Flint Knapping: Percussion

Compiled/Edited by Michael Lynn

Photo of Tim Dillard teaching me at the Center for American Archaeology in Kampsville, IL

Dedicated to all those who have taught someone else about the art of flint knapping, especially to my primary teachers – Bruce Boda, Tim Dillard, Mike McGrath and Steve Nissly. This is my attempt to pay forward.

Flint Knapping: Percussion

Platform Preparation Variables in Bifacial Reduction of Flaked Stone Tools

by Errett Callahan

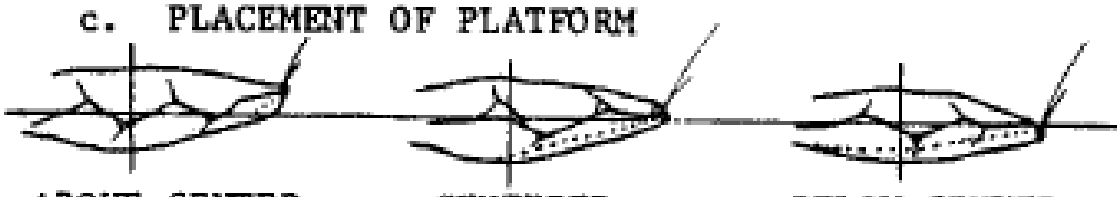
a. SHARPNESS OF EDGE

TOO SHARP	CORRECT	TOO DULL
Edge may collapse or release small flake. Dull by abrading perpendicular and/or parallel to lineal edge with coarse abrading stone.	Dull only enough to prevent collapse of platform. Correctly dulled, flake should release with first strike.	Excessive resistance, causing billet to glance off without releasing flake. Reflake so as to reduce thickness of edge.

b. ANGLE OF BEVEL

TOO LOW	CORRECT	TOO STEEP
Edge may collapse. Rebevel to steeper angle.	Bevel to 60°-70° so edge points slightly downward and flake releases on first attempt.	Force may glance off. Rebevel to lower angle. Avoid continued striking.

c. PLACEMENT OF PLATFORM

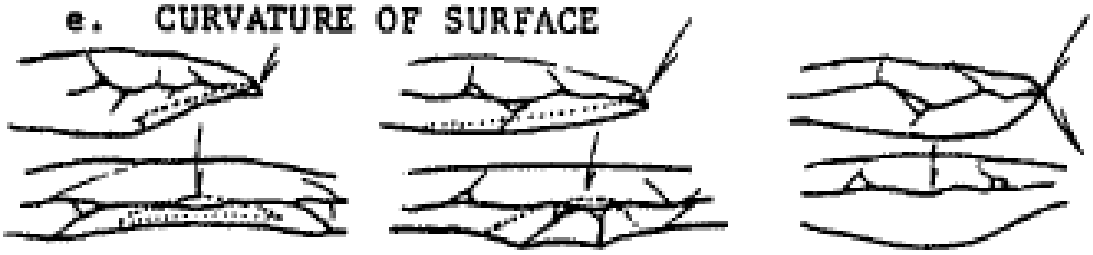


ABOVE CENTER	CENTERED	BELOW CENTER
Flake may be short or biface may break. A major cause of fracture. Lower platform.	Flake may travel to center. Less chance of fracture. Ideal for primary thinning.	Flake may span up to entire width of biface. Minimum chance of fracture. Ideal for secondary thinning.

d. PLATFORM ISOLATION

EXCESSIVE ISOLATION	SLIGHT ISOLATION	NO ISOLATION
May produce narrow flake of little mass. Reduce isolation.	May produce most massive flake of predictable attributes.	May expand to wider than long and terminate in hinge fracture. Increase isolation.

e. CURVATURE OF SURFACE

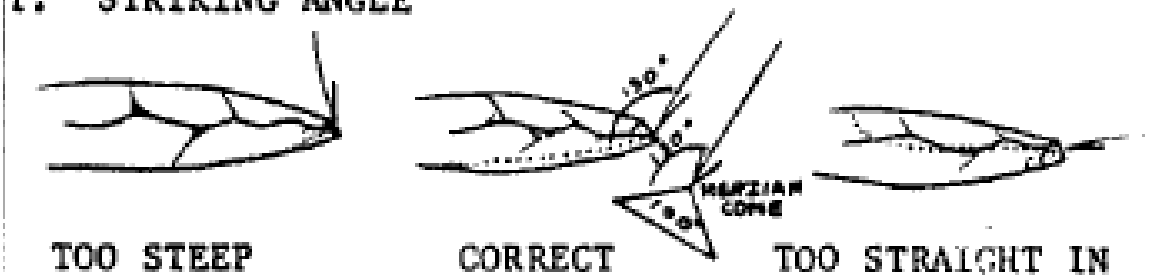


CONCAVE TO FLAT
Force may dissipate and flake may step or hinge upon encountering greater mass. Round off overhang.

SLIGHTLY CONVEX
Allows for optimum removal of mass with least resistance.

OVERLY CONVEX
Excessive resistance, preventing flake removal. Lower platform or remove hump from another direction.

f. STRIKING ANGLE



TOO STEEP
May release short flake or glance off platform. Lower striking angle. However, ideal for trim between major flake removals

CORRECT
Strike at 130° to expected flake scar for optimum results. Alternately, strike perpendicular to center plane (but not to platform).

TOO STRAIGHT IN
May split biface with overshot or deeply hinged flake or may produce partial cone and crushed edge. A major cause of rejection. Raise striking angle.

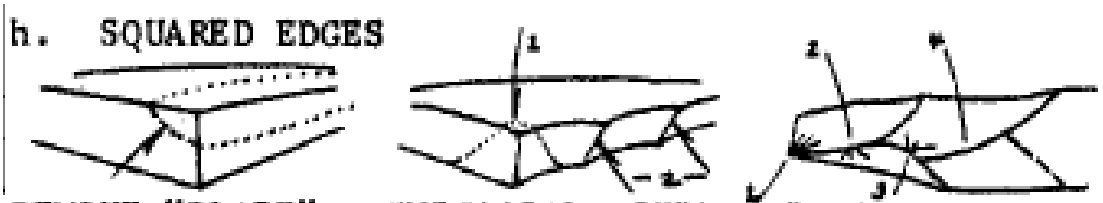
g. ACCURACY OF AIM

TOO LOW
May either fail to release flake, crumble platform, or yield flake smaller than desired. Aim higher.

CORRECT
Ideal contact point is about 1/8" back from edge. Correct platform attributes help assure correct release despite slight inaccuracy of aim.

TOO HIGH
May either fail to release flake, or break biface in two. A common cause of fracture. Aim lower.

h. SQUARED EDGES



REMOVE "BLADE"
Strike so as to remove an elongated flake down one or more corners.

UNIFACIAL BEVEL
Or bevel by striking a series of flakes perpendicular to edge, flip over, then strike perpendicularly at center of ridge.

BIFACIAL BEVEL
Or work alternately from face to face, maintaining a centered edge.

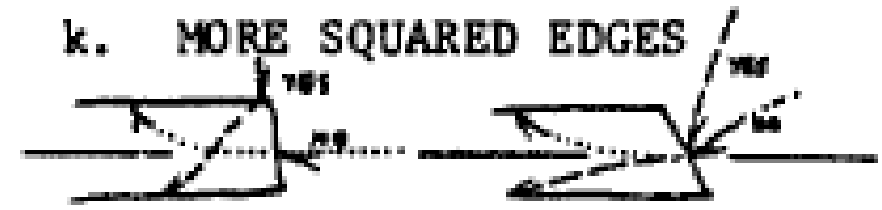
1. THINNESS OF EDGE

On excessively sharp and thin edges such as flakes or blades, remove excessive thinness so as to create a beveled platform capable of withstanding collapse.

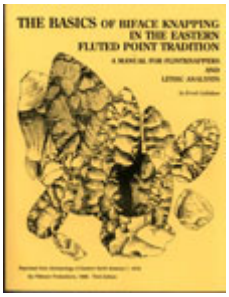
1. LIP FORMATION POSSIBILITIES

All forms are possible with all load types but ratios of occurence vary.

