CERAMICS AND SOCIAL DYNAMICS: TECHNOLOGICAL STYLE AND CORRUGATED CERAMICS DURING THE PUEBLO III TO PUEBLO IV TRANSITION, SILVER CREEK, ARIZONA

by

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ABSTRACT

Prehistoric social networks reveal paths of behavior that are vital to the understanding of past life. Utilitarian ceramics that were a part of everyday life and regular household activities, and the elements of technological style they possess, are accurate indicators of local social dynamics. Corrugated ceramic vessels in particular contain subtleties in their decoration that may distinguish learning frameworks within and between groups on a small, perhaps household-level scale. My study uses these premises to examine corrugated sherds, and the social patterns they reflect, from several sites in the Silver Creek area of east-central Arizona.

CHAPTER 1: INTRODUCTION

Introduction

The Pueblo III to Pueblo IV period transition (ca. A.D. 1250 to 1300) was a dynamic time period in the prehistory of the Southwestern United States and Northwest Mexico. Sweeping changes in social dynamics and organization occurred across the Greater Southwest that radically altered the social landscape in which prehistoric Southwestern peoples lived. Along the Mogollon Rim in east-central Arizona, small dispersed settlements were replaced by large aggregated or nucleated pueblos (Cordell 1996; Kintigh 1996; Mills 1998, 1999b; Newcomb 1999; Pilles 1996; Reid et al. 1996). This aggregation corresponds with a period of regional migration and settlement reorganization as people moved to areas with a greater resource base. Understanding these changes, and their effects on the people whose lives were changed by such reorganization, is crucial to a better understanding of the dynamics of Southwestern prehistory and the lives of individuals and families throughout this time period.

This study seeks to examine this period of settlement reorganization and social restructuring in order to understand the causes and consequences of aggregation and migration, particularly the manner in which these processes affected social organization and representations of social identity in the Pueblo III to Pueblo IV transition. While many studies of social organization use decorated ceramics as a measure of similarity or difference between communities or groups, measures of social similarity or affiliation on a smaller scale, such as the household, provide a more refined or realistic view of social organization. Utilitarian ceramics, such as corrugated ceramics, which were likely manufactured and used on a household level, provide a much better proxy of household identity, and thus organization, at a given site within this time period. With this in mind, I chose to undertake an attribute-based analysis of corrugated ceramics from five sites in the Silver Creek area of Arizona in order to examine household level social organization. My analysis examines the manner in which social groups expressed their identity through affiliation or differences in the manner they constructed corrugated pottery.

The Pueblo III and Pueblo IV Periods

The Pueblo III and Pueblo IV periods in the Mogollon Rim area are marked by a number of changes that signal a departure in the social structure of this time from earlier periods in prehistory. Of these, aggregation and migration are foremost, and are seen not only in the Silver Creek area, but throughout the northern Southwest as well. Aggregation is evidenced along the Mogollon Rim and surrounding areas by the appearance of large nucleated pueblos, usually in the form of roomblocks surrounding central plazas (Mills 1998). Generally, these pueblos begin to appear after A.D. 1250 (Herr 1999), and their occupation continues until the early 15th century (Kintigh 1996). This trend occurs not only in the Silver Creek area (Mills 1999a), but in surrounding areas as well. Aggregation is seen to the northwest in the Sinagua and Homol'ovi areas (Adams 1991; Pilles 1996), to the south in the Grasshopper area (Reid et al. 1996), and to the north and east in the Manuelito district, the Upper Little Colorado district, and the Zuni district (Kintigh 1996).

But why during this time period do people chose to aggregate when dispersed settlements had been the way of life for hundreds of years previous to this shift, especially considering that aggregation is "socially difficult and economically inefficient" (Cordell 1996:230)? In an answer to this question, Cordell (1996) suggests that aggregation was a response to an environment with patchy resources or agricultural land (after Longacre 1966) or a response to high population and limited mobility (after Plog 1983). Kintigh (1996) suggests that aggregation arose as a social response to intercommunity competition for resources and land, an assertion also proposed by Reid et al. (1996) for the Grasshopper area. Whatever the reason, aggregation presented a new situation in which large numbers of people who previously lived in dispersed settlements chose to interact and live side-by-side on a daily basis. Undoubtedly, new mechanisms for dealing with this unprecedented social situation arose, and some degree of integration was necessary. Integrative architecture, in the form of great kivas early in the Pueblo III period, and plazas and courtyards after A.D. 1250, likely functioned as mechanisms that brought groups with socially disparate backgrounds and identities together. Furthermore, site inhabitants may have utilized such integrative architecture to distinguish themselves from inhabitants of other sites, perhaps in a competitive atmosphere (Plog and Solometo 1997).

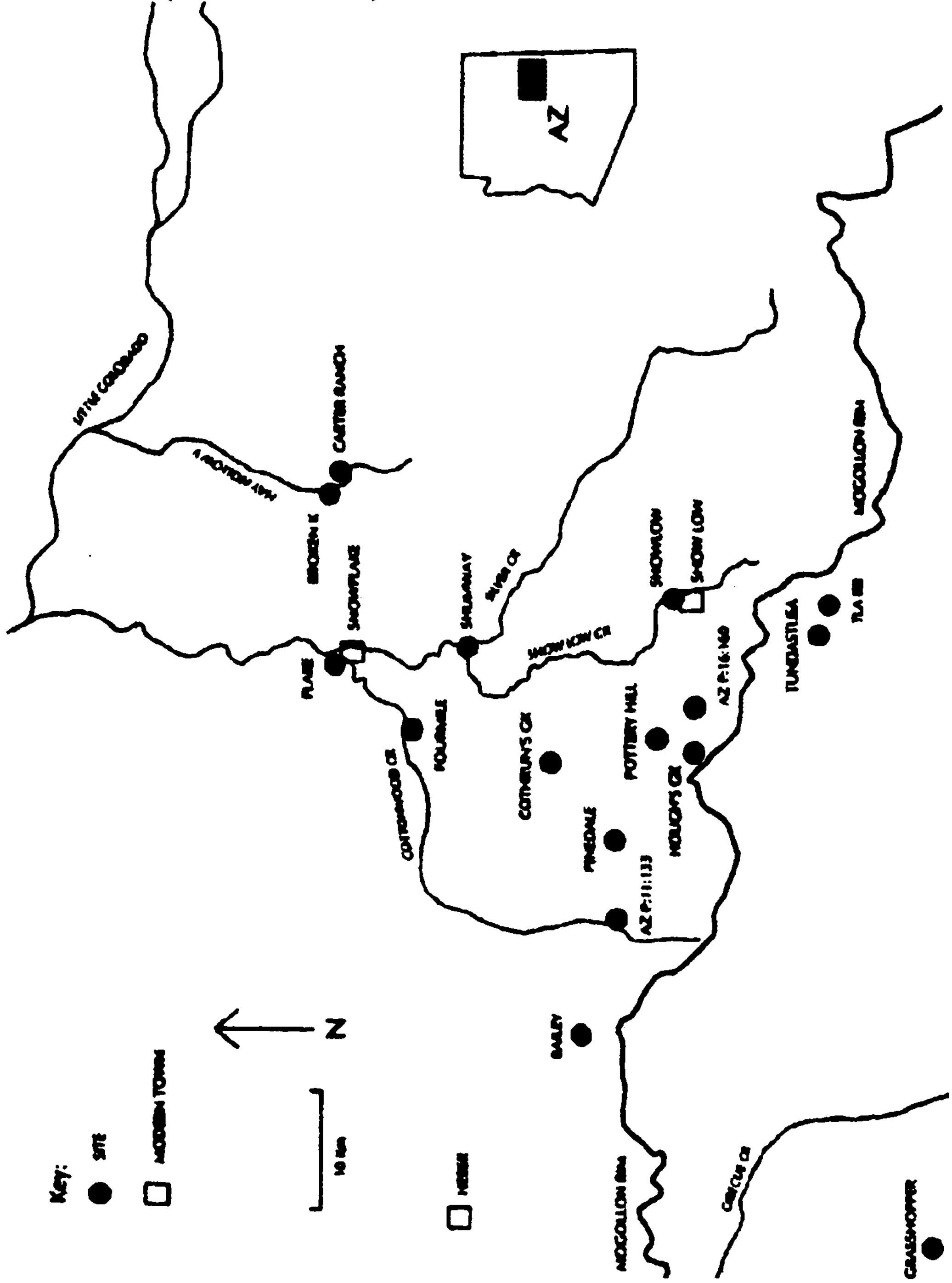
Episodes of migration in areas close to the Mogollon Rim, such as at Point of Pines, have been well documented (Haury 1958). Cases of large scale migration, like the "site-unit intrusion" at Point of Pines, are relatively easy to see archaeologically from the dramatic differences in material culture between the two excavated roomblocks. Episodes of smaller scale migration, which are thought to dominate migration patterns in the Pueblo III and Pueblo IV periods along the Mogollon Rim are much more difficult to see archaeologically (Mills 1998). Smaller migrant communities often were not spatially separated from indigenous communities at large aggregated sites of the Pueblo III and Pueblo IV periods, which led to a need for more rapid integration of these people. Consequently material culture that distinguished migrant and indigenous groups, one of few mechanisms to identify migrant groups in the archaeological record, could have been obscured. However, as Clark (1997:71-72) points out, "social reproduction in domestic settings ensures that groups with different migration histories will retain differences in the way they practice everyday activities." Therefore, material manifestations of the "everyday activities" carried out on a household level may hold evidence of different social backgrounds not visible in other material culture. Corrugated ceramic production is an everyday household based activity, and therefore differences in corrugated ceramics may provide evidence for households with different backgrounds. This will be further expanded in the following chapter.

Integration became particularly important when migrant communities entered into the prehistoric picture. Migrant groups, whether small or large, brought with them different social rules, organization, and lifestyles that may have exacerbated the differences between migrant and indigenous communities. Social differences between these two groups could only be superceded by restructuring the social organization and networks present at these large aggregated sites. It is this restructuring, whether brought on by processes of aggregation, migration, or both, that this thesis seeks to address. In order to address this issue, corrugated ceramics were used as material correlates of household level organization, and the distribution in their attributes was examined for patterning across five sites from the Silver Creek area.

The Silver Creek Area

The Silver Creek area is situated just north of the Mogollon Rim in east-central Arizona close to the modern towns of Show Low to the east and Heber to the west (see Figure 1.1). Flowing to the north, Silver Creek is a tributary of the Little Colorado River (Mills 1999a). Sites in this area demonstrate that it was inhabited throughout the prehistoric sequence, but population density was low until the late 11th and early 12th centuries. During this period, population influx into the Silver Creek area was large enough that it cannot be explained by natural growth rates alone (Newcomb 1999). Great kiva sites also make their first appearance during this period of rapid population expansion. Herr (1999) argues they are a means of integrating the socially disparate peoples coming together at this time. Technological and decorative styles of ceramics found in the Silver Creek area also contain strong evidence for migration into the 13th and 14th centuries (Mills 1999b). Abandonments in the Four Corners area further point to a migration south to Silver Creek and other areas, especially considering the improved environmental conditions along the Mogollon Rim at this time (Kaldahl and Dean 1999; Mills 1998). Although architectural and demographic information for this area does not indicate large scale migration throughout this time period, stylistic evidence from material culture demonstrates that new populations contributed to the formation of large aggregated communities (Mills 1998).

Figure 1.1: The Silver Creek Area – note the Bryant Ranch Site is referred to as AZ P:11:133 (from Mills 1999a)



Evaluation of site sizes through time in the Silver Creek area demonstrates a steady increase in the number of rooms per site, culminating with large aggregated pueblos in the late 13^{th} and early 14^{th} centuries (Mills 1999a). Although sites in the early 12^{th} century rarely had more than 10 rooms, by the late 13^{th} century most sites had more than 20 rooms, and by the 14^{th} century most had more than 50 rooms (Newcomb 1999). An exception to this trend is the Bryant Ranch site, which dates to the late 13^{th} and early 14^{th} centuries A.D., but only has six to ten rooms at most (Mills 1999b). These processes of migration and aggregation must have contributed to the formation of new social identities (Mills 1999b), which this thesis will address at five sites from the Silver Creek area.

Conclusion

In sum, this thesis will critically examine changes in social organization in the Pueblo III to Pueblo IV period transition through an analysis of corrugated ceramics from five sites in the Silver Creek area. From this analysis, I hope to gain a better understanding of the forces that shaped such changes, and how the new forms of social organization were manifested in everyday material culture. Chapter two provides a theoretical background for the analysis. The sample and methods used in this analysis are described in chapter three, and chapters four and five delve into the statistical and archaeological results of the analysis.

CHAPTER 2: THEORY OF TECHNOLOGICAL STYLE

Introduction

Recently, differing theories of style and its implications throughout history have emerged in the archaeological literature. Style itself is not easy to define, and definitions of this concept have diverged as much or more so than the theories used to develop it. Although some archaeologists have attempted to nail down specific definitions, I agree with that of Hegmon (1998:265; cited from Hegmon 1992:518) that style is no more than "a way of doing things." This definition encompasses all variation, which in turn emphasizes that all variation can be stylistic.

Although many theories of style choose to incorporate the idea that variation is stylistic, theories begin to diverge in the type of variation they choose to emphasize. Early theories of style emphasize apparent or decorative variation in material culture as style, and argue that this type of variation served as a type of identity marker or form of communication (Wobst 1977; Weissner 1983). Others saw style in more subtle forms of variation, even variation that was not visible in the finished product of material culture (Lechtman 1977; Sackett 1982). Although these two interpretations of style have essentially the same goal, to describe variation in a meaningful way, the type of variation they emphasize differs greatly. However, it is important to note that these two interpretations are not mutually exclusive, but that each seeks to explain different types of variation and its social implications with diverging conceptions of what type of style is "meaningful" in mind.

Active Style

Theories of style that emphasized its "active" nature in society were first brought to the fore by Wobst (1977). In his landmark piece, Wobst describes a new model for the analysis of style and its role in a given society, which he termed the "Information Exchange Model." This model is based on the assumption that all style is created with the purpose of sending a message, usually about personal identity, to people who are socially distant from one's own social group. Wobst (1977) argues that style most often resides in variation that is readily visible at a distance, such as patterns in clothing. As these patterns are determined by a social group, other groups who are socially distant can easily determine a person's identity from a distance from the patterning on their clothing, or other material culture that they carry. In this way, style "actively" conveys a message about social identity to the larger sphere in which people interact.

Weissner (1983, 1984, 1985, 1990) built on Wobst's Information Exchange Model and ideas of "active" style in her study of Kalahari San projectile points and headbands. Weissner proposed that the general concept of style could be further broken down into two components. The first Weissner (1983:257) termed emblemic style, and defined as "formal variation in material culture that has a distinct referent and transmits a clear message to a defined target population about conscious affiliation or identity." This version of style fits well with that proposed by Wobst, and proposes that style is a visible and obvious signal of identity. The second concept of style proposed by Weissner (1983:258) she termed assertive style, and defined as "formal variation in material culture which is personally based and which carries information supporting individual identity, by separating persons from similar others as well as by giving personal translations of membership in various groups." This definition diverges from that proposed by Wobst in supporting stylistic differences that delineate individual as well as group identity. Common between these two definitions is the idea that style must be active and visible within society in order to transmit its intended message. In order to emphasize this point, Weissner (1984) later asserts that not all variation in material culture is style, and more importantly, only "socially active" variation can be stylistic. In other words, in Weissner's definition of style, it must be created with the purpose of sending a message to a social "other," whether an individual or a group, in order to function as style (Weissner 1985). Both Wobst's (1977) and Weissner's (1983, 1984, 1985, 1990) definitions of style also portray it as delimiting the identity of a large, suprahousehold, social group, and obscure individual and other smaller scale variation.

