

Micro Flint-Knapping

by Craig Libuse



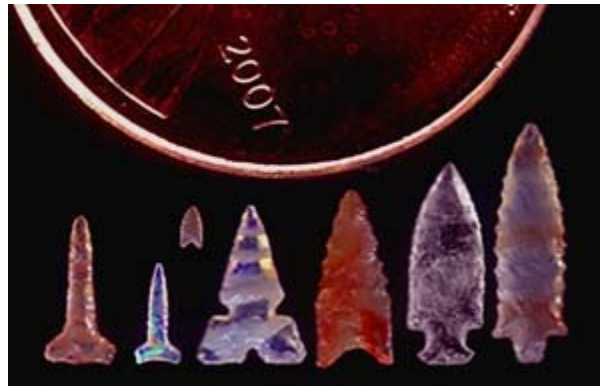
Scaling traditional techniques to extremely small sizes

Dan White (pictured) has been able to create his own form of art, based on what was one of the first forms of art—flint-knapping (shaping stone by breaking off chips). He calls it "micro-knapping". Prehistoric cultures learned early on that flint could be chipped to create sharp edges for knives, arrow and spear tips. The ability to make quality points was critical, as it meant the difference between eating and going hungry. Shape and size varied widely based on use and culture, but the technique has changed very little in thousands of years. Old points are popular among collectors, and some modern craftsmen have taken to duplicating the ancient techniques, but Dan has taken it to the extreme small end of the size scale.

Over the last few years Dan has made over 100 miniature stone arrowheads. He uses a stereo microscope to reproduce the stone-age technology of flint-knapping in miniature. After months of experimenting, headaches, and stabbing himself in the fingers, he has been able to develop a technique where he can make miniature stone arrowheads the size of a grain of rice that have all the same proportions and flaking as the full-size originals. Each miniature takes between 1 and 2 hours to complete.

Tools of a new micro-trade

His tool kit consists of a thick rubber pad, a fine grinding stone, various size small nails/pins for use as pressure flakers and Scotch tape. (He must wrap his finger 4 or 5 times with tape to prevent the smaller nails from stabbing him while flaking). He like to use the most colorful stone he can find for his microscopic arrowheads. First, he starts with a flake of stone about the size and thickness of a nickel. He then begins breaking off large chips with a sharp copper nail to shape the stone down into a bi-facially flaked "pre-form". Once the pre-form is complete it's time to use the smaller nails and pins to shape it down and begin finishing the edgework and notching or fluting. Notching is done with a small nail that has been flattened and sharpened. He makes all the pressure flaking tools with the help of a microscope. Micro-knapping is basically the same as normal flint-knapping in the way each flake has to be removed in a very similar and precise manner.



Seen here are some of Dan's favorite micro points, described from left to right: 1- A T-drill style point made of Kaolin flint from Oklahoma. 2- Another T-drill style made of opal from Australia. 3- His smallest point- a paleo style fluted point made from Alibates chert from Texas. 4- An arrowhead made from striped opal from Australia. 5- A Dalton-style made from Kaolin from Oklahoma. 6- A "bolen bevel" style point made from quartz crystal from Maryland. 7- A stemmed point made from Brazilian agate.

Scarcity of materials leads to miniature craft

Dan has been a collector for most of his life and his interest in ancient stone arrowheads is what eventually lead to his pursuit of flint-knapping. When he first started trying to make arrowheads he had no way to get large pieces of flint to practice with, so he decided to make miniature arrowheads using tiny pieces of stone that had broken off some damaged arrowheads in his collection. As far as he knows, he is the first person to ever try flint-knapping under a microscope. Since he had never heard of this before, there was no place to go for guidelines or advice.

It took several months to develop his technique and figure out the right tools to make. After much practice and pain, he was able to make a miniature arrowhead under 2 mm long that has sharp edges and is flaked on both sides just like the full-size ones. His smallest arrowhead was considered for the *Guinness Book of World Records*, but because there is no category for arrowheads or flint-knapping (and they didn't feel like creating one) he was turned down. However, some of Dan's work is in the Smithsonian collection and his smallest piece has been photographed by the Smithsonian's photographer. He has sold some individual miniatures to collectors in the past but would rather keep most of them and enjoy them himself, especially since they are so difficult to make.

Early difficulties solved by better tools and techniques

When Dan first started, his only tools were the microscope, a pin for the notching, a pocket knife and some card paper. He would find the thinnest, flattest chip of stone and then shape the edges down with the tip of the knife blade while holding the stone between his fingers in a piece of card paper. The first 10 or 15 were crude looking and not bifacially flaked (flaked equally on both sides). He used the pocket knife for a while before realizing he could never get the results he wanted (bifacial flaking) with such a hard chipping tool. This is when he started using nails and placing the stone on a rubber pad to get longer pressure flakes.

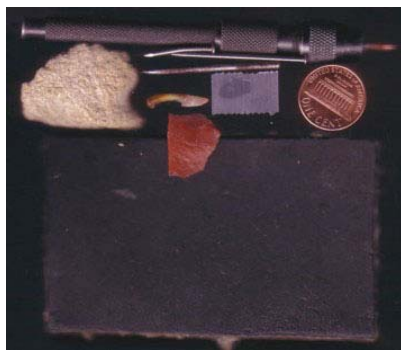


One of Dan's arrowheads is shown here attached to a miniature arrow.

When starting out and trying to teach himself how to make these tiny points, Dan would break two or three for every one he finished. After finally getting the tools and technique just right, he says he can now make two or three (if he's really careful) before he breaks one. According to Dan, "The hardest part is doing the notching and the flute flakes for the Clovis style points. Naturally, most of the breaks happen after much of the work is already finished. If I can get the arrowheads to look good under the microscope, they will look really good to the naked eye, but sometimes I break them on purpose if they don't look just right."

Dan admits that he has dropped a few of them and lost them in his carpet including a couple of his best ones. After spending over an hour looking for one he has to give up in frustration. Even so, he says working this small is worth it.

Here are several examples of Dan White's work:



Dan's tool kit includes:

- A stereo microscope (it's a lot harder to make micro arrowheads without it but it can be done).
- A pressure flaker with a sharp copper nail for making the pre-forms, and some smaller pins and nails for the finer chipping work. Also there's some clear tape used to protect his finger from being poked by the nails while pressure flaking
- A small grinding stone used to grind the edge of the pre-form prior to chipping
- A rubber pad cut from a tire for placing the point on while chipping. On the pad is a red piece of stone typical of the size and shape he likes to start with.

The penny is to show size. The small hafted knife in the center has a turtle bone handle with real sinew keeping the blade on.



Some arrowhead samples of various shapes are shown next to the tip of a toothpick for size reference.



More small points, all of a similar style are shown next to a penny.



This is Dan's smallest arrowhead, a fluted and bi-facially flaked Clovis-style point that measures just over 1 mm. According to archeologist Dr. Dennis Stanford at the Smithsonian and the people at Guinness Book of World Records, this is the smallest knapped stone arrowhead they have ever heard of. This is the only one he has made this small and says he doesn't think he wants to try it again. He made it several years ago and had to hold it down on his pad using a popsicle stick while flaking it with a special tool he made just for this point. It took about 1-1/2 hours to finish.



These points are all made from Alibates flint found by Dan's late friend George Chapman near Alibates Flint Quarries National Monument, the famous ancient flint quarry in the Texas panhandle. George lived near the quarry and he would send Dan a pile of small flakes he picked up in exchange for a finished point or two. Dan says this is some of his favorite material to work.



