SUPPLEMENT 2. THE CERAMICS

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In April, 2014, Lawrence Loendorf asked me to describe and classify the reconstructed ceramic vessel from the Wallace Site. I examined the vessel using the protocol described below and classified it as Apishapa. Loendorf later sent me the remainder of the ceramics from the site, which I have also examined. Since then, Huffman and Earley (2014: 655) have claimed an Upper Republican authorship for the site and its ceramics, which they describe as globular and cord-marked. They further contend that although typical, these artifacts [the ceramics, chipped and ground stone items and bone tools] are not sufficient to distinguish between Apishapa and the Upper Republican cluster (Huffman and Earley 2014:660). Their inadequate description of the ceramics would indeed make it impossible to distinguish between the ceramics of their Upper Republican cluster and Apishapa, or for that matter any of the tenth to fifteenth century ceramics from anywhere on the Plains.

Analytic Approach

My Apishapa claim for the reconstructed vessel from the Wallace site is based upon use of a production step and stage protocol. Priscilla Ellwood (2002:4-6) illustrated the productivity of this approach in her analysis of whole and partially reconstructed vessels from Eastern Colorado. Here I apply a similar approach to the Wallace site vessel. By applying traditional and nontraditional forms of observation and multiple lines of evidence, it is possible to produce a

precise and replicable description of how the pottery was made, and this information may be used for multiple archaeological inquiries, including cultural affiliation (Ellwood 2002:4-6; Krause 1985:63-144).

To conduct such an analysis I use a set of landmarks for dividing vessel into analytical zones. This allows both replicable measurements and precise descriptions to be made. The pertinent landmarks and zones are shown in Supplemental Figure 1, along with examples of different base shapes. For more detailed and precisely stated definitions see Krause (1995:311).

Production Steps

Steps in the production of the Wallace vessel included 1) obtaining the clay, 2) preparing the clay paste, 3) building the vessel, 4) drying the vessel, and 5) fire the vessel. To assess clay acquisition and preparation I examined all the exposed vessel cross-sections under illuminated (10X) magnification. The cross-sections and the interior and exterior surfaces all exhibited a fine-grained clay with uniform amounts of small mica flecks that when fired produced a deep brown claybody. Based on Parker's petrographic analysis of the clays available in the Piedmont area of Colorado, Ellwood concluded that vessels from this area were constructed of local clays (Ellwood 2002: 96). Since mica containing clays are also to be found in the Arkansas River Basin it seemed reasonable to conclude that local resources were used by resident potters.

Clay preparation was analyzed through close examination of temper and inclusions. The claybody in the specimen contained variable amounts of coarse sand temper. Parker and Ellwood (1994: Paper to the Annual Meeting of the Colorado Council of Professional Archaeologists) determined that the non-plastic inclusions used in the construction of eastern

Colorado ceramics were either Boulder Granodiorite or Pikes Peak Granite, materials collected from the foothills or mountains of Colorado. Sharp edges could be seen in the Wallace vessel's claybody inclusions. Similar sharp edges have been reported (Krause 2011: 309) for locally occurring coarse sands, reasonable putative evidence that they were used for temper.

There were four pressure induced rather than firing lamina, or spalls (i.e., thin oval fragments with a cord impressed exterior surface and crushed interior surface) and only nine instances of small lacunae left by incinerated organic inclusions. Thus it seemed reasonable to suppose that locally dug clays were dried, pounded, and cleaned of the larger organic and inorganic impurities they may have contained. This procedure would account for the relatively sparse and small lacunae in the sample and the universally small flecks and relatively homogeneous amounts of mica.

The next step in the analysis was to determine the sequence of manufacture and the methods used in the construction of the vessel. The production stage of a jar may begin at the bottom, proceed to the lower and then the upper walls before the rim is added and then finished with the addition of a lip. Or the potter could start at the shoulder and build upward from here, making the bottom last. He or she could also start at the shoulder and build downward making the rim last. Then again the potter might begin vessel formation near the rim and build from here and finish by forming the rim and lip. The order of construction is an important aspect of a potting tradition.

