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Some Notes on Replicating Prehistoric Pottery

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SOME NOTES ON REPLICATING PREHISTORIC POTTERY

John Miller

Introduction

My interest in pottery replication began about 30 years ago. As an archeologist, I was often required to analyze collections of prehistoric pottery. My analytical techniques were limited but standard for the day and usually involved classifying pottery according to previously defined pottery types and varieties. While this type of classification helps archeologists develop chronologies and determine cultural affiliation, it provides little understanding of how pottery was actually made. I felt that I might be able to enhance my analytical skills and possibly glean a little more from the archeological record if I could learn more about how pottery was made. So in 1978, I gathered some alluvial clay from the Arkansas River floodplain and began my long journey. My primary objective has been to try and reproduce, as closely as possible, what I see in the archeological record in hopes that it might give me and others a better understanding of all the processes involved in the manufacture of prehistoric pottery. I sometimes find that I can't see what I am looking at in sufficient detail until I am faced with the task of having to draw or make it. Replication forces us to take a closer look at things and then allows us to see a little more clearly. Replication also connects you to the past and allows you to learn directly from the original artist. For me, it was simply not enough to just study pottery – I had to experience it.

During my journey, I have drawn information from a variety of resources. These include a careful analysis of prehistoric pottery, an extensive review of archeological and ethnographic documentation regarding Indian pottery manufacture in the Southeast, studying modern cultures that still use traditional pottery making techniques, consulting with Indian potters, archeologists other replicators and through trial and error coupled with careful observation and comparison (basic Experimental Archeology).

Most of my efforts have been focused on replicating pottery types that I am familiar with and that I have had the privilege to study first hand. These include types that are commonly found in Arkansas, many of which are attributed to highly skilled Caddo and Quapaw potters. While I have made replicas of Woodland period pottery, I mostly enjoy the challenge of the shell tempered wares from the Mississippi and Protohistoric periods. I like the diversity of vessel forms and designs that develop during these periods and have a deep appreciation of the incredible artistic talents of the original potters.

While I am not a purest, (that is I don't start my fires with a bow drill and I occasionally use modern tools) I usually try to stick with the processes and materials that would have been available to the Indian potters. My operating plan is loosely modeled after the ethnographic accounts of Natchez potters that were recorded by the French in the mid 18th century. Natchez pottery is technologically very similar to some of the Mississippi period pottery that occurs in Arkansas (especially Caddo and Quapaw pottery). Even though the historic accounts are somewhat vague, they are some of the best first hand records of pottery making in Southeast by a culture that was essentially still living in the Mississippian tradition.

The following outline documents the replication process that I have developed over the years that works best for me. The outline is based on a handout that I developed to distribute during presentations and is very general. It is largely pictorial because the process is difficult to convey with words alone. While we will never know for sure exactly how the Southeastern Indians made their pots, the process outlined below can result in pottery that is technologically very similar to some of what we see in the archeological record. While there is often more than one way to do things, I think the key to understanding many lost technologies can be boiled down to efficiency. Once you find the process that reaches the desired goal with the least amount of energy expended, you are probably getting close to recreating the process that was actually used. Give me another thousand years or so and I might catch up with the skilled Indian potters of the past!

Figure 1.

The first step in the process is to prepare the clay and tempering material. I have had the best results with gray backswamp clays (often called “gumbo” or “buckshot” clays) which occur along most stream systems throughout the State. These are very fine-grained clays that have a high shrink-swell ratio and generally contain lots of iron and other impurities that allow the clay to fire within the relatively low temperatures ranges produced in an open ground fire. While these clays are not suited for most modern ceramic applications, they appear to be the type of clay preferred by many of the Indian potters. I collect most of my clay from stream banks, road cuts or fields and have experimented with numerous samples from just about every corner of the State. The clay in the bowl on the left was collected from a backswamp deposit in the Ouachita River floodplain south of Arkadelphia. It is classified as Tuscumbia Silty Clay and it may be the same clay used by some of the Caddo potters who lived in the area in prehistoric/early historic times. It has been dried and crushed and any large inclusions (pebbles or vegetal material) have been removed. The tempering agent in the bowl on the right is crushed mussel shell which was preferred by many prehistoric potters after about 1000 A.D. The shells were collected along the White River, burned to facilitate crushing, crushed and screened to obtain the proper particle size.

Figure 2.