These are some of the first ones Dan made from broken pieces of arrowheads. All are made from a thin flake and are only chipped on the edges.



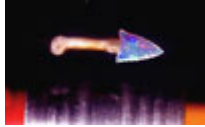
These three glowing "opals" are all made from Australian Opal from Lightning Ridge.



He has only one picture of himself at work with his microscope. It was taken by Val Waldorf in August, 2002 at Flint Ridge, Ohio for the October, 2002 *Chips* publication for flint-knappers. (Vol.14, #4)



Dan has created other weapon shapes as well, from spear points to daggers. The handles were made out of tiny bones found in owl droppings.



A knife with an arrowhead-like point made from fire opal.



A miniature knife of the type chipped from obsidian.

From <http://www.craftsmanshipmuseum.com/White.htm>, April 7, 2010, copied with permission



Section 5: Notching & Fluting

Fluting Instructions

by Gary Merlie

This series of pics are a composite of work on 2 different preforms. After each of the flake removals in the first few pics, remember to clean up the little overhangs just like you do when making a biface. There are many critical variables that I could not cover in these few pics. Nipple grinding, cross section of preform, and placement of the lever just to name a few. You will just have to experiment. All of the knapping/fluting was done with copper and modern tools. Fluting abo style is a whole different ball game, a game I have never played. I would love to see a similar layout like this one dedicated to abo style fluting by one of the good abo knappers like **Bob Patten**. (hint hint) Rockhead

Bevel base toward side to be fluted.



Remove flakes 1 & 2 on the side to be fluted to define nipple. Remove flakes 3 & 4. These are guide flakes to help flute flare out correctly.



Turn point over and remove flakes 5 & 6. These removals isolate nipple.



Remove flakes 7 & 8 from side to be fluted. These removals act as guides, and further isolate nipple.



Turn point over and remove flakes 9 & 10 as needed. These removals regulate the width of the nipple. Remember when making nipples: Define, isolate, regulate, and grind.



This nipple is ground and prepared for fluting. The guide flakes could be better, but it is good material from Harrison Co. Ind. and the flute will probably go.



View of overall preform. Note how nipple is isolated and out towards face to be fluted. Ears are back away from face to be fluted. I grind the ears at this point to keep them from snapping during fluting.



Preform in jig ready to be fluted. Note tip of copper lever on top of nipple. Side to be fluted is facing jig.



Copper lever. This tool has 4 working faces so you don't have to dress it as much.



Close up of copper lever on nipple. Ready to flute.



Preform and flute spall immediately after fluting. This flute ran about 4".



Here's the finished point after the other side was fluted and much pressure flaking was done to give it the distinctive Cumberland fishtail shape. Length is 4 1/2". I rubbed a little mineral oil on it to give it the nice glossy look. Total time to make this point? A lot less than it took to edit and post all these pics!



Copyright © 2000 - Gary L Merlie - All Rights Reserved.

From <http://www.ssrsi.org/Onsite/fluting.htm>, March 31, 2010, copied with permission

Hand Fluting

By Bob Patten (aka knapperbob)



I picked a tough piece of raw Utah agate to make a Folsom. The weathered surface is deceiving.



You can see that the stone tears rather than breaking smoothly, but works well otherwise. The unweathered interior looks quite different from the weathered outside.



I used antler baton percussion until the thickness was even and relatively thin. Some length was lost due to careless work.



After the surface was selectively contoured by antler pressure, I gave the base a bevel.



A little more work and the platform is isolated. I set up a 2 mm gap between the platform and a straight edge to control flute thickness. At this time, I make sure that there are no gaps between the straight edge and the preform crest.



The first platform is ready for fluting.



You can see my view of the fluting anvil, a moose billet resting on top of my calf muscle.



Here, the preform is in place atop the anvil. The blow follows through to land on a heavy leather pad near to the action I normally use while doing regular percussion. My avatar demonstrates the approximate positioning for fluting.



Backlighting shows the translucent nature of this agate.



Unfortunately, I held the preform off center and the first flute peeled to one side.



With just a small adjustment, I have a new platform near the edge of the preform base. Ready for another try in under a minute.



As we say, "the operation was a success, but the patient died." Although the flute went full length, an unfortunately-placed crystal pocket caused the point to snap. With a few thousand years of weathering, this point could have taken on the relatively smooth appearance of the starting quarry blank.

From <http://paleoplanet69529.yuku.com/reply/126388#reply-126388>, April 4, 2010, copied with permission

Notching Arrowheads

F Scott Crawford © 2009 All rights reserved

Before You Put The Finishing Touches On The Cutting Edges Of The New Arrowhead, Begin The Vital Work Of Making Notches.

To create the notches for a small arrowhead, I make an initial narrow indentation at the chosen location for each notch. Do this with very short flakes from one side of the preform. This creates a socket for my pressure tool. Working from the same side, I rough up the inside edge a little, to get a good grip. Now, turn the point over. Press the tool against the rough edge to drive off a guide flake from the bottom face. Repeat at both locations. Then, set up the same way, to make guide flakes on the opposite face. At this stage, I switch to a smaller pressure flaking tool, to work the point of the tool inside the notch. I do not want to touch the corners of the barbs or the tang when I am pressing inside the notch, or I might break them.



1. Locating the start of the notches for the point.



2. Turn over and press against the roughened edge.



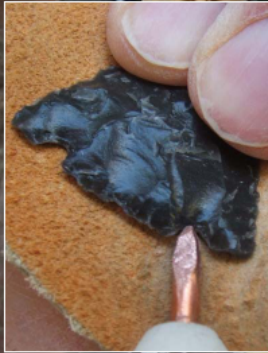
3. Here is the first guide flake for this notch.



4. Indicating the guide flake at the second notch.



5. Using a smaller pressure tool to work the notches.



6. Press inside against the edge to remove a flake.



7. Here is the next flake removed for this notch.



8. Next notch flake removed, same side as photo 6.

(Continued ...)

Once Again, Especially In Making The Notches, Edge Preparation Is Key To Facilitating The Removal Of Pressure Flakes.

(Continues ...)



9. Trimming inside notch to prepare for next flake.



10. Turn over, press in and down against rough edge.



11. A nice, long notch flake removal.



12. Trimming inside notch to prepare for new flake.



13. Turn over, press inside against the prepared edge.



14. Nice notch flake. Clean up edges inside notches.

the face from which I want to remove the next notch flake. Now, I turn the point over and apply pressure to the new edge to remove the next flake. Repeat until I finish the notches. I keep the flaking tool sharp and I try to avoid accidentally banging the tool against the barb or the tang at the instant when I remove the notch flakes, lest I break them. *Hint: you will break the barbs, and then you will know what I mean. It is all part of the learning process.*

I repeat the setup process for each new flake in the notches. Trim the edge, working from the same side as I applied the pressure for the previous flake. Rough up the new edge with the tool. This creates a working edge close to

From <http://www.arrowhead-makeyourown.com/>, April 6, 2010, copied with permission from "How to Make Your Own Arrowheads"

The Basics Of Punch Notching

by Mark Bracken

In the early days of flintknapping, I think we all have tried making notches in our flint points with a punch. All too often and with the greatest of ease, simply split the point in two or blow the ear off. You only have to do this two or three times to develop quite a rash.

Thank goodness for good friends and flintknappers. About three years ago a knapper from Texas named Dan Theus showed me a thing or two on punch notching. Dan can notch most anything as deep as he wants or needs to with this technique.

