Ancestral Polynesian Plain Ware Production and Technological Style: A View from Aganoa, Tutuila Island, American Sāmoa

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Abstract

Combining temper analysis of Polynesian Plain Ware with the concept of technological style, I argue that at least two separate pottery production groups are reflected in the ceramic assemblage of Aganoa, an ancestral Polynesian village on Tutuila Island, American Sāmoa. These production groups appear to have been consistent over time and probably reflect long term divisions in ancestral Polynesian social organization. Identification of such groups provide greater insight into production organization, allowing Sāmoan archaeologists to begin to ask questions about how the organization of pottery production articulated with other aspects of ancestral Polynesian society, including exchange, production of other material culture, and political organization.

KEYWORDS: petrography, Polynesian pottery, Sāmoa, Oceania, ceramic production.

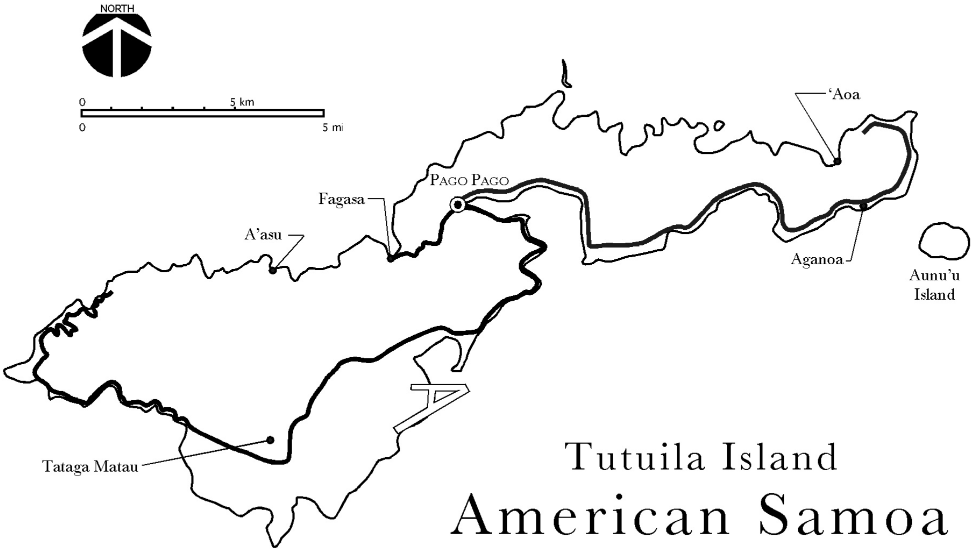
Introduction

Previous research on Polynesian Plain Ware has focused primarily on identifying changes through time or over space of specific ceramic attributes. Chronological studies have found that decoration, rim form, and body thickness change over time at some sites (Clark and Herdrich 1988; Clark and Michlovic 1996; Green 1974; Kirch and Hunt 1993; Kirch et al. 1990; Moore and Kennedy 2003). Spatial studies have been primarily focused on temper identification or paste colour to determine provenance (Dickinson 1974, 1976a; Jennings and Holmer 1980). Although a few petrographic studies have attempted to interpret data in terms of social interaction (Dickinson and Shutler 2000), no attempts have been made to describe organization of pottery production. It is my goal here to focus less on questions of chronology and provenance, and more on questions of production organization. I do this by applying the concept of technological style to decisions about temper material made by ancestral Polynesian potters.

Technological style holds that the concept of style can be applied to technical stages in the manufacturing process of material culture (Capone 2006). Technological style is characterized by "the many elements that make up technological activities which are unified non-randomly in a complex of formal relationships" (Lechtman 1977:10) and can be considered "manifest expressions of cultural patterning" (Lechtman 1977:4). Where two materials can be interchanged in the same technical step, such as crushed basalt or crushed diabase as temper in pottery, the decision on which to use may be a result of technological style on the part of a potter. I argue that at least two technological styles are present in the ceramic assemblage of Aganoa, an ancestral Polynesian village on Tutuila Island, American Sāmoa (see Figure 1).