Technological Style

About the same time that Wobst came out with his Information Exchange Model, a completely different theory of style began to emerge in the archaeological literature. Lechtman (1977) first articulated this idea, that the behavior and technology employed to produce an article of material culture has style in the choices that are made, and called this idea technological style. Under this concept, similar material culture or material culture with similar functions could be produced with vastly different technologies or manufacturing processes. The style in this case would therefore not lie in differences in the final product, as in the theories of style proposed by Weissner (1983) and Wobst (1977), but rather in the process or technology employed to produce the final product. A difficulty with this theory, as Lechtman (1977) pointed out, is ascribing a meaning to this type of style and variation, which is much more challenging than ascribing meaning to more "active" styles described previously. When approaching this task, recognition that the variation that constitutes style reflects the cultural system that manufactured the item of material culture in question will be of great help (Lechtman and Steinberg 1979).

Sackett (1982, 1985, 1986, 1990) also recognized the potential for stylistic expression outside of the decoration of an object. He termed this isochrestic style, and defined it as "seemingly equally valid and feasible options we may regard as functional equivalents with respect to a given end" (Sackett 1982:72). This contrasts greatly with the ideas of style set forth by Wobst (1977) and Wiessner (1983), which Sackett (1982:80; emphasis in original) saw as "style…narrowly equated with specific elements of nonutilitarian formal variation which functions symbolically as a kind of social *iconology* to identify human groups." Sackett (1985) asserted that the definitions of style put forth by those who conformed to the "active" style approach were too narrow, and ignored the variation present in the technology or manufacturing process.

Sackett (1986) further agreed with Lechtman's (1997) assertion that the difficulty in analyzing variation alternatively termed technological style and isochrestic variation is determining the cultural meaning behind such variation. Although Lechtman (1977) stated very generally that such variation reflected culture, Sackett (1986) saw a more specific, yet generally applicable manner of analyzing the meaning of isochrestic variation. "Simply by doing things 'the way they should be done' according to the accepted patterns and standards of their group," Sackett (1986:270) states, "artisans automatically leave an ethnic stamp on their products." This statement is reminiscent of Hegmon's (1998) definition of style mentioned earlier, and points out that isochrestic variation and technological style also reflect identity, much as the theories of style proposed by Weissner (1983) and Wobst (1977) do. However, the critical difference lies in the degree of "active-ness" of the style and the scale of identity defined. While Weissner (1983) and Wobst (1977) assert that style is created with the sole purpose of actively signaling a message of identity, Lechtman (1977) and Sackett (1982, 1985, 1986, 1990) suggest that style can be passive or latent as well, signaling a message concerning identity only when such a message is sought out. Otherwise, the passive stylistic differences seen by Lechtman (1977) and Sackett (1982) also serve to reinforce ethnic identity among the group that produced a stylistic object of material culture. The ethnicity, or identity reflected here runs the gamut from a small, individual scale, to the community level, the largest social grouping.

From Theory to the Real World

From the previous discussion, we have seen two distinct theories of style emerge from the archaeological literature. Although not mutually exclusive of each other, these two theories suggest radically different approaches to style – one focusing on more obvious variation manifested in decoration and embellishment, and the other focused on variation inherent within an object of material culture as a result of the manufacturing process. The stylistic theory chosen as the basis for a given analysis depends on the questions posed and the answers sought. Large, regional social differentiation or questions of identity might be more fruitfully pursued using a theoretical base of "active style," which seeks to find social differentiation between groups that are socially distant. On the other hand, questions of social differentiation on a smaller scale, such as the differentiation of families within a larger social group, might be better suited to analyses of technological style, which highlight differences in enculturative backgrounds and learning frameworks on a smaller social scale. However, it should be understood that each theoretical basis could be employed and yield informative results on a range of social scales from the individual to the community. A number of different studies have applied theories of technological style to real world situations, and have come up with interesting results that have proven the usefulness of this particular theoretical picture of style (Arnold 1989; Gosselain 1998; Hardin 1977; Lemonnier 1986, 1989, 1992).

Ethnographic Examples

Ethnographic studies pursued by Lemonnier (1986, 1989, 1992) and Gosselain (1998) have demonstrated that the technology of making everyday objects used in a variety of cultures can take a number of forms. In studying the Anga of Papua New Guinea, Lemonnier (1986, 1989, 1992) found that this one regionally defined group manufactured spear shafts, pig traps, bark aprons, and houses in a number of different ways. Each final product was used for the same activity or served the same purpose, and each product was manufactured with the same suite of raw materials. The crucial difference between these objects was the manner in which they were manufactured. Furthermore, each distinct technology of manufacture has a distinct geographical distribution within the region inhabited by the Anga.

Gosselain (1998) also noted a similar pattern among pottery makers belonging to 21 linguistic groups in southern Cameroon, Africa. Gosselain (1998) observed the entire pottery production process and noted important differences in the *chaîne opératoire*, or manufacturing sequence, between linguistic groups. Importantly, these differences in the process of manufacturing ceramics did not affect the outcome of the process, which was a functional ceramic vessel. Gosselain's (1998) research thus emphasizes that the process of making an object can be equally as informative as the end result or final product (Dobres and Hoffman 1994). Gosselain (1998:87) further states "all these options allow one to achieve the same goals, from both a technical and functional point of view." These two examples demonstrate the utility of theories of technological style, in that variation in the process of manufacturing an object of everyday material culture, which may also be manifested in the final product, distinguishes among "ways of doing things" and reflects upon different ethnic and enculturative backgrounds. However, both Gosselain and Lemonnier note the difficulty of determining the meaning behind such differentiation in technological style in their research, and further point out the exacerbation of these problems in an archaeological context (see also McGuire 1982).

Hardin (1977) found similar results among the San José potters of central Mexico. Although the designs on each vessel were similar, each potter had a distinctive sequence of brushstrokes used to create the same design element. In this case, the sequence of producing designs on ceramic vessels distinguished individual potters as well as potters related through kin or coresidence, much as the sequence of production of ceramics distinguished among linguistic groups in Gosselain's (1998) study area.

Enculturative backgrounds and learning frameworks are perpetuated as the knowledge used to manufacture an item is passed down to descendants of the same social group (Braun 1994, but see Stanislawski and Stanislawski 1978 for a different, though poorly documented, view). Most often, these skills are passed down to people within the same familial group who teach other "life skills," such as a mother. In another ethnographic study of potters in Mexico, Arnold (1989) found that the teachers of pottery production in his study sample had a great influence on the style of his or her students. Each teacher's style was perpetuated through the students that he or she taught. In addition, the teacher in each learning situation was almost always related to his or her students and lived in the same house or in close proximity. This research suggests that familial ties played a large role in the manner in which ceramic technology was taught and learned in Arnold's (1989) study area, and that specific styles clustered spatially due to these teacher student relationships.

Two pertinent examples of the manner in which technology and technological style are taught and perpetuated from our own society are the way in which people make a pot of coffee, or the way in which people make their beds. While some people fill a coffee maker with water before placing the filter and coffee in, others will do these tasks in the reverse order. Still other people will make coffee with a coffee press, or a percolator. Likewise, some people will carefully fold hospital corners into their neatly tucked in sheets and blankets, while others will simply throw sheets and blankets haphazardly onto a bed to be sorted out later. In both of these examples, the "life skills" in question (if coffee can be considered an essential for life) are generally taught within a family setting, and usually by a close relative, a mother or father. The skills are then passed down through time, and differentiate families from one another.

Archaeological Examples

Unlike items that have "active" style that is used to negotiate and display identity and group affiliation, items that contain technological style are less likely to be consciously manipulated or changed by any given person who employs that style (Stark 1998). Therefore, differences or variation in technological style are likely to be perpetuated and differ consistently, to some degree, through time for emically defined small-scale ethnic groups. Stark et al. (1998) found this to be the case in their study of social boundaries during the late prehistoric occupation of the Tonto Basin, Arizona. In this case, analyses of the technological style of both ceramics and domestic architecture in this area indicated regular interaction between migrants and indigenous populations through time. Despite this frequent social interaction, social boundaries between these two groups were well maintained, as evidenced by their differential ceramic and architectural styles.

Stark et al.'s (1998) study also highlights that technological style is most often manifested in everyday items that are manufactured by a process of motor skills or habits that must be taught. Corrugated ceramics in the prehistoric Southwestern United States are one such type of material culture. It has been hypothesized that corrugated ceramics were manufactured and used on a household level for cooking at sites throughout the traditionally defined Anasazi and Mogollon culture areas (Stone 1986). Several analyses of corrugated ceramics have shown technological style to be an informative and fruitful framework for research (Dobscheutz 1999a, 1999b; Hegmon et al. 2000; Stark et al. 1995). Each of these analyses demonstrated spatial clustering of technological styles of corrugated ceramics within the study areas in question. In addition, other, independent lines of evidence suggested that these differences reflected small-scale social variations between distinct groups present in each area.

Corrugated Ceramics

As previous research and theoretical underpinnings of technological style suggest, corrugated ceramics are an excellent candidate for analyses using a technological style framework. Research has demonstrated that corrugated ceramics were likely manufactured and used on a household level (Pierce 1999) and therefore were not intended to actively convey messages to other social groups. The manufacture of corrugated ceramics was a motor habit that had to be taught, and was likely passed down within social groups that were household based. Therefore, differences in corrugation technology may be the result of different enculturative backgrounds and learning frameworks that are realized in different operational sequences or technological styles, and therefore may help to delimit the presence of small-scale social groups and organization at sites in the prehistoric Southwest.

<u>A Cautionary Note</u>

Not all studies based on the theories of technological style conclusively prove that small-scale social groups were distinguished by differences in technological style of all items of material culture. For example, David et al.'s (1991) study of material culture in North Cameroon demonstrated that differences in material culture do not distinguish linguistically defined groups, but may represent ethnic groups defined by political, ritual, or technological criteria. Esse (1992) found that collared pithos, ceramics assumed to be associated exclusively with Israelites in Middle Eastern Iron Age I sites were also associated with sites of other ethnic groups. In the Southwest, Magers (1986) determined that textiles manufactured in different technological styles did not necessarily cluster spatially at the Antelope House site in northeastern Arizona, suggesting that these textiles were not utilized exclusively by the same group that produced them.

In another vein, research completed by DeBoer (1990) among potters in Peru demonstrates that a number of unrelated, and archaeologically invisible, factors influence enculturative backgrounds and learning frameworks. This research demonstrates that thorough research must be applied before blanketly assuming that kin relations were the only factor in determining the source of a learning framework or ethnically defined group. In their research in historic Washington D.C., Cheek and Friedlander (1990) found that differences in subsistence practices may have been compounded by economic factors as well as ethnicity. Hardin (1977) found that the ability of ceramic design styles to sell more quickly greatly influenced the stylistic variation employed by San José potters in Mexico. In this case, the "active-ness" of the style in question plays a large role. Those designs that held a favorable signal to their purchasers, perhaps those which the purchasers felt captured the identity or essence of the producer, sold more quickly, and were thus chosen to be replicated by their producer. These results demonstrate that the implications of differences in technological style must be carefully considered in order to certify their validity for the site and time period at hand.

Technological Style, Corrugated Ceramics, Migration, Identity, and the Silver Creek area

It has been demonstrated (Mills 1998) that the Silver Creek area of east-central Arizona, the focus of this thesis, was the receiving end of migration from the Four Corners area of the Southwestern United States during the Pueblo III to Pueblo IV transition. Material and architectural traits, such as perforated plates and kivas, which are most often associated with Four Corners area populations, begin to appear in the Silver Creek area during this period. Decorated ceramic styles, such as the Pinedale style, from Silver Creek sites show distinctively northern traits at this time as well. Local production has been demonstrated for many of these ceramics (Mills et al. 1999d), suggesting their producers used local raw materials to produce northern styled vessels. A similar trend is seen in the Homol'ovi area to the north, where stylistic as well as compositional characteristics of ceramics from these site indicate the presence of a migratory population from the Hopi area. This ceramic evidence is further corroborated with the forms of ceremonial architecture at these sites (Lyons 2001). Sites in this area do not hold evidence for a massive exodus from the Four Corners; no "site-unit intrusions" have been found that are often associated with the receiving end of such large-scale migrations (Di Peso 1958; Haury 1958; Rouse 1958). Therefore, if a migration into the Silver Creek area did occur, it was likely on a small scale, perhaps household or family-unit level. At this level, Schwartz (1970) has suggested that migrant groups may make an initial effort to show solidarity with their host group in order to facilitate social relations. As a result, many aspects of their material culture, especially those that are used in interactions with the host group, are likely to conform to the material culture of the host group to better "fit in." In this case, material differences between the newly arrived migrant group and the host group would only be seen in objects that were produced and used on a household level. Most other classes of material culture would instead render the migrant group archaeologically invisible.

Corrugated ceramics are one aspect of material culture that may not have been affected by the need to assimilate (Schwartz 1970). While decorated ceramics were likely used in contexts that involved multiple social groups and integrative processes, such as the exchange of vessels, ceremony, and feasting, corrugated ceramics were probably used for household level tasks such as cooking and water transportation (Pierce 1999; Young and Stone 1990). Therefore, corrugated ceramics may have withstood processes of assimilation due to their use by a single household. It was with this in mind that the following analysis of attributes related to the technological process of forming corrugated ceramics was undertaken. If differences in the technological style of corrugated ceramics are seen at the five sites in this analysis, these results will support the hypothesis of a migration to this area from the Four Corners during the Pueblo III to Pueblo IV transition. If not, it is important to understand why these differences did not appear in the analysis, and what the implication of each result is for the understanding of this time period and the social dynamics that characterized the Silver Creek area.

CHAPTER 3: METHODS OF ANALYSIS

Introduction

In order to evaluate whether different social groups produced distinct technological styles of corrugated ceramics within the Silver Creek area during the Pueblo III to Pueblo IV transition, an analysis of eleven attributes of corrugated ceramics was undertaken. Attributes were selected on the basis of their representation of the technological process of constructing corrugated ceramics and the potential to be measured on sherds rather than whole vessels. This chapter describes the sample of sites and ceramics chosen for this analysis, definitions of the attributes, and the methods used in the analysis.

The Sites

Cothrun's and Hough's Great Kiva

The two sites of Cothrun's Kiva and Hough's Great Kiva were excavated by the Silver Creek Archaeological Research Project (SCARP) in the summer field seasons of 1993 to 1997. Cothrun's Kiva is situated on a small mesa between two small tributaries, and contains a roomblock with over five rooms and a great kiva to the northeast, and a midden to the southeast. The great kiva measures 17.5 meters in diameter. One entire room, and half of two others were excavated, as well as a number of trenches in the great kiva and midden (Herr et al. 1999). Room excavations did not encounter a trash fill level, indicating that occupation at this site was short (Herr 1999). Calibrated AMS dates and ceramic indicators suggest that this site was most likely occupied between A.D. 1000 and 1050 (Herr et al. 1999).

Hough's Great Kiva contains a roomblock with nine rooms situated on a small ridge, a great kiva downslope and to the southeast, and a midden to the southeast of the structures. The great kiva is 24 meters in diameter, and both the roomblock and the great kiva face the southeast. One entire room, and half of another were excavated in addition to trenches in the great kiva and midden (Herr et al. 1999). The lack of a trash fill level in either room indicated that this site was only occupied for a short time as well (Herr 1999). Tree-ring dates indicate this site was occupied beginning between A.D. 1119 and 1123/1124 (Herr et al. 1999).

Pottery Hill

SCARP conducted fieldwork at Pottery Hill during the 1993 through 1997 field seasons. Pottery Hill is situated on a terraced ridge, and has an estimated 45 to 50 rooms in six roomblocks. A roomblock on a lower terrace contains a square kiva, and with several other roomblocks surrounds a plaza area that is not fully enclosed. Midden deposition suggests a lengthy occupation, which has been estimated to extend from A.D. 1200 to 1275. Two rooms, the kiva, and numerous trenches in the plaza, midden, extramural and ramada areas, and a jacal structure were excavated (Mills et al. 1999a).

Bryant Ranch Pueblo

The Bryant Ranch Site was excavated by SCARP crews during the 1999 and 2000 summer field seasons. The site consists of a three room roomblock situated on a small rise to the north, which overlooks the rest of the site – another two room roomblock, a square kiva, and a plaza area. Two rooms and three-quarters of another were excavated, as well as the kiva and plaza area to the south, and the midden to the east. Site layout and artifact density suggest that two distinct occupations may have occurred at the site, with the first occupation represented by the roomblock on top of the small rise, and the downslope part of the site representing the second occupation of the area. Midden deposits suggest that the occupation of the site was not lengthy, possibly as short as ten years. Ceramic cross-dating illustrates that the occupation of Bryant Ranch occurred between A.D. 1250 to 1300 (Mills et al. 1999b; Mills et al. 2000), and a cutting date in the A.D. 1280s narrows the window even more.