Using an Ishi stick or the smaller flakers has its limitations, for example..."dog leg" notches, thick points or very deep notching. Texas style Andice points are a good example of this.

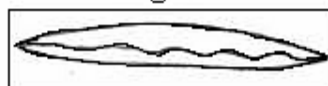
In the artifact world, it appears native American Indians preferred punching their notches. This is based on the flake scars of old points. Successful punching produces large aggressive "c" shaped flakes.

Now Lets take a look at the basic rules you must follow for risk free notching. There are four basic factors for success. These are: Platform setup, grinding, strike angle and velocity. Lets look at basic platform setup.

Fig.1 shows and view of the margin. Note that the margin is not directly located on the imaginary centerline, it is for the most part, closer to the lower face of the preform. This would make any flake removal(s) more successful and less risky. The same thing applies to the tiny margin located within the notch, in a much more critical way.

Look at fig.2. It shows the margin being closer to the top face. (It's up-side-down) The flake should be removed from the "top" of the Bi-face. Having the platform edge below the imaginary centerline is a must for punching! It is the key!

Fig. 1



Margin (Edge)

Fig. 2

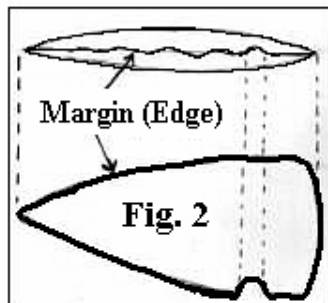
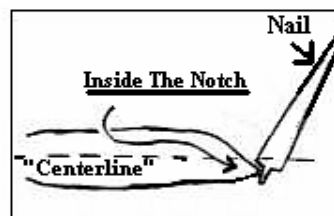
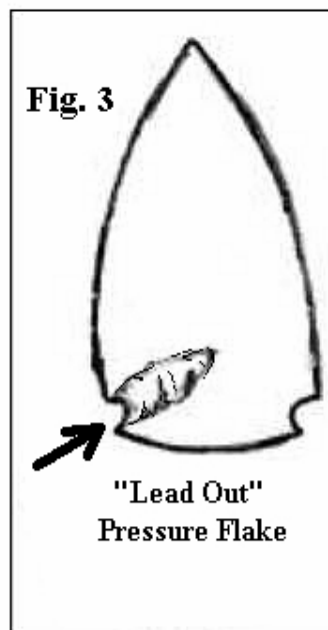


Fig. 3



To begin a notch, I like to use my ishi stick to make a "lead out" flake. Shown in Fig 3. This thins the notching area and can be done to "lower" the platform edge, I like to do this on both faces of the preform. This is not necessary but it can be a big help. Keep in mind that the notch platform is basically the same principle as a standard thinning platform.

With your platform ready as described above you must now abrade it. This is critical, even if you are doing minor adjustments to relocate the margin (something that you will occasionally have to do after punching a flake) to favor flaking the best face.

Take a look at fig.4. It shows the shoulder on the nail resting in the notch ready to punch, note that the nail shoulder is located at or slightly below the centerline of the point. Screw this up and the ear is gone! The nail will require file retouch after a few flakes.

Make sure you're not biting too much off by having too broad of a shoulder on your nail. If you have a good low platform, whack the heck out of it. You can use your billet, a chunk of wood, frozen steak or what ever to hit the nail.

A few more tips. The "lower" the platform the more you can change the angle to drive into the preform, and vice versa. Faster hits for bigger flakes and slower for smaller flakes. You can grind with a small flake. The tricky part is readjusting the margin to favor a face.



From <http://www.flintknappingtools.com/punch.html>, March 31, 2010, copied with permission

Expanding Type Notching Tutorial

- Crump Lake Point

By Jim Winn (aka Paleoknapperjim)

I've been planning on doing a notching tutorial for a long time and finally got around to doing it today. Normally most of my notched points are on the small side, but trying to take pics of notching small points would be a challenge, so I chose a Crump Lake type point which is bigger. Crump Lake points are from the Crump lake area of Oregon and are a type of Great Basin side notch point. Many are on display at the Favell Museum in Klamath Falls. Most all of them are made from black Dacite, the same material that I chose to use to make this tutorial point. Special thanks go to Chad Ring, friend and fellow knapper who took all of these pics today. This first pic shows the piece of dacite before any flakes have been removed.



Initial percussion flaking begins with Moose antler, sandstone and copper. I find the Moose antler works great in the early stages to rapidly thin the piece, many of the flakes traveling edge to edge or overshot. This picture shows the biface thinned to the desired thickness.



A little more percussion flaking has been done to shape the biface and it is now ready to pressure flake...



This pic shows the biface after the first pass of pressure flaking using an Ishi stick....



This pic shows the biface after the 2nd and final pressure flaking pass. Notice the basal thinning flakes. It is necessary to make the basal area as thin as possible in order to get narrow notches.



Here the opposite face is shown



I normally draw the starting point for my notches on the biface before notching it to be sure to get proper alignment. I use a straight edge at right angles to the long axes of the biface and place a mark on both edges on both faces. Because this point is black, I used white out instead.



The biface is now marked on both edges of both faces...



This is the edge view, showing the thinness near the basal area. This thinness is critical to successful narrow notches...



This pic shows how I support the biface on a small pad. It is very important to have very rigid control and no wiggle room anywhere. The Optivisors help a lot. If your young you may not need them, but in any case you need to be able to see real close up.



I am using a horseshoe nail for notching. This shows the placement of the tip of the notcher for the first flake removal. This first flake it taken by pressing the tip straight down, NOT IN. The idea is to take a very small flake that will set up your platform for the next flake removal on the other face.



This pic shows the first flake removed. As you can see, it is not much of a flake, but it is a starting point and we can now remove a longer flake from the opposite face...



OK, this is the oposite face flake removal, and now we are striving to push a longer flake to thin the area ahead as we go. It is absolutely essential the the tool tip be narrower than the notch. I cant stress this enough. If it is not it will rub the sides of the notch and blow it out. OK, this time I push straight in.



Here is what the 2nd flake removal looks like. It has traveled perhaps 3/16" and thinned the area ahead, looks good...



OK, this pic may look confusing, but here is what is happening. The opposite face (not shown) is where I just removed the last flake. Before removing another long flake it is necessary to get the edge of the platform as close to the face you are flaking as possible. To do this I push straight in very gently at 90 degrees to the face, just removing tiny flakes to bring the edge up. This will allow the next flake to release with less force and travel further. I NEVER grind my notches. Grinding them will stall them out and so much force will be required to remove the next flake that it will likely blow out the notch.



OK, we flip the biface over and push off another long flake on the opposite face. Again, I am pushing straight in to remove a long flake and thin the area ahead...



Here is the flake removed, not as long as I wanted but good enough...



This becomes repetitive, but here I am pushing at 90 degrees to the face again to bring the platform up to the face so that I can remove another long flake...



The biface is flipped over and we push straight in again to remove another long flake...



Here is the flake removed. This one traveled nice and far and really thinned the area ahead very well. This will make it much easier to continue. It is much easier and less risky to remove a short flake, but short flakes make it much harder to remove a flake from the opposite face. You pay the price when you go to remove the next flake. It is better to be aggressive and remove a big flake or things are sure to go wrong in a hurry..