The order of vessel part construction can be inferred. When building from the bottom up, the average vessel body tends to become thinner as the potter proceeds, so that the lower portions of the vessel are significantly thicker than the upper portions (with the possible

exception of the rim). When building either upward or downward from the shoulder the average upper and lower body of the vessel tends to become thinner as the potter proceeds. When a potter starts with the rim and builds toward the base, the rim or near-rim beginning point tends to be thicker, the average upper body thinner, and the lower body still thinner (Krause 1985:41; 1995:320).

The bottom and base thickness of the Wallace vessel was measured 10 times and a mean of 10 $\pm$ .5mm determined. Ten measurements of the lower body thickness produced a mean of 8.1 $\pm$ .6mm and 10 measurements of the upper body thickness yielded a mean of 6.0 $\pm$ .4mm. A T test comparison of means between bottom/base and lower body thickness yielded a score of 7.6929 ($p<.0.08$) A similar test comparing the means of lower and upper body thickness yielded a score of -8.5027 ($p < .07$). A test comparing the bottom/base thickness with upper body thickness yielded a score of -10.755 ($p < .06$). Since all scores indicate a significant difference, I infer a bottom to top construction strategy.

Base and Bottom

The base/bottom analysis began with multiple observations on all the available base/bottom cross-sections. Modeling clay impressions were also made of all available cross sections. Magnified examination of both did not exhibit coil fractures, coil overlap ridges, or coil juncture troughs. Since the base/bottom portion cross-sections did not exhibit coil junction fracturing and had no observable claybody discontinuities that could be correlated with surface irregularities, the base was identified as mass-modeled. There was a distinct convergence and, in a number of cases, a partial overlap of cord wrapped paddle impressions on the upper, (i.e.,

shoulder proximal), exterior surfaces of lower body sherds. There were either smoothed over cord impressions, or no cord impressions at all on the exterior surfaces of bottom proximal portions. I interpreted the base/ bottom configuration as parabolic rather than rounded or conoidal (Supplemental Figure 1) and produced by mass-modeling, (i.e., created by excavating a prepared clay ball or truncated and tapered clay cylinder).

Lower Body, Shoulder, Upper Body, Rim and Lip

The available cross-sections on shoulder, upper and lower body sherds were examined with hand glass magnification and high intensity flashlight illumination in an attempt to determine if these portions of the vessel were coiled or mass-modeled. Cross-sections with suspected instances of coil manufacture visible in modeling clay impressions were further examined under illuminated interior and exterior surface magnification for indications of smoothed over coil junctures that corresponded with discontinuities in the cross-sections. In suspect cases it was often desirable to view both near and far cross-sections of a piece at once, a task accomplished by using a dental mirror to reflect the far cross section while observing its near counterpart under illuminated magnification. By these procedures I was able to observe six upper body coils and four lower body coils (Supplemental Figure 2). The mean height for upper body coils was 8.2 $\pm$.9 mm and for lower body coils 9.6 $\pm$ 1.2 mm.

The vessel is 30 cm tall from bottom to lip with a 30 cm diameter rounded shoulder as broad as it is tall. The distance from bottom to shoulder was 20 cm which put it in the low range of high-shouldered forms. The mouth diameter was 23 cm, making the mouth wide in comparison with the 30 cm in diameter shoulder. The lip diameter of 24.5 cm was larger than the mouth diameter by only 1.5 cm. In other words the rim was gently out-flared. The out-flared rim

was created from a 1.4 cm tall, 9mm thick, and 77 cm long strap of clay mated into a circle at the free ends then affixed to the mouth by a push pull motion of a rigid finger or thumb. The rim strap was canted outward by pressure from a finger or tool and topped with a 7 mm in diameter coil of clay that was subsequently flattened by tool or finger manipulation and decorated on its upper surface with tool-incised X′s.

