortex, its rough surface will prevent slippage of the tool when it is struck on the edge. A natural, rougher, cortex surface makes dislodging a flake easier than from a newly flaked surface.

Herb: This is highspeed photography shooting at 64 frames a second is what this was shot at.

Don: Notice the response of the left hand under impact as the antler billet is striking the edge. This particular swinging motion was to gauge striking position and the next blow that will be delivered to detach the flake. There the flake was removed, you will see portions of it. There was a slight bit of shock fracture at the distal end of the flake. This flake curled off and under the core and removed the lower end of the core because too much downward and not enough outward force was applied. The angle of the blow was not quite correct to allow the flake to terminate and feather out at the distal end. Notice the right hand maneuvering the core into position by the use of the tool and the reaction of the left hand. There is a ridge now established to guide the flake so it will follow this projecting mass. The billet slipped on the edge of the core and the flake wasn't dislodged. This one was successful. The degree of accuracy in striking is very important. The removal of the last blade prepared a ridge for the next one. This is necessary, because the surface of the core is going to determine the shape of the flake. This is reminiscent of the blacksmith striking the anvil each time before he actually hits the metal. The same thing is done here for positioning the tool and then one makes the actual impact blow.

Herb: Scene 5 is highspeed photography at 5000 frames a second and notice that the frame of the picture is horizontal in order to get the close up that we wanted we had to turn the camera sideways. This was actually a picture of the cover shot that you saw in scene 1 where we showed Don Crabtree pressing down with the tool against his chest and against his knees. Now this is a close-up shot of highspeed 5000 frames per second. Would you like to discuss that opening picture, Don?

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Don: This shows the placement of the tool on the platform with the core held in a clamp. There have been several flakes previously removed from this core and the ridges are already established. There are two types of flakes that can be removed from this core. One would have a double ridge, the other a single. The double ridge is the most desirable because it leaves two beveled edges with a flat surface on the dorsal side of the blade. This type of flake will provide a greater clearance medium for a cutting tool to make a deep cut, and does not have too thick a cross-section. The tool is probably placed a 64th of an inch in from the face of the core. The tip is placed by the index finger of the left hand on the face of the core and one feels for the exact placement of this tip. After the tool is properly seated, the weight of the body is pressed down against the crutch, until almost the entire weight of the forepart of the body is resting against the chest crutch. After the tip has been positioned, if it has been placed far enough in to support the weight there will be no crushing of the platform, and this is, normally, a sense of feel. If you feel a little crushing, then the tool must be seated back farther towards the base of the core. As the weight of the body is placed on the crutch, pressure is exerted from both of the knees and both of the hands, and, at the same time, additional force is applied by the body.

Herb: It's this force from the knees and the hands that determines the angles and the pieces that fly off, am I right, Don? This comes only through practice?

Don: Yes. This comes through practice and one must learn to distribute both the downward and outward forces and coordinate them perfectly in order to remove the flake from the core.

Herb: We will start the first frame again and Don will describe the action as it goes.

Don: The force is now being applied, pressure from both of the knees, both of the

hands and also the body. There, the flake is being removed! You can notice a tiny erraillure flake flying through the air; yet, it is odd that the distal end flipped off at the same time. Another part of the action to watch is the angle of the pressure tool. This angle was originally vertical but when the downward pressure was applied, I compensated for the outward pressure, and, therefore, the angle of the tool tip is now corresponding with the angle of the cone. The angle of the cone that has been changed until it is now vertical with the core in order to detach the blade. Notice on the distal end of this core that the blade is feathered out to infinity.

Herb: Don, was it a surprising thing for this to kick out from the bottom?

Don: Yes, it was. I thought that the flake would bend its full length starting at the base to the distal end. But, the action is so very fast that it seems like the force causes a rebound from the distal end as it is detached from the base of the core. There is apparently enough elasticity in the stone to cause it to almost explode from the basal portion of the core.

Herb: SCENE 6 - This is another highspeed shot, once again I will let Don take over.