Bailey Ruin

SCARP excavated at the Bailey Ruin during the 1993 to 1997, as well as 1999 field seasons. The site is a compact masonry pueblo, built by accretion to surround a central plaza area on a northfacing slope. Bailey is estimated to have 200 to 250 rooms, and some areas of the site had two stories. Discrete trash middens surround the pueblo. Seven rooms, as well as numerous plaza and midden trenches were excavated. Ceramic cross-dating suggests an occupation span of A.D. 1275 to 1325 (Mills et al. 1999c).

Summary

These five sites together represent a sample of occupation spanning the Pueblo III to early Pueblo IV periods. The apparent trend towards larger and more aggregated sites, as well as evidence for migration found at these sites and in this area makes this an ideal sample to examine the effects of migration and aggregation on the material manifestation of identity and social group during this period.

The Ceramics

Corrugated sherds from the five previously described sites were analyzed. These five sites (see Table 3.1 for a summary of names and periods of occupation) are all located within the Silver Creek area and were occupied during postulated periods of

Table 3.1: Site Names and Periods of Occupation

Site	Date	Reference
Cothrun's Kiva	AD 1000-1050	Herr et al. 1999
Hough's Great Kiva	AD 1119/1124-1175	Herr et al. 1999
Pottery Hill	AD 1200-1275	Mills et al. 1999a
Bryant Ranch Pueblo	AD 1250-1300	Mills et al. 1999b; Mills et al. 2000
Bailey Ruin	AD 1275-1325	Mills et al. 1999c

extensive inmigration (Mills 1999b). They are therefore ripe for the consideration of differences in technological style, as each of these sites may have been inhabited by both indigenous and migrant populations. Due to the different social organization of such populations, they likely produced ceramics reflecting different learning frameworks or enculturative backgrounds, which would be apparent in the final vessel, and the resulting sherds from that vessel as well. In order to examine this hypothesis, corrugated sherds from each room were analyzed, and metric and categorical measurements were recorded. Up to fifty sherds from the floor context and up to fifty sherds from the fill context of each room were examined. Sherds from the floor context were separated from sherds in the fill context in order to control for differences in the depositional processes, under the assumption that sherds from the floor of a room were deposited by its inhabitants, while sherds from the fill context were deposited after its abandonment by inhabitants of adjacent or nearby rooms. During the process of the analysis, sherds from each context were compared to ensure that only one sherd from each vessel represented in the assemblage was analyzed to eliminate all possible biases. Table 3.2 lists each site and context, and the number of sherds analyzed from each.

Table 3.2: Sample Size Within Each Site and Context

Bailey Ruin

Context	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Floor	13	50	5	35	0	14	0
Fill	50	16	37	42	37	50	0
Undifferentiated Context	0	4	0	0	0	0	13

Bryant Ranch Site

Context	Room 1	Room 2	Room 4
Floor	4	4	19
Fill	3	9	14

Pottery Hill

Context	Room 1	Room 3
Floor	21	7
Fill	25	14

Cothrun's Great Kiva

Context	Room 1	Room 2	Room 4
Floor	2	0	1
Fill	19	1	10

Hough's Great Kiva

Context	Room 1	Room 2
Floor	5	2
Fill	22	12

Initial Analysis of Methods

Two methods of analysis were available for the measurement of coil width and indentation width: digital calipers and a digital imaging system. Previous analyses undertaken by the author suggested that they produced similar results, but in order to assure the greatest accuracy and precision possible in the analysis of coil and indentation width, a preliminary evaluation of these two methods was undertaken.

A ruler, with standardized metric measurements, was measured in a series of ten trials of five different lengths (0.5 cm, 1, 2, 3, and 5 cm), which were intended to represent the range of measurements encountered in the attributes measured in an average assemblage of corrugated ceramics. The ruler was first measured with the digital calipers, and then with a Spot digital camera using the Image Pro Plus software package. The results were recorded, and descriptive statistics run to evaluate the results (see Table 3.3). Error around the intended measurement was treated as an absolute value, therefore measurements above and below the intended measurement were treated similarly.

Table 3.3: Digital Calipers vs. Digital Imaging System Results

Digital Calipers

	0.5cm	1cm	2cm	3cm	5cm
minimum error (mm)	0.03	0.06	0.02	0.02	0.02
maximum error (mm)	0.20	0.28	0.28	0.12	0.25
mean error (mm)	0.08	0.12	0.12	0.07	0.11
mean measurement (mm)	4.99	10.08	20.11	30.01	50.05

total average error = 0.102 mm

Digital Imaging System

	0.5cm	1cm	2cm	3cm	5cm
minimum error (mm)	0.10	0.20	0.80	1.40	2.20
maximum error (mm)	0.30	0.80	1.00	1.70	2.70
mean error (mm)	0.20	0.40	0.90	1.50	2.40
mean measurement (mm)	4.91	9.54	19.10	28.50	47.60

total average error = 1.08 mm

The results of this analysis demonstrate that the digital imaging system is more precise, while the calipers produce more accurate measurements. The error in the measurements taken by the digital imaging system went up as the length of the measurement went up, but each set of measurements was internally consistent. By contrast, the error for each set of measurements with the digital calipers was comparable, but these measurements varied more around the intended measurement in comparison to the digital imaging system. However, the results in Table 3.3 demonstrate that the total average error produced with the calipers was ten times smaller than that of the digital imaging system. This is likely due to the constraints of pixels in the digital image produced by the digital imaging system. In order to accurately place the computer's measuring pointer on the image, it was necessary to enlarge the image and consequently the pixels, which inhibited the correct placement of the measurement pointer. Since the total average error for these two methods of measurement was so drastically different, I chose to use the digital calipers for the remainder of the analysis, the more accurate method with the least error.

The Attributes

The attributes selected for this analysis were chosen to reflect technological processes on a sherd basis. Previous analyses undertaken by the author also helped to demonstrate which attributes were most likely to demonstrate technological differences. The eleven attributes selected for this analysis are as follows (Table 3.4):

Table 3.4: Attributes Analyzed

1. Coil Width
2. Indentation Width
3. Indentation Depth
4. Obliteration
5. Rim Diameter
6. Rim Arc Length
7. Rim Style 1
8. Rim Style 2
9. Rim Distance
10. Rim Thickness 1
11. Rim Thickness 2

After completing the analysis, it became apparent that the sample of rim attributes at each site was too small and so they were eliminated from further analysis (Table 3.5). Therefore, statistical analyses were only carried out with the four attributes that were measured on body sherds: coil width, indentation width, indentation depth, and obliteration. All eleven attributes and their measurement techniques are described in the following section in order to facilitate comparability with future research.

Table 3.5: Sample Size of Rim Sherds in Each Context

Bailey Ruin

Context	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Floor	0	12	0	3	0	2	0
Fill	8	0	5	4	7	4	0
Undifferentiated Context	0	0	0	0	0	0	3

Bryant Ranch Site

Context	Room 1	Room 2	Room 4
Floor	0	0	5
Fill	0	2	0

Pottery Hill

Context	Room 1	Room 3
Floor	3	1
Fill	3	0

Cothrun's Great Kiva

Context	Room 1	Room 2	Room 4
Floor	0	0	0
Fill	1	0	1

Hough's Great Kiva

Context	Room 1	Room 3
Floor	1	1
Fill	0	1

Attribute Definitions and Measurement Methods

Coil width, the first attribute, was defined as the distance between two coil junctures visible on the surface of a corrugated sherd (see Figure 3.1). Often, coil junctures were somewhat obscured due to surface obliteration of the sherd, but the location of the coil junctures was still evident from the indentation boundaries. Indentation width was defined as the width of the widest part of the indentation, which was often along the coil juncture (see Figure 3.2). Coil width and indentation width were both measured with digital calipers. Three measurements were taken for each, which were then averaged. The average measurement of each attribute for each sherd was utilized in the statistical analysis.

Indentation depth was defined as the difference between the lowest part of the indentation and the highest part of the adjacent coil (see Figure 3.3). Indentation depth was measured by placing a toothpick within the deepest part of the indentation, and marking the level of the highest part of the adjacent coil on the toothpick with a pencil. A mechanical pencil with the same width lead was used throughout the analysis to eliminate variability. The length marked on the toothpick was then measured with digital calipers and recorded.

Since most measures of obliteration on corrugated sherds are somewhat subjective, I attempted to objectify this measurement as much as possible in order to make the results of the analysis of this attribute more robust. Obliteration, in this case, was defined as the blurring of coil junctures such that they were only visible through the

Figure 3.1: Measuring Coil Width

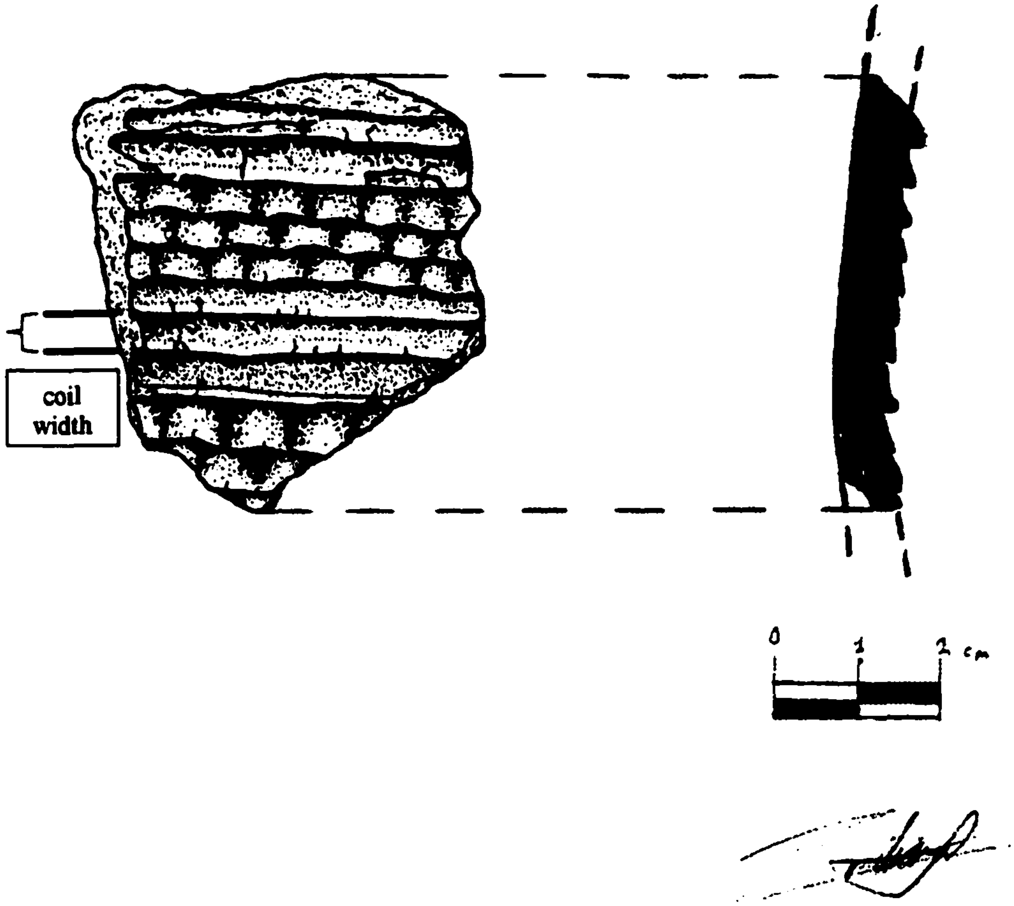


Figure 3.2: Measuring Indentation Width

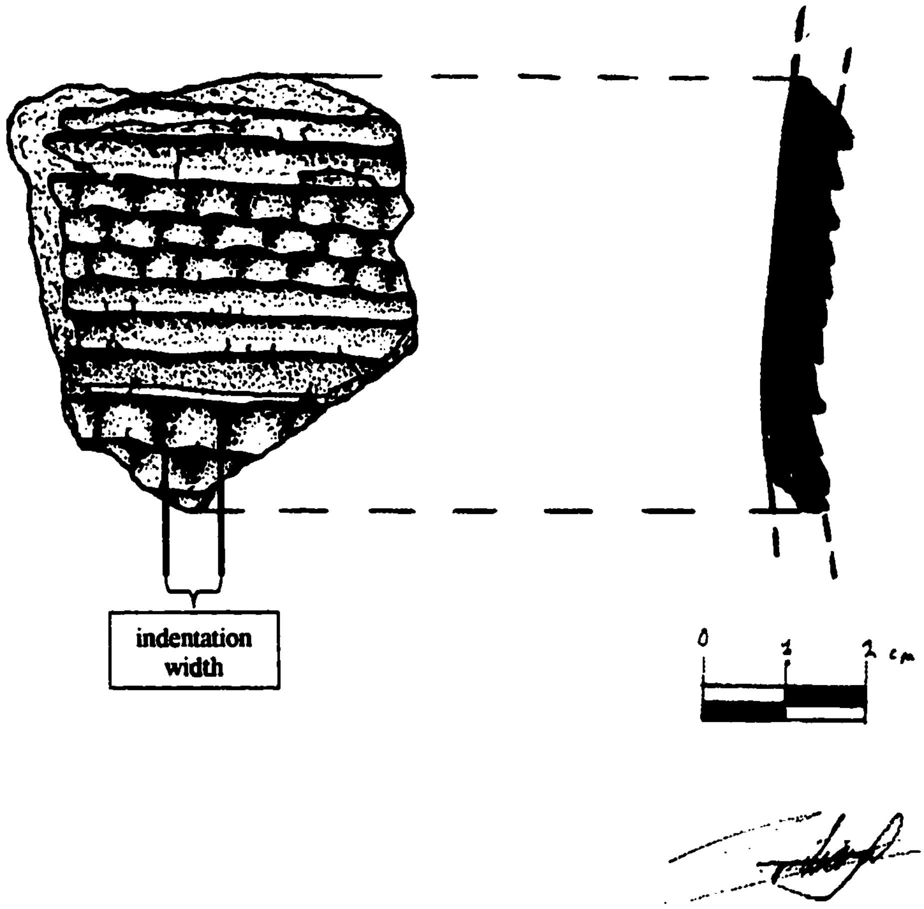
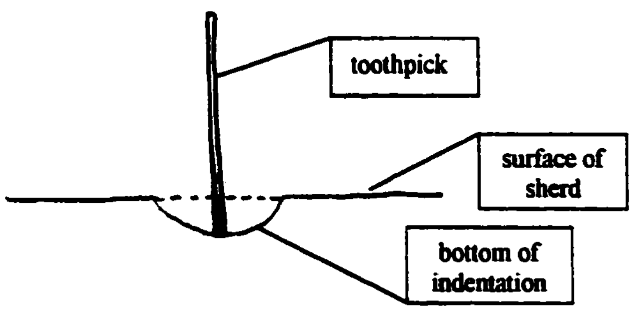


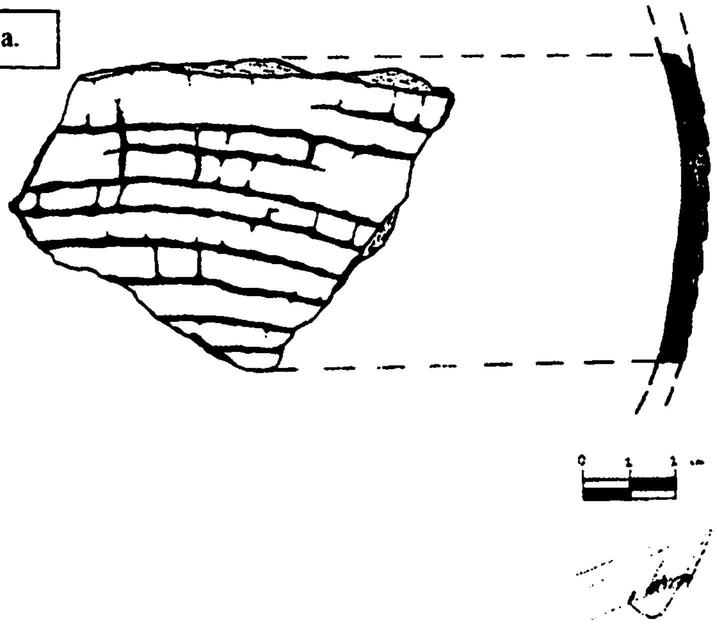
Figure 3.3: Measuring Indentation Depth (shaded area of toothpick is indentation depth)



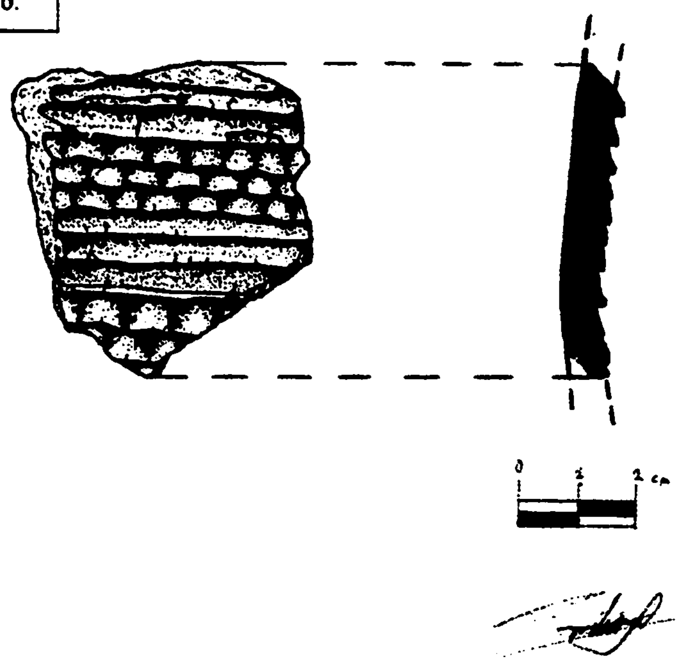
boundaries of indentations (see Figure 3.4 for an example of an obliterated and a non-obliterated sherds).