To summarize, the vessel is as broad as it was tall, with a cord impressed but smoothed over parabolic, mass-modeled bottom and base, cord impressed coil constructed lower and upper body with rounded shoulder, wide constricted mouth, low rim and a flat, out-canted and incised lip (Supplemental Figure 3c). To describe this vessel or any other pot with a parabolic as opposed to rounded bottom as globular is highly misleading.

Apishapa Vessels

In raw material selection, temper, construction techniques, bottom/base, shoulder, and upper body shape, rim and lip construction the Wallace vessel closely resembles other Apishapa pots. Ellwood (2002:41-46) provides information on three Apishapa vessels, namely the Wythe vessel from site 5LA1698, the Cramer pot from 5PE484 and the Munsell vessel (Supplemental Figure 3d) from 5PE796 (all metrics for Wythe, Cramer, and Munsell vessels were derived from Ellwood 2002: 41-46).

The Wythe, Cramer, and Wallace pots were formed from local mica-containing clays and tempered with coarse sand or river gravel. The Munsell vessel was built from non-mica containing local clay with sand temper. All have mass-modeled parabolic bases and bottoms

(Supplemental Figure 3c, d). Ellwood describes the construction technique for the production of the lower bodies, high (but in the low range) rounded shoulders and upper bodies of the Wythe, Cramer, and Munsell pots as slab or patch modeled. (Note that the original site report for the Wallace site (Oleson, Withers and Ireland(1968: 29) also called it patch modeled and hence different from the mass-modeled pots of the Central Plains Tradition.) I suspect, however, that all three Apishapa vessels were built from large (6 to 9 mm) coils that were flattened into straps or slabs during production and shaping. If so then all of them (including the Wallace vessel) were coiled. To judge by variability in body wall thickness all four Apishapa pots were built from the bottom up.

Supplemental Table 1 compares the size and shape of the Wallace site vessel to the three Apishapa vessels analyzed by Ellwood. The Apishapa vessels have diameters that range from 121 to 138 percent of their height, while the value for the Wallace vessel is 100 percent. Shoulder heights range from 158 to 192 percent of total vessel height; that of the Wallace vessel is 150 percent. Mouth diameters range from 159 to 171 percent of shoulder diameter; that of the Wallace vessel is 130 percent. Rim heights range from 1.4 to 1.5 cm; the rim of the Wallace vessel is 1.4 cm. Given the small (n = 4) and variable sample of Apishapa vessels, all one can say is that the Wallace vessel is similar in overall form.

Upper Republican Vessels

I have chosen to compare the previously described Apishapa vessels to Solomon River and Smoky Hill phase ceramics of north and central Kansas because they fall within Huffman

and Earley's (2014) Upper Republican group (Blakeslee 1999; Carlson 1971; Krause 1995:307-352; Lippincott 1976; Roll 1968; Solecki 1952; Wedel 1986). Both Solomon River and Smoky Hill potters mass-modeled their wares from local secondary clays tempered with sand (10 to 76 percent), grog (23 to 90 percent), grit (1 to 6 percent), limestone (0 to 5 percent) or shell (0 to 0.26 percent) (Krause 1995: 319). They built from the bottom-up, first excavating a rounded bottom (Supplemental Figure 3a, b) from a tempered clay mass that provided the majority if not all the raw material needed for a large (25.66 cm average shoulder diameter) or a small (9.7 cm average shoulder diameter) pot, then pulled, scraped and thinned the clay as they worked it into a high rounded shoulder and constricted mouth (15.7 cm average large or 9.79 cm average small mouth diameter) (Krause 1995: 313-327). Once mass-modeled to rough shape, the vessel was further thinned and fine shaped by the use of an S or Z twist double strand cord wrapped paddle in combination with an oval stone. Single strap (unthickened) rims were affixed to the mouth about 77 percent of the time (Supplemental Figure 3b) and topped with a lip coil that was rounded (44 to 60 percent of the time), flattened (18 to 50 percent of the time), tapered (0 to 21 percent of the time) or T-shaped (0 to 6 percent of the time). Double strap (thickened or collared) rims were constructed 23 percent of the time by affixing one strap to the mouth and overlapping its upper third with a second strap topped with a lip coil that was rounded, flattened, tapered or T-shaped (Supplemental Figure 3a). In both cases the rim was canted outward about 2 cm by differential pressure from a wood or bone tool or a rigid finger. Typical decorative fields included rim interior, lip face, rim exterior and strap junctions. Decorative elements included incised lines, trailed lines, punctated lines, cord marked lines, finger pinched nodes, lines of finger impressions, abutted incised and trailed lines, cross-hatched incised and trailed lines, and

diagonal or vertical incised or trailed lines abutted parallel horizontal incised or trailed lines (Krause 1995:319-333).