Lips tend to occur more often when crack split is delayed as with softer percussors.



From: Table 11 in Errett Callahan's (1979). The Basics of Biface Knapping in the Eastern Fluted Point Tradition: A Manual for Flintknappers and Lithic Analysts. Archeology of Eastern North America, 7 (1), 1- 180. [A CD containing this paper is available online for $45.00 at http://www.esaf-archeology.org/publications.html.]



A revised and updated 4th edition of *The Basics of Biface Knapping in the Eastern Fluted Point Tradition: A Manual for Flintknappers and Lithic Analysts* was published in 2000 by Piltdown Productions, 2 Fredonia Ave., Lynchburg, VA 24503. [The "Basics..." is out of print for now. However, see more publications from Piltdown Productions at http://www.errettcallahan.com/piltdown.htm .]

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Percussion Flint Knapping Tutorial

By Tom Sterling

Here's the actual theory put into action. Doc Higgins is holding a piece of "Silver Sheen" obsidian (named because of the gray layers in it) that he's going to turn into a seven inch blade. This is a large, angular and knobby piece of obsidian, a naturally occuring volcanic glass. Native Americans favored this material for stone tools, using it whenever they could obtain it.

Note the heavy leather glove on his left hand, and the thick leather pad on his leg. The flakes he'll be removing are said to be the sharpest edge known to man. Because of the conchoidal breakage characteristics of obsidian, the edge produced is feathered out to an edge one molecule thick, far sharper than the best surgical steel.

Here Doc's about to take the first in a long series of flakes from the obsidian. He's using a solid copper bopper here, and will be hitting about one third of the way up from the bottom of the edge nearest the bopper. The flake will detach from the uderside of the stone. By controlling where he hits the stone, the angle he holds it, the angle he strikes it at, and the force of the blow he will gradually remove unwanted portions, resulting in a beautifully flaked blade with matching flake scars. He's been doing this since about 1990, and is self taught. I've (Tom) been doing this for about two years, and can produce blades only half the size Doc can, and not nearly as pretty. I also break quite a few. For me, a tragic case of theory wildly outstripping performance. While anyone can learn to knap successfully, truly beautiful work requires lots of practice and extreme dedication.

Here Doc has struck off the first large flake and is holding it in the position it came from. You can see the edges as dark black lines. After studying the rock carefully, he has chosen this particular corner because of the ridge you see running under his thumb. Flakes tend to follow ridges quite well, and a skilled knapper can direct which direction a flake will run.

Here is the same flake removed from the rock. Note that it is a portion of that same spall cone we looked at in the beginning when a BB hits plate glass. Doc will simply remove more portions of similar cones at places (and sizes) of his choosing, until he ends up with the desired results.

Here Doc has removed the second flake, overlapping the first and along the edge ridge he created with the first flake.

Here's the rock after Doc has carefully removed almost all of the outer layers (the cortex). Note a little of it still remaining at the right hand end. The cortex is highly weathered and doesn't have that characteristically shiny obsidian surface. The rock is becoming more and more convex in cross section, which is Doc's ultimate aim. Flakes will travel very well over a convex surface, and convex blades have the best characteristics of both strength and sharp edge for durability.

As the edges become thinner and sharper, Doc is paying particular attention to thickening the incredibly sharp edge by abrading it away with a coarse stone. Modern knappers use pieces of grindstone, where prehistoric knappers would have used coarse sandstone. Thickening the edge allows the force of each blow to transfer efficiently into the stone, resulting in a clean break, in the desired place, rather than allowing the sharp but weaker edge to crush. Crushing either fails to detach a flake, or only allows the break to travel part way into the stone, then break off leaving an ugly ledge which will be very difficult to deal with later (a common beginner's mistake). A not to be overlooked advantage to abrading the edge is the stone is much safer to handle. Freshly flaked edges are so sharp you can easily cut yourself and not even notice until the area around you begins to fill with red fluid!

Here's the rock several series of flakes later, at a stage called a "biface." This is the stage at which Native Americans would have used to transport the stone for trading or taking home. Rather than carrying a lot of waste stone (remember, no pickup trucks back then), Native Americans would have reduced the raw stone to this stage, and carried them away in baskets. From this stage, a large knife blade or spear point could be produced at will, and most of the subsequent waste flakes taken off would be recycled as small cutting tools or arrow points.

Here it is from a side view. At this stage, the rock is at least half the weight of the original.

Here's the next stage. Doc has continued to go around the edges and on both faces of the stone removing flakes to further refine the shape. He's been paying especially close attention to removing flakes to help thin the stone.

The same stage edge on. Note how much thinner it is.

Several more rounds of thinning and shaping flakes. Note how much it is starting to look like a knife blade.

Same stage edge on.

More refinement. Doc's carefully programmed flake removals are starting to show up regularly spaced and matching with flakes from the opposite side. Knappers would refer to these as well spaced flake scars. Nicely patterned flake scars produce prettier blades, and are often considered a demonstration of the knapper's prowess.

Edge on. Only a few places to fiddle with and we'll be done.

Here's the "debitage" (waste stone) pile left after finishing the blade. Many of these flakes are useable as cutting tools simply by abrading the side held next to the hand (for safety), or to be made into smaller knives, arrow points, drills, scrapers or other tools. This is also the amount of material a Native American trader would not have had to carry when he (or she) took out only biface stage material.

The finished 7 inch blade. Note the evenly spaced flake scars, matching with other scars from the opposite side, and smooth edges. A beautifully knapped knife blade, or with several knotches at the wide end, hafted onto a spear. All told, several hours of intense concentration, and lots of years of practice in the school of hard knocks, cuts, scrapes and jabs.

Tom Sterling PO Box 1621 Coupeville WA 98239

From: ww.sterlingsculptures.com/Resources_folder/Knapping_folder/Knapping_6.htm, March 31, 2010, copied with permission

Abo Flintknapping Reduction Strategies

by Rick Hamilton
Spirit in the Wind Enterprises

A photo essay on abo flintknapping reduction strategies and techniques utilizing hammerstones and antler billets.

Some notes by the knapper:

This particular piece of Niobrarite had a seam which came apart on me about halfway through the reduction process, resulting in a smaller biface. This triangular cross sectioned, tabular piece would have been very difficult to use a modern lapidary saw on with much efficiency. I picked this piece as it was triangular shaped, with two square edges, and cortex on each face, which allowed for a variety of reduction techniques.

I first edged the piece, than used longitudal primary flakes from the proximal ends to thin and flatten the piece. Then I proceeded to percussion flake removal from the sides. Efficiency is the key to a good reduction process. Your flakes should travel as long as possible. Bob Patten taught me to look at my debitage pile when I was done. If you have mainly large thin flakes you have done a good job. In my opinion this is one of the major differences in antler knapping as opposed to copper and some of the other materials.

Most of the resulting debitage flakes can be used for arrow points and scrapers, or as cutting implements as is. Take a look at the last picture of the series to see the resulting debitage pile from this reduction.

A tabular piece of Republican River material a.k.a. Republican, Niobrarite, Smokey Hill Jasper, Smokey Hill Silicified Chalkstone. The piece is approx. 2 1/2" wide, 4" long, and 1 1/2" thick. The piece is triangular in cross section

The opposing edge showing an angle suitable for a large platform for initial reduction flakes.

Stitching is the process of removing flakes alternately from each face to remove a square edge. A hammerstone was used at this stage.

The opposing edge with a flake removed to help reduce the square edge.

An end view showing the triangular cross section of the piece. A challenge to thin while retaining the width on a piece like this.

A second flake removed from the base (proximal) end to further minimize the square edge utilizing a platform created by the previous flake removal. (the basic technique for blade removal). The platform was on the right hand side of the flake with an antler billet being used.

A hammerstone was used to stitch the remaining edge after the reduction of the two flakes from the proximal end to minimize the square edge

I used a whitetail antler billet and the platform shown to remove the flake and then put back in it's original position. This is the proximal (base) side.

A top view showing the same flake and it's removal scar. Notice it removed the majority of the cortex and traveled nearly the full length of the nodule.

Side view of resultant flake, notice it's flatness which is what you want on primary thinning flakes initiated from either the proximal or distal (point) end.