Figure 3.4: a. Obliterated Sherd; b. Non-obliterated Sherd

a.

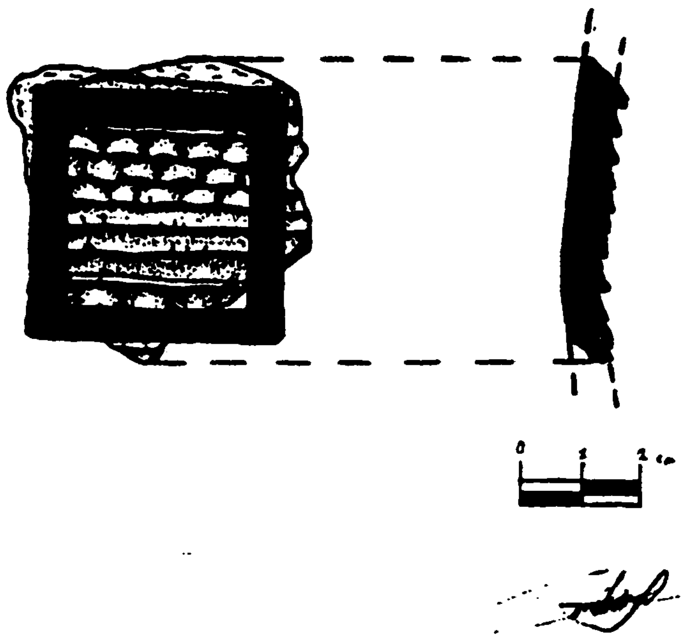


b.



To obtain a numerical measure of obliteration, I placed each sherd under a cardboard cutout of a three centimeter square area (see Figure 3.5). I counted the total number of coil junctures within this area and the number of obliterated coil junctures. I then calculated the ratio of obliterated coil junctures to total coil junctures. For example, if a sherd had five coil junctures visible, and all were obliterated, the measure of obliteration was one (5/5=1). If a sherd had seven coil junctures visible, and only two were obliterated, the measure of obliteration would be 0.29 (2/7=0.29). If no coil junctures visible in the cutout were obliterated, I assigned an obliteration measure of 0.01. Therefore, these measures of obliteration ranged from 0.01 (no obliteration) to 1 (fully obliterated). This method lessened the subjective effect of the appearance of each sherd on the measure of obliteration, and allowed the measurements a greater degree of objectivity.

Figure 3.5: Measuring Obliteration



Rim diameter was measured on a rim radius table, and recorded in whole centimeters. Rim arc length was measured with a flexible ruler, and recorded in centimeters. Only rim sherds with an arc length of two centimeters or more were included in this analysis. Rim styles 1 and 2 were recorded according to the guidelines in Colton (1953:44). Rim style 1 designated rim form, while rim style 2 designated the rim orientation. In order to facilitate statistical analyses, the orientation A designated by Colton was recorded as 1, orientation B as 2, and so on. Distance was defined as the distance from the edge of the rim to the beginning of the first coil with corrugations or indentations, and was measured with a flexible ruler. Two rim thickness measurements were taken. The first was a centimeter from the edge of the rim, and the second was two centimeters from the edge of the rim. Both centimeter markers were demarcated with pencil on the inside of the sherd, and measured with digital calipers.

In addition to these attributes, five provenience designations were recorded. Each sherd was given a unique number sequentially through the analysis, which was written on the back of each sherd in pencil. Analyzed sherds were also bagged separately within each bag after analysis. This facilitated record keeping and reanalysis when data was lost. In addition, the site number, FS number (which designates a unique three-dimensional area of excavation), room number, and a context designation were recorded. Replication of this analysis could be easily completed with this information.

CHAPTER 4: STATISTICAL RESULTS

Introduction

My analysis investigates whether differences in corrugation technology are present at the five sites discussed in the previous chapter. As noted earlier (see Chapter 2), learning frameworks affect the technological style of ceramics and often can be used for distinguishing different social groups in the archaeological record. Given that people with socially disparate backgrounds are known to be present in the Silver Creek area, I was interested in investigating whether these differences were present at either the intra- or inter-site levels. In order to critically examine whether attributes of corrugated ceramics reflect different social groups during the Pueblo III to Pueblo IV period transition, a series of statistical tests were run. This chapter describes those tests. Chapter 5 will then explore the behavioral mechanisms responsible for the differences in technological style seen in the statistical results.

Site Based Statistics and Analysis

In order to better characterize the diversity, or variability, seen in the corrugated ceramics analyzed in this sample, a number of statistical tests were performed on the data from each site. Analyses compared the data from distinct contexts – floor and fill – from each room to determine if there were significant differences in the attributes measured between rooms. Rooms with an inferred habitation use were analyzed separately from non-habitation rooms, and floor contexts were analyzed separately from fill contexts. These distinctions were made for two main reasons: first, the non-habitation rooms were often inferred to be communal spaces used by a number of families or households.

Therefore, the contents of these rooms, in both floor and fill contexts, may have been the result of deposition by groups with varied enculturative backgrounds, and are less likely to have distinct patterning in the four attributes analyzed. Secondly, floor and fill contexts were separated as each of these contexts has a different depositional history. Floor contexts are often inferred to have been left by the inhabitants of that room, who were likely from a single family or household, while fill contexts are often assumed to have been deposited by inhabitants of rooms surrounding that room after its abandonment. Therefore, fill contexts are generally the result of deposition by multiple households, while floor contexts are the result of the deposition of a single household (Plog 1978).

One-sample Komolgorof-Smirnov tests were run for all contexts in all rooms at each site. The statistical distribution of each attribute was tested against a hypothetical normal curve to determine whether it was normally distributed in each context. Each of these tests resulted in a probability of zero ($p=0$), with only a few exceptions. Therefore, the vast majority of statistical distributions analyzed here are not normally distributed, and non-parametric tests were used to test for significant differences in the data.

Cothrun's Kiva

Corrugated ceramics from three rooms at the Cothrun's Kiva site were analyzed. Analyses of sherds from room floor contexts were only performed for Rooms 1 and 4, as Room 2 did not have any analyzable corrugated sherds on its floor. The samples from the room floor contexts from both of these rooms are incredibly small; two sherds were analyzed from Room 1 and only one from Room 4. The room fill samples were appreciably larger, except in Room 2 where only one sherd was analyzed from the fill. All three rooms at this site were exclusively used for habitation.

Descriptive Statistics

Given the small sample size of room floor contexts from both Rooms 1 and 4, the measures of central tendency are difficult to compare meaningfully. Ignoring the small sample size, however, the means and medians of these samples are roughly equal, although their coefficients of variation are highly variable (see Table 4.1; all tables for Chapter 4 except Table 4.11 are in Appendix A). Comparison of the measures of central tendency from room fill samples, excluding Room 2 due to its small sample size, reveals that the means and medians of each attribute in the room fill context are roughly similar. Coefficients of variation in room fill are equally as variable.

Kruskal-Wallis and Mann-Whitney U Tests

None of the five non-parametric tests performed for the Cothrun's Great Kiva site resulted in a significant difference between the variables tested (see Table 4.2). Tests were run comparing each entire room and room fill contexts, both with and without the small sample in Room 2. A test of room floor context was also completed, although these results are suspect due to the small sample sizes in both Rooms 1 and 4. Even with some suspect results it is clear that there are no significant differences in any of these attributes between rooms at this site.

<u>Hough's Great Kiva</u>

Corrugated ceramics from two rooms at the Hough's Great Kiva site were analyzed next. Both rooms were exclusively used for habitation throughout their occupation. The sample size for the floor contexts of both Rooms 1 and 2 are small, particularly that of Room 2, which may affect the results of the analysis.

Descriptive Statistics

The descriptive statistics, particularly the measures of central tendency of the floor and fill samples analyzed from each of these rooms, are highly variable (see Table 4.3). The samples from the fill of each room generally have very similar means and medians, with moderate to high coefficients of variation. The measures of central tendency appear so similar that it seems unlikely that any of the variables will be significantly different when tested. On the other hand, the measures of central tendency and CVs from the room floor contexts contain a high degree of variation. For example, the CVs for the room floor assemblage of Room 2 (n=2) varied from 0.024 (coil width) to 1.386 (obliteration). Although not as pronounced, similar variability is seen in the Room 1 floor assemblage, where the CV varies from 0.03 (coil width) to 0.789 (obliteration). This variability can be partially attributed to the small sample size of each of these two room floor contexts.

Mann-Whitney U-Tests

Three Mann-Whitney U tests were performed on this data, testing the entire room, floor contexts only, and fill contexts only, none of which resulted in significant differences in the statistical distribution of each attribute between rooms (see Table 4.4). However, results of the test of room floor contexts are somewhat suspect due to the small sample sizes from both Rooms 1 and 2.

Pottery Hill

Corrugated sherds from two rooms at Pottery Hill were analyzed and tested here. Room 1 was entirely used for habitation, and the sample analyzed from both the floor and the fill of this room were large enough to draw fairly robust conclusions. However, Room 3 contained evidence of two separate occupations. A surface in Room 3, from which a small sample of sherds was analyzed, was determined to be from a non-habitation occupation of this room during its excavation. However, the fill of Room 3 was determined to be from a later re-use of the room, and the refuse from this later occupation indicated it was from habitation. Because the floor assemblage from Room 3 was from a non-habitation occupation, and no other non-habitation rooms were analyzed from this site, the floor sample from Room 3 was largely left out of the subsequent analyses of the site.

Descriptive Statistics

An examination of the measures of central tendency of the attributes analyzed in the room fill contexts at Pottery Hill demonstrates considerably less variability between rooms than is present at the two previous sites discussed (see Table 4.5). The coefficients of variation, however, demonstrate a comparable degree of variability within each sample. Although the samples from the floors of Rooms 1 and 3 cannot be unequivocally compared as they come from rooms with different functions, the means and medians from these two samples are relatively similar as well. A comparison of the CVs for floor and fill contexts between the two rooms reveals a high degree of difference in the variability present in each sample. However, the relative similarity in the measures of central tendency alternatively suggest that there is less likely to be significant differences between the statistical distributions of each attribute in these two rooms.

Mann-Whitney U-Tests

Four Mann-Whitney U Tests were performed on the data, testing for significant differences in the attributes analyzed between the two rooms at Pottery Hill (see Table 4.6). Both rooms, including the non-habitation surface in Room 3, were tested first, followed by the same test excluding the non-habitation surface in Room 3. Room floor contexts (habitation and non-habitation) were then compared, followed by a test of habitation room fill contexts. No significant differences in the statistical distributions of any of the four attributes were found. It should be noted, however, that the results of the test of room floor contexts are somewhat suspect given the small sample size in Room 3.

<u>The Bryant Ranch Site</u>

Corrugated ceramics from three rooms at the Bryant Ranch site were analyzed and the results tested here. All three rooms were used exclusively for habitation throughout their use, therefore consideration of room function did not play a part in the analysis at this site. The small sample size of analyzed sherds in Rooms 1 and 2 at this site was somewhat problematic throughout the analysis.

Descriptive Statistics

An examination of the measures of central tendency of each attribute at this site demonstrates a moderate degree of variability between the three rooms analyzed (see Table 4.7). The coefficients of variation also demonstrate a moderate to high degree of variability within each attribute and context, with the exception of obliteration in Room

1, and coil width in the fill of Room 1. Sample size, however, becomes an issue immediately, as the three sherds analyzed in the fill of Room 1, or the four sherds analyzed from the floor of Room 2 are not a very representative sample upon which to base further tests. Nonetheless, given the variable nature of archaeological populations available for statistical analyses, these small samples must serve as the basis of further tests and conclusions.

Kruskal-Wallis and Mann-Whitney U-Tests

Kruskal-Wallis tests were performed comparing attributes from sherds from the entire room, from floor contexts only, and then from fill contexts only (see Table 4.8). None of these tests resulted in significant differences among rooms by any of the attributes. However, the results of each of these tests are somewhat suspect given the small sample sizes in Rooms 1 and 2. In order to help diffuse the effects of small sample size on these results, samples from Rooms 2 and 4 were combined. As previously discussed, Mills et al. (1999b) hypothesize that Room 1 was part of a roomblock (the rest of which was not excavated) that represents a different, perhaps earlier, occupation of the Bryant Ranch site, given its location at the site, differential construction, and paucity of artifacts. Therefore, although the combination of Rooms 2 and 4 did not completely solve the problem of small sample size, it is logical given the archaeological indicators of difference between Room 1 and Rooms 2 and 4. Tests were then completed with pooled samples from Rooms 2 and 4, comparing entire rooms, as well as floor and fill contexts. Only the test of both floor and fill contexts with Rooms 2 and 4 pooled resulted in a significant difference, and this difference was only detected in the statistical distribution of coil width. Although this result is still somewhat suspect given the sample size of Room 1, it is interesting that this difference occurs between the proposed areas of different occupation at the site. This result therefore lends a degree of support to the hypothesis that two distinct episodes of occupation occurred, or two different groups of people occupied the Bryant Ranch Site.

<u>The Bailey Ruin</u>

Corrugated sherds from seven rooms at the Bailey Ruin were analyzed. Of these seven rooms, Rooms 1, 3, 4, and 6 were exclusively used for habitation (Mills et al. 1999c), and Rooms 2 and 7 had a small habitation component. However, floor and fill contexts for the habitation component of Rooms 2 and 7 were not differentiated during the excavation, and thus sherds from these components had to be analyzed under an "undifferentiated" context. In addition, Room 2 had a large non-habitation floor and fill assemblage resulting from an earlier use of this room (Mills et al. 1999c). Room 7 also had a non-habitation component, but the floor and fill from this use of Room 7 was not distinguished during excavation, and therefore the assemblage from the non-habitation component of Room 7 was analyzed as "undifferentiated" as well.