Aganoa, an Ancestral Polynesian Village

Aganoa (AS–22–43) is an ancestral Polynesian village located on the southern coast of eastern Tutuila Island. James Moore and Joseph Kennedy surveyed and test excavated Aganoa as part of a cultural resource evaluation for the East and West Tutuila Water Line Project (Moore and Kennedy 2003: 42–120). The ancestral village is located within the modern Sāmoan village of Aganoa. Geologically, the site sits upon sandy coastal sediments which overlie volcanic soils and beach rock (Stearns 1944; Goodwin and Grossman 2003; Nakamura 1984). Chronologically, three calibrated radiocarbon dates recovered from test excavations (Moore and Kennedy 2003:116–119) indicate that site occupation potentially spanned a period from 2797 to 473 BP; the presence of any cultural hiatuses has not been determined.



Initial survey showed that the site has several modern structures located along its southeastern boundary and three historic surface features including a basalt enclosure, terraces, and a possible buried platform (see Figure 2).

Test excavations revealed a series of 12 subsurface features identified as post-holes, basalt paving, and a storage pit; these features are interpreted as part of a living surface (Moore and Kennedy 2003). Stone tools and debitage, Polynesian Plain Ware pottery, faunal remains, fishhooks, and beads were also recovered. Retouched basalt unifaces and bifaces interpreted as coconut graters, and polished basalt adzes and preforms, make up the most common stone tools. The nine fishhooks and fishhook fragments are of the one-piece variety and made from marine shell while the beads were made from both marine shell and bird bone. This abundant material culture was particularly well-preserved, making Aganoa ideal for future archaeological research of ancestral Polynesian village life.

Aganoa's Polynesian Plain Ware Assemblage

Polynesian Plain Ware sherds recovered from Aganoa were originally subjected to a basic attribute analysis with the specific purpose of investigating changes in the ratio of thin-to-thick ware (Moore and Kennedy 2003:103–110). This focus was based on Green's (1974) observation that the production of thin ware appeared to decline over time in comparison with thick ware pottery at numerous sites in Western Sāmoa. Since Green's initial observation, this pattern has been observed at 'Aoa on Tutuila Island (Clark and Herdrich 1988) and at To'aga on 'Ofu Island (Kirch and Hunt 1993). However, other studies have found that the pattern does not seem to hold true (Jennings and Holmer 1980; Eckert and Pearl 2006). Moore and Kennedy (2003:103–110) found that mean thickness of body sherds at Aganoa decreased with excavation depth, providing further evidence for this temporal trend.

Beyond their analysis of thin ware and thick ware, Moore and Kennedy provide further description of the Aganoa ceramic assemblage. They observe that the majority of this assemblage is composed of "nondescript fragments which displayed varying degrees of deterioration" (Moore and Kennedy 2003:103). They argue that pottery was produced from dark red to reddish brown clays. They also found that rim sherds vary in terms of shape and thickness, and only two rims appear to have been decorated with incised grooves. My re-evaluation of the same collection agrees completely with these findings.

At the same time, my re-evaluation of the pottery disagrees with other aspects of their findings. First, Moore and Kennedy found "no evidence of the red slipped decoration described by