Opposing face (1) showing a flake removed from the proximal (base) end. It also removed nearly all the cortex from this face very similar to side 1. The flake did break into three pieces but held together enough to travel the full length. Removing your initial primary flakes from the ends thins while also maintaining your width.

Top view showing the flake removed in the previous photo. Notice the chalky portion in the center. There is a seam in there that would cause me problems later on.

A full length or in this case a full width flake (coast to coast) without dipping into the ocean (overshooting). These major secondary flakes are initiated from the sides using some of the platforms created by the earlier stitching of the square edges. Notice the stitching remnants on the edge in the bottom of the photo.

The same flake from a different angle. The platform is on the right hand side of the flake.

This platform is too large for a billet, the piece would probably break. I used a hammerstone to remove a small flake from the bottom on either side of the platform, which created a smaller one that I then removed with a billet.

Initial pressure flake removal to help regularize edge and also to set up more platforms for more percussion flake removal with a smaller antler billet.

The biface after the target thickness has been reached. Percussion has been used almost exclusively to this point. I lost nearly half of the biface just prior to this due to a seam which is quite common in this particular material.

I prepared isolated platforms at this point such as the one above using an antler tine pressure flaker to regularize the edge and also to remove ridges and extra mass.

Isolated pressure flaking platforms created by alternate pressure flake removal from each face while progressing unidirectionally down the edge.

The top half of the biface has been pressure flaked using the platforms shown in the previous photo, I now will create platforms on the bottom edge and pressure flake the remaining half of the face shown. Notice the percussion scar remnants on the bottom half.

We now have a thin biface with nice convexity which could be finished with pressure flaking in a minimal amount of time.

All the primary, secondary, and tertiary flakes from the reduction process to this point. A few of the pressure flakes escaped on me, but for the most part this is the complete debitage pile from the reduction process. These would all have been used as tools or as blanks for points, scrapers, etc.

From http://www.spiritinthewind.com/abo_flintknapping_reduction_stra3.htm, March 31, 2010, copied with permission

Using a Rocker Punch

By Lucas W. Nicholson (aka goose)

Okay.....I took some pics using the rocker punch. A couple are a little blurry, but they should get the point across.

The first one is a pic of the flake I intend to take. My finger is on the platform I'm going to use and it points in the direction of the indirect blow. Notice the spur I left on the opposite face? That is something I do when I plan on getting an overshot. Or in case I get a shorter undesired flake I can remove the remnants from the opposite direction. The spur allows for correct contours and edge thickness and allows the flake a place to dive (when struck correctly). It did not work perfectly in this case as you can see.

This is just an on-edge-view of the biface and the platform. Notice how the platform is lowered and well isolated.

Another pic showing the isolated platform.....

This pic shows everything ready to hit. I am pushing to the right with my left hand and pushing to the left with my right leg. This amount of pressure needs to be adjusted according to the size of flake being removed.

A pull away view just before striking.....

A side view showing approximate angle of punch placement relative to the notch.

A close-up of the notch placement. When seating the punch listen for a "click" and then visually check to make sure your punch is making a sort of spread out contact with the platform. This can be done by slightly rotating the biface angle back and forth until it is just right. What you don't want to do is have the punch just make contact with the very edge of the platform in the back of the notch. This will cause a portion of the platform to shear off resulting in a short flake and what would appear to be an overstrike.

The flake.....

The flake scar.....

These are the tools I used. I would advise against using a carborundum abrader. It will only hinder your progress and allow you to cheat. For this method I used two hammerstones: one for abrading and a narrow one for finite isolation.

From http://paleoplanet69529.yuku.com/reply/278203#reply-278203, April 4, 2010, copied with permisssion

Punch Process Pictures

Marty Rueter (aka Just a Flake)

I start on this irregular, raw chunk of burlington chert by trimming one corner of the edge down steeply. I can start with the punch at this point, but it made sense just to start by removing a large spall with a medium sized spherical hammerstone of hard sandstone. There is a pencil line at about the place i am going to strike this beveled edge. note how steep the bevel is and how high I am striking the margin. Edges like this are ideal for early spalling with hammerstones, although since so much thickness is removed with these flakes it is not ideal to remove them from the middle of the rock early, unless the ends are naturally tapered. Notice how steep the angle is in the below photo.

Here is the spall that is removed below. It is worth mentioning that this high margin strike, though safe on raw chert is more risky on heated material.

Now that this large flake (spall) is removed I can use the ridge created on the left side of this flake to begin doing the punch work. The punch work in this case is going to be aggressive. Here is the first punch platform following the ridge. Notice how the platform is seated in the notch of the punch. I strike the end of the punch on top and support the preform in my hand firmly. I apply slight pressure to the punch into the edge.

Here is the large flake that is removed. The punch I'm using is a small moose antler. I will only use this punch for the largest early flakes. I will switch to the white tail punch shortly. An alternative to the small moose punch would be a very large deer antler or elk antler

Our platforms for the punch are going to be lower than we strike with the hammerstone. Early platforms can be isolated spurs on ridges or just continuous lowered edges. The next photo shows three flakes taken from the other side of the preform along a beveled edge. This beveling was done with the hammerstone.

I continue the same process, building more isolated platforms as the edge gets thinner. I attack thickness from the ends as well

At this stage, the punch can be used to trim edges and set up platforms. As the preform edges become more acute, the notches in the punches need to be smaller, or un notched punches can be used.

From: http://www.flintknappingtips.com/processpictures.htm, accessed 10-11-10, copied with permission

Getting Better with Antler Punch

by Bejamin Eble

After numerous false starts, I finally have begun to get the hang of the antler punch. On my fifth biface, I started taking off "blowout" flakes from the edge, that remove humps, ridges, and even undercut multiple steps.

As I always intuitively felt, the biggest issue with using the punch is support. The punch takes a longer frame of time to load. And, during that time frame, the stone cannot be allowed to move.

Also, another issue which took a long while to figure out is that the normal swinging motion employed when using hammerstones, is not the best motion to use, when employing a punch. Rather, the punch needs a good pop. And, that pop needs to be a hard pop, at a high speed. I say "pop" because the normal hammerstone swing anticipates follow through, whereas a "pop" is a sudden acceleration that is not intended to go very far.

Another interesting thing about using a punch is that I have found little need to vary the size of the punch. Why? Because, the biggest determiner of the flake result has to do with the mass of the punch's percussor - the hammerstone. In other words, with the same punch, a bigger hammerstone produces bigger flakes. So, instead of varying punch size, it is more a matter of varying the hammerstone size.

Currently, I am using a large recangular tab hammerstone that is easy to swing at a high rate of speed. The advantage to using a long hammerstone, over a round hammerstone, is that you can increase swinging speed, prior to the strike, by the long hammerstone's arc.

As for the punch, it is small. It is made from the base of a deer's antler. It is about four inches long, and around a thick inch at one end. The other end is narrower, and nearly rectangular. Each end is highly compact, and almost smooth from use. There are no discernible signs of wear, in spite of the fact that the ends have been used for hundreds of blows. Also, the antler is small enough so that it can be held with the thumb, and finger, of one hand - which is really important.

In struggling to get the punch to work, I had to get over a few hurdles, some of which have already been mentioned.

In looking at the setup, it seems that there are about five critical variables that all must be controlled simultaneously. And, I find that thinking about it from bottom to top makes it easier to understand, and control.

The first is that regardless of how you are seated, whether in a chair, or on the ground, the biface must be positioned on something. In both cases, I used my leg as the support, except when engaging in really hard punching.

With the biface on my leg (on a leather pad), the biface is still too mobile to punch. So, to secure the biface, I found the following four steps to be very helpful.

First - with the left edge of the left hand, push down on the left edge of the biface. This will cause the right side of the biface to protrude upwards.

Second - while pressing down on the left edge of the biface with the edge of the lef palm, hold the punch between the thumb and first finger (or second finger), of the same hand.

Third - use the fourth finger, to pull upwards on the right edge of the biface, while holding it down with the palm.

Fourth - with the thumb, and first finger, hold the punch, and press the punch down on the platform, on the right edge of the biface.