Descriptive Statistics

Table 4.9 summarizes the descriptive statistics for all floor, fill, and undifferentiated contexts from both habitation and non-habitation rooms at the Bailey Ruin. A thorough examination of the measures of central tendency from each sample analyzed reveals a moderate degree of variability between similar contexts in different rooms. For example, the mean measure of obliteration on sherds from habitation room floors varies from 0.88 in Room 3 to 0.954 in Room 4, a difference of only 0.07 mm. Some attributes, such as coil width in habitation room fill contexts, have more variable measures of central tendency. Coil width in habitation room fill ranges from 4.884 in Room 6 to 6.424 in Room 4. In addition, the CVs seen in Table 4.2 demonstrate the generally high variability of each attribute within each context, particularly in cases such as coil width on the floor of Room 1 (CV=0.448), or indentation depth in the fill of Room 5 (CV=0.55). On the other hand, some attributes, such as obliteration in the undifferentiated habitation context of Room 7 (CV= 0.047), have relatively low internal variability. Further statistical tests were needed to determine which of this variability, if any, is significantly different.

Kruskal-Wallis and Mann-Whitney U-Tests

Non-parametric tests were performed to test for differences between the statistical distributions of each attribute in each context at the Bailey Ruin. As seen in the results of the first test (Table 4.10), there were significant differences in all attributes when entire room samples were compared to each other without distinguishing context. Comparisons of the data in entire habitation rooms revealed a similar result, and significant differences are seen in the statistical distributions of all attributes analyzed. Tests without the small sample sizes in Rooms 2 and 7 also resulted in significant differences between the statistical distribution of all attributes. Further comparison of the spatially aggregated Rooms 1, 3, and 6 demonstrated no significant difference in the statistical distribution of two out of four attributes. Interestingly, these results demonstrate that more significant differences in the statistical distributions of each attribute exist between spatially segregated rooms than aggregated rooms at Bailey. Tests comparing entire non-habitation rooms revealed a different result, no significant differences were found in the statistical distributions of any of the attributes analyzed. However, these results are somewhat suspect due to the small sample size in Room 7. Although informative about the entire site, these tests do not reveal the differences between rooms and contexts.

Therefore, further tests were performed controlling for room function (habitation or non-habitation) and context (floor or fill). Tests of habitation room floors revealed a significant difference between rooms in the statistical distribution of indentation depth. On the other hand, tests of habitation room fill showed significant differences in coil width, indentation depth, and obliteration. Therefore, in both contexts, the statistical distribution of indentation depth was significantly different between rooms. A test of habitation rooms with undifferentiated context (Rooms 2 and 7) revealed significant differences in the statistical distribution of all four attributes. However, since the context of both Rooms 2 and 7 is undifferentiated, and the sample size of each room tested is small, these results do not allow any substantial conclusions to be drawn. Thus, real significant differences in the statistical distribution of coil width, indentation width, and obliteration were observed when room context and function was controlled.

Regional Descriptive Statistics

Descriptive statistics were then run on the data for each individual site, the results of which are shown in Table 4.11 below. These results demonstrate the widely variable nature of the data at hand, and also demonstrate some interesting temporal trends. The sites in Table 4.11 are arranged in order from the earliest site, Cothrun's Kiva, to the latest, the Bailey Ruin. In examining average coil width through time, it becomes apparent that coil width initially becomes slightly smaller, from the two great kiva sites to Pottery Hill, but then demonstrates a steady increase in size through time through the Bailey Ruin. Mean indentation width demonstrates a similar trend, being larger at the two great kiva sites, dropping at Pottery Hill, and then steadily climbing through time to the Bailey Ruin.

Mean indentation depth and the mean measure of obliteration demonstrate the most apparent trends through time, however. These two attributes are linked to some extent; generally indentation depth is smaller if a vessel is more highly obliterated. Obliteration wipes away the surface of the coils on the vessel, thus decreasing the indentation depth. This trend is readily apparent in the data presented here. Indentation depth becomes smaller through time from the great kiva sites to the Bailey Ruin, while the measure of obliteration becomes greater through time. Numerous authors (Pierce 1999) have noted the trend of increasing obliteration on corrugated ceramics through time, and the data presented here substantiate this trend in the Silver Creek area.

The coefficients of variation (CV) presented in Table 4.11 also demonstrate the high degree of variability present in the attributes analyzed. The CVs of coil width and indentation width are similar through time. However, the CV of indentation depth is significantly higher at the Bryant Ranch site; an interesting result given the small size of the site. Furthermore, there appears to be a divide in the CV for the measure of obliteration, with high values for the three earliest sites, and lower values for the two later sites. Previous analyses of corrugated ceramics have anecdotally noted the high degree

Table 4.11: Initial Statistics Summary

	Cothrun's	Hough's	Pottery Hill	Bryant Ranch	Bailey
n	33	41	67	53	367
Coil Width					
minimum	3.05	1.86	2.44	2.3	1.67
maximum	7.93	6.54	10.22	8.75	11.95
median	4.93	4.64	4.41	5.45	5.34
mean	4.92	4.474	4.68	5.522	5.592
st. dev.	1.256	1.015	1.486	1.362	1.891
CV	0.255	0.227	0.317	0.247	0.338
Indent Width					
minimum	3	1.93	1.14	1.51	0.71
maximum	13.97	9.17	7.58	13.09	10.38
median	6	5.11	3.7	4.01	4.31
mean	6.286	5.272	3.645	4.221	4.512
st. dev.	2.444	2	1.199	1.685	1.515
CV	0.389	0.332	0.329	0.399	0.336
Indent Depth					
minimum	0.58	0.43	0.3	0.43	0.26
maximum	3.68	3.45	3.65	4.92	3.73
median	1.58	1.57	0.96	0.88	0.86
mean	1.793	1.609	1.081	1.038	0.909
st. dev.	0.776	0.651	0.481	0.636	0.35
CV	0.433	0.405	0.445	0.616	0.386
Obliteration					
minimum	0.01	0.01	0.01	0.25	0.25
maximum	1	1	1	1	1
median	1	1	1	1	1
mean	0.696	0.785	0.866	0.937	0.924
st. dev.	0.378	0.33	0.287	0.166	0.166
CV	0.543	0.42	0.331	0.177	0.172

of variability within any given sample (Brunson 1985, Gifford and Smith 1978), and the CVs presented here demonstrate high variability statistically as well. Moreover, a ranking of these CVs from highest to lowest (see Table 4.12) also illustrates that variability in the attributes analyzed is not consistent within each site or through time. Bryant Ranch does have two of the highest ranking (most variable) CVs, indentation width and depth, but it also has two of the lowest ranking (coil width and obliteration) as well. Likewise, Bailey has two of the lowest ranking (least variable) CVs for indentation depth and obliteration, but also has a very high ranking CV for coil width. In summary, a review of the CVs for all sites and attributes highlights a number of contrasts between sites. Only the pattern seen in the central tendencies of obliteration and indentation depth appear to be linked. Otherwise CVs taken together appear to be fairly variable across time and space.

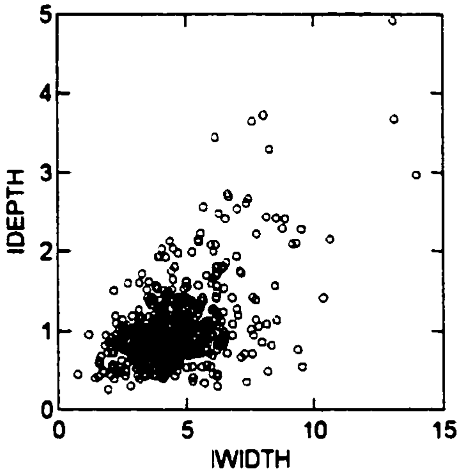
Correlations

The results of the non-parametric tests detailed above demonstrate that significant differences in the statistical distributions of the attributes measured do exist, but cannot be fully described with the results of non-parametric tests. Although the low number of significantly different statistical distributions suggest that the attributes measured on corrugated ceramics have a degree of patterning, the non-parametric tests do not illustrate where these patterns are in the data, or how they are manifested in the sherd assemblages themselves. In order to understand more specifically how the corrugated ceramics and their attributes are patterned, a series of correlations were run. Through these tests, it should be possible to determine if any of the attributes analyzed are related, and how such patterns may affect the interpretation of the data in terms of social organization.

Correlations were run for each individual room and context, for each type (habitation or non-habitation) of room, and for each context (floor and fill) at each site in order to discern any possible relationship within the data. Correlations, both positive and negative, over 0.5 were summarized in Table 4.13a-h. The first eight charts were then summarized into the last chart labeled "Total" to demonstrate which attributes were strongly correlated most often. Although some of the tallied correlations are redundant, it is readily apparent that indentation width and indentation depth are overwhelmingly strongly correlated more often than any other pair of attributes tested. A review of individual correlation charts shows that this correlation is almost exclusively positive, demonstrating that as indentation width increases, so does indentation depth. Intuitively, this strong correlation is logical, as it is necessary to push your thumb in farther to make a deeper indentation, and as more of your thumb comes into contact with the clay, a wider indentation results. Surprisingly, the negative relationship between indentation depth and obliteration seen in the descriptive statistics for all five sites (see Table 4.11) was never stronger than 0.5 in the correlations run here, and was only weakly apparent in large samples. Correlation charts from individual sites do not demonstrate any readily apparent trends through time, which shows that the compelling temporal trends in the measures of central tendency at each site are largely independent of each other (see Table 4.11).

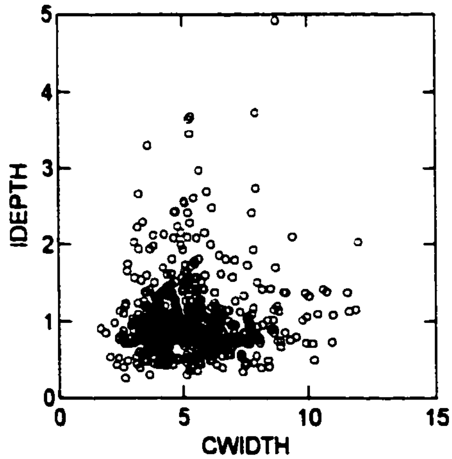
Scatterplots of indentation width and indentation depth also show their strong relationship (see Figure 4.1).

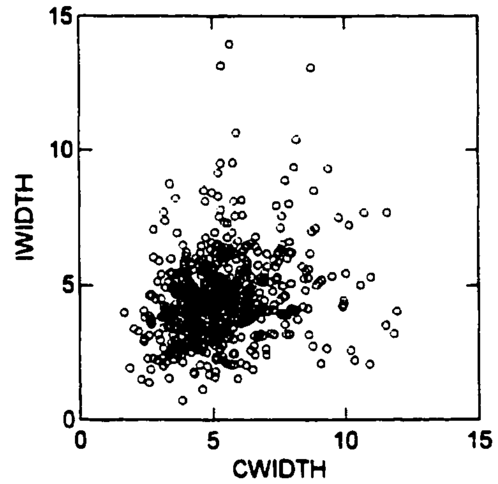
Figure 4.1: Indentation Depth by Indentation Width Scatterplot



The strength of this correlation is particularly evident when compared with scatterplots demonstrating the relationship between other variables (see Figure 4.2).

Figure 4.2: Indentation Depth by Coil Width and Indentation Width by Coil Width Scatterplots





K-means Cluster Analysis

While the correlations demonstrated evidence of patterning among the four attributes analyzed, neither the correlation analysis nor the non-parametric tests of difference demonstrated how these patterns were expressed on the corrugated ceramics analyzed. Both the non-parametric tests and the correlations analysis hinted at patterns among the attributes, but did not illustrate whether these or other patterns were evident among smaller groups of sherds. Understanding multiple patterns among sherds at each site, particularly between rooms and room contexts, will help to show how these patterns were related to patterns in social organization. Therefore, a K-means cluster analysis was performed in an attempt to create groups of corrugated ceramics that were well defined by distinct characteristics.

Cluster analyses dividing the data into 2, 3, 4, 5, 6, and 7 clusters were run. Indentation width was eliminated from this part of the analysis, as correlations analyses demonstrated a strong association with indentation depth in the previous section. Between group variation was maximized and within group variation was minimized in the seven cluster solution, but was roughly equivalent in the five, six, and seven cluster solutions (see Table 4.14). However, in the seven cluster solution, a cluster with only four members was created, and this small membership minimizes the analytical value of this solution. Therefore, the five and six cluster solutions were chosen as the most appropriate for this data.

Cluster membership in the five cluster solution is fairly variable, with each cluster containing at least one case from almost every combination of site, room, and context. Sherds from particular sites, contexts, or rooms do not seem to be concentrated in any of the clusters created, with the exception of the fifth cluster, which is dominated by sherds from the Bailey Ruin. However, this may be the result of the sheer number of sherds from Bailey that were analyzed in comparison to other sites. Because of this huge disparity in sample size it would be highly unlikely for any cluster to be dominated by sherds from a site other than Bailey.

A similar grouping in cluster membership is seen in the six cluster solution, although the spatial distribution of sherds is somewhat more segmented. Overall, all six clusters have a relatively even distribution of sherds from each site, room, and context. Upon further inspection, however, it appears that particular sites dominate some clusters where other sites are relatively absent. This trend is not distinct enough to draw any steadfast conclusions, however. For example, sherds from Room 1 of the Bryant Ranch site are absent from the first cluster, which includes sherds from all rooms at the Bailey

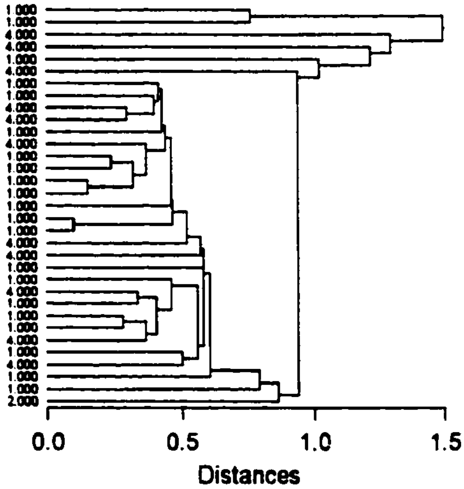
Ruin. However, in the third cluster, sherds from Room 1 of the Bryant Ranch site are included, along with a large number of sherds from multiple rooms at the Bailey Ruin. The dominance of sherds from the Bailey Ruin seen in the five cluster solution is also present in the six cluster solution, and can also probably be attributed to the large sample of sherds analyzed from Bailey. The lack of distinct patterning in each of these cluster solutions suggests that the sherds within each site, as well as across the region and time, are relatively homogenous in their variability. Tree diagrams from Cothrun's Kiva and the Bryant Ranch Site (Figure 4.3a and 4.3b) graphically demonstrate the lack of patterning or clustering among rooms as well. As also suggested by the variable nature of CVs from each site, the groups of sherds examined here are not patterned in their degree of variability, regardless of the site, room or context.

