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Pipe Manufacture on the Plains and Experimental Archaeology: Not Just Blowing Smoke

Introduction

While shown to enhance our understanding of the archaeological record, experimental archaeology has not yet achieved its full potential. It might be that experimental archaeology is too much fun to be seen as a credible analytical tool. However, we would like to point out in this article that it can do both, be enjoyable and a valid tool in archaeology. We conducted an experiment with a block of Minnesota pipestone, also referred to as catlinite, to replicate the pipe making process utilized by Plains Indians in the Late Prehistoric period. This article will outline our procedures, findings, and will showcase the benefits of combining experimental archaeology with other more commonly used archaeological methods, such as use-wear analysis.

In 1961, Ascher rightly stated that experimental archaeology is a field that most fail to take advantage of, but should. He defines archaeological experiments as those "in which matter is shaped, or matter is shaped and used, in a manner simulative of the past" (Ascher, 1961: 793). Recreating prehistoric cultural objects, for many, is a hobby or a profession. Experimental archaeology, however, is based in science and logic. That is not to say it is like the experiments done in the hard sciences, such as biology or chemistry, but rather it can be placed in a clear methodological framework when using materials that were available to prehistoric peoples (Ascher, 1961: 809).

Experimental archaeology takes many forms and stems from a variety of questions. A recent example studied the potential function of tabular scrapers from the Chalcolithic Levant (Barket and Bell, 2011). This research was able to confirm that these tools were effective in shearing sheep, an idea that had been previously discounted. Another study, found little statistical difference in the increase of distance and speed of using weights on atlatls, and concluded that the weights added a certain degree of accuracy to the weapon (Raymond, 1986). This changed some of the preconceptions of the atlatl banner stones. Both case studies highlight how experimental archaeology can resolve questions that could not be answered otherwise. As stated above, one of the main concerns of archaeological experimentation should be to replicate the procedures that prehistoric peoples used to create their cultural artifacts. This means that materials and methods should be as close to the authentic counterparts as possible.

Background to the Research

Pipes have been in use on the American Plains for hundreds of years. One form known as the Florence Pipe, is a particular type manufactured by proto-Wichita Great Bend Peoples c. 1425-1700 A.D (Blakeslee, n.d.; Odell et al., n.d.). The Robb Collection from Central Kansas contains tools which were proposed to have been used for the production of these pipes. These tools were sent to The University of Tulsa, courtesy of the Robb Family and Dr. Donald Blakeslee (Wichita State University), for use-wear analysis (Odell et al., n.d.). Our experimental study was born from this research. It supplemented the use-wear analysis in two ways: 1) through the creation of our own pipe in order to provide tools for a comparative collection, and 2) to see if the process outlined by Blakeslee (n.d.) was plausible with tools modeled after those in the Robb Collection.

For the use-wear analysis, approximately a quarter of the Robb Collection was sampled and analyzed against our group's experimental tools. The types represented in this subset were buttonhole

makers, endscrapers, awls, tabular pipe tools, reamers, pipe drills, and gouges. The research conducted by Odell et al. (n.d.) confirmed that the majority of the tools in this collection were indeed used in the process of pipe manufacture. Specifically, use-wear analysis determined that most tools were used on a pipestone material and in the motions of cutting, scraping, and drilling. To determine a more exact procedure, and to substantiate Blakeslee's hypotheses (n.d.), we followed his guidelines to construct a pipe. By combining the use-wear and experimental archaeology, we hoped to arrive at a more holistic understanding of pipe manufacture on the Plains.

Methodology and Experimentation

We started our experiment with a pre-cut block of Minnesota pipestone, measuring 9.5 x 6.5 x 5.5 cm (FIGURE 1). For inspiration, we explored various pipe shapes and designs found in publications and on the internet. The authors then agreed upon a pipe style that could be easily constructed from our block of pipestone. A pencil was used to draw a rough outline on the outside of the block. The basic procedures and materials for our pipe are similar to those of a Florence pipe (Blakeslee, n.d.) but the authors chose a form that they preferred aesthetically.

The first course of action was to saw into the block. We quickly realized this was a much more difficult process than previously anticipated; therefore, the pipe was reoriented within the block to reduce the number of cuts necessary to complete the initial stages. This decreased the total amount of time spent on initial construction, and was probably exploited in prehistoric times as well. We continued cutting the block using hand held stone tools designed after those outlined by Blakeslee (n.d.) for this process, as well as after the examples found in the Robb Collection (FIGURE 2). To that order, endscrapers were knapped, and the sides used to make the initial cuts.