There are three forces at work here. The first force, is the pressure used to hold the biface down. The second force is the pressure from the fourth finger pulling up on the underside of the biface. And, the third force is the force applied by the punch, while pushing down on the platform, while it is being held between the thumb and first (or second) finger.

Now, if you apply each pressure in consecutive order, the biface will become "locked" into place. In locking the biface into place, you can press the left down side of the biface into the support, by pushing it into the support with the punch. This will help to further immobilize the biface. Meanwhile, be sure to keep pulling the right edge of the biface up, with the tip of the fourth finger, of the left hand.

When everything feels tight, and solid, whack the end of the punch with a hammerstone held in your right hand. When you whack the punch, give it a real fast rap, or pop. Use a hammerstone that can be swung quickly, and has plenty of mass. (After detaching flakes for hours, I discovered that the fast popping motion used to hit the punch made a tremendous difference in the flakes detached.)

Now, when you start, it is going to feel a bit awkward, at first. When one spot feels tight, another spot might feel "off". It takes some time to get the hang of aligning everything, and locking everything down with pressure. But, the more you practice, the more you will see that you start from the bottom, and move up, as each area is put into alignment.

Also, it is somewhat of a relief to almost never have to switch tools. A short antler cylinder is ideal for trimming the edges, and then reworking them, in order to create new platforms, which can be popped in "punch mode", after the biface is flipped over.

As for platforms, there are quite a few possibilities. In areas where there is a high spot, a ridge, or a bulge, you can trim the edge with fast direct blows from the antler cylinder. First, work lightly to remove the fine edge. The work with more force to detach slightly thicker flakes. If a portion of the edge has a stubborn hard spot, switch to "punch mode" to punch it off. The, when the edge has a stout platform just below the ridge, high spot, or bulge, flip the biface over, set up the punch, and whack real hard. If you have a significant bulge, or ridge to remove, you can lower the punch a bit, in order to

angle the blow into the stone, a bit more. In this case, the leg hold might not be sufficient. And, there are other means by which the biface can be made more secure, while delivering a harder blow.

Also, depending on the situation (and platform), it is possible to use the punch effectively at nearly a right angle. A good analogy would be when a hard hammerstone is used to clip a biface's edge at a right angle, and the resulting fracture runs straight across the face of the biface. This can be achieved with the punch, but can require a really fast pop, plus the right contour on the face of the biface.

These are a few notes. I have taken some photos, which I will upload.















I think that my punch is a bit on the long side. I would look for a punch that is easy to hold in one hand, and is not too long. A longer punch is more prone to flexing, which can make it harder to detach flakes. Also, the tip of my punch is round, and probably an inch across. The tip on the other end is narrower, and wider. The other end also works good - especially in getting into enclosed spaces.

The punch also works good for "micro percussion", in trimming up the edges, and making platforms. So, I actually alternate between using the punch for percussion, and using the punch as a punch. In using the punch for percussion, I snap it straight down on the edges, to trim the edges, and rework them, to make new platforms. Sometimes, I trim the edges very quickly and make continuous platforms -which also work well for indirect percussion. The nice thing about using the punch as a percussor to prepare the edges, is that you never have to swap out tools.

Also, there are many techniques you can come up with, in using the punch as a percussor. I have found that in trimming the edges, a person can start at one point, by taking off microflakes, and steadily work along an edge to create a certain contour. This contour can include isolated platforms, which can be subsequently removed with the punch as a percussor. This leaves very even steep edged platforms which work well for the punch, in indirect percussion.

I would say that the really outstanding flakes - which are not seen in these photos - were created by using low, nearly vertical platforms, plus a punch that is set somewhat high on the edge, plus a pre-existing ridge on the other side of the platform, plus really solid support during the strike. If all of the factors are optimal, then the length of the detached flake will probably be determined by the contour of the flake's surface. A flake can run under a ridge, until the ridge flattens back out. At that point, the flake will simply feather out. These flakes tend to be narrower, and longer, and can span the face of the rock.

A flake can also run under a hump. But, these flakes tend to be wider than those that run under ridges. After this, there are flakes that are taken off places where the stone is already nearly flat. These flakes are generally not so great. For this reason, over a short three days I figures out that the original thinnning passes that produce ridges are really important. Because, with these ridges, you can run longer flakes that help in the thinning process. Also, once a great deal of thinning has been achieved, the original ridges are pretty much gone.

Also, in using the punch to remove spaced out flakes from a single continuous platform, you will be left with very thick deltas. These deltas can be removed by using the punch as a percussor, and striking down on the edge of the delta. By moving carefully from the thinner side of the delta, to the thicker portion of the delta, you can carefully remove flakes in sequence which will allow for full removal of the delta. The result is a slight "lobe" where the delta was, which may be the same thing that is seen on some Clovis points that certain "lobes", carefully spaced on the edges.

Normally, I would revert to hammerstones to do some of this. But, I have found that the antler actually has some advantages. In "micro-chipping", and preparing platforms, micro-chipping with short thrusts from the antler, creates very clean even edges. Also, shattering is non-existent. So, a knapper can work on a really glassy stone, and create evenly contoured platforms, that consist of flake removals, which are probably down to a millimeter in size. This can be done very quickly with the antler punch, as it doubles for a percussor, in "micro-chipping".

In looking back, I can see some real advantages to the punch over hammerstones. But, I think that hammerstones are still critical in another arena - the initial preform. A preform that is first wacked out with a hammerstone is going to have plenty of ridges, and high spots. If, at this stage, the knapper immediately switches to a punch, after the basic preform is created, the thinning process is probably going to be more easy to control. The punch rarely ever produces any kind of shattering - except maybe on realy thin edges, with poor platforms. So, with a hammerstone made preform, the knapper could probably trim up platforms opposite each ridge, and punch off long blade like flakes to thin the stone, with great accuracy.

Another limiting factor with the punch relates to inclusions, or stone that is extremely hard. The Colha that I have been working on has it's share of inclusions. And, the thin delicate punch flakes tend to stop at times, when they cannot pass through the inclusions. On a few instances, I have had to revert to a quartzite hammerstone, in order to bust a flake through an inclusion when the punch failed. When this happens, the flakes will run up against "a wall of hardness" and stop. This will produce plenty of really nasty steps. And, the only solution is to upgrade to a really hard hammerstone, such as a quartzite hammerstone, and bust through the inclusion. For this reason, I am pretty sure that anyone using punches, in prehistoric times, would have looked for really good types of chert. It is really important that the stone is fairly even, and given to fracturing. I would imagine that obsidian would be ideal.

Also, if you look carefully at the photos, you can see that I am using my third, and fourth fingers, to support the biface, by pulling up on the edge. I prefer the fourth finger, simply because it is farther away from the platform. (Already, I have managed to drive a flake through the tip of my third finger.) Anyway, fourth finger support is really crucial to keeping the preform from bobbing during the strike. That finger support is what allows the flake to run much farther. Otherwise, the preform will simply bob downwards in the leather, on impact. Before I figured this out, I was hitting really hard, with little results. Also, I figured out that there is a workaround to using one's own finger. If the preform is placed on a flat, hand held stone anvil that is covered by leather, then the knapper can insert a small wedge under the preform, just next to the platform. This wedge/prop can serve to support the edge of the platform in an elevated position, during detachment.

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from: http://paleoplanet69529.yuku.com/topic/38697/t/Notes-Getting-better-with-antler-punch.html and http://paleoplanet69529.yuku.com/topic/38743/t/Photos-Punch-Experiment-Step-by-Step-3.html, accessed 10-19-10

Heavy Hammerstone Spalling – Tripod Setup

By Benjamin Eble

Large nodules are cumbersome to hold in one's lap. If they rest directly upon the ground, they can be very hard to spall. By creating a tripod, the large nodule can be elevated, and the back side of the nodule held down with a foot, while a really heavy hammerstone is used at a low speed to detach large flakes. Here is the nodule.