The clay and temper are thoroughly mixed together in a dry state (upper photo). Temper reduces the high shrinkage rate of the backswamp clay and allows the pottery to fire properly. It also has adverse affects as it decreases the clays plasticity and makes the pot weaker. Different clays require different amounts of temper to fire properly and it often takes a lot of experimentation to come up with the proper mix when new clay sources are used. Most prehistoric pottery has between 25% to 50% temper by volume. This mix is about half clay, half temper. Once the clay and temper have been thoroughly mixed, the mix is covered with water and allowed to sit over night so that all clay particles are thoroughly moistened. The excess water is then poured off and the mix is allowed to dry to a point where it can be kneaded. Kneading is done by hand and must be thorough enough to achieve a homogeneous mix. Once the clay is kneaded, it can be stored in loaves (lower photo) indefinitely as long as it is kept moist. Aging the mix for a few weeks sometimes improves the plasticity.

Figure 3.

These are a few of the tools that I use to make pots. They include a plaster bowl that I use as a press mold for the base of the pot, a Masonite board to roll out clay coils, old credit cards for smoothing the exterior of the pot, an elliptical wood scraper for smoothing the interior of the pot, an old corncob and a wooden paddle for rough shaping and several smooth stones for burnishing the surface as the pot dries. Complete potter's tool kits from archeological sites are relatively rare. The smooth polishing stones are often found on ceramic bearing sites but many of the other tools used may have been made of wood, bone, gourd rinds or other materials that tend to decay. Other tools may be somewhat ubiquitous and difficult to identify – for instance old pots, baskets or wooden bowls were probably used as press molds. Discarded mussel shells sometimes show wear along one edge and may have been used to smooth the interiors of pots. Cordmarked pottery found on some sites seems to indicate that cord wrapped wooden paddles were sometimes used in the shaping process.

Figure 4.

To start the forming process, I press mold the base of the pot using a shallow bowl or other form (in this case a plaster bowl). To do this I flatten out a lump of clay to the proper thickness and press it into the form. The form or mold serves as a support until the limp clay becomes dry and stiff enough to retain its shape. The mold also allows the work to be turned easier which facilitates keeping the pot symmetrical. Press molding is documented in the ethnographic record and indirect evidence of it can be observed in some of the prehistoric vessel shapes. Maintaining consistent thickness is important as it affects the drying and firing processes. Pottery from most archeological sites is much thinner than modern wheel thrown pottery and I generally try to make my pots as thin as possible (about 1/8 to 3/16's of an inch thick for most medium sized pots).

Figure 5.

The walls of the pots are built up by adding flattened coils to the base. I generally roll out the coils and flatten them to about the same thickness as the base. They are then attached to the base by pinching. The use of flattened coils is documented in the early photographs of southwestern Indian potters but most evidence from archeological sites here in Arkansas show the use of round coils about the diameter of one's little finger. I find it much easier to control the intended vessel shape and size using flattened coils.

Figure 6.

A wet corn cob and various scrapers are used to help weld the coils together and to even up the walls (upper photo). A wooden paddle is used to help adjust the shape of the pot and thin the walls (lower photo).

Figure 7.

When the body of the bottle is complete, the neck is added. In this case, I am making the neck with flattened clay coils. In some cases, I make the neck separately and attach it when both the body of the pot and the neck have dried to a leather-hard state. Archeological evidence shows both techniques were used. The lower left photo shows the pot after the addition of the first coil; the photo on the right shows the neck taken to its full height. It will be smoothed and trimmed as soon as it stiffens.

Figure 8.

The finished pot, after it has been decorated and dried, but not yet fired.

Figure 9.

Burnishing is a process that involves rubbing a smooth object (usually a polishing stone) over the surface of the pot beginning at the leather hard-state and continuing periodically until the pot is dry. Burnishing compacts the surface of the pot making it less porous and adds a shine that is sometimes mistaken for a glaze. Smooth, well-worn polishing stones are often found on ceramic bearing archeological sites.

Figure 10.

When decoration is applied by engraving, the pot is generally burnished and allowed to dry for several days. I generally pencil in the major design elements by eye. Engraving is done with a metal awl – in this case a sharpened nail. Engraving on prehistoric pottery was probably done with flint flakes. I have used these but they make the process a little more time consuming and difficult. Once the major design elements are engraved, the rest of the elements fall into place and are engraved by eye.

Figure 11.

Incised designs (upper photos) are applied when the pot has dried to a leather- hard state. For fine line incising, I use a smooth pebble (lower photo) but a variety of tools can be used. Incised designs are a little more difficult to produce than engraved designs because they cannot be drawn out on the surface of the still moist pot. You must have a good mental template of the design in your head and just go with the flow.

Figure 12.