For the first 1.5 cm, sawing with the sides of the endscrapers proved efficient. Unfortunately, the thickness of the scraper's edge rapidly prevented progress, widening the cut rather than deepening it. At this time, we switched to thinner flakes, which proved to be more effective (FIGURE 3). One was a cortical flake with no retouch, the other was a cortical flake with retouch. These flakes were selected to determine if retouch provided any advantage in this particular tool function. When cutting the pipestone with the un-retouched tool, the edge of the flake continued to fracture. This re-sharpened the tool during the process of sawing, giving it a clear advantage. Sawing 1.5 cm took approximately 70 minutes at 123.5 strokes per minute.

Rather than burdening one person with all the manual labor involved in pipe manufacture, we decided to share the load. We thought that this activity, while plausible for an individual, was more enjoyable for a small group. This is something we could see holding true in prehistory as well. Rates were calculated and totaled based on each activity, and were averaged for an individual. This was done by counting the number of strokes in a one minute time span, then recording the total amount of time each activity took place. The strokes per minute were then multiplied by the number of minutes, which provided the overall strokes it took to complete each activity. Each author's times were recorded, and then averaged to obtain a more standardized number.

With most of the initial sawing completed, a rough shape of the pipe began to materialize (FIGURE 4). Total time for sawing was approximately 122 hours and the cuts covered a combined length of 64.5 cm.[1] Towards the end of each cut, the stone was prone to snap off. This sometimes completed the current cut, ultimately saving some time. With more experience, this feature of the stone could be better controlled to expedite the shaping process.

Now that the initial stages were completed, we moved to scraping in order to refine the form. We felt that scraping, rather than sanding, would be a more proficient way of contouring due to the quantity of material needing to be removed. We started with our endscrapers, since the edge thickness

[1] Note, based on the times for sawing alone, this is not a one weekend activity.

would not be a detriment in this situation. Ironically, scraping with endscrapers did not work as well as we anticipated.[2] Other flakes, even using their cortical surface, had similar problems. Progress was very limited.

While we felt it might be early in production, because of the pipes afore mentioned blockiness, we moved to using various grits of sandstone for continued shaping (FIGURE 5-6).[3] We hoped that this would speed up the manufacture process. While skeptical initially, we found that sandstone was the most productive, both in ease of use and quantity of material removed. Scraping and sanding combined carried on for approximately 4 hours, at an average of 114 strokes per minute.

At this point in production, we were ready to commence drilling. Blakeslee noted that several archaeological examples exhibited "a cross formed by intersecting lines" on the top of the bowl (n.d.). He speculated that this could have marked a location for drilling, or may also have been symbolic in nature. We found that the cross markings not only provided a guide, but a helpful pilot hole for the start of the drilling process. We experimented with several different types of drills, including a bow drill, a hafted drill, and an unhafted drill that could be used by hand. The materials available to the authors were not conducive to the construction of a bow drill.[4] The hafted drill was constructed with a reed, resin, and a flint drill bit. Essentially, this worked, but progress was slow. Out of the three, drilling by hand far exceeded the rest (FIGURE 7). The unhafted drill proved most effective because it combined the motions of drilling and reaming, limited only by the endurance of the individual and length of the drill. Eleven hours were spent drilling through 13.5 cm of pipestone at 84 strokes per minute.

A final round of sanding ensued to embellish our initial design of the pipe, and a concave flare was added to the base. For safe keeping we wrapped the pipe in wash cloths that were dyed with pipestone dust. This will be discussed more fully in the next paragraph. One cloth soaked in lard was found to be a useful tool in polishing the finished pipe (FIGURE 8).

One advantage to experimenting archaeologically is the potential for investigating questions you would not have otherwise thought of. With this particular trial, we found that pipe manufacture produces a plethora of pipestone dust.[5] After noticing that half of the apartment, in which this experiment took place, was covered in a red film, we decided to see if pipestone dust could be utilized in other ways. As a side test, we used the dust to dye two white wash cloths, one using hot water, and the other using lard as the base. Unexpectedly, the wash cloth soaked in hot water took the pipestone dust better than the one in lard, but both trials turned the white wash cloths into a distinctive "pipestone pink". A student at Wichita State University, working with Dr. Blakeslee, successfully created paint colors with the dust (Hammons, 2010).