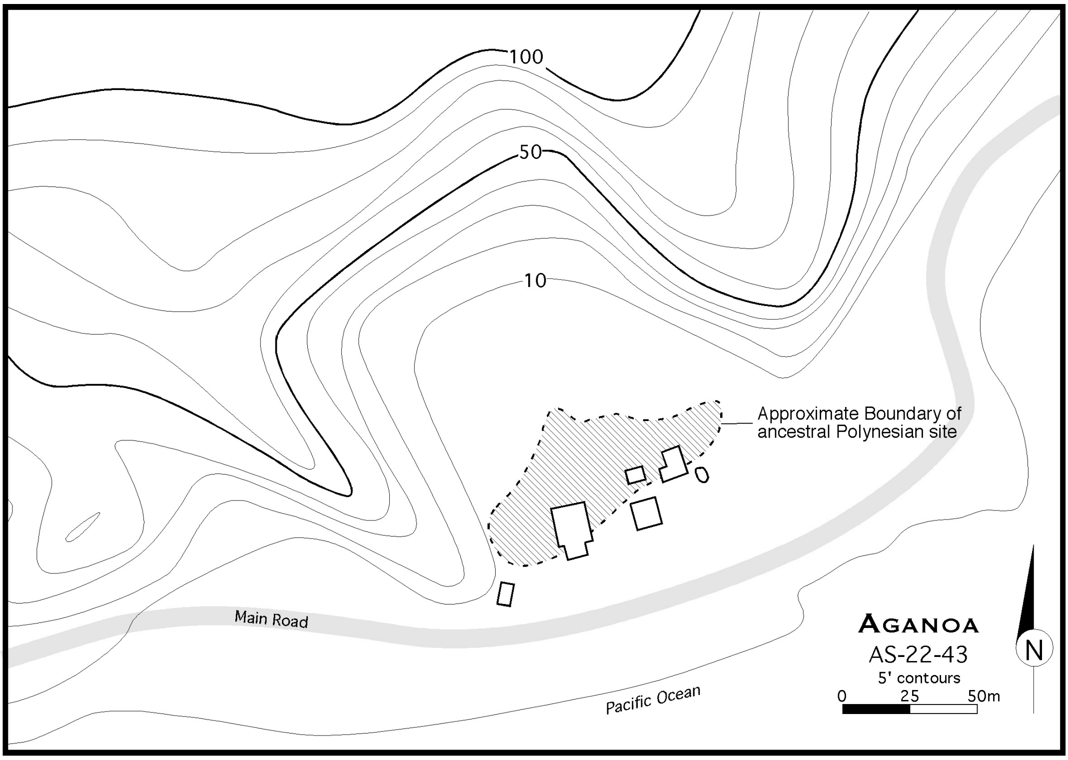


Figure 2: Map of Aganoa site (drafted by Frederick Pearl. (Moore and Kennedy 2003).

Hunt and Erkelens [1993]" (Moore and Kennedy 2003:110) while I found 15 sherds with evidence of red slip. Second, they fail to mention that four sherds were worked through grinding into specific shapes including three triangles and one disk. Third, and most pertinent to this study, while Moore and Kennedy identify sand, shell, and basalt as temper materials, they did not mention that half of the ceramic assemblage is tempered with grog (crushed sherd). These discrepancies probably result from Moore and Kennedy's sampling and analysis strategy, in which they performed detailed analysis of sherds from only two excavation units with special attention given to rim sherds. Further, they did not perform petrographic analysis to identify temper materials. However, the presence of both grog and basalt tempering traditions at the same village suggests important differences in technological style that have implications for ancestral production organization at Aganoa village.

Petrographic Patterns in Polynesian Plain Ware from Aganoa

Temper is the nonplastic material that occurs naturally in, or is intentionally added to, clay before forming a vessel. Methods of temper identification vary, but are primarily microscopic (Rice 1987). Petrographic analysis of temper informs on the processing of raw materials, construction techniques, firing behaviours, and choice of raw materials in pottery production (Habicht-Mauche 1993; Rice 1987; Shepard 1965; Whitbread 1989); it was chosen in this study as a means of exploring production location and technological style. Previous studies throughout Oceania (Dickinson 1980; Dickinson and Shutler 2000; Dickinson et al. 2001; Fitzpatrick et al. 2003), including the Sāmoan archipelago (Dickinson 1969, 1974, 1976a, 1993), has shown that petrography is an ideal method for differentiating between pottery produced on geotectonically different islands. Primarily through the work of William Dickinson, indigenous sand tempers have been expertly described throughout much of Oceania (Dickinson 1969, 1971, 1974, 1976a, 1976b, 1993; Dickinson and Shutler 1971, 2000; Dickinson, et al. 1990; Fitzpatrick, et al. 2003), greatly enriching our understanding of ceramic provenance, population movement, and social interaction. It is my contention here that petrography can also be used to discuss production organization and technological style of ancestral Sāmoans and other Oceanic groups, leading to a greater understanding of social organization within villages and on islands.

