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POTTERY MOUND PUEBLO CERAMIC GROUPS: A CHRONOLOGICAL SEQUENCE BASED ON THE STRATIGRAPHIC ANALYSIS OF CERAMIC ARTIFACTS

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Sherds from Pottery Mound. Left: Pinnawa Glaze-on-white with human figure and headdress. Right: Pottery Mound Polychrome sherd with a four feather motif similar to bird motifs on Sityatki Polychrome.

Preface

This paper presents the results of a ceramic group seriation and chronological sequence for Pottery Mound Pueblo, LA 416, located west of Los Lunas, New Mexico. This sequence is based on ceramic samples obtained in a set of stratigraphic profiles exposed in arroyo bank sections and limited tests completed in 2018 in conjunction with the Isleta Pueblo-Bureau of Reclamation Pottery Mound Stabilization and Preservation Project. It is one of five chapters submitted by Michael Marshall of Cibola Research Consultants to Isleta Pueblo and the U.S. Bureau of Reclamation. It was completed under the direction of Isleta Tribal Historic Preservation Officer Henry Walt and Director of the Isleta Pueblo Historic Preservation Department Daniel Waseta. A somewhat revised version is published here with the permission of Isleta Pueblo. This report represents the first attempt to define a complete ceramic group sequence for the entire site occupation based on stratigraphic sections in various areas of Pottery Mound Pueblo. These investigations resulted in the identification of cultural-stratigraphic deposits which both pre-date and post-date previously reported occupational periods. The study defined six ceramic group periods extending for nearly 300 years, from about 1250-1300 to

about 1550-1600 A.D. It is likely that further study of stratigraphic sections at Pottery Mound will refine this sequence and perhaps identify ceramic types, traits, or styles which will provide still further subdivision of this ceramic-chronological sequence.

Introduction

Stratigraphic profile investigations at Pottery Mound Pueblo and research completed in conjunction with the Isleta Pueblo-Bureau of Reclamation Pottery Mound Project resulted in the identification of six ceramic group horizons spanning the period from about 1250-1300 to about 1550-1600 A.D. These investigations included the exposure and study of ten stratigraphic sections within arroyo embankments, and seven test pits around the margins of the pueblo (Figure 1) (Marshall 2018a and 2018b). Three of the arroyo profile sections (Profiles 7, 9, and 10), which have the most information potential, yielded 6 of the 8 radiocarbon dates, and 15 of the 20 flotation botanical samples. They also produced sufficient ceramic samples in stratigraphic context to allow identification of six ceramic groups that span the chronological sequence at Pottery Mound.

Some additional information from the 1979 Cordell test (Franklin 2007), the recent study of materials from the Annex component (Franklin 2018; Marshall 2018a), and the East Swan Gallery test (Test 3) (Marshall 2018b) have also provided information helpful to understanding the ceramic group sequence at Pottery Mound (Figure 2). It should be noted that despite the extensive excavations at Pottery Mound during the 1954-1961 University of New Mexico field school excavations, very little study of the ceramic material in controlled stratigraphic context was completed. Thus, the ceramic group sequence at the pueblo was not clearly understood.

The ceramic group sequence and estimated group dates identified in the following discussion are not cast in concrete, and may need revision following further examination of ceramic samples found in stratigraphic context at Pottery Mound.

Ceramic groups, as defined by H. S. Colton (1953:65-67), are "…an assemblage of contemporary…pottery types recognized in a restricted area at sites occupied for a short period of time." The ceramic group is the assemblage of wares and types, both indigenous and intrusive, which may be found on a single occupation surface or within a specific stratigraphic layer (surface samples or disturbed deposits often span two or more ceramic groups). Ceramic groups attempt to seriate the cultural-stylistic development of various ceramic traditions and ware-series into discrete temporal horizons. The temporal affinity of a ceramic group, when available, is estimated by the association of specific ceramic types in the groups with dendrochronological dates, and the overlap of those dates in the group inventory. A ceramic group, as defined by the presence and absence of certain ceramic types, and by the relative frequencies of types, styles, and wares within the assemblage, yields a chronological signature much more specific and reliable than that for specific types, which might span two or more ceramic groups. The Pottery Mound ceramic groups identified in this investigation are of unequal temporal span, as are most ceramic groups, and still require further refinement and definition in discrete stratigraphic deposits.

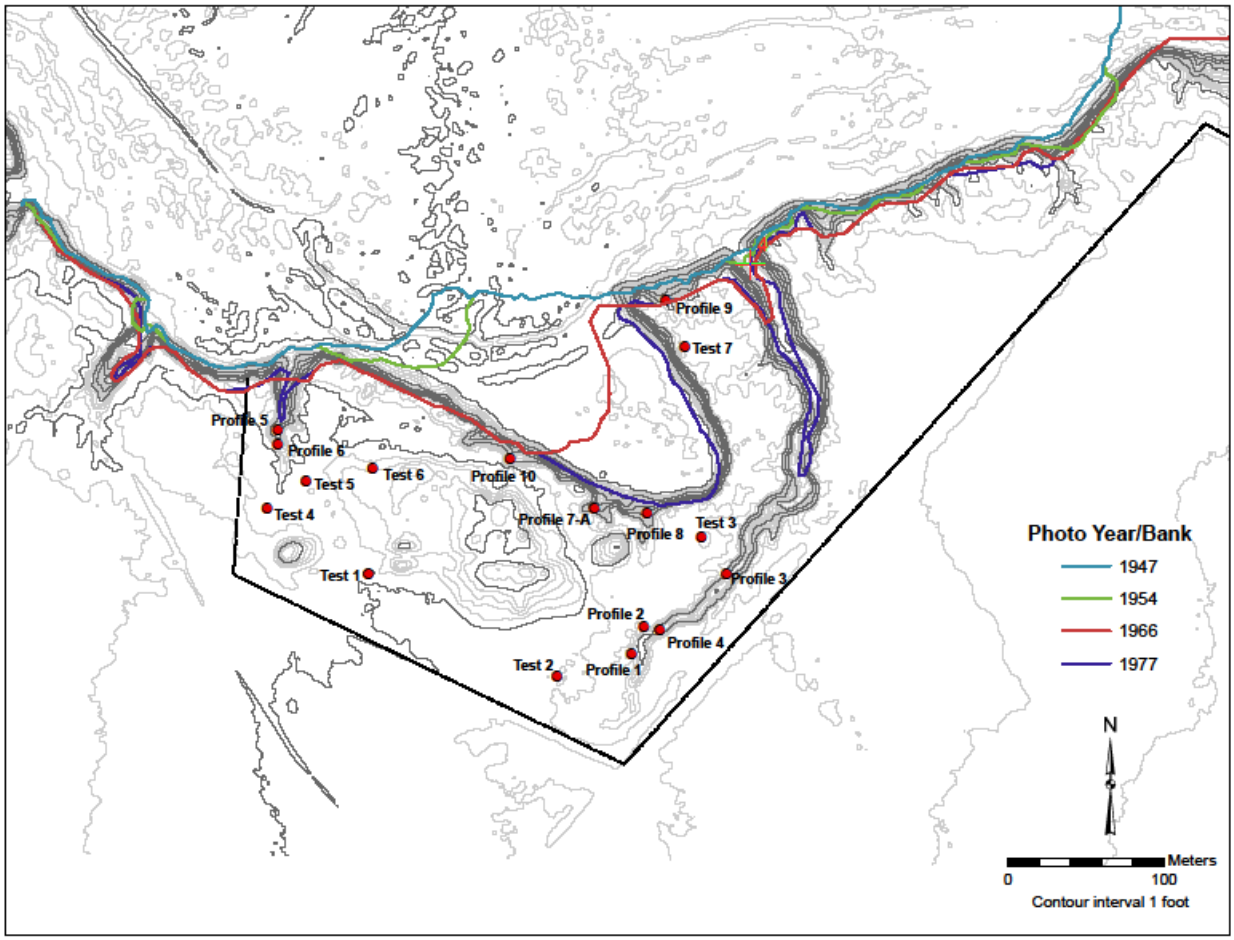

Figure 1. Contour map of Pottery Mound and erosional features showing locations of stratigraphic profiles and test pits. Map by Eileen Camilli. Used with permission of the Bureau of Indian Affairs.

Colton suggested that ceramic groups should be assigned names rather than numbers, in the event that additional groups in a sequence are recognized by further and more detailed study of the ceramic continuum in a given area. This was not done in the present study for lack of logical names identifying the groups, but if necessary can be rectified in later investigations.

In general, the ceramic group sequence at Pottery Mound Pueblo is as follows: Ceramic Groups 1 and 2 date to the early site occupation in the Late PIII-Early PIV transition period. Group 3 dates to the period before the introduction of Glaze C rim forms in ca. 1425. Ceramic Group 4 deposits are those which include Glaze C rims, but no Pottery Mound Polychrome, and probably date to the middle 1400s. Group 5 with Pottery Mound Polychrome and many exuberant Kuaua-style C rims is likely of late fifteenth-early sixteenth century affinity. The last ceramic group, the Group 6 assemblage, contains Glaze D and E rims (and trace Glaze F Tonque imports) in association with Glaze A and C forms, and dates to the sixteenth century up until the time of early Spanish contact. The estimated dates for the ceramic groups in Table 1 still require further consideration based on additional radiocarbon or dendrochronological dating, and should be considered approximate.

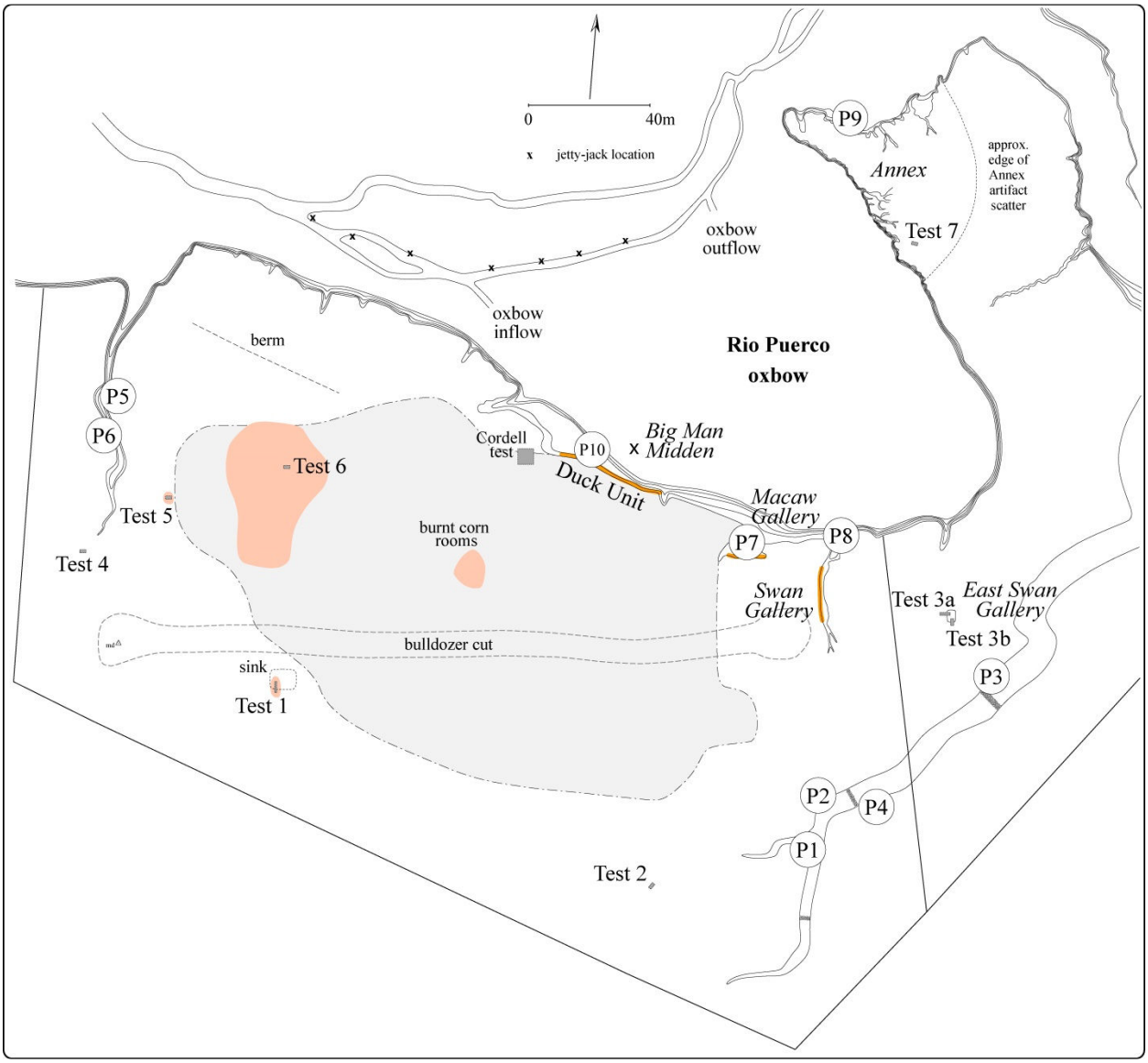

Figure 2. GPS Map of the Pottery Mound Site Complex showing the locations of profiles and test excavations. The central gray area identifies the limits of the visible mounds. Rose-colored areas in Tests 1, 5, 6, and burnt corn rooms indicate fires or fire rubble debris. Rose-colored lines in Duck Unit and Swan Gallery are bank-exposed roomblocks. Lines in lower half of frame are fences built by UNM in 1984. Map by Michael Bletzer. Used with permission.