<u>Summary</u>

The results of these statistical analyses demonstrate that patterning exists among the attributes and corrugated sherds analyzed, but that this patterning is difficult to tease out or highlight. Two particularly strong patterns emerged. First, non-parametric tests of difference at the Bailey Ruin demonstrated that significant differences exist when all seven rooms were compared, and when the habitation components of all seven rooms were compared. In addition, habitation room floors of Rooms 1, 4, and 6, yielded significant differences in indentation depth, as did habitation room fill in Rooms 1, 3, 4, 5, and 6. The repetition of these significant differences in tests with varying degrees of specificity demonstrates the robust nature of these differences. Furthermore, these rooms with significant differences are fairly spatially segregated at the Bailey Ruin (see Figure

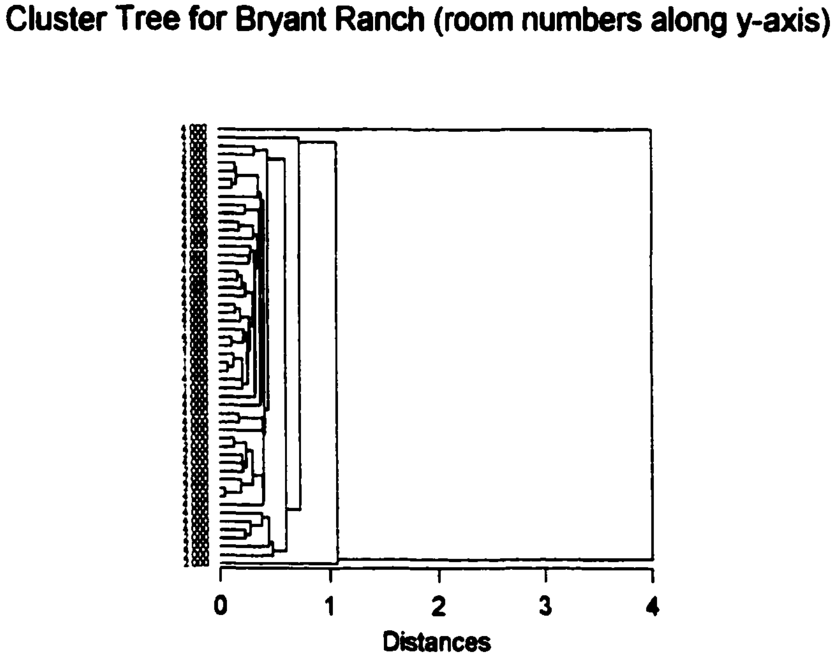
Figure 4.3a: Tree Diagram from Cothrun's Kiva

Cluster Tree for Cothrun's Kiva (room numbers along y-axis)



4.4), which illustrates a spatial pattern at this site. The statistical distributions of attributes in rooms in close proximity to one another, such as Rooms 1, 3, and 6, contain fewer significant differences than rooms that are spatially segregated. Furthermore, this pattern of attribute similarity may be particularly apparent when examining room fill from spatially aggregated rooms, which was likely deposited by the same social group, as the pattern at Bailey suggests. Because the Bailey Ruin is the most likely of these five sites to have been occupied by multiple social groups with varied enculturative backgrounds, given its size and length of time of occupation, this spatial pattern suggests that differences in the technology of corrugation may be most apparent when comparing ceramics from areas of a given site, rather than specific rooms. Additional analyses

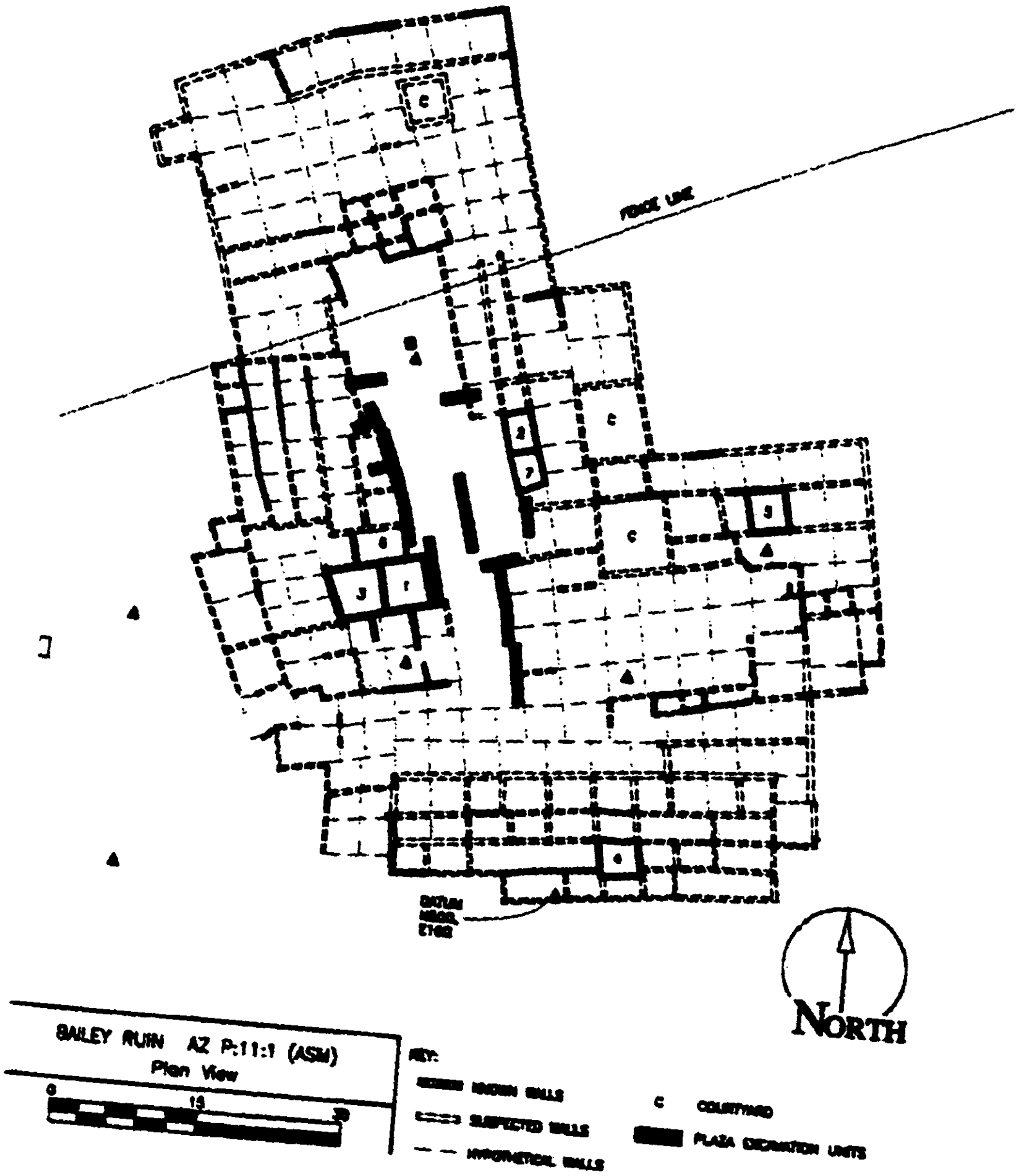
Figure 4.3b: Tree Diagram from the Bryant Ranch Site



testing for differences between rooms that are spatially close, in comparison to differences between spatially segregated rooms may further define this pattern.

The second strong pattern that emerged from this analysis was the association between indentation depth and indentation width across time and space. This pattern yields relatively little information about differences in corrugation technology, but instead demonstrates a degree of homogeneity through time in the samples analyzed here. Such cross-cutting patterns serve as a reminder that attributes must be chosen with care for analyses of technological style in order to avoid compounding effects of internal

Figure 4.4: The Bailey Ruin (from Mills et al. 1999c)



association. Nonetheless, this association, in combination with the trends of central tendency seen in all the attributes through time, provides a great deal of information concerning the evolution of corrugation technology in the Silver Creek area, as well as the Greater Southwest.

CHAPTER 5: CONCLUSION AND IMPLICATIONS

Conclusion

Theoretical developments concerning technological style have proposed that material culture that is manufactured and used on a household level often reflects the identity or ethnicity of its producer. Corrugated ceramics in the prehistoric Southwestern United States likely fit this class of material culture, and were thus chosen to examine changes in social organization in the Silver Creek area of east-central Arizona. Previous analyses of corrugated ceramics (Hegmon et al. 2000; Stark et al. 1998) suggest that they are good indicators of identity and ethnicity, particularly in situations such as migration, where socially disparate groups come together and live in close proximity. Attributes on corrugated ceramics that reflect the process used to construct these vessels were analyzed and statistically tested. If socially disparate populations did come together at any of the five sites examined here, as Mills (1998) has suggested, then significant differences between rooms and contexts should become apparent.

An examination of the statistical results of this analysis reveals that significant differences exist in the attributes tested, but they are somewhat difficult to tease out of the data. The most apparent and unexpected patterns in the data analyzed were the temporal trends in all four attributes analyzed. Although previous research (Pierce 1999) has shown trends towards the increasing obliteration of corrugated ceramics through time, which is also seen in these data, no other attributes have been found to have such temporal trends. The data presented here, however, conclusively demonstrate that apparent temporal trends for each attribute exist, with indentation depth steadily decreasing through time, the measure of obliteration increasing through time, and coil and indentation width decreasing and then increasing later in time.

Examination of the CVs on a room context basis for each site demonstrates that most exceptionally high or low CVs are from room floor contexts, such as coil width, indentation width, and indentation depth on the floor of Room 1 at Cothrun's Kiva. Although some unusually high or low CV values occur in room fill contexts, such as coil width in the fill of Room 1 and indentation depth in the fill of Room 4 at the Bryant Ranch site, the majority of unusually high or low CVs are in room floor contexts. This suggests that sherds from room fill contexts are generally less variable in the four attributes measured, although this could be influenced by small samples. The higher number of significant differences found between attributes in fill contexts suggests that the variability in fill contexts, although less than found in floor contexts, is likely modally patterned. Floor contexts, on the other hand, have high variability, as seen in the high number of unusual CVs, but this variability is probably more evenly statistically distributed, as fewer significant differences were found among attributes on sherds from floor contexts.

Coefficients of variation on a site basis provide further information concerning temporal trends in the data as well as patterns of difference within sites and rooms. While CVs are roughly similar for coil width, indentation width, and indentation depth for all five sites, the CV of the measure of obliteration is inversely proportional to the mean measure of obliteration through time. As the CV goes down, the measure of obliteration goes up, suggesting that increasing obliteration was also accompanied by a higher degree of standardization in obliteration over the body of a vessel. Overall, however, the CVs for each attribute at a site level are not highly patterned. As seen in Table 4.12, the Bryant Ranch site has the highest CV for two out of four attributes, and the Bailey Ruin has the lowest CV for two out of four attributes. These rankings do not form a consistent trend, however, as each high or low ranking CV is accompanied by CVs at the other extreme ranking at each site. In sum, patterns can be illuminated in the CVs of only one individual attribute – the measure of obliteration. As a whole, the CVs across sites and time reveal no distinct patterns in the degree of variability at any of these sites.

Statistical tests also illuminated other patterns in the data. The most apparent significant differences in all four attributes analyzed appeared at the Bailey Ruin, where significant differences were found between samples from entire rooms, as well as between habitations floor and fill contexts in the statistical distributions of coil width, indentation depth, and obliteration. Fewer differences were found between spatially aggregated rooms than between spatially segregated rooms, reminiscent of the pattern found by Arnold (1989) among contemporary potters in central Mexico. Correlations demonstrated a strong relationship between indentation depth and indentation width, and this relationship is evident through space and time. The K-means cluster analysis also did not discern differences in the attributes tested between rooms at any of the five sites, but rather the results suggest that each site, room, and context evaluated has highly variable assemblages of ceramics with subtle patterning. In sum, differences exist, but they are not clear-cut or obvious.

Four possibilities emerge to explain these results within the archaeological context of the Silver Creek area in the Pueblo III to Pueblo IV transition. First, these results may demonstrate that corrugated ceramics were not a marker of ethnicity or identity of the people inhabiting the five sites analyzed here. Second, it is possible that corrugated ceramics are a marker of identity and ethnicity among these populations, but in an effort to assimilate, migrant populations rapidly adopted the technological style of the indigenous populations at these sites. Third, the assemblages may represent the products of multiple potters that moved around through the site through exchange. In this case, differences between households would not be represented by different contexts, as was assumed here. A fourth and final possibility, which only applies to the Bryant Ranch, Cothrun's, and Hough's Great Kiva sites, stems from the small number of rooms at these sites. Since each of these three sites is so small, it is possible that only one household or a closely related group of households was residing at each, in which case a smaller, and not significantly different, degree of variation would be present in markers of technological style, as each household should have its own coherent technological style.

Corrugated Ceramics as Markers of Identity and Ethnicity

Corrugated ceramics were selected as the basis for this analysis for two reasons. First, corrugated ceramics fit the criteria for a category of material culture that would display elements of technological style (Lechtman 1977, Sackett 1982, Stark 1998). Corrugated ceramics are inferred to have been produced and consumed on a household level. Therefore, the knowledge and skill of making these vessels was likely passed down within a familial or household setting, perpetuating a single learning framework or enculturative background. Corrugated ceramics were probably not manufactured to actively transmit a message to a socially distant group, and therefore their production was less likely to be influenced or changed by outside social factors. Furthermore, the skill used to manufacture corrugated ceramics could be classified as a motor skill or habit, which is likely to be relatively static once learned and perfected. All of these attributes of corrugated ceramics suggest that they did display technological style that was a reflection of the social environment in which the skill of making these ceramics was learned.

Secondly, a number of previous studies have demonstrated that corrugated ceramics are a good indicator of ethnicity and identity in the prehistoric Southwest. Dobscheutz (1999a, 1999b) examined corrugated ceramics from the Mesa Verde area in southwestern Colorado and found that attributes of corrugated ceramics were highly correlated at a number of sites, which she inferred to be the style of a bounded social group. Stark et al. (1998) found that corrugated ceramics, in combination with domestic architecture, were excellent indicators of ethnicity in the Tonto Basin in central Arizona. Their studies also demonstrated that social boundaries between indigenous and clearly migrant populations in this area were rigidly maintained, as indicated by differences in the technological style of corrugated ceramics and domestic architecture. Hegmon et al. (2000) examined a similar phenomenon in the Mimbres area. Their studies demonstrated that technological style was initially a good indicator of migrant populations who moved into the area, and in combination with ceramic provenance analyses, they demonstrated that the corrugated technological style that originated with the migrant population was slowly transferred to, or absorbed by, the indigenous population.

The results of these three analyses, in combination with the aforementioned potential of corrugated ceramics to display elements of technological style, suggested that an analysis of corrugated ceramics in the Silver Creek area would be a fruitful means of examining identity and ethnicity during the Pueblo III to Pueblo IV period. My analysis confirms that corrugated ceramics provide a good measure of similarities or differences in technological style in the Silver Creek area during this period, but that these patterns may be obscured by other behavioral mechanisms, beyond the production and use of these ceramics. The variable and generally high CVs in each room and context hint that mixing of ceramics and their attributes may have occurred. Low CVs within each site, however, demonstrate that variability within each attribute was generally low within each site, even though variability in attributes was high within rooms. This may account for the relatively low number of significant differences in attributes of corrugated ceramics between the rooms tested at each of the five sites, particularly the four earliest sites.

<u>Assimilation and Transfer of Material Traits</u>

A number of ethnographic studies have shown that many migrant populations, particularly small scale migrant populations, will attempt to assimilate or fit in to the culture of the indigenous population (Schwartz 1970). This may also be the case for the Silver Creek area during the period in question. Mills (1998) has proposed that migration into the Silver Creek area during the Pueblo III to Pueblo IV period was on a household level. If this is the case, as the lack of site-unit intrusions indicates, then migrant populations were almost certainly smaller than the populations residing at the large aggregated pueblos to which they moved. In order to fit in and subsist in a new-comer position, migrants may have assimilated many aspects of their daily lives, including their material culture. If so, very few differences would be evident in the corrugated ceramics found at each site even though corrugated ceramics are less likely to undergo processes of assimilation in comparison to other types of material culture. In addition, mixing of populations through the reduction of social boundaries and intermarriage between migrant and indigenous populations as a result of assimilation likely further reduced differences in material culture on a site level. This is substantiated by generally low site CVs for each attribute. If this scenario describes the social atmosphere at the five sites examined in this analysis, then differences in the technological style of corrugated ceramics would be difficult to detect. This situation is particularly relevant for the Bailey Ruin, where differences between habitation rooms are very subtly manifested. Perhaps assimilation leads to a gradual change in material culture, visible only when examining discrete roomblocks, or rooms that are spatially separated from one another at a site. Differences found between, but not within, spatially segregated rooms at the Bailey Ruin indicate such processes of assimilation.

The Role of Redistribution and Exchange

Although archaeologists have long assumed that corrugated ceramics, like other utilitarian ceramics in the Southwest, were produced and consumed within a household setting, this fundamental assumption may be flawed. The linear use-life of corrugated ceramics probably became particularly convoluted at sites with migrant populations who were attempting to assimilate rapidly and effectively (Schwartz 1970). As part of the process of assimilation, corrugated ceramics may have moved around a site as a method of facilitating social relationships and good will between new neighbors. Corrugated ceramics that circulated away from their location of manufacture, and were thus deposited with dissimilar ceramics, would obscure spatial patterns in attributes of technological style, such as those analyzed here. Exchange and redistribution of corrugated ceramics between groups with distinct technological styles would explain the high CVs within rooms and low CVs within sites, and the subtle patterning in the statistical distribution of attributes at the Bailey Ruin. Further research must be conducted to illuminate the role of redistribution in the use-life of corrugated ceramics during this period. The subtlety of the patterns also suggest that exchange of ceramics may have occurred between extant social groups at the site, the immigration of distinct social groups may not have played a role in the observed patterns at Bailey and the four other sites.