Here is the nodule in a tripod. (I am holding a flake in place by hand):

Here is another shot of the other end, with the support stone underneath:

Here is a shot of the heavy hammerstone. It is not a "two hander". But, it is pretty heavy:

With one foot on the back side of the nodule, and the nodule edge fairly low, I bring the heavy hammerstone down, and clip the edge at a low speed. A flake detaches. Here are the results:

Here you can see the corner of the flake, where I hit a fault in the rock. Too bad, or the flake would have been bigger.



The tripod support makes it possible to hold one end of the nodule down with one's foot. By using two support stones, it is possible to create support without a direct support that would impede the progress of the flake, while holding the nodule off of the ground. In my case, the flake hit a fault and stopped. Also, by using a really heavy hammerstone, and clipping the edge, it is possible to detach at low speeds, with less shock, shattering, etc. Also, there is absolutely nothing magical about my hammerstone. In fact, it was not a hammerstone until I used it as one. For people who have never used hammerstones, I hope that this tutorial is of a help. Ben

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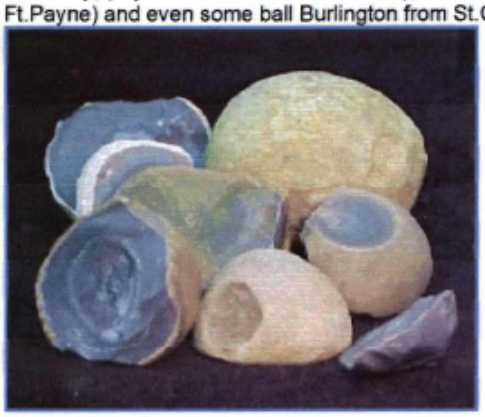
From http://paleoplanet69529.yuku.com/topic/32201, April 4, 2010, copied with permission

Ball Flint Reduction

By Gary Merlie

Since I live in the southern half of Illinois, I have been fortunate enough to hunt and work ball flint from Illinois(Cobden), Indiana (Wyandotte), Kentucky, (Wyandotte and St. Genevieve), Tennessee, (St.Genevieve and Ft.Payne) and even some ball Burlington from St.Charles, Mo.



Here is our guinea pig for today, a half ball of Wyandotte from Breckinridge Co. Ky. that Jeff Shelton and I dragged home from the creek a couple years ago.

I first take flakes off all the way around the core to remove cortex, using the flat face as a platform. Continuing like this will produce the so-called "core-struck blades". A large nodule with good mass will produce flat blades. As the mass decreases, the blades start coming off curved.

Crossroads: You can go two ways from here. You could continue removing blades from the core, using the flat side as a platform, until it is becomes an exhausted polyhedral core. Or, you can use the side of the core as a

platform and remove flat flakes and spalls from the face. Pic shows one removal of each type.

I've chosen to remove a large spall from the face by striking the edge. Due to a bad center in the core, this spall only went half way across the face. No problem, as this is a good artifact size spall. The blow to remove the spall came from the upper right of the core.

I've struck off another spall from the face, striking from the opposite side. The core is now flat again, and I now have two spalls for artifacts.

Here's two more flat spalls/flakes taken off the flat side, again using the side as a platform.

As the core becomes reduced and flatter, (the so called "turtle-back") I eventually reduce it into a biface as well. This pic shows the yield from the 4" dia. ball. 3 usable spalls I've turned into bifaces. One unusable spall I discarded, and several flakes that will work up into nice bird points.

I chipped the 3 bifaces into points, and here is what I ended up with, a side notch, a fluted point, and a Thebes.

Depending on what you are setting out to make, flint balls can be an effecient use of flint or a terribly wasteful process. If you don't have a lot of ball flint to waste, and not many people do, I think these balls are best utilized by slabbing with a rock saw.

I hope this small presentation enlightens someone out there just a little. Post any questions you have, and I'll try to answer them if I can. Rockhead

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From http://opalvalley.com/gary/flint2.hml, May 2, 2006, copied with permission

Dome and Plane Reduction

By Tony Baker

Step 0--Flatten Face A

A large flake or spall removed very early after opening up a nodule was the beginning of the D&P process. If the spall did not have an acceptable flat face, then Step 0 had to be executed. If Step 0 was executed it was done only once because subsequent D&P faces provided the necessary flat face.

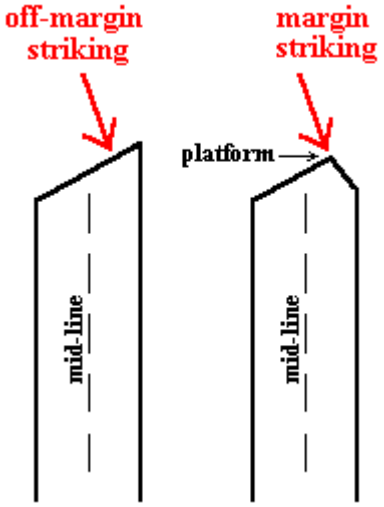
One way the New Clovis knappers accomplished flattening a face was with wide flakes that ran from edge to edge (outre passé). Flakes that travel from edge to edge remove any surface irregularities that might exist on that face. Bifaces 1 & 5 with their outre passé flake scars (left images) are classic examples of what I associate with Clovis. However, as I looked though the hundreds of bifaces that Carl had, I found few pieces like these. I was puzzled by the scarcity of this type of artifact until I began to understand the D&P process. Step 0 occurred only one time for any given biface, and sometimes not at all if a flat face was naturally present. Cycle 2 then obliterated the outre passé flake scars. Bifaces 1 & 5 are rare artifacts and one of the keys to understanding the D&P process.

Cycle 1--Step 1. Dome Face B

Step 1 was the first step in the repeatable cycle. This step had the purpose of creating a dome on Face B. The dome must lie along the center of the face and run from end to end. Often in the first cycle there was a raised area resulting from creating the spall. With very little work on the face the knapper was able to modify this raised area to create a satisfactory dome. However, in subsequent cycles, considerable work was required to dome a face because it had been flattened by the previous D&P.

Left image of Biface 13 shows some of the work that went into the creation of the dome on a subsequent cycle. A regular pattern of flakes was removed from the edges of the biface. These flakes terminated at the center of the face thus creating the dome. To remove these flakes from the edge, the edge had to be turned or beveled to favor flake remove from this face. Each time the edge is turned to dome the other face, the biface becomes narrower. Since the knapper desired a biface with a large width to thickness ratio, they had to proportionally remove more thickness in the planing step than they removed width when turning the edge.

When the edges were turned to construct the dome, the proximal end where the planing blow was struck was also turned. As reported above, Sanders observed minimum platform preparation during the early biface stages (1990:45). His observations were correct, because during the earlier stages of planing, the LRCC knappers were employing off-margin striking (off-edge blow). Thick bifaces do not require the extreme accuracy of blow for successful planing so the knappers were saving time by not building platforms. The classic example of planing with off-margin striking is the creation of the Levallois flake.

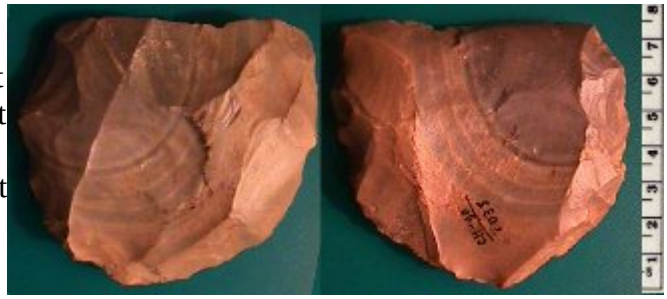


In later cycles when the biface was thinner, a platform was constructed to be used as a target. This was done by positioning the margin (edge) at the appropriate distance from the face and then grinding it so it would not crush during impact. (The two conditions depicted in this image, off-margin and margin striking, will produce the same flake.)

To reiterate, Step 1 contains three sub-steps: 1) turn the edge, 2) create the dome, and 3) create the platform. If each of these sub-steps is performed correctly, then Step 2 will almost always be successful.