Table 1. Estimated Dates for Ceramic Groups Identified at Pottery Mound Pueblo*

Ceramic Group 1	ca. 1250-1300-1325 A.D.	Very Early 14th Century
Ceramic Group 2	ca. 1325-1350 A.D.	Early 14th-Century
Ceramic Group 3	ca. 1350-1425 A.D.	Late 14th-Early 15th Century
Ceramic Group 4	ca. 1425-1450 A.D.	Early 15th-Middle 15th Century
Ceramic Group 5	ca. 1450-1520 A.D.	Late 15th-Early 16th Century
Ceramic Group 6	ca. 1520-1550 or 1600 A.D.	16th Century

* Pottery Mound Pueblo seems to have been occupied for about 250 or 300 years from about 1300 to 1550-1600 A.D. The pueblo was first colonized at the time ceramics show a transition from the PIII-Early PIV period ware-types. The last structural features and cultural deposits identified in the Annex component and in the northeast areas of the main pueblo extended into the Spanish Contact period to at least 1540, but perhaps as late as 1580 to 1600. Obviously, ceramic manufacture and import at Pottery Mound is a continuum, and there were no abrupt or revolutionary changes which occurred on the precise dates estimated for the Ceramic Group sequence. Furthermore, some cultural deposits might span more than one ceramic group, although discrete stratigraphic layers investigated in the recent study do in most cases represent single ceramic group horizons.

Care should be taken in ceramic group assessments that the deposits are not mixed by later intrusions such as burial pits in midden deposits or pothunter and archaeological excavations. Deposits which have a decided dip, such as the north midden areas at Pottery Mound, should be excavated in levels which follow the deposit slope. In addition, excavated levels should not exceed 20 cm in order to prevent mixture of materials from various ceramic group horizons.

The dates estimated for the ceramic groups are only approximate, and further investigations may identify needed revisions. The radiocarbon dates obtained in the recent study (see Bletzer 2019b) generally support the estimated dates noted above. However, samples from the Profile 10 Ceramic Group 1 deposits seem to be somewhat later than the 1300-1325 A.D. estimate, which here is based on traditional archaeological ceramic horizon dates.

Glazeware rim form variability in the stratigraphic sample groups inspected in this study is shown in Table 2 for the 370 rim sherds documented in the samples.

Unfortunately, the ceramic groups identified in this study were not recognized during the major excavations at the site between 1954 and the 1980s. Otherwise, we would know a great deal more about the construction-abandonment sequence at Pottery Mound. While there were some rather good early studies of ceramics from Pottery Mound (Voll 1961; Brody 1964), these did not examine the materials carefully in stratigraphic context. Part of the problem with previous ceramic studies at Pottery Mound has been the inordinate focus on the Rio Grande Glazeware rim form sequence as the primary indicator of chronology. However, glazeware bowls with A rim forms were manufactured at Pottery Mound Pueblo in predominant numbers throughout the occupation of the site. This misled the archaeologists working at the site to conclude that Pottery Mound Pueblo was occupied for a rather short period between about 1325 or 1350 to 1450 or 1475,

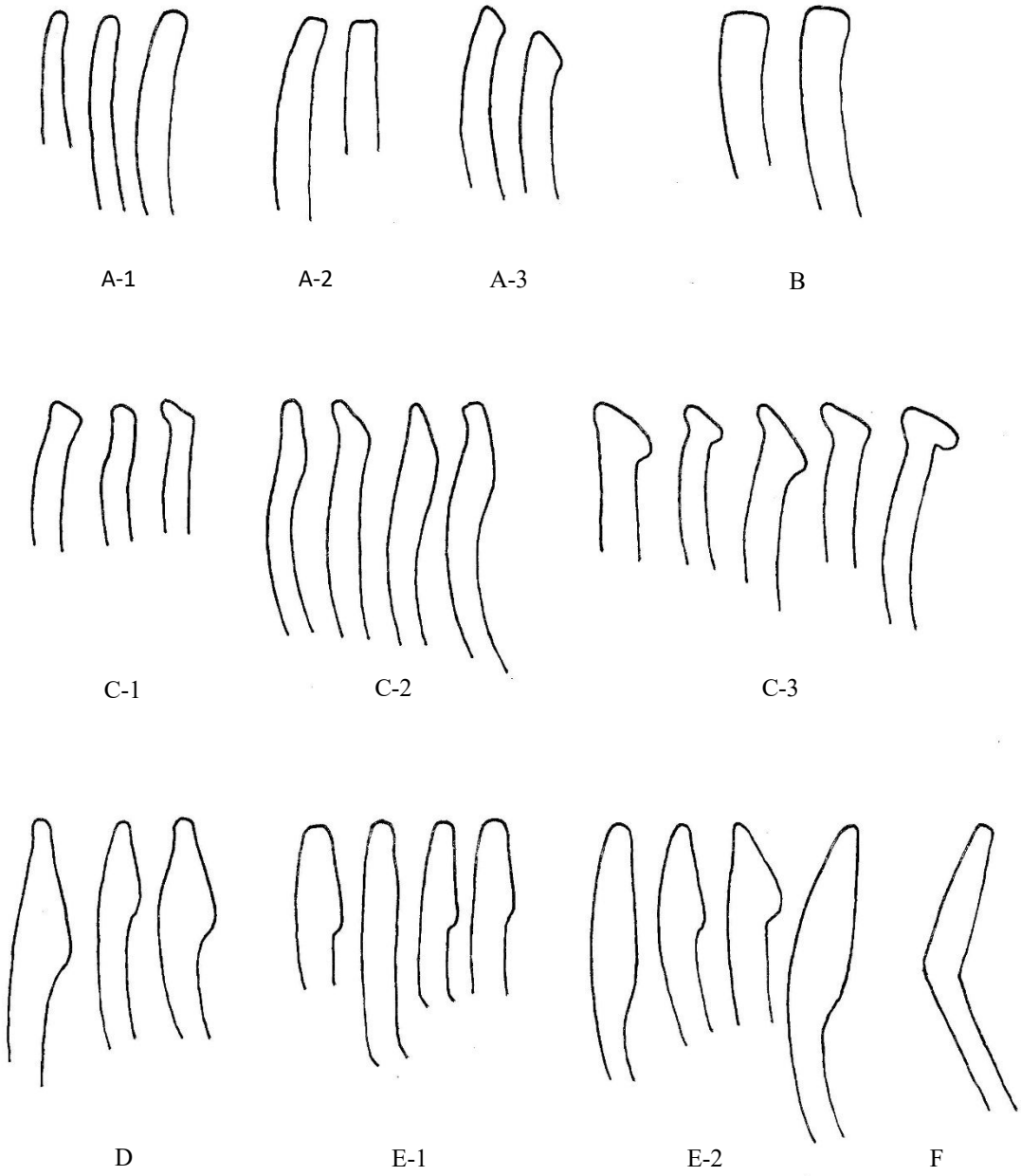

Figure 3. Pottery Mound Pueblo glazeware rim forms (bowl interiors to the right).

when in fact the site was probably first established in the very late thirteenth or very early fourteenth century (Ceramic Groups 1 and 2). It then developed into a large pueblo complex in the 1300s and 1400s (Ceramic Groups 3, 4 and 5), and in certain sections (the Annex and northeast pueblo area) was still occupied at the time of Spanish contact in the sixteenth century (Ceramic Group 6).

Table 2. Pottery Mound Rim Form Variability and Decorative Ware Frequencies of Ceramic Groups 1-6.

Ware-Type (*1) Rim Forms	Group 1 Profile 10 Room 3	Group 2 Profile 10 Room 2	Group 3 East Swan Lower (*2)	Group 4 Profile 7 Lower (*3)	Group 4 East Swan Middle	Group 5 Profile 7 Middle-Upper	Group 5 East Swan Upper	Group 6 Annex Profile 9 Area (*4)	Totals
Whiteware	N = 30 47.8 %	N = 27 26.5%							
Glazeware	N = 28 39.9%	N = 76 73.5%	100%	100%	100%	100%	100 %	100%	
White Mt. Redware	N = 12 17.1 %								
A-1	3	9	21	27	22	18	77	46	223
A-2			1		1	6	1	4	13
A-3			1			2	2	3	8
B				1		1		1	3
C-1						1	1	5	7
C-2 (*5)				3		6	6	18	33
C-3 (*6)				3	6	5	25	13	52
D								13	13
E-1 (*7)								7	7
E-2 (*8)						1		9	10
F								1	1
Totals	3	9	23	34	29	40	112	120	370

*1. Whiteware, Glazeware, and White Mountain Redware frequencies for Groups 1 and 2 only. All decorated ware materials in Groups 3-6 are glazeware except for occasional traces of whiteware and imported Hopi yellow ware.

*2. All decorated material in Ceramic Group 3 is Glaze A material. There are no Glaze C materials in Groups 1-3.

*3. Glaze C materials first occur in Group 4 and continue through Groups 5 and 6.

*4. Other than a trace of Glaze E in Upper Level of Profile 7, most Glaze D and E with a trace of F rim forms occur at the Annex component and in the Profile 9 area of Ceramic Group 6. However, there does seem to be some clustering of Glaze D and some E rims on the surface in the northeast section of the main site area, and one F form from the Annex.

*5. C-2 rims are "S" shaped Espinoso style forms.

*6. C-3 rims with club-like rim edges are typical of Kuaua-style forms.

*7. E-1 rims are typical of Escondido forms (Honea 1966), which are common in the Southern Tiwa and more frequently in the Piro areas.

*8. E-2 rim forms are more similar to Puaray style found in the Tiwa area and locations north and east.

Some former evidence of the early and late occupations at Pottery Mound Pueblo was previously identified, but was not carefully evaluated. A fair number of ceramic whiteware and corrugated materials were observed at the site, but the earliest stratigraphic deposits underlying the Duck Unit Roomblock (Profile 10) and probably elsewhere in the north and northwest areas of the pueblo were not previously recognized. Evidence of the latest occupations at the site were largely ignored, despite the fact that H. P. Mera identified some Glaze D and E rim forms in surface collections from the site in the 1930s. Hibben (1975:3-4) described an outlying component of Pottery Mound said to be on the edge of Rio Puerco cut bank that was "completely obliterated by the floods of 1956 and 1957 and that was found to contain late glazewares." This may have been the Annex or perhaps another roomblock, which was indeed entirely destroyed. Furthermore, Bruce Ellis in 1955 reported the discovery of a single fragment of chain mail (3 joined rings) from the northeast site area, but the significance of this discovery was overlooked, mostly because of the overwhelming focus on the great discoveries and exposure of the Pottery Mound murals, and again because of the long persistence of Glaze A ceramic types. Now, with the discovery of Spanish armor and ballistic debris located in the Annex area and in the north site area from east of the Swan Gallery to west of the Cordell test pit, and with radiocarbon dates extending into the sixteenth century, we know that the site, as a much diminished settlement of its former self, was visited and probably destroyed by an early Spanish expedition (Bletzer 2019a).