Pots are generally allowed to dry for at least 2 or 3 days before firing. No archeological evidence of pottery kilns has ever been found at Indian sites in Arkansas. Ethnographic accounts and archeological evidence indicate that pottery was fired in relatively uncontrolled open ground fires. The first step in the firing process involves pre-heating the pots in order to remove the atmospheric water. This involves building a small fire and letting it burn down to coals, then raking out the center of the coal bed and adding the pots to allow them to slowly absorb heat. It's important not to let the pots come in direct contact with the coals, hence the reason I have elevated these pots on pieces of wood. The pots need to reach the boiling point (100C) to remove the atmospheric water. This process usually takes about 15 minutes. It is sometimes referred to as "water smoking" by some of the South American tribes since steam can often be seen rising from the pots as the atmospheric water vaporizes.

Figure 13.

Once the atmospheric water has been removed, fuel is placed over the pots and allowed to catch fire. It doesn't take much; I usually fire my pots down by the river using readily available driftwood as shown in the picture above.

Figure 14.

The fire is allowed to burn down and no additional fuel is added. The process takes about 20 minutes and generates enough heat to force a chemical change in the backswamp clays. Technically, the molecular water is driven off and the clay turns to pottery which will last for centuries. Refiring experiments on archeological ceramics indicate that most Indian pottery was relatively low-fired (somewhere between 500C and 700C). Getting this pottery too hot will cause problems with some types of tempering agents and the pots can actually begin to melt. These types of clays usually contain iron and other impurities that act as fluxes during the firing process. They are ideally suited for this type of technology but are avoided for modern ceramic applications.

Figure 15.

Once the fire has burned down, the pots can be removed from the fire and allowed to cool. Because of the high temper content, they are extremely resistant to thermal shock. I have taken pots out of the fire and tossed them directly into the river without any adverse effects. Once fired, the pots will hold water without dissolving back into clay and can be placed directly over open flames for cooking without pre-heating.

Figure 16.

When the proper temper/clay mix is not correct and the atmospheric water cannot escape slowly enough, spalling will occur. I probably lost my first 200 to 300 pots during the firing process before I finally reached the proper mixture necessary to withstand the rapid temperature rise that occurs during open ground firings. I now rarely lose any vessels in the firing process.

Figure 17.

A reducing firing atmosphere can be used to produce jet black pottery. A reducing fire is one in which there is a lot of carbon – or simply a very smoky fire. When I want to turn pots black, I simply smother the fire with leaves, grass or pine needles while the pots are very hot (upper photo). The pots will actually absorb some of the carbon produced by this process and turn black. This color will be permanent as shown in the two pots cooling on the log in the lower photo.

Figure 18.

Red and white pigments were commonly used for decoration. Analysis of archeological examples indicates that white pigments are most often kaolin clays – the same types of clays used by modern potters to make china and porcelain. The red pigments are usually clays that contain a lot of oxidized iron. These clays are generally found on older landsurfaces in the uplands and were rarely, if ever, used for actually making pots. These clays will retain their natural color when fired in an oxidizing atmosphere, unlike the backswamp clays which will change from gray to buff during firing. These clays were used for making slips that were applied to the pot at a leather hard state and were also rubbed into engraved and incised lines of pots after firing to highlight the decoration.

Figure 19.

Slip designs must be applied to the pot while it is leather hard otherwise they will not adhere to the surface. Slips are prepared by adding enough water to the slip clay to give the mix a cream-like consistency. Slips are not tempered and are applied to the pot by finger or brush in a very thin layer. If slips are intended to change the color of the vessel, they must be fired in an oxidizing fire – i.e. a very clean burning fire with a lot of oxygen present. These two pots show red and white slip designs and have been fired in an oxidizing fire. The slips have retained their natural color while the underlying backswamp clay used to make the pots has turned a buff color.

Figure 20.

The black color seen on polychrome pots may have been made using finely ground manganese concretions. I replicate this color by mixing ground manganese with water and applying the mixture to the pot before it is completely dry. It is then burnished into the surface of the pot producing a mechanical

bond with the clay body. The pot is then fired in an oxidizing atmosphere (see Miller 2010:3-6 for more on this subject). Please note that manganese can be toxic if ingested or inhaled and must be handled carefully. This may be why the rarely occurring pottery type Avenue Polychrome occurs primarily as a mortuary offering and does not appear to have been used for food preparation or storage.

Figure 21.

After firing, red or white clays were often rubbed into engraved and incised lines to highlight the decoration. These are usually the same clays used for slip decoration.

Figure 22.

The pictures above show a few examples of the possible design combinations using different techniques: a. black bottle fired in a reducing atmosphere with red pigment rubbed into the engraved design; red slipped bottle fired in an oxidizing atmosphere with white pigment in the lines; b. bottle fired in a reducing atmosphere with white pigment in the engraved lines; c. bowl with red slipped interior fired in an oxidizing atmosphere and white pigment rubbed into the incised designs; d. red and white slipped bottle and a red slipped bottle with the underlying buff colored clay body showing; both fired in an oxidizing fire.

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