“I now had the curiosity to examine the quiver of arrows belonging to the prisoner.”

-Alexander Henry 1814

From the Journals of the Corp of Discovery, to the more recent accounts recorded in the Journals of Peter Skene Ogden, Jedediah Smith, and others, there are numerous accounts made describing various aspects of arrows encountered as these men ranged from the Rocky Mountains Westward. Peter Skene Ogden and Jedediah Smith both made mention of Native arrows as they passed through present day southern Oregon and northern California. During the winter of 1826-1827 Peter Skene Ogden was traveling through this area when he encountered the Clammittes-known today as the Klamaths. On November 30th, 1826 he wrote “They are well provided with bows and arrows.” And on December 5, “They appear to live in dread of enemies, constantly wearing their arms.”[i] On April 15th, 1828, Jedediah Smith records in his journal a confrontation between his party and a group of local Natives as he neared the present day border of southern Oregon and northern California. His journal describes an “arrow in the neck of a horse” and “10 or 12 Indians were throwing their arrows into camp”.[ii] On October 26, 1826, David Douglas recorded an incident in his journal that happened in present day Southern Oregon. He was busily engaged shooting sugar pine cones out of a tree when, “…eight Indians came at the report of my gun. They were all painted with red earth, armed with bows, arrows, spears of bone, and flint knives, and seemed to me anything but friendly.”[iii]

It is possible to use these descriptions, accounts written shortly after the Fur Trade Era and the archeological record to replicate an arrow similar to what these men were encountering and describing. This arrow is generic to the region and not specific to one group. The process of making an arrow involves selection of a shaft material, shaft preparation, preparing the fletchings, attaching the fletchings, and hafting the point. Figure 1 shows what tools are needed to make an arrow as described in this paper. All of the tools used and described are made from materials that were readily available prior to European contact.

Fortunately, there are still a few surviving examples of arrows from this region.[iv] Figures 2 and 3 show some of these examples. An examination of specimens shows that a native reed, California hazel, Oceanspray, and wild rose, were popular shaft materials.[v] The shaft material used in the narrative that follows is wild rose. The best arrowshafts are harvested from where they had to grow in competition for sunlight. In these conditions the plant grew fast for light, so the distance between nodes are the greatest distance apart. This is important because at each node there will be a slight bend in the prospective shaft. Another factor to consider is that the prospective shaft will have been protected from the weight of snow by the same conditions that limited access to light. Without the weight of snow, the prospective shaft will be straighter. Therefore, it is advantageous to harvest shafts from under a significant over

story canopy or the middle of a large bush.[vi] Shafts harvested in the winter are less prone to checking and cracking as they dry.[vii] One effective way to cut a shaft is to use a stone flake with exaggerated serrations as a saw to cut around the circumference of the prospective shaft and then break the shaft off.[viii]

When multiple shafts are harvested at the same time, they can be tied together in a bundle and laid flat for a time to allow the moisture content to decrease. This process is known as seasoning. If the bark is removed too soon the shaft will crack and split as it dries. After a few days enough moisture will have left them that it is time to remove the bark. This process differs slightly depending upon the characteristics of the material. Some materials, like California hazel, are forgiving and easy to work regardless of the time of year when collected. Other materials, such as wild rose, require a greater sensitivity to the speed at which the moisture content leaves as it seasons; too fast and it will check and split.

A bifacial thinning flake, about 6 mm in thickness, snapped in half will yield a serviceable scraper for scraping the bark from the shaft. After removing all the bark, the shafts are kept tied together in a bundle, lying flat. Each morning and night, sight down the length of the shaft. Carefully bend it straight. Repeat this process for a week. After one week, some of the shafts will have been broken and discarded through the straightening/seasoning process, others will now be deemed to large or small in diameter. There will be a few that are ready to be made into arrows. After being seasoned and straightened in this manner, there rarely is a need for heat. However, it is possible to let the shafts dry completely and then scrape the bark off. At this point, the shaft will need to be heated, a pile of coals answers nicely, and then bent straight. There are accounts of Natives using this process as well.[ix] Speaking from experience, it is generally easier to scrape the bark off before the moisture is gone if using stone tools.