The earliest occupation at Pottery Mound may have been in the Pueblo III period Socorro Phase, as a concentration of Socorro material was found in the basal deposits of what was identified as the North Midden. Curtis Schaafsma examined the records of Hibben's 1980s excavations in the North Midden, and concluded that a Socorro Phase component underlies the Pueblo IV period deposits at Pottery Mound (see End Note 1). However, the absence of St. Johns Polychrome or later White Mountain Redware in the collection suggested that this component was perhaps 100 years before the PIV period occupation at the site (Schaafsma 2007:293, Appendix D). Now that older deposits dating to the very Late PIII-Early PIV period have been found in a sub-floor midden under the Duck Unit roomblock (Profile 10, Ceramic Groups 1 and 2), the actual hiatus between the Socorro phase and what appears to have been a colonization at the pueblo by a population using both carbon painted whitewares and the earliest glazewares may not have been so chronologically separate. In fact, mineral painted Socorro Phase ceramics were probably manufactured contemporaneously with carbon painted PIII ceramics in the Rio Puerco north of Interstate 40 (Hurst 2003; Roney 1996). Thus, early colonization at the pueblo may have resulted from various, and perhaps regionally distinct, PIII period populations.

Exclusive of a possible earlier Socorro occupation, there are a total of 6 ceramic groups or group horizons recognized, to date, in the Pottery Mound stratigraphic sections. These are identified as Ceramic Groups 1 thru 6. All of these ceramic groups are represented in the stratigraphic sections recently exposed at Pottery Mound (Marshall 2018a, 2018b). Additional study of ceramic materials from discrete stratigraphic levels at Pottery Mound may provide more details on the groups identified, and other type-variant-attributes useful as key indicators of chronological significance.

Because of the persistence of Glaze A rim forms, and the extended manufacture of various glaze types (Agua Fria Glaze-on-red, Cieneguilla Glaze-on-yellow, and San Clemente Polychrome),

much of the ceramic material manufactured during the Ceramic Group 3-5 horizons appears similar, although changes in style not identified in this study may exist. A good definition of the ceramic types and variants found at Pottery Mound was prepared by Hayward Franklin (2007) and is available online as part of the Maxwell Museum of Anthropology Technical Series (No. 5), and should be consulted for descriptions of the types mentioned in the following ceramic group discussions.

Ceramic Groups 1 and 2

The earliest ceramic group horizons identified at Pueblo Mound were encountered in the sub-floor midden deposits underlying the Duck Unit Roomblock in the Profile 10 area. The groups represent a transition from the very late PIII to early PIV periods. The earliest Ceramic Group 1 sample was recovered from below Room 3, Profile 10; what appears to be a somewhat later deposit (Ceramic Group 2) was found under the adjacent Room 2. The samples are of such difference to rule out sample error. The reason for this disconformity in adjacent deposits is undetermined, but may relate to the construction of Room 3 over the Group 1 deposits, with removal of the adjacent Group 1 deposits to the east, followed by subsequent deposition of Group 2 materials over which Room 2 was built. (Note: The room numbers assigned here are not those assigned by Hibben (1987), and the north room rows excavated by Hibben were subsequently destroyed by the erosional bank of the Rio Puerco oxbow.)

Both the Group 1 and 2 samples are characterized by a relatively high incidence of carbon-painted whiteware in association with early Glaze A Arenal-style Polychrome and early red-bichrome (glaze-on-red) ceramics, and by significant quantities of corrugated-indented materials (about one-third of the utility ware sample in both groups). Minor quantities of Los Lunas Smudged occur in both Groups 1 and 2, and temper type diversity in the utility ware group is rather high (unlike the predominance of basalt-tempered and mostly plain utility materials of later periods). However, Group 1 exhibits a significant number of White Mountain Redware materials, a higher incidence of whiteware, and glazewares tempered only with sherd.

Ceramic Group 1: Profile 10, Room 3 Sub-floor Midden.

The ceramic materials recovered from the Room 3 sub-floor midden (Tables 3 and 4) clearly represent a Late PIII-Early PIV transitional assemblage. The sample contains significant quantities of late White Mountain Redware ceramics (St. Johns Polychrome and Heshotauthla Polychrome), and very early sherd-tempered glaze-on-red in the decorated group (18.5%), which are not present in the later Ceramic Group 2 sample. The incidence of whiteware material in Group 1 is somewhat higher (42.8% of the decorated group) than in the later Ceramic Group 2 sample (26.5%). Most of the Group 1 whiteware is carbon painted, often with a yellowish and slightly crackled slip, and exhibits a diversity of temper types (Figures 4 and 5). Minor quantities of mineral-painted Chupadero Black-on-white are also present. All of the local early glazeware material (38.5%) is Glaze A red bichrome and Arenal-style Polychrome tempered with sherd.

Table 3. Frequency of Decorated Wares in the Group 1 Sample.

Type	Number	Percentage
Chupadero B/W	4	5.7%
Carbon Painted Whiteware	26	37.1%
White Mountain Redware	12	17.1%
Western Glazeware (Red)	1	1.4% (10 sherds from 1 bowl)
Early Glazeware (all red slipped)	27	38.5% (all with sherd temper)

Table 4. Ceramic Artifacts from Profile 10, Room 3 Sub-floor Midden (Ceramic Group 1).

Ware Type	Under Adjacent Room 4 (*1)	L2:C-24 Sub-floor Midden Upper Zone	L2:C-27 Sub-floor Midden Lower Zone	L2:C-25 Lower Midden Outside Profile	L3:C-26 Lower Floor Surface	Total
UTILITY WARES						
Granitic Sand (Pitoche-like) Temper						
Plain	1					1
Corrugated-Indented		3		5	4	12
Corrugated-Indented Smoothed		3				3
Basalt Temper						
Plain	2			2		4
Corrugated-Indented		1				1
Rhyolitic Rock Temper						
Plain		10	3			13
Micaceous Temper						
Plain	1					1
Corrugated (non-indented)				1		1
Gray-Purple Rock Temper						
Plain	1			2		3
Corrugated-Indented Smoothed						
Sherd Temper						
Plain		2		1		3
Sand/Sandstone Temper						
Plain				5		5
Schist Temper						
Plain		2				2
LOS LUNAS SMUDGED						
Plain-Smudged	5	5				10
Indented-Smudged	5	1		3		9
CHUPADERO BLACK ON WHITE		4 (*2)				4
CARBON PAINTED WHITEWARE						
Sand Temper	4	2 (*3)		2		8
Sand and Sherd Temper			6	2		8
Sand and Basalt Temper				1(*4)		1
Sand and Rhyolite Temper	4			2	3	9

WHITE MOUNTAIN REDWARE						
Unidentified Style	5		3			8
St. Johns Polychrome		1				1
Heshotauthla Polychrome		3				3
GLAZEWARE, SAND AND SHERD						
Red-Tan Slip	4	5 (*5)	1	3		13
Glaze-on-white	2 (*6)					2
Glaze-on-red	2	2		1		5
Arenal-style Polychrome (*10)		3 (*7)	2 (*8)	1	1 (*9)	7
WESTERN GLAZEWARE (*11)						
Gray Paste, Sherd Temper, Plain Red	5		5			10
Totals	**41**	**47**	**20**	**31**	**8**	**147**

*1 An extension of about 50 cm was made into the adjacent Room 4 sub-floor midden in an attempt to increase the sample size.

*2 Two of the specimens appear to be large, narrow-mouthed ollas with flared rims. One of these specimens has mineral paint, a scored (scraped) interior, and a somewhat carbonaceous paste.

*3 Two sherds of a single direct bowl rim. Carbon paint on a white-blue slip, design includes a ticked line. No rim edge decoration. No crackle.

*4 This sherd exhibits line motifs with ticked dots. No crackle. The rim is direct and somewhat pinched at the edge.

*5 Glaze A rim form.

*6 These specimens have the appearance of a whiteware with sub-glaze decoration. They are likely the first attempts by potters to produce glazewares. (Note: There are no other white slips on glazewares in the deposits from the sub-floor midden.)

*7 One Glaze A rim form.

*8 One sherd has a Glaze A rim. The kaolin exterior decoration consists of a narrow band below the rim edge and diagonal lines down from the band. The red slip looks similar to the Western glazeware maroon red color.

*9 This specimen has a clean gray, sherd-tempered paste and maroon-red slip and is either an early Arenal Polychrome or perhaps Heshotauthla Polychrome.

*10 While Arenal-style Polychrome with sherd temper is often defined as Los Padillas Polychrome and that with crushed rock temper is called Arenal Polychrome, in this study I have opted to include both the sherd and basalt-tempered material as Arenal-style Polychrome.

*11 Most of the sherds in the Room 4 sub-floor sample are apparently one bowl.

It should be noted that in Ceramic Group 1, all of the early glaze-on-red material is sherd tempered. No basalt temper, which is common in later glazewares at Pottery Mound, is present. The paste in these early glaze-on-red sherds tends to be gray, unlike the brown to brick-red paste in glazewares from Ceramic Group 3 and later. As noted above, the utility wares exhibit diverse temper types, and indented or other textured materials (corrugated-indented and indented-smoothed) represent about one-third of the utility ware group. This contrasts to a great predominance of plain utility material in Groups 3 thru 6 at Pottery Mound.

Figure 4. Ceramic Group 1. Arenal-style Polychrome upper two rows; carbon paint whiteware in middle two rows and lower left sherd; White Mountain Redware sherds on the bottom right row.

Figure 5. Ceramic Group 1, Utility Ware Types. Upper row Plain, middle row corrugated-indented; lower row Los Lunas Smudged.

Los Lunas Smudged, another type normally associated with Pueblo III period sites is relatively common (19 sherds), but there may be some clustering in the sample. The service-utility ratio is 53.7% service vs. 46.3% utility. The relative frequencies of decorated materials in the Ceramic Group 1 sample from Room 3 sub-floor deposits show nearly equal quantities of whitewares and glazewares, and the relatively common appearance (17.1%) of White Mountain Redware (Table 3).

Two radiocarbon sample dates were obtained from midden deposits underlying the Duck Unit Roomblock in the Profile 10 stratigraphic section. Both samples were annual corn specimens associated with Ceramic Group 1 materials. These samples produced the oldest of the eleven AMS radiocarbon dates yet recovered from Pottery Mound (see Bletzer 2019b). However, the estimated dates seem to indicate a somewhat later fourteenth century affinity, with an earliest possible date of 1322 A.D. Clearly the Ceramic Group 1 assemblage identified in the Duck Unit sub-floor midden shows a transition from Pueblo III whiteware manufacture into the early glazeware, which is traditionally considered to have occurred in the early fourteenth century. However, there is a possibility that whiteware manufacture in the lower Rio Puerco may have persisted into the early fourteenth century. This is a problem that requires further consideration, and the acquisition of additional datable materials, preferably dendrochronological evidence.

Ceramic Group 2: Profile 10, Sub-floor Midden Room 2

Ceramic Group 2 was identified in the Profile 10 sub-floor deposit underlying Room 2 of the Duck Unit Roomblock. This midden appears to have been deposited somewhat later than the midden in the adjacent Room 3. The Ceramic Group 2 assemblage differs in certain respects from the slightly earlier assemblage under the adjacent room (Tables 5 and 6). Like Ceramic Group 1, the assemblage exhibits a relatively high incidence of whiteware in association with early Glaze A Arenal-style Polychrome. It also has a high diversity of temper types in the utility ware group, and indented materials are still relatively common (34%). However, the Group 2 sample lacks the presence of White Mountain Redware, which is rather common in Ceramic Group 1. Carbon-painted ceramics are common in Group 2, but the tempering material is restricted to only one type (sand and rhyolite), and a few Socorro Black-on-white specimens are also present. In all, there is about 26.5% whiteware vs. 73.5% red-slipped glazeware in the sample, a significantly higher incidence of early glaze than in the Group 1 sample. The carbon-painted whitewares include a few specimens with yellowish-white and crackled slip, like Group 1, but most appear to be similar to Santa Fe Black-on-white.

Table 5. Relative Frequencies of Decorated Ceramics: Ceramic Group 2, Profile 10 Sub-floor Room 2.