Pipe Manufacture Today

Contrary to some popular thinking, pipe manufacture has never disappeared. In order to have a more rounded understanding of pipe making in prehistoric times and today, we contacted various groups of amateurs and professionals that continue to style pipes out of pipestone. This was done after our own pipe experiment was completed. While some of the tools have changed, it is still an important avenue to consider. Some advantages are that others have more experience and a more comprehensive

[2] Using endscrapers to scrape pipestone is reminiscent to nails on a chalkboard; very unpleasant.

[3] Special thanks to the Geology Department at The University of Tulsa, specifically Dr. Bryan Tapp, for providing the sandstone.

[4] This was unfortunate as the authors feel that a functioning bow drill would have been most useful in this stage of the pipe making process.

[5] Based on the amount of pipestone dust created during our experiment, we recommend doing this activity outdoors.

view of pipe construction. Two responses were received and included information on modern and older methods of pipe making.

Our two informants had very similar procedures for pipe manufacture using the "old ways" (Alan Monroe, personal communication 2011; Kim Tali, personal communication 2011).[6] A major difference, however, was in the initial shaping of the pipe. One of the contacts used the peck and grind method for shaping pipes (Tali, personal communication 2011), while the other worked with flint knives, scrapers and sandstones (Monroe, personal communication 2011). The latter used a similar method as our own. The peck and grind method was noted to work better on stones other than catlinite, and requires very little time. He cited the same property we noticed, that catlinite is easy to fracture and a misplaced strike can destroy your pipe. Monroe mentions that cutting the initial blank of the pipe out of the stone takes significantly more time using older methods, however, the time for the shaping process is approximately the same as with modern tools.

For drilling, Tali pecks an indentation for a pilot hole. He then employs a hickory bow drill or a river cane drill, noting that he has had very little luck in the past using a copper tip on the drills.[7] Monroe drills with a straight shaft of ash or willow, with a flint or brass tip. Drilling is either done by hand or with a bow drill. Flint reamers are employed to enlarge or tapper the holes as needed (Tali, personal communication 2011). Tali remarks that you should not use the peck and grind method once the pipe has been drilled, due to an increased risk of fracture. He smoothes the almost finished pipe with sandstone, water and reamers.

The authors feel that it would be advantageous to take this information and create another pipe. The knowledge gained from our informants, coupled with our experience, would not only save time, but also give us more insights into this process as it may have been done in prehistoric times. As a final point for this section, we want to reiterate that pipe manufacture is a skill that has not died out. Even though most of our correspondents prefer using newer methods over the traditional ones, the "old ways" are still practiced and remembered.

Conclusions

Saraydar and Shimada contend "that there is much that experimental archaeology can contribute … and that experimentation can provide certain kinds of data unobtainable by more conventional studies of artifacts" (1973: 344-345). As this paper has demonstrated, there are different avenues of exploration for archaeological questions that can open new doors of inquiry. A combination of use-wear analysis, experimental archaeology, and ethnoarchaeological research provided a more detailed understanding of pipe manufacture in the prehistoric Plains than excavation alone.

This experiment ties up some loose ends about the manufacture of Great Bend pipes with tool types similar to those in the Robb Collection. We would like to note here, however, that this methodology for creating a pipe is only one possible way, and many others could be plausible. Older methods, as our experiment illustrated, require significantly larger time commitments and efforts. Our pipe took approximately 136.8 hours, or 5.7 days, to complete. Although, without the taunting electric drill in the corner of the room, the time commitment might not have seemed so large to a Plains Indian.

[6] For more information about the work of Al Monroe, see http://www.matoska.com; for more information on the work of Kim Tali, see http://www.catlinite-pipe.com/.

[7] A quote from Tali, received by email, that the authors identified with for the pipe drilling process: for drilling, Tali uses "lots of water, lots of sand and mostly a lot of bad words (LOL) especially knowing [he has] an electric drill that can do the same job in seconds" (Tali, personal communication 2011).