Don: You will notice the pressure tool does not move out at the same angle of the former detached flake. With this detachment the lower end of the blade did not feather out, for there was too much downward and not enough outward pressure and the distal end of the core was removed by what is called a hinge fracture. The flake wasn't broken but the whole lower end of the core was removed because the outward pressure wasn't sufficient to compensate and equalize the two forces.

Herb: This was shot at 5000 frames.

Don: Notice the lip and overhang on the proximal end of the core - a result of the bulb of force, or bulb of pressure. This must be eliminated and platform re-prepared each time before blade removal in order that the force may be applied directly above each of the ridges.

Herb: One of the other things that we noticed too, is the wavering of the tool as it follows the flake that is going off.

Don: The pressure tool seems to move out and backward for some reason which I don't fully understand. Something that I have failed to mention in this shot is the positioning of the tool. I also didn't describe how you determined producing a flake with two ridges or a single ridge. When placing the tool, if you want a double ridged flake, you must intersect the position of the tool between the two ridges. If a single ridged flake is desired, the tool will be placed directly above the ridge.

Herb: SCENE 7 - Another shot at 5000 frames. We will stop it on the first picture so that Don could give you the description of the tool and its placement and any other pertinent facts.

Don: Notice the leading edge, or the overhang, has been removed before placing the pressure tool. After a flake has been removed it leaves this bulb of force causing a lip on the leading edge. This is removed by the use of a hand-held pressure tool and it is dragged along the platform, but without crushing the platform. A projection is often times left at the exact position that you want to place the tool. Before the pressure tool has traveled half an inch the blade has detached from the core and is probably an inch and a half, or an inch and a quarter, above the core; while the pressure tool has traveled less than half an inch. You will notice the little errraillure flake flying through the air, these are peculiarities that occur as the cohesion is broken between the blade and the core. The errraillure flake sometimes adheres to the core and this seems to be because of the inertia between blade and core, which is, apparently, in perfect balance. In this instance, the errraillure flake came free and did not adhere to the core itself.

Herb: Don, now we have noticed in three different highspeed shots in the sequence that one blade took off from the bottom and the bottom traveled faster, the second one flipped from the top and it traveled faster away from the core and this one travels nearly horizontal to the core. Is there a reason for this?

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Don: Yes, there is a reason for this. It is because the rhythms and muscular reactions are not exactly compensating for the downward and outward pressure. The muscular reaction must be perfectly coordinated and, by practice, this can be developed so that each flake will be absolutely uniform and be an exact duplicate of the next one.

Herb: Regardless of the duplication of this, if you wanted each one of these blades to be the same then, theoretically, if the first blade flipped up from the bottom you would have that same pressure and downward motion to get the same blade. We could assume, then, or could we assume, that the next blade if it were going to be duplicated, would have the same characteristics. That it would come up from the bottom first or top first or the middle?

Don: The ideal flake is the one that we saw feather out and come off parallel to the face of the core. Successful feathering is the result of using the correct amount of downward and outward pressures and each time duplicating the placement of the tool, the preparation of the platform, the angle at which the core is supported and the tightness of the core in the clamp, and the correct positioning of the tip of the pressure tool on the platform. In each of these conditions there is almost no tolerance and it must be done correctly in order to develop this uniformity.

Herb: Actually the last scene that we saw Scene 7 where it went off horizontally is the better of the three flakes.

Don: Yes.

Herb: SCENE 8.

Don: Scene 8 is an excellent shot showing the position of the pressure tool. Notice the angle of the tip of the pressure tool. It is beveled on the outward edge, so it won't drag on the lip of the core which was left by the removal of this first flake. It is designed so that it has strength in the part that is inserted into the shaft, but its beveled tip will not drag against the basal portion of the core. You can see the alignment of the pressure tool in rela-

tion to the flake. This side shot is of a flake that has a double ridge. But the angle at which the picture was shot shows only the single ridge and the tool appears to be placed directly behind this ridge which is directly in front of the viewer. Actually, it is placed between the two ridges, but this is not discernable to the viewer and the blade will come off and intersect just below the ridge of the second flake. This blade will leave a very slight bulb of force. There is very little overhang which is an ideal condition because if there is too deep a bulb, and one has to keep repreparing the platform, the core will ultimately assume a teardrop shape, with the platform or top of the core, utilized and there would be considerable mass left on the distal end of the core. There is a little arraillure flake, a very microscopic one, floating in the air between the core and the blade.