Type	Number	Percentage
Socorro B/W	7	6.9%
Carbon Paint Whiteware	20	19.6%
White Mountain Redware	0	
Early Glazeware	76	73.5% (corrected for clustering)

Table 6. Ceramic Artifacts from Profile 10, Room 2 Sub-floor Midden (Ceramic Group 2).

Ware Type	5-15 cm below wall	15-40 cm below wall	40-65 cm below wall	Total
UTILITY WARES				
Granitic Sand Temper (Pitoche-like)				
Plain	3	6		9
Corrugated-Obliterated		7		7
Corrugated-Indented		4		4
Corrugated-Indented Smoothed				
Basalt Temper				
Plain	7		5	12
Corrugated-Indented	1	1	1	3
Rhyolitic Rock Temper				
Plain			2	2
Micaceous Temper (thin)				
Plain	1	2		3
Sand/SandstoneTemper				
Plain	5	13	11	29
Corrugated-Indented	2	8		10
Wide Coil Band	1	1		2
Schist Temper (Tijeras Grayware)				
Plain		2	7	9
Corrugated-Obliterated		1	2	3
Corrugated-Indented		1	1	2
Los Lunas Smudged				
Plain-Smudged	1	1	1	3
Indented-Smudged		5		5
SOCORRO BLACK-ON-WHITE	2	5		7
CARBON PAINTED WHITEWARE				
Sand Temper				
Sand and Sherd Temper				
Sand and Basalt Temper				
Sand and Rhyolite Temper	1	9	10 (*1)	20
GLAZEWARE				
Sand and Basalt Temper				
Plain Tan-Red	4	4	4 (*2)	12
Glaze-on-red	1	6		7
Arenal Polychrome		1		1
Sand and Sherd Temper				
Red-Tan Slip	4 (*3)	1	10 (8 one vessel)	15 (without cluster, 7)
Glaze-on-red		3	4	7
Arenal-style Polychrome			2 (*4)	2
Sand Temper				
Red-Tan Slip	6	10		16
Glaze-on-red	4	4 (*5)		8
Arenal-style Polychrome	2			2

Brown Schist Temper				
Plain Tan-Red	6		3	9
Glaze-on-red	3			3
Arenal-style Polychrome	2			2
Totals	**56**	**95**	**63**	**214**

*1. Carbon whiteware mostly with quartz sand temper with traces of gray-purple rock, possibly rhyolite.
*2 Two Glaze A rim sherds.
*3 Two Glaze A rim sherds.
*4 Two Glaze A rim sherds.
*5 One Glaze A rim sherd.

It is significant that there is a much higher diversity of temper types in the glazeware materials (unlike the presence of only sherd temper in the Group 1 sample), including the presence of some sand and basalt-tempered materials, which is so typical of all later ceramic groups at Pottery Mound. However, the paste in these sherds is gray, as in Group 1. The predominant glazeware types remain Arenal-style Polychrome and early bichrome Agua Fria Glaze-on-red. All of the glazeware slip colors are red.

It should be noted that in the lowest levels of the sub-floor deposit, the white kaolin designs on the exterior of the Arenal-style Polychrome material appear in panels with narrow lines, while those in the upper level of the deposit consist of isolated broad lines placed vertically or diagonally below the rim. These isolated exterior kaolin white motifs resemble the black line isolated elements found on many of the later glazewares at Pottery Mound.

Ceramic Group 3

No clear stratigraphic evidence of any Ceramic Group 3 assemblage was identified in the arroyo bank profile sections investigated at Pottery Mound in this study. However, a Ceramic Group 3 assemblage was found in the lowest levels of the East Swan Gallery test (Marshall 2018b), and was identified by Hayward Franklin in the lower section of the Cordell test pit (Franklin 2007). The primary characteristics of Ceramic Group 3 are the near absence of whiteware ceramics, the high incidence of Glaze A materials with basalt temper—some with orange slips (orange slips are not found in the Group 1 and 2 collections), the first appearance of local glazeware ceramics with white slips, and the complete absence of Glaze C ceramics. Glaze C ceramics occur in all subsequent ceramic groups (Ceramic Groups 4-6). Also, Cieneguilla Glaze-on-yellow and San Clemente Polychrome first appear and are relatively common, but Pottery Mound Polychrome is now absent. Arenal-style Glaze Polychrome, which is common in the Group 1 and 2 assemblages, apparently was no longer made or was produced only in traces and probably with basalt temper.

The local basalt-tempered glazewares in this group are predominantly tan, brown, or brick red, unlike the gray pastes of Ceramic Groups 1 and 2, but similar to those in Ceramic Groups 4-6.

No Hopi ceramics were found in the Ceramic Group 3 lower deposits in the Cordell test pit. However, a trace of Sikyatki Polychrome was found in the lowest level (1.6-1.9 m below the

surface) in the East Swan Gallery test probe. No Biscuit A and B imports occur in Ceramic Group 3 samples examined to date. Western Glazewares do occur in minor quantities (3 to 4.5% of the decorated sample) in the Group 3 samples.

The estimated dates for the early manufacture of Jeddito style with red solid designs (Early Sikyatki Polychrome) is 1385 A.D. to the mid-1400s, whereas Sikyatki Polychrome (Flamboyant style) first appears about 1400 or 1450 and extends to 1500. Very Late Sikyatki style, with densely massed painted surfaces and "flying saucer" jar forms, apparently began about 1500 and extended to 1630 (Gilpin and Hays-Gilpin 2012: 52). The presence of a single sherd of Sikyatki Polychrome in the lower level of the East Swan Gallery test suggests that this Ceramic Group 3 assemblage dates from about 1385 or 1400 A.D., but before Glaze C rims were produced in ca. 1425, or in general during the late fourteenth into the early fifteenth century.

Also in Ceramic Group 3 there is a decided shift in the utility ware materials to a predominance of plainware (95%) with few textured materials (5%), in contrast to the nearly one-third textured types in Ceramic Groups 1 and 2. This pattern of few textured utility ceramics (corrugated-indented, obliterated, and clapboard) is evident throughout the remainder of the Pottery Mound occupation.

Ceramic Group 4

The Ceramic Group 4 horizon was identified in the lower levels of the Macaw Gallery stratigraphic section (Profile 7A and 7B), and in the middle section of the East Swan Gallery test. The ceramic materials in this level of Profile 7 are clearly unlike the materials in the middle and upper midden zones of the same section. The deposits of this horizon group are characterized by the first appearance of Kuaua Glaze C ceramics, the higher incidence of orange-slipped Glaze A materials, and the common appearance of San Clemente Polychrome variants. However, there is no evidence that Pottery Mound Polychrome was manufactured during the period represented by Group 4, and if so it must have been in traces (see End Note 2).

In the lower midden of Profile 7, Glaze C Kuaua rims occur (3), but Glaze A rims predominate (27). Only a single Glaze B rim is present. The S-shaped Espinoso Glaze C rims (3) also first appear in this ceramic group, and are all imported Tonque materials. All Kuaua C rim sherds in this and later ceramic groups have basalt temper in a brown-brick red paste, and are likely of local manufacture. Imported ceramics include traces of Hopi Jeddito Black-on-yellow and Sikyatki Polychrome (1.2% of the decorated group), fewer than the specimens of imported Tonque glazeware (4.5%) and Western glazeware (3.7%). However, no Biscuit whitewares were found in the Macaw Gallery Profile 7 or East Swan Gallery test in this group, but larger samples could contain traces.

Ceramic Group 5

The Ceramic Group 5 assemblage was identified in the middle and upper deposits of the Macaw Gallery Midden of Profile 7A and 7B, and in the upper 1.0-meter deposits of the East Swan Gallery test. The main characteristic of this ceramic group is the appearance of Pottery Mound Polychrome (see End Note 2) with both A and C rim forms. It should be noted that the Pottery

Mound Polychrome style (Figures 6-9) represents only about 2 to 8 percent in various samples of the local glazeware materials manufactured at Pottery Mound.

In the middle and upper Profile 7 sample, most of the rim forms are Glaze A (28 specimens), but Glaze B (2), Kuaua Glaze C (4), and Espinoso Glaze C (4) rims also occur, as well as a single Glaze E rim (Figure 2 and Table 2). Some of the Kuaua C rims (2) in this collection have somewhat bulbous rims undercut on the interior, which might be another attribute addition to the ceramic group horizon. Two of the Espinoso Glaze C rims and both Glaze B rims in the Profile 7 sample are imports from the Galisteo Basin. However, two Espinoso C rims with basalt temper in brown-red paste suggest that this rim form style had been adopted by local potters. The single Glaze E rim found in the upper level of the deposit of Profile 7 is also a Tonque Pueblo import.

Traces of Biscuit Whiteware first appear in this sample group in Level 12 of the Cordell test (Franklin 2007), and is found in traces thereafter in the Cordell test midden deposit.

Figure 6. Pottery Mound Polychrome, Ceramic Group 5. Rows 1-3 upper Midden of Profile 7; Row 4 upper 1.0 m deposits of East Swan Gallery test.

Figure 7. Sherds from surface of Pottery Mound Pueblo. Stepped pendant motifs common on Sikyatki Polychrome and H motifs often found on Acoma Glazeware also occur on Cieneguilla Glaze-on-yellow and Pottery Mound Polychrome at Pottery Mound Pueblo. Upper left Pottery Mound Polychrome; upper right and lower left and right Cieneguilla Glaze-on-yellow. Middle sherds with H forms: upper Pottery Mound Polychrome; lower Acoma Pinnawa Glaze-on-white.

Figure 8. Pottery Mound Polychrome bowl sherd. Glaze C rim with closed four-bar motif on rim edge and red paint spatter on interior surface, both similar to Sikyatki Polychrome.

Figure 9. Exterior of Figure 8 Pottery Mound Polychrome sherd. Compare with similar Sikyatki Polychrome illustrated in Fewkes 1898, reprinted 1973, Plate CXXII.

The evidence tends to suggest that the sculpted rims of the later Rio Grande Glazeware sequence first appeared in the Rio Grande Valley, and were manufactured later at Pottery Mound. However, Glaze A rims continued to be produced and were rather common throughout the Pottery Mound continuum. It should also be noted that a few D and E rims and one Glaze F (Tonque) rim have been found on the surface near the Macaw Gallery profile and in the northeast pueblo area, as well as scattered Spanish military debris. This suggests a probable Ceramic Group 6 component somewhere in this vicinity.

Two radiocarbon dates obtained from the middle section of the Profile 7 midden deposit provided dates with the highest probability of a late fifteenth to early sixteenth century affinity (Bletzer 2019b). This appears consistent with the ceramic inventory and the early development of Pottery Mound Polychrome some 50 years after the earliest development of Sikyatki Polychrome style in the Hopi area (Gilpin and Hays-Gilpin 2012).

Ceramic Group 6

The latest ceramic group horizon evident at Pottery Mound was identified in the Annex component situated across the Rio Puerco oxbow, about 100 meters north of the main site. This assemblage was identified in a recent study of mostly surface ceramic materials at the complex by Hayward Franklin (2018), and in the Profile 9 stratigraphic section in the Rio Puerco bank at the Annex component (Marshall 2018a). The main characteristic of this late ceramic group is the common appearance of Glaze D and Glaze E ceramics and 1 specimen of Glaze F. It is clear, based on the ceramics recovered *in situ* from the Profile 9 stratigraphic deposits, that despite this late affinity, glazeware bowls with A rims are still predominant. Most of the ceramics, including

the D and E forms, have red-brown paste and basalt temper, and appear to be of local manufacture. However, the single Glaze F sherd has a Tonque Pueblo paste.