The shaft is now straight, but will still have minor bumps on the surface where leaves and twigs grew out. A tool made of two halves of fine grained sandstone that fit together with a groove between them is used to sand out these bumps.[x] Both Steve Alley and Otis Mason note that on old specimens there are tool marks going around rather than up and down the length of the shaft. This implies that these sand stone tools were used in such a way that the shaft was rotated in them. Speaking from personal experience, it works quite well to sit at a comfortable height with the feet planted firmly on the ground and the legs forming a right angle at the knee. While holding the sandstone tools between the thighs, push the shaft down through and rotate vigorously as though attempting to use a hand friction spindle to make a coal. This differs from other descriptions but works quite well.[xi]

Once the shaft is straight and sanded to the satisfaction of the craftsman, it is ready to be cut to length. Many surviving examples are quite long, sometimes thirty inches.[xii] The overall length of about thirty inches was frequently broken into two sections; a main shaft and a foreshaft. Once the desired length is identified, the process of cutting it is the aforementioned method of cutting a ring and breaking it.

As Captain Lewis was passing near the area under discussion, he made some relevant observations:

> "The arrow is formed of two parts usually though' sometime entire; those formed of two parts are unequally divided that part on which the feathers are placed occupies four fifths of its length and is formed of light white pine rather larger than a swan's quill, in the

> lower extremity of this is a circular mortice secured by sinews rolled around it; this mortice receives the one end of the 2nd part which is of a smaller size than the first and about five inches long." – Journal of Captain Meriwether Lewis January 15th, 1806[xiii]

In an incident recorded by Alexander Henery, a native male was taken prisoner. As he recorded, this allowed him to examine and make some observations about the weapons of the prisoner.

> "Their arrows are neatly made, and are of cedar and tipped with hardwood and bone about 5 inches, and sharply barbed with iron, and painted a very neat green, red, brown, and yellow, some of them are fired in socket so as to leave the barb in the flesh when received there." –Journal of Alexander Henry 1814[xiv]

Alexander Henery reinforces the idea of composite arrows and also make some observations regarding the painting of the arrows. The painting of arrows will be addressed later in the process of fabricating an arrow.

> "They often made their arrows in two sections, the front one containing the tip being short and fastened by a socket so contrived as to leave the tip in a wounded animal, while the longer and more valuable feathered section dropped upon the ground and could be found in the fleeing animal's trail." –Described by A.G. Walling[xv] and [xvi]

A.G. Walling[xvii] describes composite arrows and provides additional insights into the purpose for composite arrows. Composite arrows are well documented in this area.[xviii]

Many contemporary collectors act as though the stone projectile point was the most valuable part of the weapon system. This simply isn't true. In the first had experience of the author, an individual experienced in the art of making stone arrowheads can produce a serviceable projectile point in less than 30 minutes. In contrast, the time involved in producing a finished arrowshaft will routinely require more than a week, including seasoning time. This validates the statement, "…leave the tip in a wounded animal, while the longer and more valuable feathered section dropped upon the ground…"

Another possible reason for the composite shaft system is that it allows for a wider range of shaft materials to be used. The archeological record also documents the use of cane for the mainshaft.[xix]

> "An arrowhead attached directly to the main shaft would seem like the simplest and most logical way of mounting the point, but this was not the pattern used when cane shafts were prepared. Instead of mounting the shaft to the cane portion, the Modoc workman used a wooden foreshaft." [xx]

At this point, if making a composite arrow, it is time to drill out the point end that will receive the foreshaft. Sit on the ground and use a stone tool that has a long, narrow tip, perhaps 2.5 cm in length, and an oval base. Hold this tool, point up, by the oval between the balls of the foot. Place the end of the shaft downward on the upward tip. Rotate the shaft using the same motions as making a coal with a hand friction set. As downward pressure is applied the tip of the tool drives up into the end of the shaft. Sometimes the shaft will split. This can be prevented by wrapping a tight piece of cordage around the end of the shaft. These tools for drilling show up in the archeological record. [xxi]

The other end of the shaft will need to have a notch cut to receive the bowstring. The saw like tool is used to cut an initial notch and touched up with a piece of sandstone that has a knife like edge.

The mainshaft is now ready to be painted. A variety of sources show that there were some generalities in how this was accomplished across the region.