Herb: SCENE 9 - Another shot working on the same core. A continuation of the core treatment.

Don: Notice this flake - there was a rebound. This second flake shows a considerable overhang on the lip of the core and, as the cohesion was broken, the top of the blade rebounded from the proximal end of the core striking against the core. The blade bounces one time - yet the pressure tool traveled little more than a quarter of an inch.

Herb: SCENE 10.

Don: Now the overhang has been eliminated from the core and the platform prepared for the next stage. Notice the pressure tool has been set too far to the leading edge and the blade was excessively thin. Before the release of the blade, at the basal portion of the core, too much pressure was applied. This caused flexing and the flake is turning sideways which indicates that the tool wasn't directly in line with the ridges, causing the flake to break in the center. There is still twisting of the blade from the side motion. But this is caused

by the molecular attraction and the differences in force as the blade is removed, thereby causing this spiralling and twisting resulting in a fractured blade. Fortunately, the blade detached to the distal end of the core and there was no step fracture in the center. Had it step-fractured, the core would have been of no further use for making blades.

Herb: SCENE 11.

Don: This view illustrates the base of the core as now being nearly flat. Therefore, one must re-establish additional ridges, and start at each corner of the core in order to keep the ridges re-established so the next flake can be removed.

Herb: Don, I have noticed that the pressure that you are applying to the core throws a little flake. Right there you've got your little pre-flake.

Don: This was a crushing of the platform and the crushed portion is flying through the air before the final pressure is given. This is the result of the tool being placed too close to the leading edge of the platform and, therefore, it is crushing. But there is enough remaining platform to permit the blade to be detached. The blade flexed too much causing an undulation and wave motion towards the distal end of the core.

Herb: You could trace that on this film, you could see that undulation there starting from the left side of your film about a third of the way back. It undulates rather sharply up to that point. This little pressure flake that flies off is not desirable. Is it a misplacement of tool?

Don: The undulation was caused by the blade being too thin and it was too thin because the tool was set too close to the leading edge of the core. This undulation is going to disfigure all the additional blades because it is the ridge that guides the blades and the ridge must be uniform in order to remove a uniform blade. Now, if the undulation is excessive one can set their tool back further from the edge. Then, the worker gives a very severe thrust with

additional pressure and sometimes one takes off a thick enough blade to eliminate this undulation. But, normally if the blades are of the same thickness, this undulation will follow all the way through till the last blade is detached. In other words, the balance of the blades will be disfigured. This material is glass and you can see the cracks starting to open up at the base right next to the pressure tool. But the undulation has caused too much pressure as the blade goes over the top of the ridge which will cause the blade to sever. The blade is broken before the pressure tool has traveled more than about an eighth of an inch.

Herb: Don, another thing here on this going back just a little bit, you see right from the point of your tool there's a light reflection of pressure before the crack begans.

Don: Yes, the blade is still adhereing to the core at the distal end. As the blade departs from the core and comes to the ridge, or the undulation left by the previous flake, it takes additional force to carry it over this hump, or wave, and this has caused the blade to break.

Herb: SCENE 12. This is a different technique, and what are you doing?

Don: This is hand-held percussion using a hard hammerstone. Sandstone or granite is ideal for this method. This type of hammerstone will show the difference in the amount of shock and probably the fracturing of the flakes from end shock due to the harshness of the impact from the hammerstone to the leading edge of the core. This shows the positioning the tool on the edge-directly over a ridge - to guide the flake down the surface of the core. This time the tool struck a little too close to the edge but it still didn't crush the edge. This time the stroke will place the tool a little more directly in line with the ridge in order to guide the flake. Notice the shock fracturing on impact, also the hinging off of the lower portion of the core as it was cleaved.