The absence of Pottery Mound Polychrome with Glaze D or E rims in the Annex Profile 9 deposits suggests that the style had died out sometime before the abandonment of Pottery Mound Pueblo, or that the style continued to be made with only earlier rim forms. The Pottery Mound Glaze D and E materials are similar to the Rio Grande Valley pueblo types. However, the temper and paste composition of the Pottery Mound D and E forms appears similar to ceramics from Groups 3-5, suggesting that most are of local manufacture (Franklin 2018). The characteristic persistence of Glaze A rims evident at the Annex also suggests the continued occupation of the site by local populations. There are a few sherds of Glaze A Pottery Mound Polychrome material in the Annex collection (Franklin 2018), but no Glaze D or E forms. No Pottery Mound Polychrome material was found *in situ* in the Profile 9 section which yielded the sixteenth-century radiocarbon dates. Perhaps the Glaze A Pottery Mound Polychrome materials from the Annex were manufactured near the beginning of the Annex occupation in the Ceramic Group 5 period. It has been recognized for some time that the Pottery Mound Polychrome which mimics Sikyatki style may not have survived at Pottery Mound during the last period of its occupation as indicated in the following note by Franklin (2007:95):

> "It is interesting that very little stylistic evolution of the D sherds out of Pottery Mound Glaze Polychrome is evident. A clear continuum of attributes, over time, connects Agua Fria, San Clemente, Kuaua, and Pottery Mound Glaze Polychrome. The Glaze D sherds are not a decorative outgrowth of the last expression of this series, Pottery Mound Glaze Polychrome, but follow the more general and widespread San Lazaro style. The painted designs on the Glaze D sherds are thus no longer unique to Pottery Mound, even though most specimens exhibit the local paste and temper. One explanation is that after the end of the main occupation, a few stragglers made pottery, but only in a generic style. The peak of ceramic design achieved in the Pottery Mound Glaze Polychrome was gone."

The apparent absence of Pottery Mound Polychrome style on Glaze D and E forms during the last phase of the Pottery Mound occupation demands explanation. It has been suggested that the last occupation included actual Rio Grande populations or even perhaps a short hiatus with a Rio Grande Pueblo re-occupation with potters utilizing local clay and tempering materials. However, the persistence of Glaze A ceramics within the *in situ* and discrete late stratigraphic deposits in the Annex Profile 9 suggests a continuation of the former ceramic tradition. No kiva murals dating to this last phase of the Pottery Mound occupation have been identified, thus it is not possible to determine if the Sikyatki mural style continued. The fact that Pottery Mound Polychrome was never that frequent (the largest Group 5 samples represent only about 5% of the glazeware materials), suggests that the type could very well have been made by a few potters at the site, perhaps Hopi immigrants or more likely a limited group of local potters emulating the Hopi style. Sikyatki style in the kiva murals seems to have been used more frequently, and was more similar to the flamboyant Sikyatki style. Whatever the case, the use of multiple slip colors, matt red elements, often without glaze line borders, and the Sikyatki decorative style seems to have been susceptible to decline during the last phase of the Pottery Mound occupation. Further study concerning the absence of Glaze D and E Pottery Mound Polychrome style is needed, as indeed is the latest occupation (Ceramic Group 6) at the pueblo.

In a sample of 110 glazeware rims recovered from Profile 9 at the Annex and nearby slump (Marshall 2018a), there is a relatively high incidence of Glaze A (48.2%), indicating this form was popular well into the sixteenth century. Glaze C rims of both Kuaua and Espinoso style are also frequent (23.6 %), and well as Glaze D and E rims (26.3%), with only a trace of imported Glaze F (0.9%) (Table 7).

The great majority of rims is tempered with basaltic materials and is likely of local manufacture (90.6%). The most frequent imports are from the Galisteo Basin (7 sherds, 6.5%), while traces of Western Glazeware (2 sherds, 1.8%) and crushed white rock (1 sherd, 0.9%) are represented. A few body sherds of Biscuit A and B, Hopi material, and Western glazewares are also present in the samples obtained from the Profile 9 area.

Table 7. Glazeware Rim Form Frequencies from the Profile 9 Annex Component Area.

Type	Number	Percentage
Glaze A	53 rims	48.2% (A-1, A-2, and A-3 rims)
Glaze B	1 rim	0.9%
Glaze C Kuaua	13 rims	11.8% (C-3 rims)
Glaze C Espinoso	13 rims	11.8% (C-1 and C-2 rims)
Glaze D	13 rims	11.8%
Glaze E	16 rims	14.5% (E-1 and E-2) (total D-E-F rims = 27.2%)
Glaze F	1 rim	0.9% (Tonque paste)

The incidence of rim forms in the larger sample of 235 rim sherds (mostly from surface contexts) at the Annex examined by Franklin (2018) is listed in Table 8:

Table 8. Glazeware Rim Form Frequencies in the Annex Component Surface Collection.

Type	Number	Percentage
Glaze A	102 rims	43.4%
Glaze B	10 rims	4.3%
Glaze C Kuaua	46 rims	19.5%
Glaze C Espinoso	4 rims	1.7%
Glaze D	56 rims	23.8%
Glaze E	17 rims	7.2% (Total D and E rims = 31%)

The earliest occupation date of the Annex component is undetermined, but it is apparent from the Profile 9 deposits dated by radiocarbon that the occupation extended into the sixteenth century and that Glaze A rims continued to be made in large numbers until the end of the occupation. This is evident by the predominance of Glaze A rims in the Profile 9 *in situ* stratigraphic deposits in association with Glaze D and E rims, and by the presence of Spanish armor (chain mail) and ballistic (a single lead ball) debris at the Annex (Bletzer 2019a). This substantiates that the component was occupied at least into the middle 1500s and perhaps to about 1600 A.D. A review of the early Spanish Colonial records by David Snow (2007) suggests the possibility that the site was visited by Spanish explorers (see End Note 3).

Two radiocarbon dates from the Annex component include one from the upper east Profile 9 section and one from the deposits in the adjacent refilled arroyo. The dates are identical, and suggest sixteenth century affinity with a slim possibility of extension into the very early seventeenth century (Bletzer 2019b). These dates suggest that Spanish contact at the site could have been any of the pre-colonization entradas.

The probability that Pottery Mound Pueblo was occupied and visited during the early Spanish contact period was discussed 10 years ago by David Snow, and was recently confirmed by the Isleta Pueblo Pottery Mound Research Team (see End Note 3).

End Notes

End Note 1. Evidence of Late PIII Occupations at Pottery Mound Pueblo

The excavations in the "Big Man Unit" midden area (north refuse area) first reported by Hibben in 1987 consisted of a group of stratigraphic tests for which no stratigraphic profiles are known to exist. These test units were not far northwest of the Profile 10 Section discussed herein from the Duck Unit sub-floor deposits. The north midden tests extended to a depth of 3.0 meters.

Ceramic inventory tables were assembled from the test units, grouped by 50 cm to 1.0 m levels. These tables were copied and subsequently studied by Curt Schaafsma (2007:291-292, Appendix D). There is a significantly higher incidence of Socorro Black-on-white and what is described as Socorro Corrugated and Los Lunas Smudged in the lower section from 2.0 to 3.0 meters, which suggests a possible Socorro Phase component. Curiously, there are no carbon-painted whitewares, which are common in the Profile 10 Ceramic Groups 1 and 2. Also, there appears to be a considerable variety of glazeware types in the lower North Stratigraphic tests in the Big Man Unit, including a predominance of what appear to be later glazewares. This suggests that the lower Big Man deposits are somewhat mixed, perhaps by later intrusions. Nonetheless, there is a significantly higher incidence of Socorro materials in the lower deposits, suggesting a possible Socorro Phase component in that area.

It should be noted that all of the PIII sites identified by the Isleta research team in the adjacent Pottery Mound landscape study are Socorro Phase, as are most previously recorded PIII sites in the area (Marshall and Walt 2006; Wendorf et al. 1956). Only one Socorro Phase site in the area (ICR-61) located 3.3 km southwest of Pottery Mound also had some early glazeware. Socorro Phase Pueblo III period sites with minor quantities of carbon paint ceramics and St. Johns Polychrome occur in the Pottery Mound area, but no PIII carbon paint sites have been found, to date, in the lower Rio Puerco. However, there are numerous PIII carbon paint (Loma Fria Black-on-white) sites in the Rio Puerco further north (Hurst 2003:90-96) and in the Magdalena Phase sites (Magdalena Black-on-white) to the south (Knight and Gomolak 1981).

End Note 2. Pottery Mound Polychrome

Pottery Mound Polychrome is identified as a glazeware type of multiple colors on a red, yellow, or white-slipped ground of one or more vessel surfaces (Franklin 2007). In this study, only those sherds having a yellow slip for the decorative surface (sometimes fired olive-gray or off-white)

on at least one surface over which are red decorative elements bordered by glazeware paint are included (Figure 6). Also quite common is the appearance of matte red design elements independent of glaze line borders. The use of these unframed dusty red designs motifs is the primary indicator of the type identified here in Ceramic Group 5. A trace of Pottery Mound Polychrome also has spatter on the interior surfaces much like the Hopi wares (Figure 8). Complete Pottery Mound Polychrome vessels clearly show an attempt to mimic Sikyatki Polychrome style, although this is sometimes difficult to discern in individual sherds. Most ceramic studies from Pottery Mound Pueblo indicate that the Pottery Mound Polychrome style is somewhat infrequent, ranging from about 2 to 8 percent (ca. 5 percent in the largest sample) of the local glazeware production (Schaafsma 2007:Appendix D; Eckert 2007; Franklin 2007).

Previous study of the Cordell test stratigraphic section (Eckert 2007:63; Franklin 2007) identified Pottery Mound Polychrome throughout most of the section, except in the lower levels which are also devoid of Glaze C rims (i.e., identified as Ceramic Group 3 in the current ceramic group sequence). This suggests a rather long period of manufacture for Pottery Mound Polychrome. Other sections also suggest an earlier and longer presence of Pottery Mound style (Schaafsma 2007:291-292), as identified by Hibben in 1987. This may be in part because of a somewhat broader definition of the Pottery Mound style than the type as it is recognized herein (Figure 6). Franklin (2007:29) recognizes at least 5 variants of San Clemente Polychrome, which illustrates a great deal of experimentation in the application and location of painted decoration and rightly considers Pottery Mound Polychrome as a San Clemente-related type. However, in this study Pottery Mound Polychrome is restricted to the definition provided by Brody (1964), which is clearly a mimic variant of Hopi Sikyatki Polychrome decorative style.

In the Profile 7 stratigraphic section, a clear separation of Pottery Mound Polychrome in the upper levels suggests that the type appeared somewhat later in the site occupation (Marshall 2018a) This clear separation was further confirmed in the East Swan Gallery stratigraphic section, with Pottery Mound Polychrome occurring in the upper levels, but absent from the lower section.

End Note 3. Annotation of David Snow's 2007 Article

La Ciudad: Pottery Mound Revisited? In *Texas and Points West: Papers in Honor of John A. Hedrick and Carrol P. Hedrick,* edited by Regge N. Wiseman, Thomas C. O'Laughlin, and Cordelia T. Snow, pp 163–174. Papers of the Archaeological Society of New Mexico No. 33. Archaeological Society of New Mexico, Albuquerque.

This paper explores that possibility that Pottery Mound may have been visited by an early Spanish Entrada in the sixteenth century. The presence of a chain mail fragment found at Pottery Mound (Ellis 1955) and the occasional D and E glazeware ceramics, which were likely manufactured into the sixteenth century, led David Snow to consider the possibility of early Spanish contact at the site. This consideration has been discounted by most archaeologists because of the preponderance of prehistoric Glaze A-C ceramics, which suggested an occupation end date in the late fifteenth century, while the chain mail was explained as a Spanish item left by a later visitor to the pueblo ruins (Ellis 1955).

The review of the early Spanish documents by David Snow identifies and discusses a number of references which might refer to a pueblo settlement in the lower Rio Puerco valley. Snow suggests that Pottery Mound may have been visited by the Coronado Expedition in 1540 coming from Cibola, via the San Jose-Rio Puerco-Rio Grande, and perhaps during Coronado's visit to the Tutahaco Province before going north to join Alvarado in the Tiguex area (there were four contingents from Cibola to Tiguex).

In a review of the later accounts of the 1581-1582 Chamuscado-Rodriguez Expedition (Hammond and Rey 1966:130), Snow notes that another pueblo (estimated to have 500 houses) up the river on another northern stream was visited and called Nueva Tlaxcala, and in a second visit to the pueblo the party continued on to Acoma and Zuni. The name La Ciudad comes from the Benavides Memorial of 1630 (Benavides 1965:177) in what appears to have been the "interpolation of another person who probably never set foot in New Mexico." This account refers to a large pueblo half a league from the Tihues (Southern Tiwa Province) built of stone (unlike Pottery Mound), with three plazas and 20 estufas. This is considered to be a garbled rendition, perhaps of some earlier document (Forrrestal 1954). Snow reviews each of the above accounts in conjunction with the archaeological records and concludes that one or all might refer to a large settlement in the Lower Rio Puerco at Pottery Mound, but states, "What I have proposed, of course, is speculation supported, perhaps, by a few 'facts'" (Snow 2007:170).