Now we switch techniques. As the notch gets further in from the edge, it is too risky to push straight in. If the tool tip even touches the edges it will blow them off. So now we come up from underneath. Place the tool tip up on the platform and apply the force straight in as before. If the tool tip is too sharp it may bend, so you may need to file the tip a bit duller at this point. However, it still must be narrower than the notch.



Here is the flake removed. Again it travelled far and the area ahead is nice and thin and will be easy to notch...



OK, now it is time to begin expanding the notch. So now I take 2 flakes side by side on each face. Here is the first flake removal, again coming up from beneath with the tool tip...



Here is the 2nd flake removal. Notice I have moved the tool tip to the other side of the notch end.



Here are the 2 flakes just removed...



We flip the biface over and remove 2 more side by side flakes. here is the first flake removal.



Here is the 2nd flake removal...



We flip the biface over and continue. From here on, I may remove 1, 2, 3 or more flakes on each face, whatever is needed to open the notch up to the desired thickness. This part is relatively easy.



Here is the first notch completed. Now I will follow the same procedure for the 2nd notch. Note: Normally I do both notches at the same time. It is much easier to maintain symmetry by having them travel along at the same pace, rather than trying to make the 2nd notch match the first. Also, if you stall the notch out but are in far enough you can stop and call it good enough...



Here the 2nd notch is completed. Notice that I did manage to blow off a tiny piece of the 2nd opening. This happened when the tool tip accidentally touched the opening, it does not take much to blow them off!



A close-up photograph of a hand holding a large, dark, serrated arrowhead. The arrowhead is made of a dark, possibly black, material with a rough, textured surface. It has a long, narrow shape with a pointed tip and a wide base. The serrations are visible along the edges. The hand is holding the arrowhead from the base, with the fingers visible. The background is a light-colored, textured surface, possibly concrete or stone.

A collection of primitive tools and weapons, including spears, knives, and arrowheads, displayed on a dark brown leather surface. The items include two long spears with wooden shafts and dark, pointed tips; a large, curved knife or spearhead; a smaller, straight knife; several arrowheads of different shapes and sizes; and various other small tools and components, all arranged neatly on the leather background.

This is another view of the notching tool unassembled. I shaped and cut a plastic bolt to a bullet shape and then heated up a horseshoe nail repeatedly over the stove and inserted it into the bolt tip until it penetrated all the way through. This fits the nail like a mold and nails are easily replaced. The handle is steel pipe with the same diameter as the bolt and makes a snug fit. A wooden dowell is glued inside the pipe to act as a stop for the bolt and nail



One final word, this is not necessarily the best way to notch a point, it is just one way of many possible ways. I tried many different techniques, most ended in failure, and after many attempts this is what is working best for me at this time...

From <http://paleoplanet69529.yuku.com/topic/4139>, April 1, 2010, copied with permission



Photo courtesy of F. Scott Crawford

Section 6: Finding & Treating Knappable Stone

Where Can I find Flint?

by Mark Bracken

Hunting flint is one of my favorite things to do. It's an adventure every time I go on a rock hunt! Over the years I have searched far and wide for the finest and most colorful materials for knapping. Many times I have come up empty handed and an empty gas tank. I always wondered where the "Mother Lode" was or if such a thing existed. In my quest, over the years, I have found some fantastic flint sources. It is a lot of hard work yet very satisfying experience.

Here are some tips for *your* next rock hunt!

The best advise I can give to the "flint hunter" is this: familiarize yourself with geological maps of the areas you plan to hunt. Look everywhere, in plowed fields, look in the gravel of creek and river bottoms, construction sites, under bridges and eroded roadside ditches. Be sure to get permission from land owners first! I assure you it is not worth the risk. The rewards are greater when material is gathered with a blessing from the land owner. Beware of "freeze fractured" flint. This is flint that has been exposed to freezing and literally frozen. The problem starts with this. Flint and all other stones contain moisture deep within the stone, when the temperature falls well below 32 f. the result of the expanding freezing moisture is fractures the flint. This is a bad thing for knappers. This material is useless unless the pieces are large enough to knap. You want pure crack free stone. It can be a serious challenge to find high grade stone. If you plan on getting material from construction sites, get them before it freezes. These stones have never been exposed to freezing temperatures and when they do, they will likely suffer. Searching creek and river bottoms can be a lot of fun. Take a big copper billet and start testing the gravel to see what is inside. You never know what you might find!

In summary, do a lot of research. Talk to artifact hunters, they know what the flints look like from their area. Don't waist your time in areas where there is no flint to be found. Don't expect other knappers to reveal their sources. Many a knapper has spent years to find their "honey holes". Remember, always get the land owners permission to hunt rocks on their property! Try to hunt areas that have not been exposed to freezing. Use common sense, have safety equipment along. Take Band-Aids, gloves, safety glasses and long pants. Just take a day off work and get a tank full of gas and have fun exploring the country side. It's great fun! you never know what you might find!

If you don't have much luck or just don't have the time you can get good material from reputable rock dealers. You want to learn more about modern knapping? Simply search this site or view the Links page.

From http://www.flintknappingtools.com/where_flint.html, March 31, 2010, copied with permission

Flintknapping Buyer's Tips

by Wilkie Collins

These tips could save you hundreds of dollars

1) Many people who sell knapping stone do not know how to grade it very well for flintknapping.

Silica is available at about 3 cents per pound in the form of gravel and up to 1500 dollars per pound in the form of semiprecious stones. Knappable silica is somewhere between these two figures in value, and the skill of the vendor at stone grading and his familiarity with the specific stone he sells are your only reliable access to value. Someone who offers you graded stone for less than a dollar a pound is probably offering you what most flintknappers would call "gravel".

2) For best value, purchase your supplies and tools from one dealer, especially while you are learning the basics.

Knapping materials vary, and purchasing your tools from the dealer that offers the stone can help to ensure success. Some billets don't work well with everything.

3) Learn to flintknap with the best material you can acquire, then move on to experimenting with all of the lower grade materials that may look more like the stone your own local Indians had to use 'cause they couldn't get the good stuff.

Heated Arkansas novaculite is a near perfect stone for the beginning flintknapper. Novaculite is less brittle than obsidian and is much safer to use. It is far more consistent than chert, can be reliably heated to knappability, and is consistently available in larger high grade pieces than other forms of silica.

Students typically learn faster with heated novaculite and experienced knappers who demonstrate look extremely competent when using novaculite as opposed to less consistent materials.

We do not recommend obsidian for beginnning flintknapping because:

a) It behaves too much like glass, and one is generally better trained by using a material more like natural stone, and

b) It is very dangerous to chip and will leave you bleeding.

5) Whenever possible, obtain your stone from the people who mined it, and who mined it FOR FLINTKNAPPING.

If the person who supplies your knapping stone has purchased it second or third hand, the likelihood is great that you are getting second or third rate materials. While many dealers may protest that their stone is "#1 quality", if they did not do the mining and are not experienced flintknappers they might not even know what the best material looks like.

Questions to ask your knapping stone dealer:

a) Is this stone heated?

If it is not, it will probably be very difficult to work especially for a beginner. The exception is obsidian.

There is a tremendous difference in material that *CAN* be worked raw and material that can *EASILY* be worked raw. After teaching hundreds of students our advice is that your first 50 lbs of material be graded and heated.

b) Is this material spalled and bifaced?

If it is not, it CANNOT be graded as well as processed material, and is a risky buy. Most beginners ruin more material than they successfully spall (strike into large flakes) from blocks.