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Appendix: Figures

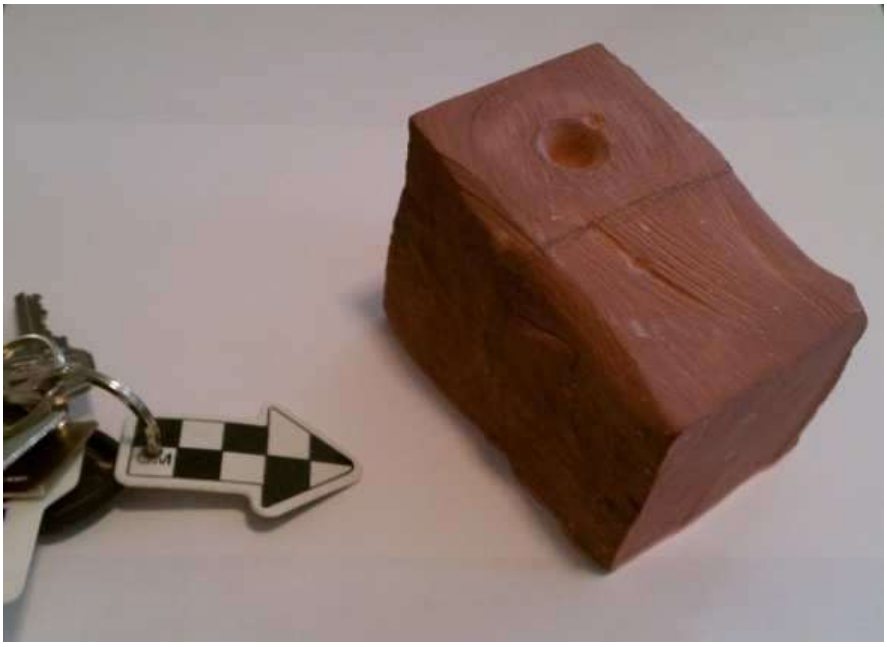


Figure 1: The block of Minnesota pipestone used for this experiment.



Figure 2: Some of the experimental tools created and utilized by the authors for manufacturing their pipe. From left to right: we have an unhafted drill, endscraper, and reamer.



Figure 3: Sawing into the block of pipestone with one of our cortical flakes.

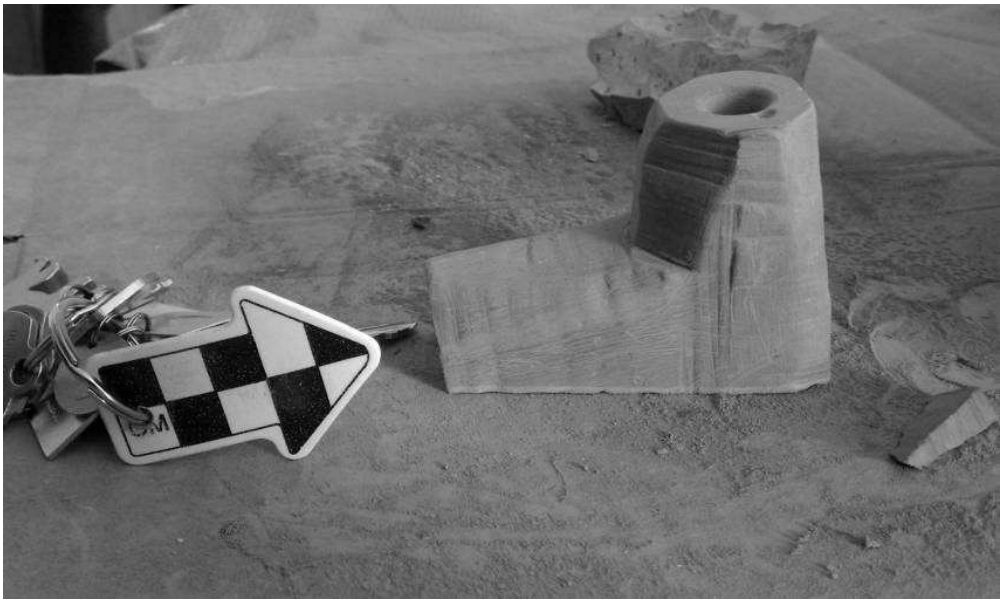


Figure 4: Our pipe after sawing was completed, before any other shaping took place.





Figures 5-6: Using sandstone to shape the pipe during later stages.