In the Fall of 2015, Spanish Entrada expert Clay Mathers identified additional fragments of chain mail and a lead shot ball in the northeast area of Pottery Mound in a preliminary metal detector examination. Further investigation by the Isleta Pueblo Pottery Mound Research Team subsequently identified two areas with concentrations of Spanish chain mail, additional lead balls, and other debris. This included materials from the area of the Annex and the northeast area of the pueblo (Bletzer 2019b).

End Note 4. Late Glaze Rim Forms at Pottery Mound

Glaze D and occasional Glaze E rim forms are reported in various ceramic inventories from the northeast areas of Pottery Mound Pueblo, but are more concentrated (ca. 30%) in the Annex Component. In the H. P. Mera LA 416 type collection located at the Center for New Mexico Archaeology in Santa Fe, Glaze D and E rims represent 11.5% of the sample. It is probable that these materials came from the main roomblock, as the outlying Annex component is not included on his site map (see Mera type collection inventory in Appendix A by David Snow in Franklin 2014). Based on the recent investigations, late glazeware sherds in the main site area are confined to the northern sections of the pueblo facing the Puerco oxbow. They extend from the Cordell test pit to the area of the East Swan Gallery and across the northern sections of Roomblocks A and C, about 150 meters east-west by 50 meters north-south.

Surface sampling suggests that Glaze D and E rim forms do not occur except as very rare specimens in the southern and western sections of the pueblo. A trace of Glaze F material (2 sherds seen in the recent investigations) has been found; one sherd in the Annex and another just above the Macaw Gallery in the northeast site area. Both of these Glaze F sherds have paste and temper indicating that they were imported from the Galisteo Basin. This suggests that Glaze F was developed in the Rio Grande prior to the abandonment of Pottery Mound, but was never manufactured at Pottery Mound.

Where Glaze D and E specimens are found in stratigraphic context at Pottery Mound, they occur in association with a predominance of Glaze A rims, and in locations with a high number of exuberant Glaze C Kuaua-style rims. The concentrations and distribution of Spanish artifact materials (chain mail, lead shot, nails, and other items) at Pottery Mound is confined to the same areas where Glaze D, E, and trace Glaze F rims have been found. This suggests that the northeast area of the main pueblo and the Annex were still inhabited by remnant Pueblo populations up until early Spanish contact. Radiocarbon AMS samples from the upper deposits of Macaw Gallery (Profile 7) and from the Annex (Profile 9) yielded dates that extend into the sixteenth century. The presence of Glaze D and E rims in stratigraphic context is (at present) limited to the Annex. The exception is a single Glaze E rim found in a Ceramic Group 5 sample from the upper Macaw Gallery midden (Profile 7), which is also a Galisteo import. It is likely that late Ceramic Group 6 deposits will eventually be identified in the northeast pueblo area. The relatively low incidence of late glazes in the northeast pueblo is probably, in part, masked by the long previous occupation of the site in that area, as well as the limited extent of the sixteenth century occupation.

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DATA IN SEARCH OF A MODEL: MESA VERDE REGION ORANGE AND RED POTTERY PRODUCTION, EXCHANGE, AND CULTURAL INTERACTION

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Keywords: Resource Approach to Ceramic Analysis, Sourcing Analysis, Production, Exchange and Interaction, Predictive Modelling, Ecological Anthropology, Ethnoarchaeology, Anthropological Archaeology, Ceramic Ecology, Ceramic Archaeology, Landscape Archaeology, Archaeometry, Geolocation, Network Analysis.

Abstract

Near completion of a decades-long research program guided by the Resource Approach to Ceramic Analysis, with a focus on sourcing oxidation-fired pottery to precise production locations within the Mesa Verde Region of the Northern Southwest, has resulted in an unprecedented familiarity with the ceramic resources and cultural landscapes of the Blanding Manufacturing Tract of southeastern Utah. The Blanding Red Ware research design was organized to structure the fieldwork and analysis required for assignment of a production provenience to every sherd in our site collections. Sourcing analysis matches sherds with clay voucher samples in the landscape whose shared identity is verified by elemental chemical analysis data that are subsequently translated into map coordinates of individual production communities. The recovery provenience of each sherd collected during the fieldwork phase was documented as a GPS waypoint at the time of collection and comparison of those two proveniences constitutes an unambiguous measure of ceramic exchange. However, those data are mute concerning the cultural dynamics of adaptation that shaped the structure of production and enabled the exchange of pottery across the cultural landscape within and exterior to the Mesa Verde Region. The following paper presents a predictive model to explain how production and exchange was organized and proposes two temporally distinct interaction spheres on the cultural landscape of Ancestral Pueblo occupation of the Northern Southwest.

Introduction

The Resource Approach to Ceramic Analysis is a systematic technological and typological methodology developed during the author's tenure at the Dolores Archaeological Program (Breternitz 1993) as a means for recording unique combinations of temper and clay types informative of local versus non-local pottery sherds in the analysis database (Lucius 1988). The necessary typological adjustments, justifications, and description of the analysis approach and preliminary results were published in the Fall-Winter 2020 issue of Pottery Southwest (Lucius 2020). Although ware and type assignments are generated during the analysis, they serve primarily as temporal place-markers onto which compositional attribute data derived from sourcing analysis can be added.

The author's dissertation research on the topic of village formation from the perspective of ceramic analysis data (Lucius 1988) involved a deep dive into the literature of exchange, which developed into a research specialty that guided the development of the Blanding Red Ware Project. The primary focus of the research is on the exchange networks that served to distribute oxidized pottery from their production locales in or adjacent to the Blanding Manufacturing Tract, hereafter referred to as the Blanding Tract (Figure 1) of Southeastern Utah (Lucius 2010).

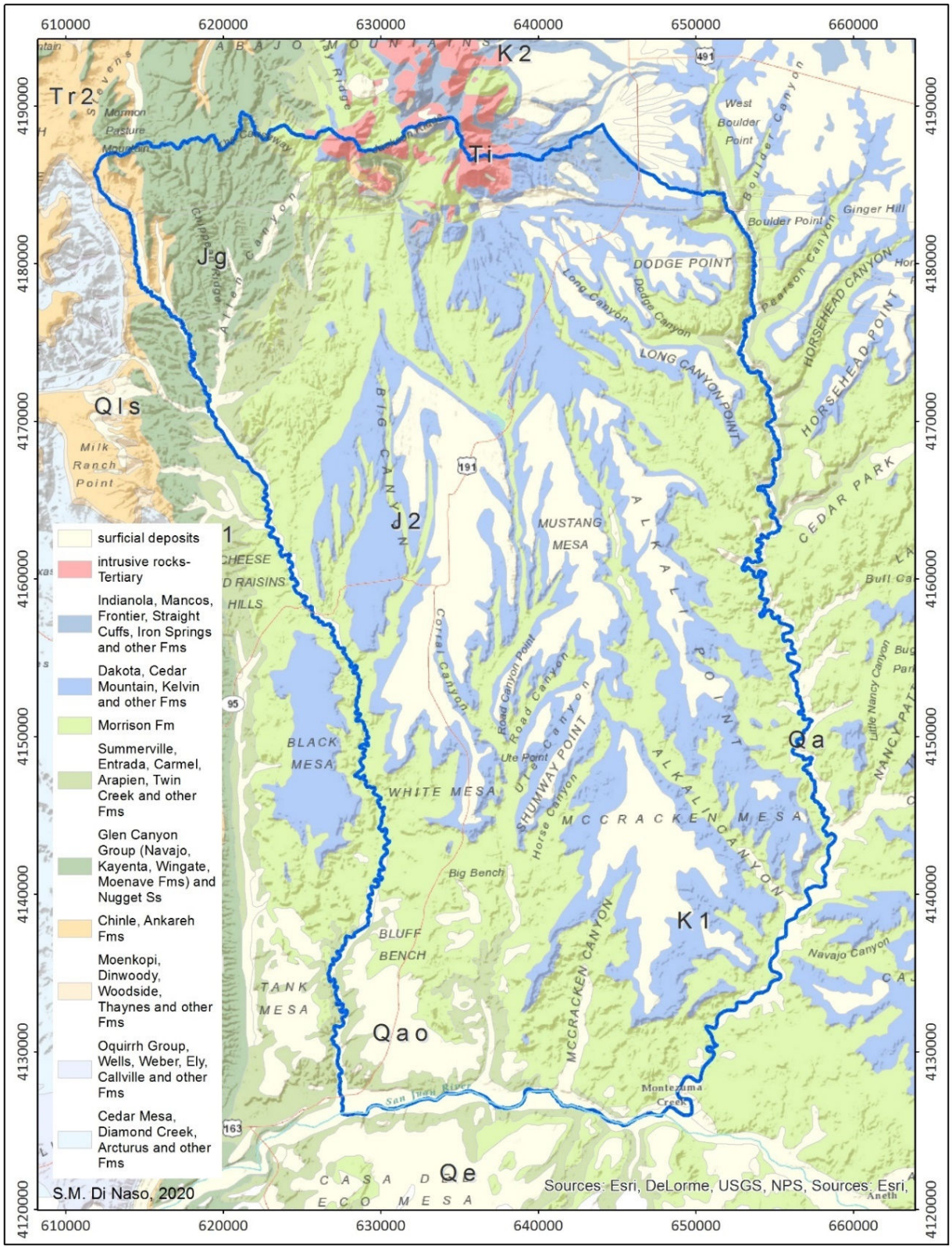

Figure 1. The Blanding Manufacturing Tract of Southeast Utah. Map by Steven Di Naso, used with permission.

Fieldwork began in the year 2000 with simultaneous analysis of collected pottery sherds and clay voucher samples (see Lucius 2020 for a description of the project). In 2008, Steven Di Naso joined the project to provide geophysical and archaeometry expertise. He subsequently developed a program of elemental analysis of all clay and sherd samples. In 2017, sherds and clay samples collected by the San Juan Red Ware Sourcing and Exchange Research Study (SJRWS&ERS) (Di Naso et al. 2019) extended the research focus to the Pueblo II period, and those clay and sherd samples were subjected to the same typological and elemental analysis.

The research is in large part a study in geolocation; although it is possible to graph sherd data in terms of production and recovery provenience (Figure 2), there is nothing in those data that is informative of the cultural dynamics of production and exchange—that information has not been preserved in the archaeological record (Binford 1982:133). Similarly, the possible intermediate sites through which those pots moved remain unknown (Wright and Gokee 2013). The following model derives from a variety of anthropological and archaeological sources and is further informed by the author's intimate knowledge of ceramic technology and clay resource variability, as well as experience as a replicator and potter.

The earliest available reference to a phrase whose use has become *de rigueur* for nearly every archaeological report that includes ceramic analysis derives from an anthropological concern with economics as the "production, distribution and consumption of material goods" (Anderson 1976:211), which in terms of anthropological archaeology has been restated as production, exchange, and interaction. Stages of socioeconomic complexity closely correlate with the organization of exchange (Sahlins 1972:Chapter 5). Webb (1974:365) similarly notes that "… if one can determine from the archaeological data the general type of society with which one is dealing, then one can use this larger context to arrive at a reasonable presumption about the types of exchange systems likely to have been operating. In nonmonetary, nonmarket "direct economies" (Thurnwald 1932) such as the Ancestral Pueblo of the Northern Southwest, production and exchange are embedded in, rather than separable from, the sociocultural processes (Lucius 1988:15) of a gift-based economy (Hayden 1982:113; Sahlins 1972:186).

Unfortunately, rarely do any of those papers give more than lip service to the above concepts or operationalize them into a research design able to structure fieldwork and analysis or provide insights on how to interpret the resultant data. In the following discussion, axioms are the warranted assumptions (Binford 1982:126; Hill 1970:21-22) that are presented in the form of propositions within the three domains of production, exchange, and interaction. The resulting model serves to allow for testable interpretations of the research data from an anthropological perspective.