Don't be snookered into "comparing apples to oranges". Knapping material sold as a ten pound, six inch block for a dollar a pound *might* not make even a single 4 inch spall. But if you buy #1 graded spalled material with the size listed you will know what you are getting and might get several four inch spalls *PER POUND*. Two pounds of \$5.00 per pound material could very easily yield you more usable stone than 10 or 12 pounds of blocks or poorly graded stone.

The rule of thumb for knapping stone value goes basically as follows:

RAW stone is generally worth less than 50 cents per pound.

SPALLING the stone into prime spalls adds about a dollar a pound to the value.

HEATING the stone adds another dollar or so to the value of the stone.

CLEANING and BIFACING the stone rapidly adds to the value.

If your dealer has been in business for a long time, you usually get your dollar's worth in higher priced stone.

c) What is your spall width to thickness ratio?

If they do not know what you are talking about, they probably cannot grade stone effectively. Slight variation in the thickness of spalls or flakes can mean many more or less pieces per pound and much lower value.

d) How much of this stone have you personally used for flintknapping?

A dealer/flintknapper will have used many pounds of his favorite materials.

From <http://www.nativewayonline.com/fkfast.htm>, March 31, 2010, copied with permission

Heat Treatment

By Travis Smolinski

Heat treatment in itself is an art. How it was discovered by the old teachers is unknown but it was a significant invention, just as water treatment was.

There are many discussions on why it works, but I will only add my theory and say no more, "because it does". Treating stone allows difficult stone to become workable. Agates like Brazilian or Montana turn from blood vessel poppers into glass. This obviously has an effect on the final tool or weapon. So if you are planning on making a good sturdy axe, don't treat it. But it does not have a significant enough effect that it deteriorates the effectiveness in scrapers, knives, arrowheads or the like. It simply makes the flint knappers job more easy.

- Fire
- Bar-b-que
- Oven/Roaster
- Kiln
- Temperatures
- Special Notes

Some types of stone are also affected by water treatment. While I do not have enough stone to experiment with this process, one should try leaving some pieces in a bucket of water for a couple of weeks and test the results.

It should be noted that in regards to heat treatment, different types of stone require different temperatures. Others, such as Obsidian, require none.

1) Fire

The old teachers use to build a pit under their fire, or in the side of a hill next to it. This was there Kiln. You should dig a fire pit large enough for the material that you would consistently be treating. Now bury the spalls (etc.) under a bed sand. A fire is now built over it. It doesn't have to be large enough to alert the fire department, just so that it heats the coals up good enough to allow them to burn throughout the night. While some people scrape all the coals off, re-layer the spalls, performs, etc., add more sand and re-light the fire, I usually skip this step and keep the fire going nicely throughout the day. After a day or more the stone is dug up and checked to see if it has been sufficiently heat treated.

Where you place them in the bed of sand will depend on what temperature they require. It has been said that 1" under the sand produces about 600 degrees of heat and will decrease about 50 degrees for every half inch deeper. Of course this assumes that all the sand is equal and that the fire is spread evenly. The edges of the sand pit would experience less heat if the fire were not over it enough.

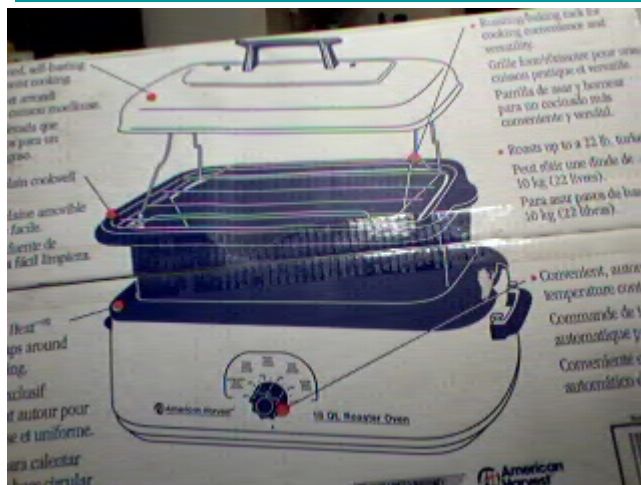
- My first experiment at heat treatment involved a fire pit. First I dug a hole into the ground, filled it with about half a foot of sand and then layered the rocks so that they wouldn't be touching each other. Finally more sand and then we built a fire on top of it and roasted marshmallows. The next day I dug it up and noticed that there didn't appear to be much color change. Further examination of the rocks proved this as there was no change in the ease of pressure flaking the stones. Perhaps the fire wasn't hot enough?

2) Bar-b-Q

I have a small bar-b-q that I filled with sand and layered the stones accordingly. Then I lit a sufficient amount of charcoals (covered in lighter fluid) and let them burn over night. However, while I have heard that this works too, I was unsuccessful. I just can not seem to get the fire hot enough. This time I used less sand but had the same results.

- A friend told me that he cooks novaculite (requires 700-950 degrees F.) on the bar-b-que. Haven't tried it yet.

3) Oven/Roaster



The same goes for the oven, but after the wife banned me, I got a turkey roaster and love it and would not go back. It is larger so I can put more in, spread them out differently, leave the sand in it and not worry about burning out the internal mechanisms. The 18 quart ones have temperature gauges that goes up to 450, or 550 on the more difficult ones to find. You can get the temperature up an additional 100 - 150 degrees more by removing the middle pan. They can go

anywhere from \$40 to \$300. The one pictured above was purchased brand-new for about \$45; A significant savings from a kiln!

It is simple to use. Spread the slabs (preforms) out, slabs on their side, and pour sand over then making sure they do not touch one another. Note that hotter temperatures will be generated at the very bottom of the sand (reverse from the fire method) and the sides.

I found that the best method was to:

- Heat roaster (with sand and rocks) for two hours at 100 degrees
- Bring it up 50 degrees every hour
- Once it reaches the desired temperature leave for an hour and reverses the process; Or,
- Once it reaches the desired temperature leave it there for a couple of hours and turn it off.

The above last two points really depends on the stone. Sometimes when it reaches the desired temp, it is heated perfectly. Other times, it needs to be maintained at that heat for a certain period of time. If you surpass it on some stones, they turn to dust.

Since I do not get a lot of material, I usually try and throw pieces that require 450-550 degrees together and hope for the best. I have only lost one piece of jasper and a couple small slabs of wood using this approach.

Note: Some people do not even use the sand with mixed results. They just throw the stone in and get to it. Basically the sand does two things. One it maintains the heat evenly, allowing the temperature to slowly raise and cool. And two it keeps the stone from touching one another. Both achieve the same goal by preventing surprises to the stone that might cause it to explode or crack. Since I buy rock, I will not take any chances of breakage and will stick to the sand.

When I first tried heat treatment I wanted quick and dirty rules, "how much-how long". But I quickly learnt that different rocks need different temps and hold times. To make it worse, the same stone is NEVER the same and batches of the same rock, i.e. Brazilian Agate, may lead to different results for each slab.

3) Kiln

If you are fortunate enough to have the funds and enough material to justify purchasing a kiln, you are one of the lucky ones, otherwise you will struggle using the traditional approach or a oven. Using a kiln is very predictable and easy to measure the results. With computerized controls and an even temperature spread, you should be able to achieve the results with much greater success and ease. For a kiln be prepared to be shelling out around \$1,000. I, unfortunately, am not one of the lucky ones so I cannot offer and more information on kilns.