1--Step 2. Plane Face B

Step 2 consisted of only one percussion blow that planed the dome created in Step 1. If successful, a single, wide D&P flake was removed from the proximal end to the distal end and a flat face that was parallel to the reverse face was the result. Because this single planing blow was responsible for a large portion of unfinished bifaces found in the archaeological record, I have chosen to make it a single Step in the dome & plane process. The most common fatal error while planing was the overshot or reverse hinge as depicted in the right image of Biface 2. It was abandoned after the D&P flake cut it into two pieces. If the overshot failure had occurred at a further distance from the proximal end the biface probably could have been salvaged. However, after this short overshot the biface was too thick for its length and the knapper chose to abandon it.



As stated earlier, successful planing is largely dependent on the flatness of the opposite face. Another way of saying the same thing, is the thickness of the biface must not change radically along its length. Sudden changes in thickness will almost always cause the S&P flake to hinge or reverse hinge at that juncture. Correct flatting of the reverse face yields a successful planing step.

Cycle 2 and subsequent cycles
At this juncture the biface had two flat faces. However, it probably was too thick, so the knapper just repeated Steps 1 and 2 again. Since both faces were flat, the knapper could in theory choose to dome the face he had just planed. The knapper could have even reversed the ends and plane from the distal end in the next step. All was possible after the two flat faces had been achieved.

From: http://www.ele.net/Carl/flt_bifa.htm, accessed 12-16-10, copied with permission

Preventing Broken Points

It's so discouraging. Seems like everytime you get your points anywhere near a thin stage they break. They endsnap. They fold. Reaching your goal of thinner bifaces is just within your grasp and then it's snatched away in the blink of an eye. Well, I've been there. But I can honestly say that ever since I learned the things in this article, I haven't broken a single point while billet thinning as long as I didn't rush things and I took the time to apply the techniques. That brings up an important thing to remember. **There aren't any shortcuts** to creating those beautiful points. Besides, you don't want to hurry. Flintknapping is fun. Relax and concentrate on really seeing what the stone needs and you'll be happier with the results.

I learned the techniques described here from my good friend Jerry Ulrich, a knapper from Battle Creek, Michigan. After watching me knap a piece down to a 4 to 1 W/T (width to thickness) biface and then break it, he told me that there was no reason to ever break a point that had gotten that far. But I needed to memorize some things and practice them until they became second nature. I did what he said and he was right! I'll list them for you and then we'll discuss how to achieve each one of them. Here they are:

PLATFORM HAS TO BE BELOW THE CENTER LINE
ISOLATE THE PLATFORM
ABRADE
PROVIDE SUPPORT
DAMPEN VIBRATON

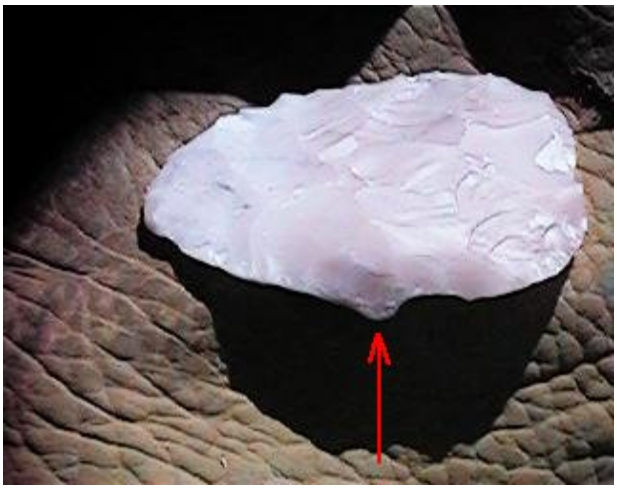
Every time you are going to strike a platform make sure you have done the things in the above checklist.

Platform Is Below The Center Line

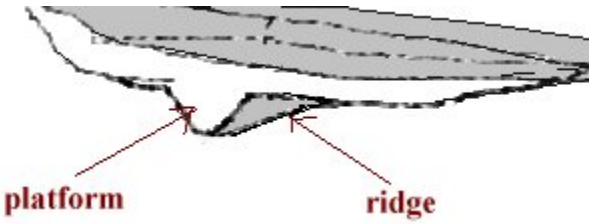
First thing is to make sure that the place where your billet is going to connect is **below the center line**. When you hit below the centerline, a flake comes off. When your preform is thin, and you hit above the center line, it is almost certainly going to break. As the preform gets thinner, it's very important to take a little time and really look at each platform you make. You need to make sure they're right. Do what you can to make every platform as perfect as you can and you'll be rewarded with more predictable results. As you gain experience you'll find that there are times where you might spend five minutes just preparing a platform but the results are well worth it.

Isolate The Platform

Isolating a platform allows your billet to connect with certainty on the exact spot you wish to hit. It allows for concentration of all the force from that blow into that one spot. When using a moose-antler billet, striking properly abraded and isolated platforms results in large, fan-shaped thinning flakes. It's a great technique--especially for beginners.



The above picture shows an isolated and abraded platform ready for the billet. I made this one a bit exaggerated so you can get the idea, but it will still work. You can see that some of the material has been removed from either side of it so that the billet will only catch the platform. Look at it! It's right out there beggin' for it. Don't you just want to hit it? Wait a minute, OK? Let's take care of a couple more things first.



Another example of a platform set up on a ridge. The platform has to be at an angle less than 90 degrees. The relative dimensions of the platform, ridge, and preform in this drawing have been exaggerated for clarity. As the preform gets thinner the platforms get smaller too. Everything gets more subtle as you near the final form.

Abrade

We talked a little about abrading in the last section. You also saw a picture of how our platform looked after it was abraded. We'll use this section to explain **why** we abrade.

Abrading is the rosetta stone of flintknapping. It's the "Eureka, I found it!" So many people who had to learn flintknapping by themselves have told me that when they discovered abrading they advanced "light years." There's good reason for this. An unabraded edge is sharp. It uses up the shock from the billet before it can do any good. Without abrading you end up with a crushed edge and a myriad of step-fractures. Abrading dulls the edge so that it has the strength to hold up under the force of the billet. On top of that, because you're hitting a blunted edge, the shock wave travels cleanly on through the stone. If you pay attention to the angle at which you are holding the piece, a long, wide, thinning flake results.

Here's another trick. Abrade a little on either side of your platforms. Then if somehow you do miss the place you intended to hit, at least you'll still remove a flake rather than damaging the edge.

Provide Support And Dampen Vibration

We're in the home stretch now. The thinner your point gets, the more important these last two rules become. Here's how you hold a preform so as to provide support and dampen vibration when you hit your platforms.

The picture on the left shows how the bottom face of the preform is supported by the fingers. Only the finger that the knapper may be using to apply force for "pulling" a flake is actually applying any kind of real pressure. Mainly the fingers are there to support the whole point so that it holds up to the force of the strike. They also assist in dampening vibration. By the way, don't let your thumb clamp down and put force on the middle of the point. Let it rest closer to the back edge of the piece. That way it doesn't stop the shockwave halfway through and break the piece.

You will notice from the pictures that I like to use a piece of real leather chamois to protect my hand during knapping. I like how it's easier and less bulky to use than a glove and because it's so thin I believe you retain some of the "feel" that a bare handed knapper has. I can't explain this "feel". But you will know what I'm talking about when you "pull" enough flakes and feel the sensation of the shock from the releasing flake. In addition the leather supports the piece in the areas between your fingers and further helps reduce vibration. You double or triple the thickness in areas of the hand where an edge is seated. I strongly recommend protecting your hand- especially for beginners who are getting used to how knapped stone behaves.

The picture on the right shows the billet pressing **hard** and **inward** on the outside edge of the biface. What this does is firmly seat the "back" edge against the hand. Dampening the opposite edge to the one you are hitting does something to the shockwave as it travels through the stone that helps prevent the point from breaking. On Craig Ratzats video "Caught Knapping" he uses this technique to prevent "endsnap" when hitting the base of a point he was working on. He pressed the end opposite the one he was going to hit against his leg. If you are just holding the point out there without dampening the edge the shockwave does a mean trick and folds the piece or, if you are hitting the base or the tip, it does the "endsnap torture" trick.

After you have seated the back edge it's time to hit your platform. Now before you hit your next platform go through the above list again and then..smack it!

The result of the strike using the techniques described here. The flake was 3 1/2 inches long and traveled all the way across the face to the other side.