Site and Sample Size

The small size of three of the sites used in this analysis could pose a potential problem. The Bryant Ranch Site, Cothrun's Kiva, and Hough's Great Kiva all have fewer than ten rooms. This fact alone suggests that there was never large group of people present at any of these sites during their occupation, and further implies that the people residing at these sites were part of the same household or a group of closely related households. If there was only one household residing at each of these three sites, then differences in the technological style of corrugate ceramics may not readily be evident in these data. Given spatial clustering of all rooms analyzed at the two great kiva sites, the differences seen in the spatially segregated rooms at the Bailey Ruin would also not be evident at any of these sites. Spatially discrete rooms at the Bryant Ranch Site showed significant differences in the statistical distribution of only one attribute, and the lack of further differences may be attributable to site size. This may account for the low number of significant differences between any of the corrugated ceramics in different rooms at each of these smaller sites.

In a related vein, sample size at Cothrun's Kiva, Hough's Great Kiva, and the Bryant Ranch Site, particularly the two great kiva sites, became a problem in the statistical analysis. The number of analyzed sherds from floor contexts at the two great kiva sites ranged from 1 to 5; samples that do not represent the corrugated ceramics used at these sites during their occupations well. These problems of site and sample size may have also contributed to difficulties in discerning robust trends and significant differences in attributes of corrugated ceramics analyzed at these three sites. Therefore, results from these three sites may be somewhat misleading and inaccurate reflections of the population of corrugated ceramics utilized.

Summary

Although significant differences found in the attributes analyzed here were subtle, the trends observed did provide new information about the social organization of these sites during the Pueblo III and Pueblo IV periods. Differences were present at the Bailey Ruin among habitation rooms, and therefore provide a glimpse of the social networks in use at the Bailey Ruin during this time. The results suggest that social differentiation between groups was present, but boundaries between disparate social groups are most visible in spatially aggregated rooms, and were not rigidly maintained. Two possible explanations seem most probable to explicate the results from the other four sites. First, since other analyses of corrugated ceramics in the Southwest have suggested that their technological attributes are good indicators of ethnicity and identity, it is mostly likely that other factors account for the subtlety in differences in the corrugated ceramics of the Silver Creek area. Migrant populations may have assimilated their style of corrugation technology to the style of indigenous populations. Redistribution of corrugated ceramics may have mixed ceramics produced by social groups with distinct technological styles. Alternatively, some sites, particularly the three smaller sites, may represent episodes of migration as individual site-unit intrusions, which would account for their relatively homogenous assemblages of corrugated ceramics. Further research involving other material classes, such as chipped stone, domestic architecture, or subsistence practices, may help illuminate the most likely explanation, and place these Silver Creek area sites in the greater cultural dynamics of the Southwest.

APPENDIX A: STATISTICAL RESULTS

Table 4.1: Cothrun's Kiva Descriptive Statistics by Context and Room							
a) Room Floor Statistics				**b) Room Fill Statistics**			
Coil Width				Coil Width			
	Room 1	Room 4			Room 1	Room 2	Room 4
n	2	1		n	19	1	10
minimum	4.74	5		minimum	3.05	4.88	3.29
maximum	4.93	5		maximum	7.93	4.88	7.77
median	4.835	5		median	5.08	4.88	4.68
mean	4.835	5		mean	4.95	4.88	4.87
st. dev.	0.134			st. dev.	1.27		1.542
CV	0.028	1		CV	0.257	1	0.316
Indentation Width				Indentation Width			
	Room 1	Room 4			Room 1	Room 2	Room 4
n	2	1		n	19	1	10
minimum	5.47	4.4		minimum	3.57	3	4.18
maximum	5.74	4.4		maximum	13.97	3	10.64
median	5.065	4.4		median	6.07	3	6.11
mean	5.605	4.4		mean	6.386	3	6.749
st. dev.	0.191			st. dev.	2.771		1.978
CV	0.034	1		CV	0.434	1	0.293
Indentation Depth				Indentation Depth			
	Room 1	Room 4			Room 1	Room 2	Room 4
n	2	1		n	19	1	10
minimum	0.86	1.39		minimum	0.58	1.06	0.9
maximum	2.15	1.39		maximum	3.68	1.06	3.3
median	1.505	1.39		median	1.58	1.06	2.04
mean	1.505	1.39		mean	1.833	1.06	1.89
st. dev.	0.912			st. dev.	0.851		0.7
CV	0.606	1		CV	0.465	1	0.371
Obliteration				Obliteration			
	Room 1	Room 4			Room 1	Room 2	Room 4
n	2	1		n	19	1	10
minimum	0.5	1		minimum	0.01	0.01	0.01
maximum	1	1		maximum	1	0.01	1
median	0.75	1		median	1	0.01	0.785
mean	0.75	1		mean	0.725	0.01	0.669
st. dev.	0.354			st. dev.	0.371		0.391
CV	0.471	1		CV	0.512	1	0.585

Table 4.2: Cothrun's Kiva Kruskal-Wallis and Mann-Whitney U-Tests of Corrugation Attributes Across Rooms and Contexts

a) Test of All Contexts, Rooms 1, 2, and 4 (context not distinguished)				
	KW test statistic	p	df	results
Coil Width	0.019	0.99	2	no sig. diff.
Indentation Width	3.181	0.204	2	no sig. diff.
Indentation Depth	1.118	0.572	2	no sig. diff.
Obliteration	2.61	0.271	2	no sig. diff.
*Results of this test are suspect given the small sample size in Room 2.				
b) Test of All Contexts, Rooms 1 and 4 (context not distinguished)				
	Mann-Whitney U test statistic	p	df	results
Coil Width	118	0.921	1	no sig. diff.
Indentation Width	100	0.538	1	no sig. diff.
Indentation Depth	113.5	0.937	1	no sig. diff.
Obliteration	122.5	0.763	1	no sig. diff.
c) Test of Room Floor Contexts, Rooms 1 and 4				
	Mann-Whitney U test statistic	p	df	results
Coil Width	0	0.221	1	no sig. diff.
Indentation Width	2	0.221	1	no sig. diff.
Indentation Depth	1	1	1	no sig. diff.
Obliteration	0.5	0.48	1	no sig. diff.
*Results of this test are suspect given the small sample size in Rooms 1 and 4.				
d) Test of Room Fill Contexts, Rooms 1, 2, and 4				
	KW test statistic	p	df	results
Coil Width	0.023	0.988	2	no sig. diff.
Indentation Width	3.312	0.191	2	no sig. diff.
Indentation Depth	1.226	0.542	2	no sig. diff.
Obliteration	2.687	0.261	2	no sig. diff.
*Results of this test are suspect given the small sample size in Room 2.				
e) Test of Room Fill Contexts, Rooms 1 and 4				
	Mann-Whitney U test statistic	p	df	results
Coil Width	98	0.891	1	no sig. diff.
Indentation Width	79	0.463	1	no sig. diff.
Indentation Depth	92.5	0.909	1	no sig. diff.
Obliteration	106	0.586	1	no sig. diff.

Table 4.3: Hough's Great Kiva Descriptive Statistics by Room and Context						
a) Room Floor Statistics				**b) Room Fill Statistics**		
Coil Width				Coil Width		
	Room1	Room 2			Room1	Room 2
n	5	2		n	22	12
minimum	1.86	5.31		minimum	3.06	2.77
maximum	4.72	5.49		maximum	6.18	6.54
median	4.2	5.4		median	4.675	4.655
mean	3.73	5.4		mean	4.57	4.452
st.dev.	1.117	0.127		st.dev.	0.866	1.197
CV	0.3	0.024		CV	0.189	0.269
Indentation Width				Indentation Width		
	Room1	Room 2			Room1	Room 2
n	5	2		n	22	12
minimum	1.93	3.85		minimum	2.49	3.39
maximum	8.14	4.87		maximum	9.17	8.78
median	4.85	4.36		median	5.295	5.425
mean	4.832	4.36		mean	5.269	5.613
st.dev.	2.353	0.721		st.dev.	1.765	1.664
CV	0.487	0.165		CV	0.335	0.297
Indentation Depth				Indentation Depth		
	Room1	Room 2			Room1	Room 2
n	5	2		n	22	12
minimum	0.73	1.15		minimum	0.43	1
maximum	2.43	1.27		maximum	3.45	2.42
median	1.42	1.21		median	1.585	1.625
mean	1.428	1.21		mean	1.673	1.634
st.dev.	0.687	0.085		st.dev.	0.754	0.482
CV	0.481	0.07		CV	0.451	0.295
Obliteration				Obliteration		
	Room1	Room 2			Room1	Room 2
n	5	2		n	22	12
minimum	0.01	0.01		minimum	0.01	0.33
maximum	1	1		maximum	1	1
median	0.86	0.505		median	1	1
mean	0.608	0.505		mean	0.819	0.844
st.dev.	0.48	0.7		st.dev.	0.294	0.262
CV	0.789	1.386		CV	0.359	0.31

Table 4.4: Hough's Great Kiva Mann-Whitney U-Tests of Corrugation Attributes				
Across Rooms and Contexts				
a) Test of All Contexts, Rooms 1 and 2 (context not distinguished)				
	Mann-Whitney U test statistic	p	df	results
Coil Width	177.5	0.752	1	no sig. diff.
Indentation Width	174	0.68	1	no sig. diff.
Indentation Depth	191	0.956	1	no sig. diff.
Obliteration	187.5	0.962	1	no sig. diff.
b) Test of Room Floor Contexts, Rooms 1 and 2				
	Mann-Whitney U test statistic	p	df	results
Coil Width	0	0.053	1	no sig. diff.
Indentation Width	5	1	1	no sig. diff.
Indentation Depth	6	0.699	1	no sig. diff.
Obliteration	5.5	0.839	1	no sig. diff.
*Results of this test are suspect due to small sample sizes				
c) Test of Room Fill Contexts, Rooms 1 and 2				
	Mann-Whitney U test statistic	p	df	results
Coil Width	148.5	0.552	1	no sig. diff.
Indentation Width	117	0.589	1	no sig. diff.
Indentation Depth	130.5	0.957	1	no sig. diff.
Obliteration	133	0.965	1	no sig. diff.

Table 4.5: Pottery Hill Descriptive Statistics by Room and Context						
a) Room Floor Statistics				**b) Room Fill Statistics**		
	Habitation Surface	Non-habitation Surface			Habitation Fill	
Coil Width				Coil Width		
	Room 1	Room 3			Room 1	Room 3
n	21	7		n	25	14
minimum	2.7	2.92		minimum	3.03	2.44
maximum	10.22	5.65		maximum	7.67	7.83
median	4.32	4.31		median	4.54	4.46
mean	5	4.269		mean	4.516	4.699
st. dev.	2.092	0.869		st. dev.	0.961	1.454
CV	0.418	0.204		CV	0.213	0.309
Indentation Width				Indentation Width		
	Room 1	Room 3			Room 1	Room 3
n	21	7		n	25	14
minimum	2.11	2.21		minimum	1.7	1.14
maximum	5.44	5.06		maximum	7.58	7.1
median	3.94	3.7		median	3.38	3.835
mean	3.765	3.713		mean	3.439	3.797
st. dev.	0.861	1.136		st. dev.	1.326	1.477
CV	0.229	0.306		CV	0.386	0.389
Indentation Depth				Indentation Depth		
	Room 1	Room 3			Room 1	Room 3
n	21	7		n	25	14
minimum	0.43	0.95		minimum	0.3	0.73
maximum	1.94	1.19		maximum	3.65	1.98
median	0.92	1.1		median	1.02	1.06
mean	0.952	1.074		mean	1.115	1.217
st. dev.	0.379	0.09		st. dev.	0.623	0.43
CV	0.398	0.083		CV	0.559	0.353
Obliteration				Obliteration		
	Room 1	Room 3			Room 1	Room 3
n	21	7		n	25	14
minimum	0.01	1		minimum	0.01	0.43
maximum	1	1		maximum	1	1
median	1	1		median	1	1
mean	0.803	1		mean	0.836	0.947
st. dev.	0.314	0		st. dev.	0.343	0.156
CV	0.391	0		CV	0.41	0.164

Table 4.6: Pottery Hill Mann-Whitney U-Tests of Corrugation Attributes Across Rooms and Contexts				
a) Test of All Contexts, Habitation and Non-Habitation Structures, Rooms 1 and 3 (context not distinguished)				
	Mann-Whitney U test statistic	p	df	results
Coil Width	492.5	0.898	1	no sig. diff.
Indentation Width	451	0.665	1	no sig. diff.
Indentation Depth	364.5	0.109	1	no sig. diff.
Obliteration	375.5	0.052	1	no sig. diff.
b) Test of All Contexts, Habitation Structures only, Rooms 1 and 3 (context not distinguished)				
	Mann-Whitney U test statistic	p	df	results
Coil Width	312.5	0.868	1	no sig. diff.
Indentation Width	305.5	0.773	1	no sig. diff.
Indentation Depth	239	0.147	1	no sig. diff.
Obliteration	263.5	0.189	1	no sig. diff.
c) Test of Room Floor Contexts, Habitation Room 1 and Non-Habitation Room 3				
	Mann-Whitney U test statistic	p	df	results
Coil Width	80.5	0.71	1	no sig. diff.
Indentation Width	73	0.979	1	no sig. diff.
Indentation Depth	46.5	0.152	1	no sig. diff.
Obliteration	45.5	0.062	1	no sig. diff.
*Results are suspect given the small sample size in Room 3.				
d) Test of Room Fill Contexts, Rooms 1 and 3				
	Mann-Whitney U test statistic	p	df	results
Coil Width	169.5	0.872	1	no sig. diff.
Indentation Width	145.5	0.388	1	no sig. diff.
Indentation Depth	147	0.412	1	no sig. diff.
Obliteration	154	0.383	1	no sig. diff.