Stone Cooking Temperatures

Here are some temperatures that I picked up and saved over the years - don't know why as I can't get most of this stuff, just hopeful I guess.

- Agate Brazilian - 450-500
- Agate India - 500
- Agate Mexican - 500
- Agate Montana - 550
- Agate Moss - 450
- Alibates - 425-500
- Bloodstone - 500
- Burlington - 600-650
- Coral - 450-600
- Dacite - NONE
- Flint Ridge - 500-600 (set the roaster at 200 degrees for two hrs then increase until the max temp. is reached and leave it for 12 to 24 hours)
- Flint - Fort Hood - 400-550
- Flint - Georgetown (Blue and Black) - NONE
- Flint - Georgetown Banded - NONE to 400
- Flint - Knife River - 350 - 450 (Do **NOT** overheat or it could pot lid)
- Flint - Danish - 300 -350
- Flint - British - 300 -350 (hold time could be 6 hours)
- Jasper Red - 500 (very hard stuff to work)

- Jasper Sunset 450-475
- Jasper Fancy 450-500
- Jasper Picture 525
- Kay County - 500-600
- Novaculate - 700-900
- Obsidian - NONE
- Pedernales - 450
- Petrified Wood - 300-450

Special Notes on Heat Treatment

- All rocks are different! There is no fool proof temperature or procedure as rocks form with different minerals, flaws, cracks, moisture, etc. in them and all are different. Therefore, what might work for the majority, may not work for some. This is especially the case for petrified wood and some jaspers.
- Be careful as rocks can explode. The best ways to prevent/prepare for this are to make sure that they are thinned down first and dry (moist rocks will have a higher chance of breaking). Also, if you can, use a metal roaster with a lid. That way if it does explode, it won't go through the glass. Just joking, explosions usually means that the rocks crack and pop and do not react like a grenade.
- Make sure that your significant other doesn't know, or at-least doesn't plan on using the oven for a day or so. It may stink, especially the sand!
- Keep windows open as the oven generates a lot of heat. In addition, this cooking process soon filled up the apartment (and hallway I am sure) with the smell of cooking rocks!
- Turn off your fire alarm. From midnight until 1 a.m., when the oven was at its hottest, my alarm kept going off waking up the neighbors. I would have been caught dead in my tracks if the fire department was called out. However, make sure that you **put the battery back in afterwards** the next day or when the place cools down a bit. If your windows are open, then you may be able to skip this process.
- NEVER leave it unattended!

From http://www.sparrowcreek.com/Heat_Treatment.htm, April 6, 2010, copied with permission

Heat Treating Tips and Temperatures

by Mark Bracken

Why do we heat treat? Heat treating alters knapable material that is otherwise unchippable and transforms it to a glass like characteristic. Heat treating will also improve the colors of some flints. Browns can become reds, grays can become blues yellows become orange and so on. It's an oxidation of the minerals in the stone. Soak heating (heating for 36-48 hours at a constant temp) is not necessary but will further enhance this knapability and color change. Not all materials can be heat treated. An example of this is the black and bluish Kentucky "Horn Stone".

For the sake of simplicity, we will call all knapable stone "flints" regardless of what they are. Remember that there are different grades of all materials, So the chart below has ranges for each type and or grade. It is also important to understand that these temperatures are for spalls or pieces that are absolutely no thicker than 2 inches.

Heating thicker pieces requires lower temps and a kiln with NO air leaks. Preforms, seem to be able to take hotter temps than spalls. This is likely because of there uniform shape. The preforms can be fairly thick. This is a nice advantage for knappers who have attractive flints that knap like concrete when there raw. They can be preformed and then heated with little risk of damage.

If a material is not on the chart, experiment with it. If it seems high grade and you still want to heat it to get that glass like look or workability then start with low temps (around 350f.). A rule of thumb is this: white or gray flints take hotter temps than darker flints.

Moisture content is ever present throughout the stone in ALL flints. Some materials indicated below are very sensitive to heat due to this. They require a special drying process. With out this drying process listed below, your flint will be destroyed.

Most of our Coastal Plains (including the Jaspers and Corals) flints need special care because of this. It is not total necessary but worth it! For example: on the chart below, Flint River" chert can be heated to 450-460f. This is with the drying process. If you don't want to go through the trouble of the drying, then the max temp must be lowered to 350f. Any hotter and it WILL become damaged. Now then, if you dry it, and following my instructions below, then the stone can be heated to 450f. This is fact.

The final result for this drying process is better color and knapability with this particular type of stone. If you have heated your flint and it has not improved, you can always re heat the flint to hotter temps but you can never go back. Once you have over heated the stone, the damage is done.

I have had experiences where I know I have heated flint just a bit too hot. The stone became very unpredictable and easily developed splits at the point of impact on the platform. After some tears, the rock was put in a bucket and forgotten about for over a year. I could not bring myself to trim through it and salvage what I could. Then, after it was re discovered a year later, hidden away in my shop, I tested the flint with a billet. The same pieces that had chipped uncontrollably now became very manageable. It was awesome I might add. This has happened to me twice now and I am certain that some of the stresses caused in heating had come out of the stone over time.

*Highly recommended drying as per directions below.

Any deviation from this will result in blown flint! That I guarantee!

First the flint must be dried...This takes about a week so be patient

Take the flint up slow and down slow, no faster than 50 degrees an hour!

Step 1. run up to 250 F and NO higher,. and allow to cool to room temperature.

Step 2. run up to 250 F. and NO higher, allow to cool to room temperature.

Step 3. run up to 250 F. and NO higher, allow to cool to room temperature.

Step 4. run up to 250 F. and NO higher, allow to cool to room temperature.

Step 5. The final heating will go to 450 for high grade material

For lesser grades 460-470. {Thin Slabs may go higher}

Do Not heat whole rocks or spalls thicker than $\frac{3}{4}$ of an inch.

Please remember...If I said it here, I mean it!

Basic flint heat treating instructions

Be sure the kiln is packed full with NO room for more stone. If you need to top the kiln off, get anything of poor grade to fill it up, even a brick will do! This insures that the flint will ramp up and cool slow with limited air currents within the kiln. (This causes temperature shock, which can blow up or crack your flint).

Take the flint up slowly and down slow, no faster than 50 degrees an hour.

Hold time at finished temps should be at least 3 hours. (No need to hold it longer unless your going for enhanced color)

Do Not heat whole rocks or spalls thicker than 2 inches.

Basic Kiln safety

Operate your kiln safely!

1. Never operate kiln on a wooden or flammable surface. Use cement blocks.

2. Place kiln elevated on concrete blocks with holes in them or a proper metal stand.

Do NOT set directly on any floor!

3. Keep kiln at least 20" from any walls or other objects at all times.

4. Use cement fiberboard on near by walls for an extra-added protection!

5. Use a "dedicated" outlet for each kiln switch on a 15-amp breaker.

6. Never heat-treat large blocks of stone. Stones could violently break apart. This could knock the lid right off a kiln ejecting VERY hot Fragments, creating a serious fire hazard!

7. Keep your kiln out of the weather, Damage to electrical parts will result.

7. Never operate kiln with flammable fumes, liquids or vapors present.

8. Avoid heat-treating in your home or living space. Heating rocks can produce poisonous or harmful vapors, even if not cut on rock saws!

9. ALWAYS WEAR A RESPIRATOR WHEN LOADING OR UNLOADING YOUR KILN!!! DUST FROM BRICKS AND ROCKS ARE DANGEROUS TO YOUR LUNGS!