Production

The overwhelming concern of Southwestern Archaeology with constructing culture histories (Rouse 1953; Spencer and Jennings 1965) has led to the development of typologies for assigning dates to sites or site components by their associated pottery (Breternitz 1966) while recognizing their association with large regional subdivisions of the Northern Southwest. Ceramic types of the Mesa Verde Region (Breternitz, Rohn, and Morris 1974) are arranged in a hierarchical framework of types, series, and wares for use by field workers and analysts without any concern

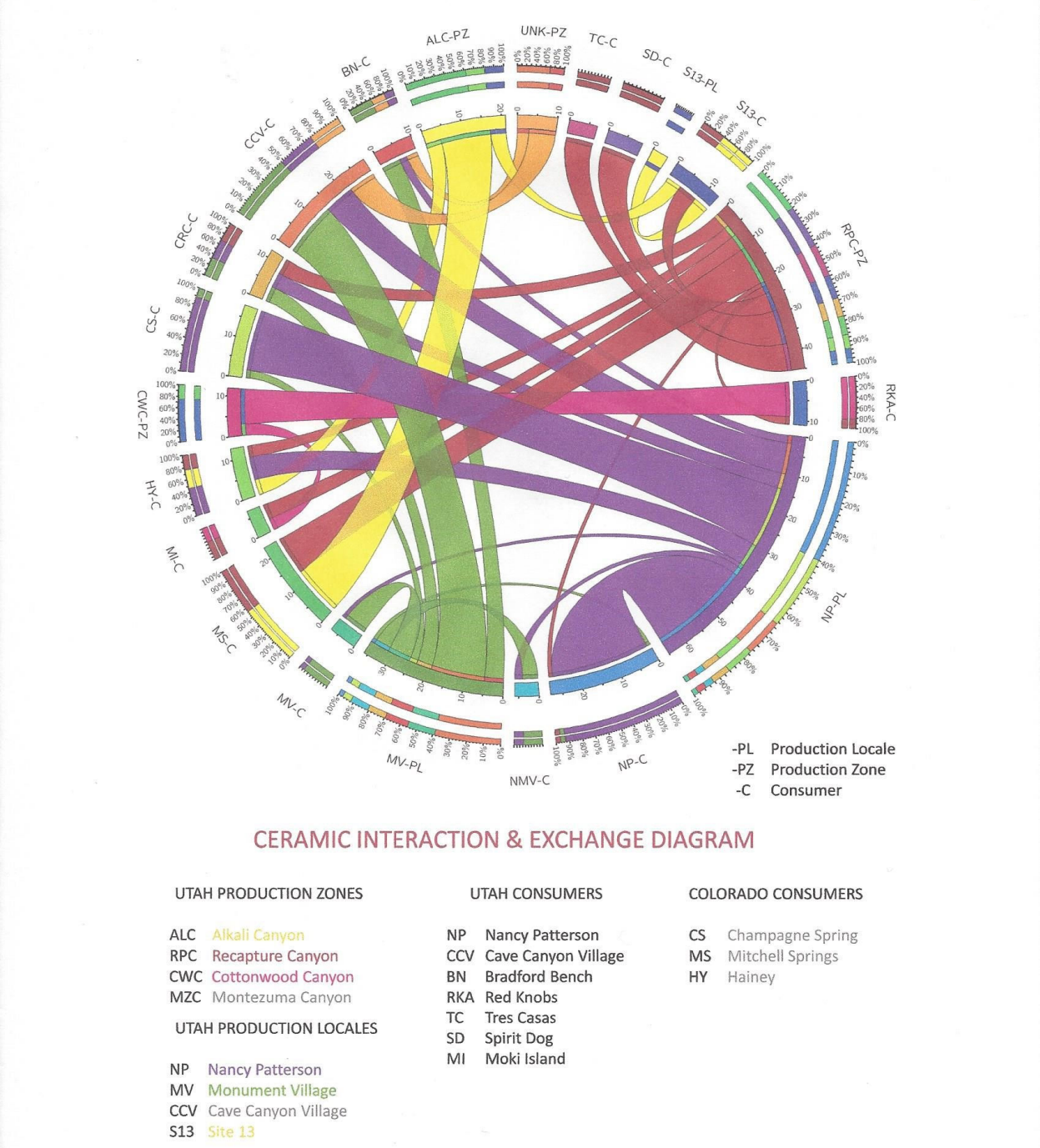

Figure 2. San Juan Redware production locales and trading partners. Chord diagram by Steven Di Naso, used with permission.

as to where in that large order geographic area the pots were made. The Mesa Verde Region therefore constitutes a large black box in terms of pottery production. In large part the question of where production occurred has seldom arisen since Kidder's excavations at Pecos Pueblo. The guiding assumption has been that, except for readily identifiable painted items from other

regions (Colton and Hargrave 1937:27), the pottery found at a site was made at the site, or at least somewhere nearby. Although Kidder disavowed this assumption of local production (Kidder 1942:i) in the face of Anna O. Shepard's technology-based analysis to the contrary (Shepard 1942), it has been resurrected as the Criterion of Abundance, which states that "pottery of a specific paste compositional group should normally have been manufactured in the locality in which it is best represented" (Rands and Bishop 1980:20). This assumption is unwarranted and violates the stricture that the structure of ceramic production should be demonstrated, not simply assumed (Ramon and Bell 2013:596).

Subdividing the Mesa Verde Region into smaller production locales begins with attention to temper, which although not usually considered a type determinant (Hargrave 1974: 80-81), does point to second-order geographic manufacturing tracts within the larger region where potters had access to and preferentially selected a specific tempering agent for pottery production (Lucius 1988:33; Shepard 1942:178). The Blanding Tract is a petrofacies (Miksa and Heidke 2001) with distinct bounding drainages within which diorite river cobbles ultimately derived from the Abajo Mountains laccolith (Mutschler, Larson, and Ross 1998:243) are universally available.

Once tract affiliation has been determined, identification of individual production locales within the tract requires bridging or middle range arguments (Binford 1972:249-250, 1982:128) that link the cultural selection of clays for pottery production with clay type variability in the landscape, establishing their shared identity. Fieldwork was initiated in the year 2000 with a focus on identification of third-order or "Resource Procurement and Production Zones" (Rands and Bishop 1980:20) within the Blanding Tract where potters lived in residential association with the clay sources selected for Pueblo I orange pottery production (Chang 1975:221; Lucius 2010).

Production Proposition #1 is that each piece of pottery was made by potters living in residential association with temper and clay sources available within a five-kilometer resource catchment—the finished products, not the bulky ingredients (Glowacki et. al. 2015) of production are transported through exchange (Arnold 1975:189). This approach references Ceramic Ecology, defined by Matson (1965) and elaborated from an ethnoarchaeological perspective by Arnold (1975, 1976), as that field of study concerned with the relationships between resources and their cultural selection for use in pottery.

Production Proposition #2 is that the attributes of temper type and clay type are formal compositional variables that record the resource landscape where pots were made regardless of where they were found (Binford 1972:144). We collect sherds, or broken pieces of pots, and subject them to typological analysis, extracting (Anderson 1976:52) selected stylistic attributes (Hargrave 1974:90) including surface color, paint color, and design layouts that are summarized as types. Tying those types to the calendar by tree-ring dating of sites where they occur (Breternitz 1966) allows for their use to tell time, or more appropriately, assigns them to distinct occupational periods of manufacture and use (Hayes 1964:Table 6). The generally accepted position is that sourcing pottery, unlike obsidian, turquoise or marine shell, is difficult if not impossible (Doelle et al. 1992:89). It **is** possible, however, using sourcing analysis, but types cannot be the focus because they are not understandable in terms of availability of raw materials or production technology. Indeed, an uncontrolled amount of compositional variability is

inherent in any one type (Bishop, Rands, and Holley 1982:309). Rather, technological analysis extracts the attributes of temper type and clay type from individual sherds and links them with discrete resource landscapes using archaeometric procedures.

Production Proposition #3 is that although there may be many clay sources, only a small fraction exhibit sufficient plasticity to make a pot, and only a small fraction of those were actually used for production. Clay type is not readily observable given that it requires refiring analysis, which enlists a research kiln to bring all sherds to a comparable state by subjecting them to a target temperature of 950º C in an oxidizing atmosphere (Lucius 1988:39-40; Shepard 1939:250). Refired clay color is recorded as a Munsell Soil color designation and points to where in the landscape matching clay sources may occur. Samples of potential matching clay sources are identified, collected, and similarly refired to bring sherds and clay samples to a comparable state. Although the clay sources used for pottery production must necessarily return the same refired clay colors as the sherds made from them, clay voucher sampling reveals that clay outcrops of the same refired clay colors repeat across the Blanding Tract. This in turn prevents use of refired clay color alone to determine which of those clay outcrops were used for pottery production. For that reason both sherds and clay voucher samples were subjected to archaeometry-based elemental characterization procedures (Shepard 1976:Foreward), which were specifically designed to link clay voucher samples and archaeological sherds to discrete production locales (Lucius 1988:26). A manuscript that details those procedures is currently in preparation.

Production Proposition #4 is that production was organized for creation of surplus vessels for exchange (Hays-Gilpin 2013:194; Sahlins 1972:84; Ramon and Bell 2013:609). The ability of archaeologists to assign a Pueblo I or Pueblo II period of occupation to sites across and beyond the Mesa Verde Region by the presence of orange or red sherds is suggestive of the scale of pottery production. This proposition is in opposition to the commonly held ecological and isolationist view (Braun and Plog 1982:505) of self-sufficiency or village autonomy (Leone 1968), which assumes that production and consumption are congruent—pots were made where they were used (Glowacki 2006:95-96).

Production Proposition #5 is that communities, rather than their constituent households (Graves, Longacre, and Holbrook 1982:200; Woodson 2011:130), were organized to create pottery for exchange with other communities, given that the household economy is unsuited for surplus production (Sahlins 1972:86). Further, that a community had pots does not necessarily signal that any pots were made there because not every community had potters (Ramon and Bell 2013:609). This proposition is in direct opposition to the common assumption that production was household-based and that throughout the area and temporal span of occupation each household produced its own basic complement of pottery vessels (Wilson and Blinman 1995:65; Plog 1995:269).

Production Proposition #6 is that production for exchange indicates where pottery was used, not where it was produced (Ramon and Bell 2013:602). There is nothing in typological data that is informative of precisely where on the landscape pots were made, other than from somewhere within the first-order Mesa Verde Region of the American Southwest (Lucius and Breternitz 1992:Figure 1).

Sourcing analysis reveals that Pueblo I period orange pottery production was restricted in the sense that only a few communities in the Blanding Tract had direct access to usable Upper Brushy Basin red clays used to make the unslipped Abajo Red-on-orange and Bluff Black-on-orange pottery types. Pueblo II period red pottery production of Deadmans Black-on-red was distributed in the sense that various communities within and exterior to the Blanding Tract used locally available clay sources for body clays, and if those clays did not return a red surface color, applied a red clay slip prior to polishing, painting, and firing.

Ceramic Exchange

The ability to map the movement of pots from their production locale to the individual sites where they were recovered is not informative of how and when they were moved. The preeminent exchange model in the literature (Renfrew 1977) predicts that the occurrence of exchanged items will decrease as one moves away from their point of production. In addition to being inherently directional, this fall-off model does not address the cultural dynamics of exchange (Binford 1972:249-251), given that it is not necessary to demonstrate that exchange, the between-hands transfer of things (Earle 1982:3-4), occurred at all (Renfrew 1977:72). Fall-off curves cannot be derived because only sherds were collected—the actual number of pots in the exchange relationship cannot be determined. The following propositions are an attempt to reconstruct the cultural dynamics governing ceramic exchange.

Exchange Proposition #1 is that Pueblo I and Pueblo II agricultural communities were endogamous, which requires the presence of two or more unrelated descent groups of matrilineal clans practicing matrilocal residence living together (Wilshusen and Ortman 1999:383). Interlocking clan segments grouped into segmented communities (Ware 2018:639-641) would have been widely dispersed across the cultural landscape of the Northern Southwest (Ramon and Bell 2013:Figure 12; Ware 2018:Figure 2), creating lines of communication that ensured relationships of exchange (Sahlins 1972:133). Material flow underwrites social relations (Sahlins 1972:186) and generalized reciprocity (Sahlins 1972:196), resulting in the movement of surplus food (Sahlins 1972:217) and ensuring a measure of food security (Ford 1972:10-12; Ware 2018:646). Because the exchange of food cannot be readily documented, gift exchange of pots with distant kin groups (Ford 1972:13-14; Ware 2018:646) serves as a proxy measurement of the exchange relationships.