The data set from Aganoa consists of 895 sherds that were sorted into separate temper categories based upon recognizable differences in paste and nonplastic inclusions as observed under a binocular microscope; specifically, categories were based upon colour and texture of paste matrix as well as differences in the type, range, and relative proportion of mineralogical and lithic inclusions. This initial sorting resulted in 13 preliminary temper groups, which were then verified and identified using petrography. On average, two sherds per binocular temper group were selected for petrographic analysis, resulting in 23 petrographic thin sections. Using a standard petrographic microscope, each slide was examined for general characteristics and then a point count sampling was performed. General characteristics recorded include paste matrix colour and texture as well as sorting of nonplastic inclusions; further, mineral or lithic identification, size, and angularity were recorded for all nonplastic inclusions. Eventually, data from this study will be combined with data from other ancestral villages on Tutuila, and compared with geological resources collected from around these sites, to determine whether or not petrography can be used for intra-island provenance studies. In this current research, only the broadest categories of temper selection are discussed, specifically, basalt rock and grog.

The majority (96 per cent) of the 895 examined sherds from Aganoa can be placed into one of two temper categories: basalt rock or grog (crushed sherd). The remainder of the sherds were tempered with either sand, coral, or an as-yet identified igneous rock. Basalt rock temper composes 45 per cent of the assemblage. Although the basalt inclusions vary somewhat in texture, coarseness, and angularity, they all fall within the range of Oceanic basalt found on the Sāmoan archipelago (Dickinson 1969, 1976a, 1993; MacDonald 1944). Whether or not variation in the basalt tempers can be used to distinguish inter and intra island production locations within the archipelago is yet to be determined. Grog temper composes 51 per cent of the assemblage. Grog temper is consistently angular and of medium coarseness; however, colour and texture vary. Further, secondary inclusions found with the grog are diverse, including corals in some samples, and Oceanic basalts in others. The extent to which these secondary inclusions are meaningful in terms of provenance studies or production technology will be the focus of future research.

To examine possible changes through time in temper selection, I examined the temper categories by excavation layer for two of Moore and Kennedy's test excavation units, AG/3 and AG/3A. These two units were selected because they had adequate sample sizes, and because they were the focus of Moore and Kennedy's original sherd analysis (Moore and Kennedy 2003). Petrographic evidence from these two units illustrates a tendency toward continuity in temper material choice through time when examined stratigraphically (see Table 1).

Table 1: Frequency of grog and basalt temper by layer for text excavation units AG/3 and AG/3A.

Layer	**Basalt Temper**	**Grog Temper**
Unit AG/3		
I	46% (**N** = 48)	54% (**N** = 57)
II	38% (**N** = 82)	62% (**N** = 132)
III	54% (**N** = 7)	46% (**N** = 6)
Unit AG/3A		
I	57% (**N** = 4)	43% (**N** = 3)
II	41% (**N** = 70)	59% (**N** = 66)

Although grog temper is as low as 43 per cent at the top of Test Unit AG/3A, and as high as 62 per cent in the middle of Test Unit AG/3, for the most part it comprises about 50 per cent of a given layer. The important point here is that both grog and basalt temper were regularly being used to temper the pottery found at Aganoa. This has important implications for the organization of pottery production that requires understanding why these two temper choices were being employed.

Temper Choice as Technological Style: Implications for Production Organization at Aganoa

Understanding why either basalt rock or grog was chosen as temper by ancestral Polynesian potters requires first understanding the purpose of temper in pottery production. Nonplastic inclusions can modify the characteristics of both wet and dry clay, as well as the ceramic material during and after firing (Rice 1987; Rye 1981; Shepard 1954). Temper can modify workability by making the clay less plastic and therefore less sticky; it can modify a clay's drying behaviour by decreasing shrinkage. During firing, temper can lower a clay's vitrification temperature or reduce the spalling of clays high in calcium carbonate. Temper can also affect the final ceramic product by changing its colour, increasing its porosity, or increasing its strength (Rice 1987; Shepard 1954). Although a clay's natural inclusions, when present, can modify these characteristics, potters will also intentionally add temper to clay to create such desired effects.

A potter's choice of material on what to use as temper is seemingly endless: through time, potters around the world have used various types of igneous, metamorphic and sedimentary rocks, grog (including ceramic sherds and crushed brick), salt, sand, ash, blood, bone, shell, coral, dung, and numerous types of plant material (Matson 1989; Rice 1987; Shepard 1954; Stilborg 2001; Wettstaed 2005). Selection of temper is primarily based upon the desired effect a potter wishes to achieve. For example, if a potter wants to increase the porosity of her final vessel, she may choose to add an organic material such as straw to her clay and then fire her vessel in an oxidizing atmosphere (Rice 1987; Shepard 1954). The straw will burn away, leaving behind pores in the clay. Although the potter could choose between any number of organic materials such as straw, grass, or leaves, she would never add quartz sand to her clay to increase porosity as quartz sand would not burn away during firing. Resource availability and technological style may also play a role in her choice. She would probably only choose an organic material that was easily available; if a variety of such material were equally available, her decision would then be based upon technological style, a personal, cultural or ideological preference for a specific material.