Below I have classified the materials into three grades:

"A" = High grade, sometimes very knappable in the raw state. A slight to good gloss.

"B" = Medium grade, a dry texture. Gritty when you scratch it with your fingernail. No gloss

"C" = Quite dry in appearance. Coarse and very difficult to knap.

All Temperatures ar Fahrenheit

Some common (but not all) of North America's lithics...

| | | | | | |
|--|---|---------|--|---|---------|
| * Southern Alabama Coastal Plains Corals found in water Cherts Rivers or oceans | A | 400-530 | North Dakota "Knife River" Fossil cattails | A | 350-380 |
| | B | 530-600 | | B | |
| | C | 650-700 | | C | |
| Texas "Ft. Hood" Coastal Plains Fla. fossil stratamontes Corals found on land | A | 500-530 | Arkansas Novaculite | A | |
| | B | 550-600 | | B | |
| | C | 600-630 | | C | |
| Texas * Coastal Plains Cherts Edwards Plateau River cobbles & tabular cherts | A | 480-500 | Ohio "Coshocton" flint | A | |
| | B | 500-550 | | B | |
| | C | 550-650 | | C | |
| * Tennessee Coastal Plains Cherts found on land | A | 520-530 | Ohio "Flint Ridge" flint | A | |
| | B | 500-520 | | B | |
| | C | 500-650 | | C | |
| Coastal Plains Chalcedony found in water (kal-sed-ni) | A | 350 | Ohio "Flint Ridge Chalcedony" | A | |
| | | | | | |
| | | | | | |
| Coastal Plains Jaspers | A | 450-500 | * Midwest "Burlington" chert | A | 500-540 |
| | B | 500-575 | | B | 540-580 |
| | C | 575-750 | | C | 580-630 |
| * Coastal Plains "Flint River" Chert | A | 440-450 | Texas "Georgetown" | A | 350-360 |
| | B | 450-480 | | | |
| | C | 480-515 | | | |
| * Florida Cherts | A | 500-540 | Texas "Alibates" | A | 450-530 |
| | B | 540-600 | | | |
| | C | 600-700 | | | |

Some flints that will not heat treat:

North Dakota "Rainy Buttes" Fossil wood

Kentucky "Horn stone"

Tennessee "Ft. Payne Chert", "Dover Chert"

Pa. Ny. Ontario "Onondaga"

-Mark Bracken

From http://www.flintknappingtools.com/heattreating_temps.html, March 31, 2010, copied with permission



Photo of Steve Nissly's keeper case, copied with permission

Section 7: Displaying & Making Things with Your Points

Photographing Your Points

By Michael Miller (aka mjflinty)



I use my flatbed scanner to make the pictures of my points. The trick is to leave the lid up and to do it at night and turn off all the lights in the room. Be sure to clean the glass well first. Sometimes I do end up with a smudge or some dust and I'll use Photoshop to clean it up. One fun thing to do is to use different materials (e.g. paper, fabric, etc) and lay it on top the points to create a backdrop effect.

From <http://paleoplanet69529.yuku.com/topic/33645>, April 7, 2010, copied with permission

Point Displays with Girl Power

By Gary Abbatte (aka rhymeswithwhat)

My loving heart partner Mary B. has been a very talented artist since before I met her in 1965 when we were sophomores in high school. It is a love story how we got together just this January after all these years. Mary was the girl of my dreams that made me studder and trip over my own feet all through high school. We never even dated then, I was too shy to ask the nicest, most beautiful girl in the world out on a date. She gets all the credit for imagineering this new point display technique. I told her my point displays were boring and looked like every body else's and that they were plain with the points all in straight rows. Then I asked her for some help. My display boxes were at her home for safe keeping while I was moving to my new apartment this spring. When I saw what she has done, I was amazed and very grateful. She has made my work look better than it is!

Here are some photos and tips on what Mary has done:



The display boxes when new have a white fiber pad, like the material that home heating filters are made from. The pads are springy but just plain white.

First Mary sprinkles a thin layer of base color of decorative sand over over the pad in the box. The colored sand is available at hobby and craft stores. It is also used in model railroad landscapes and rail-beds.



After the base color, a contrasting decorative color is sprinkled in a free hand design or pattern. Kitchen seasoning sprinkle bottles work nice for applying the sand, one sprinkle bottle for each color is needed.

Before the points are set in place, a spray adhesive is applied to the sand design. Commercial spray adhesive can be used but a mix of Elmer's clear dry glue one part. to 4 or 5 parts water in a dollar store plant misting pump spray bottle works great to apply the glue/water mix to the sand for fixing the design.to stay in place.



After arranging the points on the sand, replace the glass windowed cover and leave to dry for several days.

The sand and points and have stayed very stable through car travel to both the Bald Eagle and the Letchworth Knap-ins. That is a lot of driving vibration, but all has stayed pretty stable.



The instructions I gave will work with the Glue/Water mix by just spraying the sand to dampen like I have done with model railroad landscape.. A different technique is used with commercial spray glue. First spray the pad and apply sand and lightly shake off what does not stay. Build in layers with commercial spray glue like 3M.

A very few flier specks of sand have been easily brushed away with the Artist Brush of my Mary.

ThankYou Mary. I think she loves me too.

From <http://paleoplanet69529.yuku.com/topic/28623>, April 7, 2010, copied with permission

New Look for Display Case

By Steve Colby (aka Mutt.vets)

I was really impressed with Gary's post "Point's Display With Girl Power" and the way it made his points look better. <http://paleoplanet69529.yuku.com/topic/28623> I usually just shove in a piece of white foam and line up my points like a bunch of little soldiers. Well, after seeing Gary's post I felt that I needed to do something with my display box. But, I didn't want to mess with sand and glue. But then I saw this krylon paint called "stone" Krylon Stone Paint



I painted the foam pad and then just cut it out to fit into the case. Beware, if you put it on really thick, it take FOREVER to dry

Well, I think the whole thing turned out pretty decent. And, it has the same style of look as the ones in Gary's post. But, this is the cheater's easy way to do itLOL

Here's how it turned out Hope your's is a success. Enjoy Mutt



From <http://paleoplanet69529.yuku.com/reply/252039#reply-252039>, April 7, 2010, copied with permission

Cord Wrapping for an Arrowhead Necklace

By Kyle (aka Potholes Primitive)

I make necklaces for friends by stringing the cordage right to the arrowhead. I came up with this technique myself. I start by tying a hangman's noose and then wrap the point with the resulting loop and pull the noose tight. The way the point is wrapped is difficult to explain, but the example in the photo is loose so you can kind of see how in the picture. You'll probably need to play with it a while to figure it out. The result is a point that hangs straight down and a knot that won't come loose. It sure beats just tying a clove-hitch around the point like I see in novelty shops.