Among the Hupa:

> "A professional fletcher made them [arrows], many at a time, keeping them all at the same stage of production until he had finished. Then he sorted them to size and painted the shaft and sometimes the foreshaft of each bunch with distinctive rings of blue, black or red. This was to allow the purchaser to prove it was his arrow in a slain deer or man."[xxii]

The manner in which Ishi applied the pigments was described as follows:

> "In applying his paint he used a little stick of wood, or drew a small bunch of bristles, set in resin through a quill, making a brush. To make the rings of color he clamped the arrow shaft between his left arm and chest, while he rotated it with the left hand. In his right, which was steadied on his knee, he held the brush with its coloring matter. In making serpentine lines he used a little pattern of wood or deer hide, cut with a zigzag edge, along which he passed his brush. He made arrows painted red and green as well as red and blue."[xxiii]

Steve Alley says:

> "Patterns differ, ranging from the common cross bands of color to barber pole-like spirals. Sinew lashings were often painted, possibly to repel moisture. ...the foreshafts or front of the arrow was frequently painted, which may have been to darken it and help in camouflage. Most arrows were painted with only one or two colors but sometimes more were used. Red and black were the most common with blue, green, yellow and others following behind."[xxiv]

Arrows were painted to show ownership and possibly for camouflage. Rings and barber pole patterns of black, red, blue and green are common in the area. It is very plausible that the arrows being observed by Ogden and Smith were painted with patterns such as these.

Once the shaft has been painted, it is time to fletch it. To 'fletch' the shaft means to tie the feathers on. Sinew was used to lash the fletchings to the shaft. Sinew is often obtained from along the spine or from the legs of large game animals. Sinew from legs comes in round bundles and sinew from along the spine comes in flat strips. Figures 4-6 show where the sinew lays along the spine of the animal, what it looks like after it is removed and some being teased out into fine threads. Once the sinew is prepared, a sizing coat of hide glue is applied on the shaft where the sinew will eventually be applied to lash the fletchings. Use three different feathers, all from the same wing and same side of the feather. The webbing of the feather to be used is gently pulled off the quill of the feather. This is repeated for each fletching. These fletchings are compared to each other and cut to the same length with a sharp piece of stone. They can be soaked in warm water to make them more pliable and elastic. The sinew should be

wet so that as it is applied, it can be stretched. As it dries, it shrinks and becomes even tighter. The first fletching is started and placed so that it stands perpendicular to the bowstring knock. The other two are spaced equal distances from each other and the first. No knots are required to secure the sinew. When wound tightly around the shaft, over the webbing of the fletching, it will secure to its self. If desired, an additional sizing coat of hideglue will further secure it. Figures 4, 5, & 6 show what sinew bindings on fletchings looks like once completed.

Figure 7 shows a small bead of hide glue being applied down the length of the fletching and the sizing coat of hide glue where the sinew bindings will be applied to the other end of the fletchings. It is also possible to see that the space under the fletching was painted before applying the fletchings. Once the sinew has dried on the fletching bindings, it can be painted, as described by Steve Alley.

There are several ways to trim the feathers to height. One is to use a straight piece of wood as a straightedge and cut it with a sharp piece of obsidian.[xxv] Another is to use a fine coal on the end of a twig and melt the feathers to the desired height, see figure 8.[xxvi] An arrow brought to this stage of production with a straight, painted shaft and fletchings on it will look like figure 9.

Now that the mainshaft has been prepared, a foreshaft needs to be made. Considerable time and effort has gone into the mainshaft. Foreshafts, on the other hand, can be made from almost any length of short, straight stick that is about six inches in length. The foreshaft can be made of a wide variety of materials. "One end of the foreshaft was formed into a spindle and made to fit the socket in the mainshaft, leaving a slight shoulder where the two segments met. Salmon glue or resin was used to secure union, and the joint was bound with macerated tendon for the distance of an inch or more."[xxvii] Figure 12 shows a completed foreshaft/mainshaft union.

The arrowhead was hafted into the exposed end of the foreshaft. A notch was cut, similar to cutting one for the bowstring. Pine resin was heated and placed in the notch. Pine resin becomes more brittle the longer it is heated. Therefore, it isn't necessary to add ground up egg shells, dried elk fecal matter or any other material to control how brittle the pine resin is or isn't. Rather, the emphasis should be how long to heat the pine resin. In the arrow making kit shown in figure 1, in the bottom left-hand corner is a shallow broken soapstone dish. Soapstone dishes show up in the archeological record.[xxviii] The black substance in this fragment of a soapstone dish is pine resin that has been heated, some used and the remainder left to cool. It is a simple thing to lay this in the coals, heat it up, use some resin and then let it cool to be carried or stored until the next use.

The base of the stone arrowhead was heated in the fire and pressed into the pine resin. The same process of using sinew to bind the fletchings to the shaft and the union between the mainshaft and foreshaft was repeated to secure the projectile point. See figures 13 & 14.