Table 4.7: Bryant Ranch Descriptive Statistics by Room and Context

a) Room Floor Statistics				b) Room Fill Statistics			
Coil Width				Coil Width			
	Room 1	Room 2	Room 4		Room 1	Room 2	Room 4
n	4	4	19	n	3	9	14
minimum	5.12	3.32	3.39	minimum	6.4	2.3	3.15
maximum	7.08	7.23	7.35	maximum	6.92	6.57	8.75
median	6.23	5.92	5.39	median	6.85	4.31	5.45
mean	6.165	5.597	5.323	mean	6.723	4.713	5.848
st. dev.	1.051	1.641	1.026	st. dev.	0.282	1.399	1.669
CV	0.171	0.293	0.193	CV	0.042	0.297	0.285
Indentation Width				Indentation Width			
	Room 1	Room 2	Room 4		Room 1	Room 2	Room 4
n	4	4	19	n	3	9	14
minimum	2.18	3.22	2.56	minimum	3.75	1.51	2.9
maximum	4.07	6.19	6.23	maximum	4.86	6.45	13.09
median	3.96	3.83	3.91	median	4.17	3.77	4.45
mean	3.543	4.267	4.018	mean	4.26	3.909	4.868
st. dev.	0.911	1.348	1.113	st. dev.	0.56	1.657	2.563
CV	0.257	0.316	0.277	CV	0.132	0.424	0.527
Indentation Depth				Indentation Depth			
	Room 1	Room 2	Room 4		Room 1	Room 2	Room 4
n	4	4	19	n	3	9	14
minimum	0.71	0.78	0.43	minimum	0.57	0.43	0.63
maximum	1.27	1.43	1.73	maximum	1.15	1.42	4.92
median	1.025	0.87	0.91	median	1.06	0.88	0.81
mean	1.008	0.987	1.018	mean	0.927	0.893	1.206
st. dev.	0.266	0.298	0.397	st. dev.	0.312	0.323	1.112
CV	0.264	0.302	0.39	CV	0.337	0.361	0.922
Obliteration				Obliteration			
	Room 1	Room 2	Room 4		Room 1	Room 2	Room 4
n	4	4	19	n	3	9	14
minimum	1	0.25	0.25	minimum	1	0.67	0.67
maximum	1	1	1	maximum	1	1	1
median	1	1	1	median	1	1	1
mean	1	0.812	0.921	mean	1	0.963	0.944
st. dev.	0	0.375	0.189	st. dev.	0	0.11	0.114
CV	0	0.462	0.205	CV	0	0.114	0.12

Table 4.8: Bryant Ranch Kruskal-Wallis and Mann-Whitney U-Tests of Corrugation Attributes Across Rooms and Contents				
a) Test of All Contexts, Rooms 1, 2, and 4 (context not distinguished)				
	KW test statistic	p	df	result
Coil Width	4.829	0.089	2	no sig. diff.
Indentation Width	0.265	0.876	2	no sig. diff.
Indentation Depth	0.232	0.891	2	no sig. diff.
Obliteration	1.704	0.427	2	no sig. diff.
b) Test of Room Floor Contexts, Rooms 1, 2, and 4				
	KW test statistic	p	df	result
Coil Width	1.654	0.437	2	no sig. diff.
Indentation Width	0.406	0.816	2	no sig. diff.
Indentation Depth	0.047	0.977	2	no sig. diff.
Obliteration	1.126	0.57	2	no sig. diff.
*Results are suspect given the small sample size of Rooms 1 and 2.				
c) Test of Room Fill Contexts, Rooms 1, 2, and 4				
	KW test statistic	p	df	result
Coil Width	4.895	0.087	2	no sig. diff.
Indentation Width	0.794	0.672	2	no sig. diff.
Indentation Depth	0.263	0.877	2	no sig. diff.
Obliteration	0.907	0.635	2	no sig. diff.
*Results are suspect given the small sample size of Rooms 1 and 2.				
d) Test of All Contexts, Rooms 1, 2, and 4, Rooms 2 and 4 Pooled (context not distinguished)				
	Mann-Whitney U test Statistic	p	df	result
Coil Width	237.5	0.044	1	sig. diff.
Indentation Width	152	0.813	1	no sig. diff.
Indentation Depth	169.5	0.823	1	no sig. diff.
Obliteration	192.5	0.206	1	no sig. diff.
*Results are suspect given the small sample size of Room 1.				
e) Test of Room Floor Context, Rooms 1, 2, and 4, Rooms 2 and 4 pooled				
	Mann-Whitney U test Statistic	p	df	result
Coil Width	62	0.275	1	no sig. diff.
Indentation Width	37	0.539	1	no sig. diff.
Indentation Depth	43.5	0.864	1	no sig. diff.
Obliteration	56	0.314	1	no sig. diff.
*Results are suspect given the small sample size of Room 1.				
f) Test of Room Fill Context, Rooms 1, 2, and 4, Rooms 2 and 4 pooled				
	Mann-Whitney U test Statistic	p	df	result
Coil Width	55	0.1	1	no sig. diff.
Indentation Width	38	0.779	1	no sig. diff.
Indentation Depth	36	0.904	1	no sig. diff.
Obliteration	40.5	0.443	1	no sig. diff.
*Results are suspect given the small sample size of Room 1.				

Table 4.9: Bailey Ruin Descriptive Statistics by Room and Context							
a) Room Floor Statistics							
Habitation Rooms							Non-habitation Room
Coil Width							
	Room 1	Room 3	Room 4	Room 6			Room 2
n	13	5	35	14			50
minimum	2.62	5.26	3.62	3.4			2.78
maximum	11.53	9.9	9.94	11.86			10.73
median	5.68	5.86	5.88	6.17			6.28
mean	5.782	6.63	6.417	6.613			6.16
st. dev.	2.59	1.868	1.759	2.632			1.747
CV	0.448	0.282	0.274	0.398			0.284
Indentation Width							
	Room 1	Room 3	Room 4	Room 6			Room 2
n	13	5	35	14			50
minimum	3.13	3	2.94	2.03			2.13
maximum	7.54	7.61	9.37	5.57			7.73
median	4.63	4.12	4.71	4.035			4.575
mean	4.759	4.426	5.057	3.918			4.622
st. dev.	1.369	1.859	1.604	1.22			1.154
CV	0.288	0.42	0.317	0.311			0.25
Indentation Depth							
	Room 1	Room 3	Room 4	Room 6			Room 2
n	13	5	35	14			50
minimum	0.5	0.64	0.36	0.63			0.34
maximum	1.86	1.42	1.73	1.65			1.81
median	1.05	0.87	0.81	0.86			0.94
mean	1.045	1.032	0.809	0.987			0.925
st. dev.	0.336	0.344	0.298	0.298			0.307
CV	0.321	0.334	0.368	0.302			0.332
Obliteration							
	Room 1	Room 3	Room 4	Room 6			Room 2
n	13	5	35	14			50
minimum	0.5	0.4	0.5	0.6			0.4
maximum	1	1	1	1			1
median	1	1	1	1			1
mean	0.932	0.88	0.954	0.944			0.938
st. dev.	0.15	0.268	0.121	0.123			0.143
CV	0.161	0.305	0.127	0.131			0.153
b) Room Fill Statistics							

Habitation Rooms							Non-habitation
Coil Width							Room
	Room 1	Room 3	Room 4	Room 5	Room 6		Room 2
n	50	37	42	37	51		16
minimum	2.4	2.16	3.6	2.22	1.67		2.04
maximum	10.16	7.76	11.95	9.3	9.39		9.93
median	4.715	5.5	5.89	4.755	4.645		4.745
mean	5.009	5.509	6.424	5.026	4.884		4.964
st. dev.	1.738	1.151	1.987	1.531	1.704		1.805
CV	0.347	0.209	0.309	0.301	0.352		0.364
Indentation Width							
	Room 1	Room 3	Room 4	Room 5	Room 6		Room 2
n	50	37	42	37	51		16
minimum	1.87	2.1	1.61	0.71	1.39		3.14
maximum	8.18	6.35	10.38	9.51	9.34		6.6
median	4.47	3.85	4.51	4.785	3.935		4.245
mean	4.476	3.926	4.853	4.881	4.222		4.467
st. dev.	1.391	1.017	1.93	1.859	1.643		1.059
CV	0.311	0.259	0.398	0.379	0.393		0.237
Indentation Depth							
	Room 1	Room 3	Room 4	Room 5	Room 6		Room 2
n	50	37	42	37	51		16
minimum	0.39	0.39	0.35	0.45	0.4		0.3
maximum	2.22	1.1	2.03	3.73	2.1		1
median	0.92	0.76	0.925	0.955	0.88		0.74
mean	0.935	0.742	0.97	1.056	0.915		0.714
st. dev.	0.344	0.17	0.345	0.589	0.309		0.174
CV	0.368	0.229	0.356	0.55	0.34		0.244
Obliteration							
	Room 1	Room 3	Room 4	Room 5	Room 6		Room 2
n	50	37	42	37	51		16
minimum	0.25	0.33	0.25	0.6	0		0.33
maximum	1	1	1	1	1		1
median	0.83	1	1	1	1		1
mean	0.816	0.959	0.94	0.961	0.925		0.908
st. dev.	0.216	0.136	0.148	0.103	0.208		0.195
CV	0.265	0.141	0.158	0.105	0.172		0.214
c) Undifferentiated Fill Statistics							
Habitation Rooms							Non-habitation
Coil Width							Room

	Room 2	Room 7					Room 7
n	4	9					4
minimum	2.67	3.12					3.35
maximum	4.29	10.97					9.12
median	4.02	4.29					4.48
mean	3.75	4.989					5.375
st. dev.	0.757	2.385					2.699
CV	0.202	0.478					0.504
Indentation Width							
	Room 2	Room 7					Room 7
n	4	9					4
minimum	1.88	1.72					3.51
maximum	4.95	5.31					6.04
median	4.275	3.81					5.315
mean	3.845	3.746					5.045
st. dev.	1.382	1.2					1.083
CV	0.36	0.32					0.215
Indentation Depth							
	Room 2	Room 7					Room 7
n	4	9					4
minimum	0.26	0.43					0.95
maximum	1	1.21					1.38
median	0.815	0.73					1.085
mean	0.722	0.763					1.125
st. dev.	0.322	0.276					0.208
CV	0.445	0.362					0.185
Obliteration							
	Room 2	Room 7					Room 7
n	4	9					4
minimum	0.8	0.86					0.71
maximum	1	1					1
median	0.9	1					0.89
mean	0.9	0.984					0.872
st. dev.	0.115	0.047					0.15
CV	0.128	0.047					0.172

Table 4.10: Bailey Ruin Kruskal-Wallis and Mann-Whitney U-Tests of Corrugation Attributes Across Rooms and Contexts

a) Test of All Contexts, Rooms 1, 2, 3, 4, 5, 6, and 7 (context not distinguished)				
	KW test statistic	p	df	result
Coil Width	29.716	0	6	sig. diff.
Indentation Width	16.426	0.012	6	sig. diff.
Indentation Depth	14.556	0.024	6	sig. diff.
Obliteration	27.491	0	6	sig. diff.
b) Test of Habitation Rooms, Rooms 1, 2, 3, 4, 5, 6, and 7 (context not distinguished)				
	KW test statistic	p	df	result
Coil Width	34.594	0	6	sig. diff.
Indentation Width	16.57	0.011	6	sig. diff.
Indentation Depth	16.352	0.012	6	sig. diff.
Obliteration	29.618	0	6	sig. diff.
*Results are suspect due to small sample sizes in Rooms 2 and 7.				
c) Test of Habitation Rooms with Sample Size Greater Than 10, Rooms 1, 3, 4, 5, and 6				
	KW test statistic	p	df	result
Coil Width	26.899	0	4	sig. diff.
Indentation Width	14.47	0.006	4	sig. diff.
Indentation Depth	14.186	0.007	4	sig. diff.
Obliteration	27.235	0	4	sig. diff.
d) Test of Non-Habitation Rooms, Rooms 2 and 7 (context not distinguished)				
	Mann-Whitney U test statistic	p	df	result
Coil Width	161	0.463	1	no sig. diff.
Indentation Width	94	0.336	1	no sig. diff.
Indentation Depth	59	0.065	1	no sig. diff.
Obliteration	170.5	0.185	1	no sig. diff.
*Results are suspect due to small sample size in Room 7.				
e) Test of Habitation Room Floors with Sample Size Greater Than 10, Rooms 1, 4, and 6				
	KW test statistic	p	df	result
Coil Width	0.847	0.655	2	no sig. diff.
Indentation Width	4.666	0.097	2	no sig. diff.
Indentation Depth	6.836	0.033	2	sig. diff.
Obliteration	0.543	0.762	2	no sig. diff.
f) Test of Habitation Room Floors, Rooms 1, 3, 4, and 6				
	KW test statistic	p	df	result
Coil Width	1.242	0.743	3	no sig. diff.
Indentation Width	5.275	0.153	3	no sig. diff.
Indentation Depth	7.641	0.054	3	no sig. diff.
Obliteration	0.633	0.889	3	no sig. diff.
*Results are suspect due to small sample size in Room 3.				

g) Test of Habitation Room Fill, Rooms 1, 3, 4, 5, and 6				
	KW test statistic	p	df	result
Coil Width	22.777	0	4	sig. diff.
Indentation Width	8.963	0.062	4	no sig. diff.
Indentation Depth	16.635	0.002	4	sig. diff.
Obliteration	30.553	0	4	sig. diff.
h) Test of Undifferentiated Habitation Room Floor and Fill, Rooms 2 and 7				
	Mann-Whitney U test statistic	p	df	result
Coil Width	10.5	0.247	1	sig. diff.
Indentation Width	20	0.758	1	sig. diff.
Indentation Depth	17	0.877	1	sig. diff.
Obliteration	10	0.094	1	sig. diff.
*Results are suspect due to small sample sizes in Rooms 2 and 7.				
i) Test of Spatially Aggregated Habitation Rooms, Rooms 1, 3, and 6				
	KW test statistic	p	df	result
Coil Width	5.187	0.075	2	no sig. diff.
Indentation Width	4.945	0.084	2	no sig. diff.
Indentation Depth	11.972	0.003	2	sig. diff.
Obliteration	19.259	0	2	sig. diff.

Table 4.12: Coefficient of Variation Summary

a) CV Summary

	Cothrun's	Hough's	Pottery Hill	Bryant Ranch	Bailey
Coil Width	0.255	0.227	0.317	0.247	0.338
Indentation Width	0.389	0.332	0.329	0.399	0.336
Indentation Depth	0.433	0.405	0.445	0.613	0.386
Obliteration	0.543	0.42	0.331	0.177	0.172

b) Rankings

	Cothrun's	Hough's	Pottery Hill	Bryant Ranch	Bailey
Coil Width	3	5	2	4	1
Indentation Width	2	4	5	1	3
Indentation Depth	3	4	2	1	5
Obliteration	1	2	3	4	5

*1=highest CV value; 5=lowest CV value

Table 4.13: Correlations Summary

*numbers in tables refer to the number of positive or negative correlations greater than 0.5 in the category specified in the table title

a) Individual Room and Floor Context by Site

	Coil Width	Indent Width	Indent Depth	Obliteration
Coil Width	.	.	.	.
Indent Width	1	.	.	.
Indent Depth	0	1	.	.
Obliteration	0	1	0	.

b) Individual Room and Fill Context by Site

	Coil Width	Indent Width	Indent Depth	Obliteration
Coil Width	.	.	.	.
Indent Width	2	.	.	.
Indent Depth	1	8	.	.
Obliteration	0	2	0	.

c) All Habitation Rooms by Site (context not differentiated)

	Coil Width	Indent Width	Indent Depth	Obliteration
Coil Width	.	.	.	.
Indent Width	2	.	.	.
Indent Depth	0	8	.	.
Obliteration	0	1	0	.

d) All Non-habitation Rooms by Site (context not differentiated)

	Coil Width	Indent Width	Indent Depth	Obliteration
Coil Width	.	.	.	.
Indent Width	0	.	.	.
Indent Depth	0	1	.	.
Obliteration	0	0	0	.

e) Floor Context of All Rooms by Site (function not differentiated)

	Coil Width	Indent Width	Indent Depth	Obliteration
Coil Width	.	.	.	.
Indent Width	0	.	.	.
Indent Depth	0	1	.	.
Obliteration	0	0	0	.

f) Fill Context of All Rooms by Site (function not differentiated)

	Coil Width	Indent Width	Indent Depth	Obliteration
Coil Width	.	.	.	.
Indent Width	0	.	.	.
Indent Depth	0	3	.	.
Obliteration	0	0	0	.

g) Individual Habitation Rooms with Undifferentiated Context by Site				
	Coil Width	Indent Width	Indent Depth	Obliteration
Coil Width	.	.	.	.
Indent Width	1	.	.	.
Indent Depth	1	1	.	.
Obliteration	0	0	0	.
h) Individual Non-habitation Room Floor Context by Site				
	Coil Width	Indent Width	Indent Depth	Obliteration
Coil Width	.	.	.	.
Indent Width	1	.	.	.
Indent Depth	0	0	.	.
Obliteration	0	0	0	.
*All other combinations did not have any correlations greater than				
0.5 in cases with a sample size of greater than ten.				
I) Total				
	Coil Width	Indent Width	Indent Depth	Obliteration
Coil Width	.	.	.	.
Indent Width	7	.	.	.
Indent Depth	2	23	.	.
Obliteration	0	4	0	.

Table 4.14: K-means Cluster Solution Summary		
a) Five Cluster Solution		
Variable	Between Groups Variation	Within Groups Variation
Coil Width	1601.215	135.72
Indentation Depth	5.357	150.647
Obliteration	0.807	26.603
Total	1607.379	312.971
b) Six Cluster Solution		
Variable	Between Groups Variation	Within Groups Variation
Coil Width	1602.792	134.144
Indentation Depth	56.744	99.26
Obliteration	1.709	25.702
Total	1661.244	259.106
c) Seven Cluster Solution		
Variable	Between Groups Variation	Within Groups Variation
Coil Width	1604.443	132.493
Indentation Depth	79.434	76.57
Obliteration	1.937	25.474
Total	1685.813	234.537

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