Exchange Proposition #2 is that establishment of an exchange system required reorganization of the settlement pattern of dispersed household communities into aggregated communities, commonly referred to as villages, for intensification of production for exchange (Douglass and Heckman 2012:206; Lucius 2008). When orange pottery first appeared in the archaeological record at approximately A.D. 750, its production was localized at White Mesa and Alkali Ridge, probably related due to population growth and fission (Ware 2018:645). The site of Alkali Ridge (Brew 1946) is the earliest known village community with clan segments, ritual architecture, and ritual ownership and control of farmland and production in the Mesa Verde Region (Ware 2018:644). Aggregated communities and orange pottery production continue throughout the Pueblo I period. The Pueblo II settlement pattern accompanied by red pottery production began at approximately A.D. 950 with the appearance of village communities sited at canyon heads and the intersections of canyons where springs or flowing water were readily available. These Pueblo II

sites were often on top of the ruins of abandoned Pueblo I sites. By A.D. 1000, production of red serving ware pottery ended in the Mesa Verde Region (Breternitz, Rohn, and Morris 1974:62).

Exchange Proposition #3 is that exchange events were linked to a ritual ceremonial calendar that brought people together with the expectation of feasting and gift exchange (Ford 1972:14), which constitutes a time-dependent regulation of exchange over regional distances (Frigout 1979). Feasting among farming communities would have been large-scale events with large group size but low sociopolitical competition that served to integrate spatially dispersed farming communities (Kassabaum 2019:614, 618).

A basic hypothesis of ecological anthropology is that "… in an egalitarian society living in an effective environment with unpredictable and potentially disastrous fluctuations of biotic and abiotic variables, reciprocity and ritual will regulate the circulation of nutrients for the survival of the human population" (Ford 1972: 3). The quote is as an apt summary of the structure of the exchange network outlined above, but in turn also requires shifting focus to the concept of interaction, which is signaled by occurrence of pottery from production locations in the general Blanding area to communities across and beyond the arbitrarily defined Mesa Verde Region.

Cultural Interaction

Exchange systems are inherently cultural, and the occurrence of sherd fragments from the exchanged pots serve to delineate the geographic boundaries of that interaction, given that every community in the exchange system, however indirectly, gets some pottery from various production locales (Sahlins 1972:83). The ceramic assemblage recovered from a site is informative of local participation in a gift exchange economy constituting an interaction sphere.

The Interaction Proposition is that the areal distribution of pottery to segmented agricultural communities across the cultural landscape signals the presence of an interaction sphere, defined as constituting regular and institutionally maintained inter-societal points of articulation between participating communities (Binford 1972:204). Production for exchange is ubiquitous, and the distribution networks can cover wide areas and even overlap with other networks so that pots from different production locales can be found in the same community (Ramon and Bell 2013:610), even if they also were pottery producers. Interaction spheres may crosscut both traditions and culture areas (Binford 1972:204) to include all clan segments participating in the interaction.

The need for visualization of the geographic extent of interaction spheres documented by the orange and red variety pottery distributed by ceramic exchange systems in the cultural landscape of the Northern Southwest (Plog 1977) initially led to evaluation of Social Network Analysis (SNA) (Brughmans 2014:19) as a possible candidate given that the participating sites constitute nodes, and that the GPS waypoints of production and recovery proveniences are the ties that link those sites together. Although those locational data allow for calculation of fall-off curves and least-cost paths associated with SNA (Bishchoff 2018), they are of questionable utility given that such statistics assume a directionality that is at odds with the proposed model, which presupposes numerous intermediate sites through which pots appear to have circulated. Similarly, the use of formal economic terminology such as modes, centralities, gateway communities, and central

places assumes a level of sociopolitical differentiation (Wright and Gokee 2013) not relevant to understanding interaction in non-market, egalitarian economies (Lucius 1988:15-18; Morris 1978:315). At the author's invitation, Steven Di Naso is currently designing a geographic approach for visualization of the geographic extent of interaction spheres.

The focus on interaction predicts the presence of two temporally distinct interaction spheres. The Pueblo I interaction sphere is signaled by the exchange of orange pottery vessels during the Pueblo I period, which dates from approximately A.D. 750 and ends concurrently with an abandonment event at approximately A.D. 900 (Wilshusen and Ortman 1999:380-382). The Pueblo II interaction sphere is signaled by the exchange of red pottery vessels between aggregated communities, most likely representing clan segments ultimately tied to immigration following abandonment. The presence of Pueblo II Kayenta and Cibola red types suggests that the new inhabitants were participating in a possible Chaco-centralized interaction sphere (Safi and Duff 2016:1, Figure 1) that extended across the Northern Southwest. Rather than continued concern with pottery types associated with individual sites (Wright and Gokee 2013), it should be possible to contrast the areal extent of the individual interaction spheres and their continuity and changes over time (Mills et al. 2015).

Summary and Considerations

Examination of production necessarily addresses the physical relationship between potters and the resource landscape where they extracted the tempering materials and clays required for making pots. The end product of this examination is the unambiguous assignment of a production provenience to every sherd in the ceramic analysis database. Documentation of exchange also requires the assignment of a recovery provenience for those same sherds. The road toward that goal has been stupidly difficult.

In summary, orange and red pottery production in the Mesa Verde Region was for exchange, and the exchange of pottery represents the material consequences of cultural interaction that extended over the cultural landscape in the shape of interaction spheres representing cultural adaptation of farming communities to an agricultural lifestyle in the Northern Southwest.

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REVIEW

Applications of Deep Learning to Decorated Ceramic Typology and Classification: A Case Study Using Tusayan White Ware from Northeast Arizona. 2021. Leszek M. Pawlowicz and Christian E. Downum. *Journal of Archaeological Science* 130:105375 (14 pages).

Reviewed by Kelley Hays-Gilpin, Museum of Northern Arizona and Northern Arizona University

Machine Learning for Skeptics

Research into digital image recognition of painted pottery design styles, typology, and classification is well underway at Northern Arizona University and is expected to result in much improved consistency of classification and refined chronology. Early results appear in the *Journal of Archaeological Science* 130:105375 (https://www.sciencedirect.com/science/article/pii/S0305440321000455). "Applications of Deep Learning to Decorated Ceramic Typology and Classification: A Case Study Using Tusayan White Ware from Northeast Arizona," by Leszek M. Pawlowicz and Christian E. Downum, became available in Open Access form on April 25, 2021.

Let me begin this brief review, or perhaps advertisement, with a disclaimer: I am not an unbiased reviewer. I am one of the four ceramic analysts who assigned photos of over 3,000 Tusayan White Ware sherds to types in order to "train" the computer to recognize stylistic patterns and assign them to groups. Like many steeped in the historical traditions of Southwestern pottery analysis, I was skeptical about the utility and accuracy of the outcomes. But I have come to appreciate how far the effort has come and its potential to supplement, and perhaps revolutionize, the ways we study pottery to learn about ancient communities in the Southwest and beyond.

The article begins with a concise review of what we know about the Kayenta Series of Tusayan White Ware, our traditional typologies and dating methods, and the first problem facing us: although Tusayan White Ware design styles are remarkably consistent compared with other wares in the Southwest, inconsistency among analysts assigning types can and does result in inconsistent chronological determinations. Could Convolutional Neural Networks (CNNs) help? In this case, yes. Do CNNs replace traditional ceramic specialists? No. We still need to sort potsherds by ware. We need to feed the machine lots of identified images with visible attributes, that is, high-contrast painted designs without significant fire-clouding or spalling. Once the machine is trained on a particular ware, it recognizes the same patterns we do, and assigns sherds to types. In this case study, the CNN's classification accuracy is comparable to, and in some cases better than, human classifiers. We very likely can increase the machine accuracy by improving the training models and by incorporating more and better data.

How does the machine recognize patterns? I do not understand the math. As an avid user of Facebook and Pinterest, however, I know a little bit about what happens, if not how it works. I tag you in a social media post, and as more of your friends tag different photos of you, the facial recognition algorithms get better at recognizing newly uploaded photos of you. You get a prompt to confirm that is you in the new photo or not, and the machine learns. If I consistently "like" and save photos of cats to my Pinterest collection, the algorithm suggests more and more photos of cats for me to "like." Sometimes photos of opossums show up on my feed. If I create

and label a separate folder for opossums that I like, I am probably helping Pinterest's algorithm learn to tell cats from opossums. Without having to know words for "eyes" and "noses," the machine is probably noticing patterned relationships that humans would describe as "opossums have longer noses than cats." Nose length is visible in some photos but not others but observations add up with larger samples, and gradually, other, more subtle, opossum diagnostic features may be identified and incorporated into the model. This crowd-sourced training is free to the company, and probably has a vast future payout in ways we don't want to think about right now.

For machine-recognition of pottery styles, however, risks are low, benefits are measurable, and the most useful applications are still to come. A mobile app could assist field researchers (once they are trained and competent to classify on-the-ground pottery by ware). Training the machine on sherds from tree-ring dated floor assemblages will pin the patterns it sees to timeframes. Temporally sensitive features can be identified and emphasized. Temporally irrelevant features or types can be removed from our increasingly elaborate classifications—for example, are intergrade types really useful or not? With machine pattern recognition, there is a consistent alternative to linguistic mediation of style descriptions (such as motif lists like flagged triangles, running fret, ticked lines, etc.). The machine learning model can match sherds with similar designs with no human mediation, opening the door for practical microseriation and other applications. Identification of key elements the CNN finds most relevant to assigning a case to a type, which can be rendered as "hot spots" on digital maps of sherds, can help human analysts learn typologies and refine them. We could compare design styles on wares produced by adjacent but separate communities of practice—how similar are Tusayan White Ware and Little Colorado White Ware, for example? What are the differences, displayed graphically (as "hot spots" on diagrams of designs) rather than linguistically? How do design styles map out across different production areas—can we learn anything about interactions, influences, and boundaries?

Stay tuned for progress and critiques.

EXHIBITS AND EVENTS

Even in the Age of Coronavirus, museums are starting to open up.

The Museum of Indian Arts and Culture on Museum Hill in Santa Fe has two exhibits of interest:

"A Place in Clay" will be open through May 16, 2022. This exhibition honors Kathleen Wall of Jemez Pueblo, and her distinguished title of Living Treasure for 2020.

"Clearly Indigenous: Native Visions Reimagined in Glass" will be open through June 16, 2022. This is a groundbreaking exhibit of works in glass by 33 indigenous artists, plus leading glass artist Dale Chihuly who introduced glass art to Indian Country. The stunning art in the exhibit embodies the intellectual content of Native traditions expressed in glass.

The 2021 Southwest Kiln Conference

Steven Rospopo, Field Correspondent

In 2003, a group of archaeologists, potters, pre-contact technology specialists, and material scientists met in Luepp, Arizona for the first Southwest Kiln Conference. Throughout the last 18 years, the conference has expanded to include workshops, demonstrations, and lectures to augment replication and experimental firing and fuels technologies at various American Southwest locations. The conference has included trench, pit, and surface kilns to create, investigate, and replicate functional and decorated pottery using traditional methods and practices.

2019 Southwest Kiln Conference participants. Photo by Larry Galbiati.

After a year of COVID-19 dominated isolation, this dedicated core group of replicators will be celebrating a return of the Southwest Kiln Conference at the Edge of the Cedars State Park in Blanding, Utah from September 24th to the 26th, 2021. The 2021 conference will include collecting, testing, and processing raw clay; presentations and classes on forming pots; painting greenware and tiles with organic and mineral paints; and educating the public and attendees on the archaeology, typology, and seriation of pottery in the American Southwest.

Cherylene Caver demonstrates corrugated pottery at Besh Ba Gowah as part of the 2019 Kiln Conference. Photo by Andy Ward.

For information and complete schedule of the 2021 conference, please access the following website: https://www.swkiln.com. A detailed report with photos of the conference proceedings will follow.

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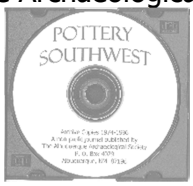

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