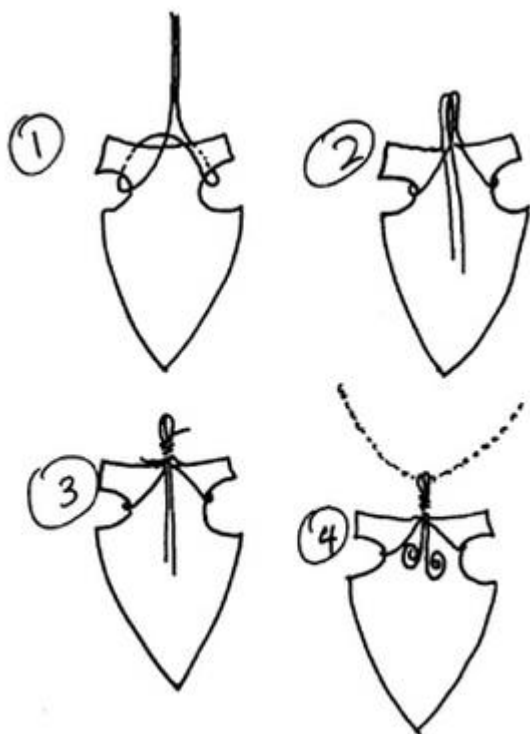
This necklace only has one wrap between the notches. I do two now because I think it looks better. Again, this one hasn't been cinched up all the way. The finished necklace will look almost seamless. If you can't figure it out, tell me and I'll try to draw instructions on paint.

From <http://paleoplanet69529.yuku.com/reply/31455#reply-31455>, April 6, 2010

Wire Wrapping for an Arrowhead Necklace

By Jim (aka Flyfish)

This is what I do with wire. I don't remember where the drawing came from. Wish I could remember so I could give the credit.



From <http://paleoplanet69529.yuku.com/reply/31455#reply-31455>, April 6, 2010

For a video demonstration of this technique,
see <http://www.youtube.com/user/mjflinty#p/a/u/1/d3AWa5GGkjA>

Hafting Blades into Knives

By Travis Smolinski

Warning: Working with antler and bone dust can be hazardous. Always wear safety glasses and a mask. While I have had no problems as of yet, I have heard horror stories about people who have received awful infections from antler dust. If you have any cuts make sure they are sealed off completely.

Modern Methods

Wood and Antler

As wood and antler can be hafted the same way, I will discuss them both here. The main difference is that wood is easier and can be done without any use of power tools. Antler can too but it just takes a lot longer and is tougher on the tools. Stone is also done in the same way but high powered drills and diamond tools are needed.

<http://www.sparrowcreek.com/KH1.JPG>

Here is a typical style of blade that you see and an antler that I used a saw to cut it to the size I wanted. The first thing we need to do is to place the blade to the knife and determine where the best fit is. Once we see how the knife should be (general look) we place the blade to the area we need to cut.



What we are doing here is finding the area that needs to be worked to fit the blade. We then hold the blade in place and take a marker and draw out the circle where the blade will fit. If we are going to make a slot then we want to determine the thickest width of the tang (the area to be hafted) and draw two cut lines. The

finished markings will look like this.





Now we have two choices. One choice is to use a drill with various sizes of bits and drill out several holes to the depth of the tang. You can clean up the hole marks with knives and files. The hole will look like this. Then the knife will fit in the hole. Epoxy or pine pitch will hold it into place.



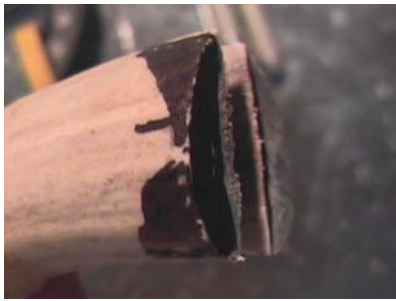
The other method is just as easy. With the straight lines marked you can use a jig or hand saw. First measure the tang and mark it on both the bottom and top of the handle to give you a clear vision of where to cut. The best method is to cut thin and then use a file to scrape away slowly where the tang is still wide. This method will make a tight fit and is superior to the one I will describe. The only draw back is that it could take 2 hours to

do. I use to do this method all of the time till I realized that epoxy is strong and the lashing material will hide the cuts. Therefore, I mostly use the quicker method.



Now take your saw and cut each line from start to mark. Then go down the center and angle it to each side to remove all the middle antler. You can now cut off the remaining pieces with a hand saw. You can finally clean it out with a file making sure not to remove too much from the sides. Test your blade into the slot to make sure it fits and nothing more needs to be removed.





Now as an optional method we can round the sides of the antler. Take your marker and mark the areas to be removed. Now take it to the grinder and remove these areas as well as cleaning up anything on the base of the antler. If you have no grinder then this can be done with steel rasps and 60 grit sand paper. I did the hand method for years and it can be done but takes a lot longer. Finally, once in shape, take 120 grit then 220 grit sand paper and sand it down smooth.



Now the antler handle is almost finished. We need to polish it. There are two methods to use. If you don't have a power buffer then get some polyurethane spray of semi-gloss, or gloss if you want a high finish. Spray it on after reading the instructions. You will then have to wait 72 hours before

proceeding. The other method is take it to your power cloth buffer and add tripoli, a brown soap like substance. Buff it and be careful to hold it good or it will throw it. Also, I always get static shocks that causes me to jump.



Now that we have a finished handle it is time to haft the blade. I got a little careless on this one as doing two things (taking pics) was too much for my little attention span. But it is a good mistake as it shows you how to overcome problems. What I did was cut too much off so that the blade wobbles in the hafting area. This can easily be fixed by adding some wood braces That will be taken out and added after the glue has been placed in the slot.



So that we don't have a big mess it is best to tape off the blade and antler. Now we take viscous (non runny) 5- minute epoxy. One option is to add black India ink, available at any craft store. Only add enough to color the epoxy. This will turn it



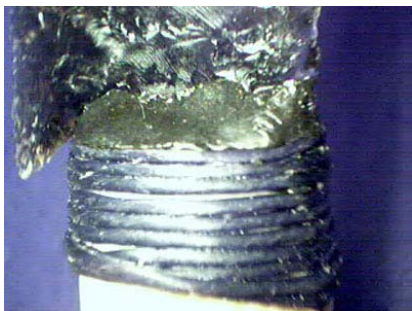
black and when it dries it will look very similar to pine pitch. Set a timer for 15 minutes and fill in the slot completely with the glue. Now we do a little clean up making sure none of the glue runs and let it sit for 10 minutes. If you made the mistake like I did and the blade does not sit still then you will have to watch it moving it back into place.



Ding Ding! The timer goes off. Immediately set it again for another 15 minutes. The glue should be like play dough now. Remove the tape. Now clean up the glue with a flattened nail or similar. What you are doing here is making sure there are no lumps, no glue



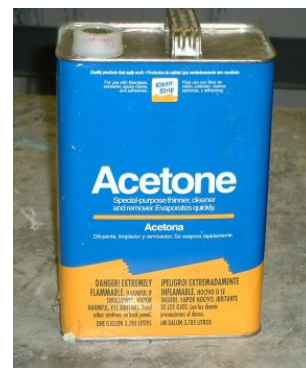
away from the hafting area and finally that the hafting area is completely covered. A good thing to do is to lick your finger and push down on the glue spreading it evenly. This will give it a smooth look. Also we are still constantly making sure that the knife remains even and straight, i.e. the blade isn't leaning crooked to one side or the other. It is important to do this slowly and never forcefully. This is why it is important to do it slowly from the start. If you wait too long the glue will have set too much and you can crack the wood handle or break off the tang.



When the timer goes off again check to see that the glue is dry. Once it is, you can lash on any material that you desire. I have used hemp cord, simulated sinew, leather straps and even wool from my wife's sewing kit. A little bit of Elmer's glue will help it stay in place.



Now we let it dry for an hour or so just to make sure. Also, acetone will help take off any spilled glue. And its done.



From http://www.sparrowcreek.com/Hafting_Knives.htm, April 6, 2010, copied with permission