Well, there you have it. I think you are going to be very happy with the results if you take these techniques to heart. Using these rules my bifaces went from W/T ratios averaging around 3.5 to 1, to being nicely thinned pieces in the 6/1 range in the course of two weeks-and they're getting thinner. Let me know if this helped you and Happy Chipping!

From http://www.onagocag.com/break.html, April 1 2010, Copied with permission

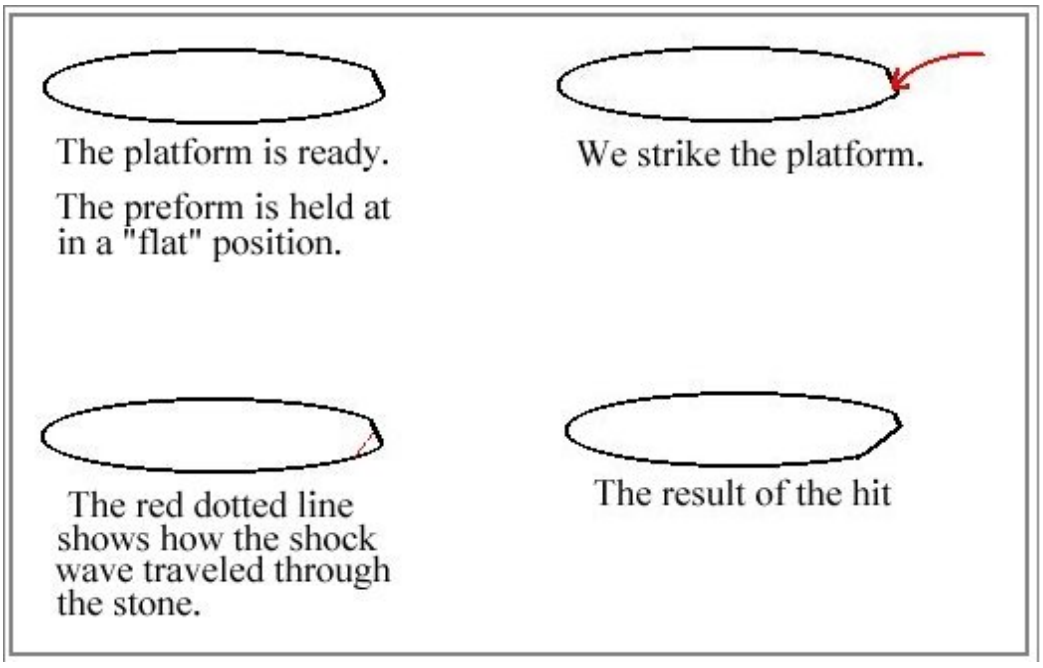
Note: Wyatt R. Knapp is the author of "The New Atlatl and Dart Workbook" to be released Summer 2010.

Some Talk About Angles

Okay...by now you've learned about herzian cones. You know that it is a cone shaped shock wave with sides that expand outward 130° to the point of impact on the stone. You know we use this shock wave, created from a billet strike, to make flakes come off knappable stone. But now we need to learn how to "cheat the angles" to make the best use of this shock wave.

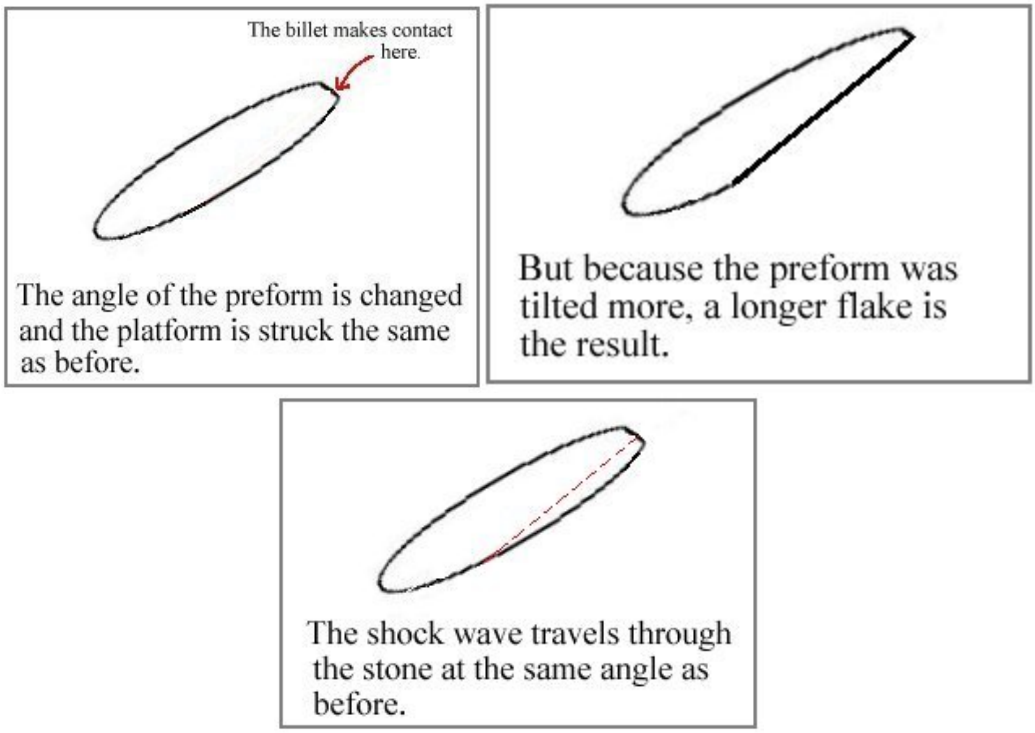
After much practice you have probably standardized your billet swing so that it is coming down at pretty much the same angle all the time. This swing has become natural to you. You are hitting your platforms pretty much the same every time. Since this swing has become a constant, we have an opportunity to have some control over the thinning process and the length of the flakes we take off.

If you tilt your preform at different angles you can control how long your flakes are and how much material you remove. Depending on how much material you are trying to get through you may have to adjust the power of your strike as well. But a lot can be accomplished by understanding how to use different angles. The illustration below depicts a preform as viewed from the base end. The angle of the strike is indicated by the red arrow. Let's see how the shock wave travels through a stone that's held at this "flat " angle.



Well, the flake came off. And as you can see, we ended up with a rather shallow result. If we continue hitting our platforms with the preform held at this angle, it will get smaller and stay thick. We will get points that look like "turtle backs." This won't do will it? Well, let's change the angle we hold the preform at and see what happens.

In the illustrations below we take the same preform we had before and start all over with it. The angle of the strike is exactly the same as before. The resulting shock wave is at exactly the same angle as in the first example too. The only thing different is that this time we're going to change the angle that the preform is being held at. Let's see what happens.



There we go! Now we took a nice bite out of it and got a flake that went right across the middle. If we keep this up the point will get thinner way faster than it gets narrow. By changing the angle we hold the preform at, we can control how thick and long the flake is that we take off. Just don't hold it at too much of an angle or you'll get a hinge or worse--you'll break the preform in half !

Now I should say that the angles that we showed in the illustrations are just examples. They might work for you. They might not. It depends on the angle of your billet swing. But just experiment with how you hold your preforms and see what angles work for you--and then all you have to do is practice enough to remember them.

Judicious use of this idea can really help you to "take the cap" off those really chunky pieces. Good Luck !!

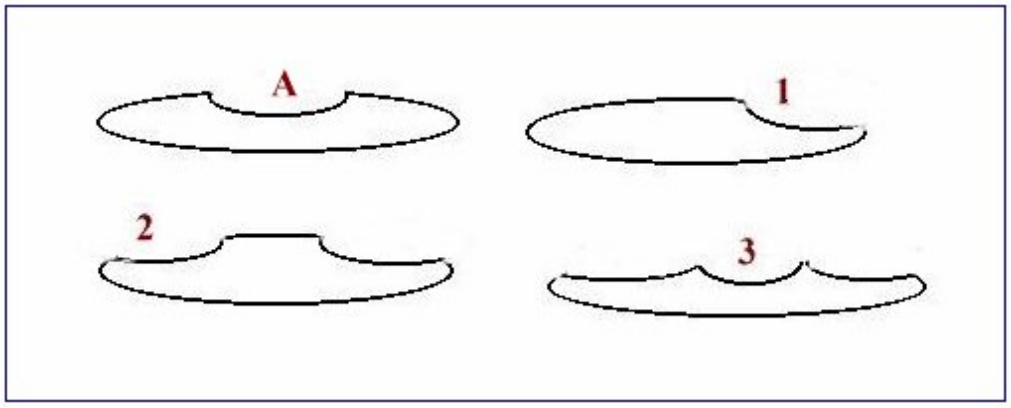
From http://www.onagocag.com/angle.html, April 1 2010, copied with permission.