A variety of arrowhead styles and materials were used in this region.[xxix] Agate, jasper and obsidian were three commonly used materials. Long, delicate side-notched points were common as were intricately barbed points with needle like tips and fine serrations.

The Rocky Mountain Fur Trade was an era of excitement and exploration. The connection between this era and today becomes stronger the more is known about the most minute details. By replicating arrows

as encountered by these men people today are able to more accurately understand the experiences recorded in their journals.

Figure 1: Clockwise from lower right; sandstone tools for sanding the shaft, small piece of sandstone feathered to a knife like edge used for sanding and dressing the inside of the nock, two possible obsidian points, length of elk sinew, broken soapstone dish holding pine resin, complete soapstone dish holding hideglue, stone saw, drill, shaft and feathers for fletching.

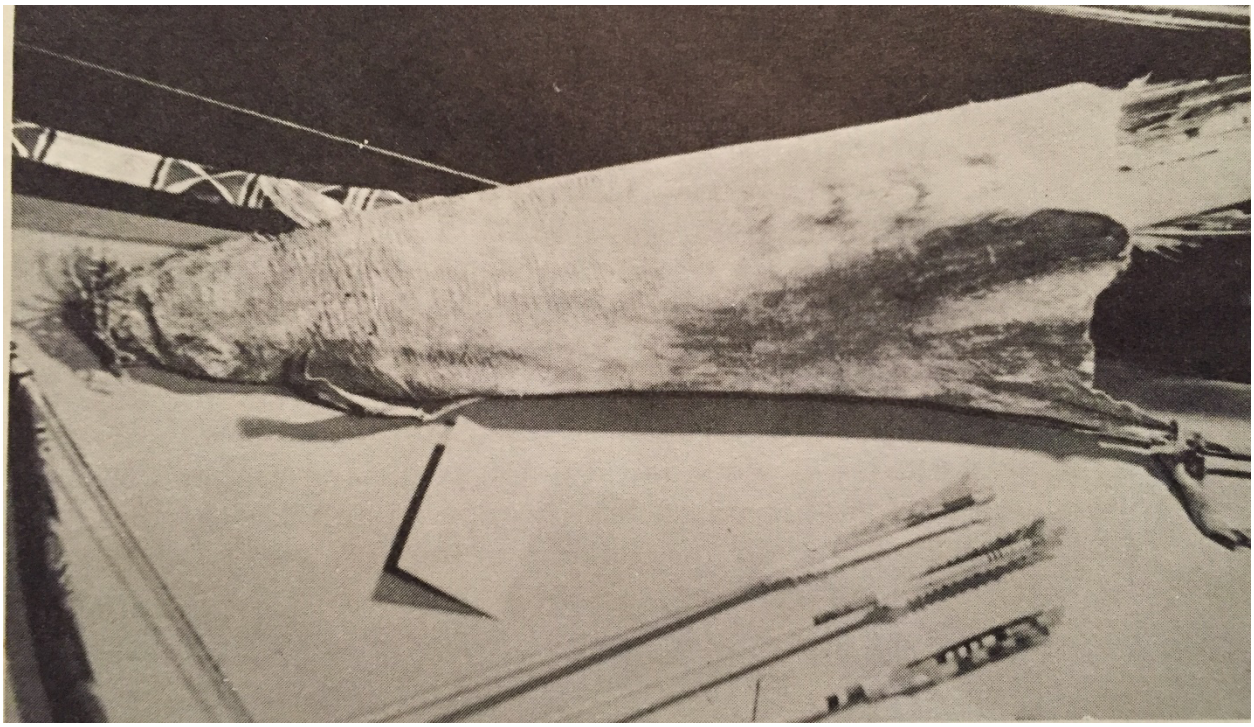

Figure 2: Rogue Indian (Takelma) Arrows[xxx]

Figure 3: Hupa arrows. Note the composite shafts and painting patterns that include alternating rings of blue and red as well as barber pole patterns.[xxxi]

Figure 4: Sinew on the animal, the wide, flat, white strips along the spine.[xxxii]

Figure 5: The four round bundles at the top of the picture are leg sinew and the two flat strips at the bottom are back sinew. Sinew brought to this stage can be dried and stored for extended periods of time. [xxxiii]

Figure 6: Back sinew in the process of being prepared for use. Notice how the fibers are separated and teased out into thread-like strands.[xxxiv]

Figure 7: Applying a small bead of hide glue down the laminae of the fletching with a sharp stick to guide the glue.