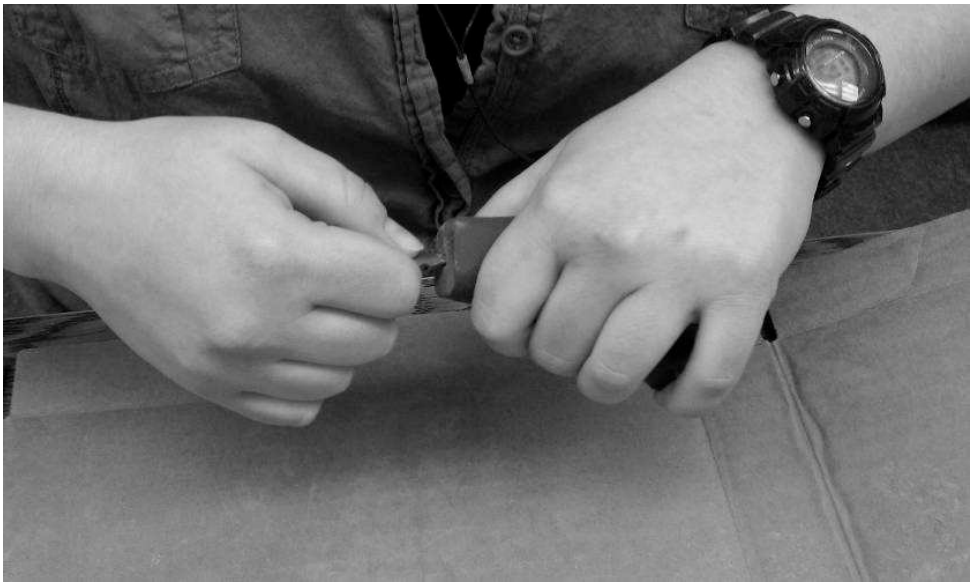


Figure 7: Dilling into the base of our pipe

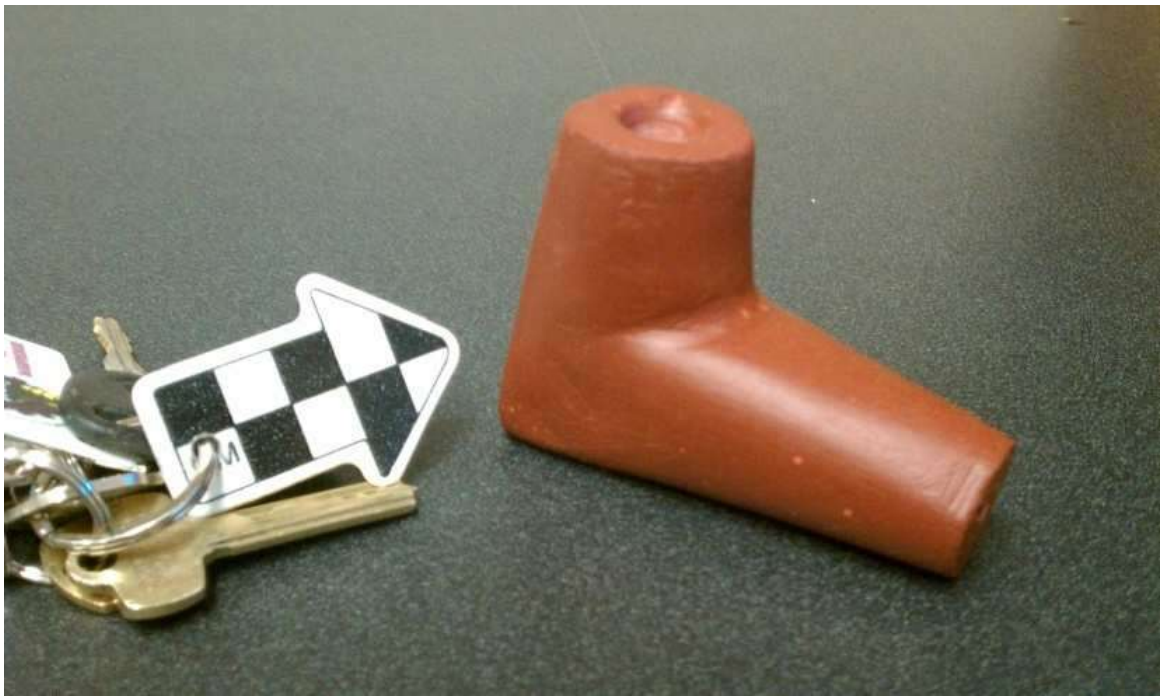


Figure 8: Our completed pipe!