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The angle of the core was not exactly right to remove the blade intact from the full surface of the core. Notice the excessive undulations using a hard hammerstone and the deep bulb of percussion. Notice the fingers manipulating the core to the proper position. The ridge is oriented so that it will be in line to receive the impact of the hammer against the platform. This was a nice, long, narrow blade, however, it did fracture. Because of the sharpness of the ridge, the wave motion and the undulations were eliminated. This is quite a flat flake detached from this side of the core. Examining the surface of the core and the contrast of the two flakes, notice the very slight ridge which allowed the flake to spread producing the flat flake. The flake wasn't narrow due to the flat surface and this allowed the force to radiate. This will show removal of a single ridged flake on the side of the core and a change of percussion tool. The tool is a section of a deer antler held vertically in order to get the weight. Notice it is not held billet style, or as a club. But, in order to get more weight, more follow through, the section of antler is held vertically. This shows the preparing the face of the core to provide a projection which will receive the impact of the antler percussion tool. The surface of the platform was too slick. This is a flake surface but had it been a natural surface, or a cortex surface, the tool probably would not have slipped.

Herb: SCENE 13 - We've changed from the antler to another scene and you are doing what here?

Don: This illustrates a method of indirect percussion. This is a copper tip hafted in a wooden handle. This handle is split and the force of the impact caused the copper projection to almost leave the handle.

Herb: Why are you using copper?

Don: Because copper doesn't slip, which provides for a little better placement of the tool. The mechanics are the same as when using antler, but antler has the ten-

dency to abraid and it has to be repointed more often. The core is between the knees and they do not give sufficient support. The hammer is also excessively heavy and does not permit sufficient speed for a core of this weight. If sufficient speed is developed, the flake will be flatter and will terminate without curving around the distal end of the core. This is a section of antler being used as an intermediate tool placed on the platform. It doesn't have as much tendency to shatter the flake and it reduces end shock. Since the antler is a little softer material, it serves well as an intermediate tool.

Herb: SCENE 14.

Don: The core is turning because the knees cannot provide enough pressure to immobilize the core. Had this been supported on a anvil, with a second party holding the core, the method would be much more successful. This is only to demonstrate the use of the intermediate tool and the use of the knees for a one man operation. Here the platform is the natural cortex surface on the edge of this block. Here, again, one needs the support or the use of an anvil or the core must be placed in the sand or on the ground.

Herb: Now in placing this in the sand or on the ground, what is the purpose there just to keep that core from shifting?

Don: Yes, and it also provides enough enertia for the cohesion, or the molecular attachment to the core, to be broken. One must provide by support some enertia for the core in order for the flake to be removed easily. Without the support, the changes, causing excessive undulations and flexing as the blade is being removed.

Herb: SCENE 15.

Don: This is to demonstrate my normal pressure position. The angle at which pressure is being applied to the tool governs the removal of the parallel flakes

obliquely from the edge of the artifact. The flakes are being removed on the underside of the projecting edge of the tool.

Herb: Don, I want to point out one thing here and have you expand upon it. Is the action of your arms, in fact, this is one of the things we shot this particular scene for, was to watch the muscular action of the arm and also some of the interaction of the knees on here. Could you explain that?

Don: The left hand is supported by the inside of the left thigh and the left thigh applies pressure simultaneously with the pressure exerted by the right hand which is resting on the inside of the right thigh, and a downward pressure is exerted by the shoulders and arms. This appears to be a single motion, but actually there are several motions. One is seating the tool, and, at the same time pressing inward and downward. There is a seating of the tip of the tool each time a flake is removed. You can see the movement as the tool is positioned directly in line with the ridge left by the previous flake. This positioning is necessary to guide the flakes across the surface of the artifact. This is the technique of bending flakes over the mid line of the bifacial artifact being pressure flaked. I am now examining for little step fractures, removing some of the little adhereing flakes on this side. This is a shearing process for the preparation of the next series of flakes. It is done to make the edges considerably more regular before the next series of pressure flakes will be removed. And this will establish uniformity all along the leading edge of the tool so that when pressure is applied, it can be done in a uniform manner and the flakes, of course, will be uniform as well. One might notice the position of the tool and leverage of the fingers during this shearing process. The artifact is held between the thumb and fingers as this shearing takes place. This shearing is sometimes called turning the edges.