Figure 8: Using a coal on the tip of a twig to melt the feathers to height.[xxxv]

Figure 9: Close-up of sinew bindings on fletchings. The reader will be able to see the length of fletchings as well as fletching heights.

Figure 10: Close up of the front end of the fletching and sinew binding.

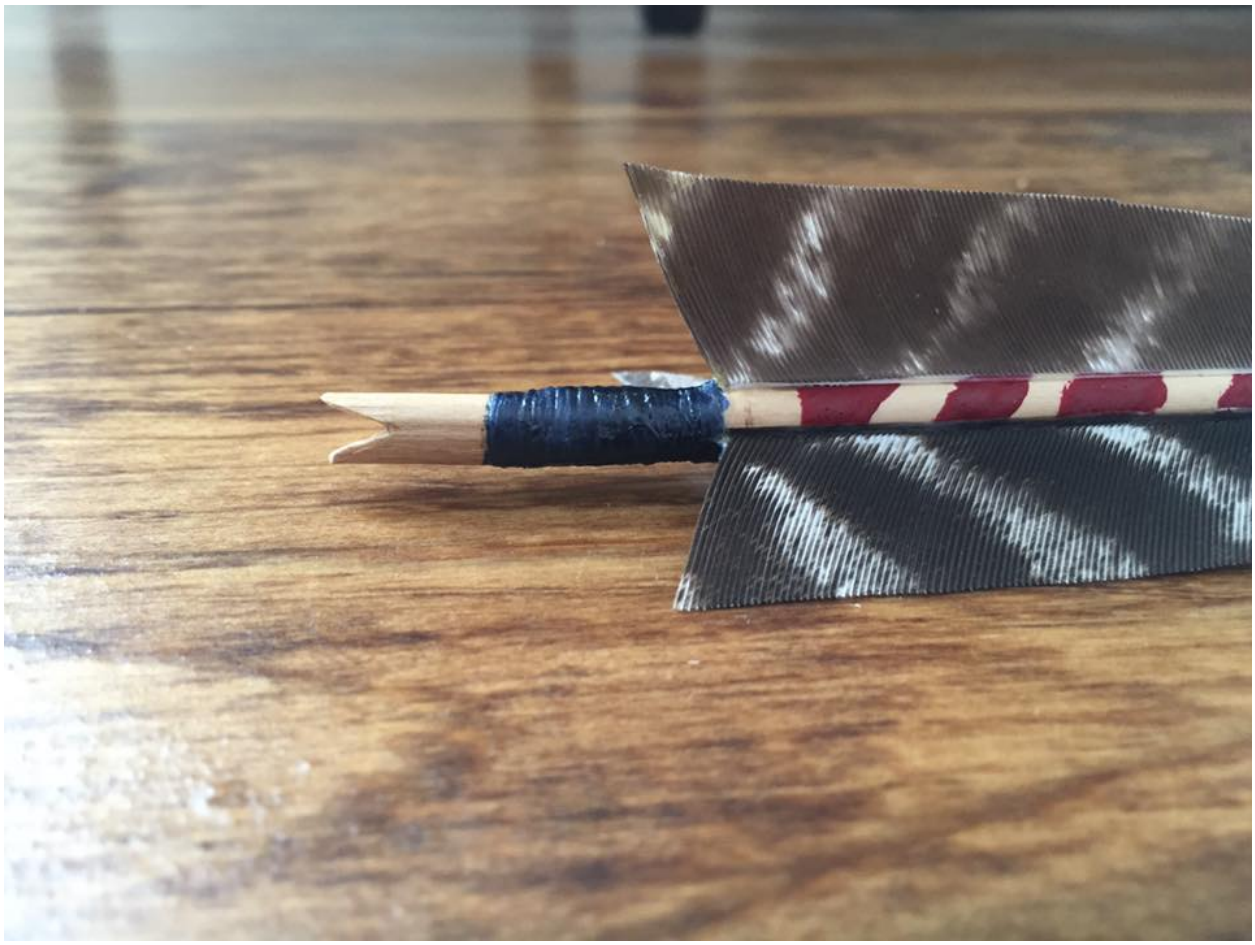

Figure 11: Nock end of the same arrow, sinew binding and painting.

Figure 12:Union between fore-shaft and main-shaft on one of the author's arrows. Knots are evidence of being shoots, not dowels.

Figure 13: A close up of the hafting and the obsidian head. Note the evidence of the entire hafting process. The notch, the pine resin, the sinew and the painting of the sinew.

Figure 14: Close-up of agate point. Note the limited use of pine-resin and the painted sinew bindings.

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