Apishapa and Upper Republican Wares Compared

A comparison of the raw material preparation practices, construction technique, morphological metrics and decorative practices of Apishapa and Upper Republican potters clearly indicate that, while their potting traditions may be divergent developments from a common Woodland base, they participated in separate potting traditions. While Upper Republican vessels are tempered with sand, grog, grit, limestone or shell, no known Apishapa vessel is tempered with grog, grit, or shell. While some Apishapa vessels are coil or strap built, all Upper Republican vessels are mass-modeled. While Upper Republican vessels have mass-modeled rounded bottoms (Supplemental Figure 2b), Apishapa pots have parabolic mass-modeled bottoms (Supplemental Figure 2a). While both Apishapa and Upper Republican vessels are built from the bottom up and have high rounded shoulders, the mouth to shoulder ratios are significantly different. Apishapa vessels on average have a mouth 57 percent smaller than their shoulder and Upper Republican pots have mouths that on average are 65 percent smaller than their shoulders.

Rim strap values for Apishapa and Upper Republican vessels are dramatically different. Upper Republican rims are on average 3.3 cm tall; Apishapa rims average 1.4 cm. The rims on Upper Republican wares are bent outwards an average of 1.7 cm, those on Apishapa pots 1.5 cm. Upper Republican potters manufactured single strap and double strap (i.e., collared) rims,

their Apishapa counterparts produced only single strap rims. The lips on both Apishapa and Upper Republican pots were built by affixing a lip coil to the uppermost edge of the rim strap(s) then manipulating it with finger or tool pressure. Apishapa potters produced only flattened lips but Upper Republican potters created rounded, flattened, tapered, or T-shaped lips. Very few Apishapa pots were decorated while Upper Republican potters decorated their wares with incised lines, trailed lines, punctated lines, cord marked lines, finger pinched nodes, lines of finger impressions, abutted incised and trailed lines, cross-hatched incised and trailed lines, and diagonal or vertical incised or trailed lines abutted parallel horizontal incised or trailed lines. Apishapa potters fine shaped their wares by using a cord wrapped paddle on the vessel exterior while supporting the opposed interior surface with their fingers. Upper Republican potters also used a cord wrapped paddle but supported the opposing surface with a stone anvil rather than rigid fingers. The height to width ratio is a final significant difference between Apishapa and Upper Republican wares. In sum, given the marked differences previously noted it would be difficult if not foolish to claim an Upper Republican authorship for the Apishapa vessel from the Wallace site.

Analysis of the remaining sherds from the Wallace site revealed the following: of the 540 sherds analyzed, 95 percent are Apishapa ware, and 5 percent are intrusive. Of the intrusive specimens, one is Barns Red filmed, one is an Upper-Republican-like (Buick Campsite thickened rim.) and one is a reworked Santa Fe Black on White sherd. Thus the individual sherds confirm the results from the reconstructed vessel: the Wallace site is best interpreted as belonging to the Apishapa ceramic tradition.

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FIGURE CAPTIONS FOR SUPPLEMENT 1

Supplemental Figure 1: Morphological Landmarks and base/bottom shapes.

Supplemental Figure 2: The Wallace Vessel. a. Vessel cross-section showing coils (with clay-filled interstices blackened); b. Cross-section showing coils (magnified but unmodified).

Supplemental Figure 3: a. Typical collared Upper Republican vessel; b. Typical uncollared Upper Republican vessel; c. Wallace vessel; d. Munsell Apishapa vessel.