Note: Wyatt R. Knapp is the author of "The New Atlatl and Dart Workbook" to be released Summer 2010.

Why You Should Work The Ends

and Then The Middle !

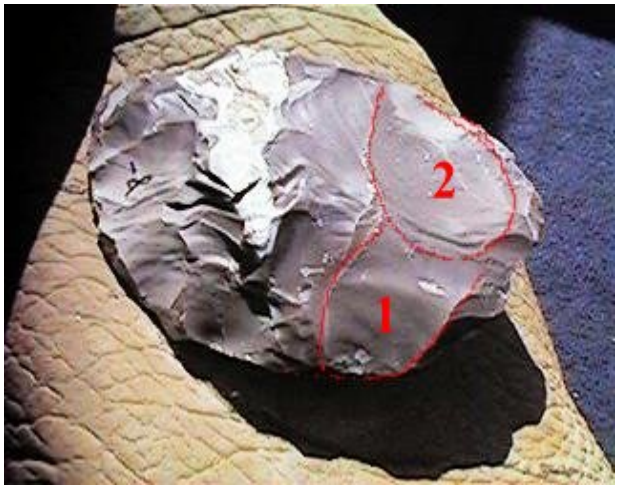
My friend John Geyer told me as a beginner to "always work the ends first, then the middle." Of course I didn't quite catch on right away. Too many things to absorb. And with all the herzian cones and angles and platform isolation there's a lot of abstract visualization going on anyway. Well you don't have to worry...I'll show you right now what he meant.



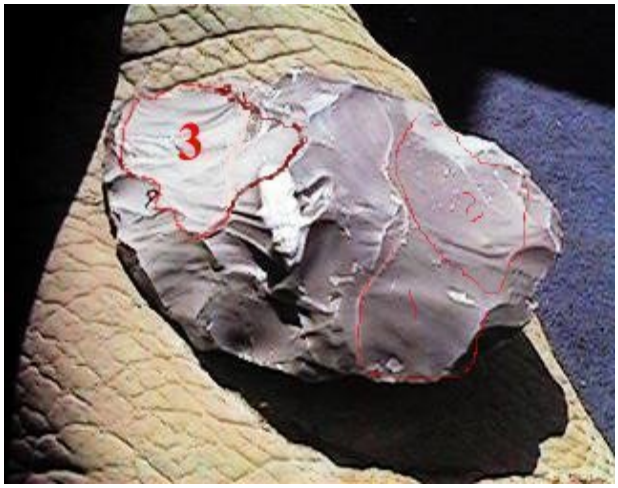
Look at the above illustration. If you were to take a flake out of a preform so that it ended up like figure "A" what do you think would be likely to happen on your next strike? Well, because the preform is so narrow in the center compared to the rest of the preform, it is likely to break in half. Now I drew these examples a little exaggerated for clarification. A real life example could be a lot more subtle. But the result would be the same.

But there is a solution to this trap! Work the ends then the middle. Our first move would be to thin the end like we see in figure 1. Then we would go to the other end and work on that. (fig.2) Finally we would work the middle (fig.3), because now that it has enough bulk to stand up to the strike there's less chance of breakage. And look at the added benefit we achieve. Nice ridges to follow on either side of the middle for our next strikes. When you plan your strikes like this you will notice a more deliberate and "right" look to the scar patterns on your preforms, and they get flat fast!

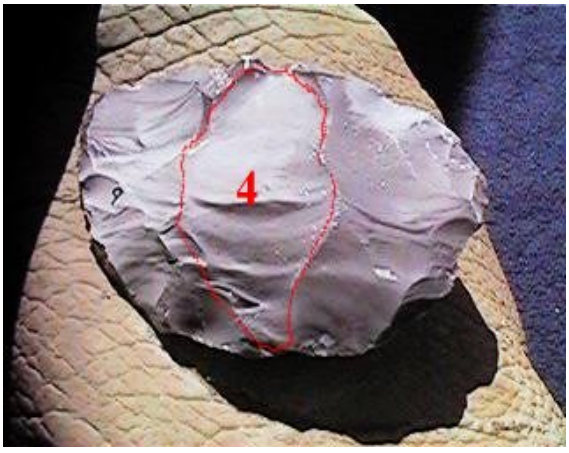
Now lets use all this on a real life example.



Flakes 1 and 2 are taken from the base end.



Flake 3 is taken off the tip.



And now flake 4, the middle, is taken off. Because the middle had such a nice ridge, the flake flew clear across the piece--six inches. This preform is six inches wide and seven and a half inches long. but it has already become quite flat on this side with just a few hits because the techniques we have learned here were followed.

So see if it helps you to "work the ends, and then the middle." Good Luck!!

From http://www.onagocag.com/buff.html, April 1 2010, copied with permission

Note: Wyatt R. Knapp is the author of "The New Atlatl and Dart Workbook" to be released Summer 2010.

Knapping on the Leg

Well, you've probably heard of it already, but I've used this method for a while now and I think its great. Its worth looking at why so many knappers are using it. It isn't the only way to knap, but I have found that I have better control and accuracy this way.

You see, quite often with freehand knapping you are holding your preform out in the air with one hand, and your other hand is holding the billet out there. Then you take your swing and you hope that you kept everything in position during that time and didn't flinch, or tilt the stone, or any of the hundreds of other variables that can occur.

Well, when freehanding it, you can cut down on these variables by resting the wrist of the preform holding hand on your leg. Then anchor the billeting arm by resting the elbow against the side of your body. This way you can adjust the "feed" of your preform into the anchored path of the billet swing.

But you can take it a step further.

Why not rest the preform on your leg where you can easily hold it at the proper angle. Your wrist won't change, the action of making your billet swing won't wiggle things and change them, and you won't flinch at the last second. Remember to still anchor your billeting arm as before. The more you can control the variables, the more accurately you will be able to knap.

The picture above shows how easily the angle can be determined on the knee. The hand would then rest flat on the preform to press it into the pad and prepare it for the strike.

The picture in the section below shows how this all comes together. Notice how easily the preform can be held at the correct angle.

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Note: Wyatt R. Knapp is the author of "The New Atlatl and Dart Workbook" to be released Summer 2010.

Buffalo Hide As Leg Pad
and Preform Shock Dampening Tool

You probably noticed the buffalo hide leg pad in the above photos. This hint will work with any leather pad but the buffalo hide seems more supple and thicker, and more perfectly suited to this next tip.

or 

When knapping on your leg as described above, you have a very handy tool for support, and shock dampening. Just fold the edge of the lap pad over the preform as shown and seat it into the resulting pocket with your billet. Now when you smack the platform, not only is everything locked into the proper position, but the stone is supported and dampened, and the hand holding

the preform is protected. And you didn't have to pick up another pad or put on a glove to accomplish it!

Now there may still be situations where you would want to use the "pull" the flake technique and you would need to adjust your knapping style to accomplish it. But otherwise you may find this style of support helpful. (You may be able to "pull" the flake by pressing and pulling on the area from the bottom and through the leather.)

Knapping on the leg has been a great help for me. I realize that everyone has their own style. But if you have been having trouble with the accuracy of your strikes, or holding the proper angles, give this a try for several knapping sessions and see if you don't find it a big help. Many of the experienced knappers I have seen use this. And if you hit the platforms right you don't have to worry about hurting your leg because most of the shock is used up with the flake detachment. I don't get any bruises or sore legs.

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Note: Wyatt R. Knapp is the author of "The New Atlatl and Dart Workbook" to be released Summer 2010.