Ancestral Polynesian potters chose a variety of nonplastic materials as temper including basalt, sand, and grog (Dickinson 1969, 1974, 1976a, 1993). All of these temper materials would have modified the same clay characteristics: they would have decreased wet clay plasticity, decreased drying shrinkage, and increased vessel strength (Rice 1987; Shepard 1954). If grog and basalt rock can be used interchangeably, what factors were involved in temper choice of ancestral potters who produced the pottery recovered at Aganoa? Currently, it is not known whether or not Aganoa potters produced grog-tempered or basalt-tempered pottery. It is possible that all, some, or none of the pottery was produced at the village; conversely, it is possible that all, some, or none of the pottery was exchanged. We can be almost certain that the basalt-tempered pottery, as well as any grog-tempered pottery with occasional inclusions of Oceanic basalt, was produced on the Sāmoan archipelago (Dickinson and Shutler 2000). With this in mind, temper choice probably does not reflect resource availability. Grog would be available to any potter with broken pots in her village; this petrographic analysis shows that at least some of the grog temper was also tempered with grog, suggesting that broken pots were not in short supply. Similarly, volcanic rock would not be difficult to come by on the volcanic islands that make up the archipelago.

If temper choice was not a matter of functional difference or resource availability for ancestral potters on the Sāmoan archipelago, then it was a matter of technological style. Ethnographic and historic potters are quite conservative in their temper choice (Capone 2006; Shepard 1954); in all probability an ancestral Polynesian potter would have consistently chosen the same material as her temper as long as it was available to her. I argue that the presence of two technological styles reflects at least two different contemporary production groups on the Sāmoan archipelago. A production group is a network of potters who learn and teach their craft to one another, probably through work groups composed of experienced and inexperienced potters of different generations and ages.

Different technological styles result from different production groups making different decisions throughout the production process, but using a similar set of tools and techniques available to all potters within an area. Although there were at least two production groups over a long period of time on the Sāmoan archipelago, at this point I do not have sufficient data to determine the nature of these production groups or how they articulated with other aspects of ancestral Polynesian society.

These two production groups reflect different production interaction and learning spheres; however, without further data, it is impossible to know whether or not there were multiple production groups within a village or on an island. I am currently in the process of collecting the necessary data to further define the organization of ancestral Polynesian pottery production.

Research Directions and Conclusion

The existence of at least two pottery production groups on the Sāmoan archipelago leads to further questions about the organization of pottery production and how it articulated with other aspects of ancestral Polynesian society. In the immediate future, I hope to determine if there are more than two pottery production groups that can be recognized on the archipelago. A temper analysis similar to the one presented here, but of ceramic assemblages from multiple ancestral villages, will hopefully provide information on the number of pottery production groups. Comparison of temper to geological samples collected from different volcanic formations and sand deposits around these sites will provide a production provenance for each group. If petrography does not provide any further information, then chemical composition analyses will be performed. Combined, these data will provide us with a greater understanding of the number of production groups per village, of production organization within each village, and of exchange between villages.

Understanding the organization of pottery production creates an avenue through which models of production organization in ancestral Polynesian society can be evaluated and refined. By comparing my ongoing research on Polynesian Plain Ware to archaeological studies of Polynesian adze production and exchange (Bayman and Nakamura 2001; Cleghorn 1986, 1992; Lass 1998; McCoy 1990, 1999; Withrow 1991), pottery analysis will both be informed by, and inform on, variability in the concentration and intensity of craft production, as well as the scale of exchange, in this region of the world. Such comparisons will allow me to place my findings in perspective with broader Polynesian cultural developments. Once the scale of pottery production and exchange in Sāmoa is understood, questions concerning how pottery production articulated with the production of other Polynesian crafts, why pottery was never adopted in eastern Polynesia, and why it ceased to be produced in western Polynesia, can be adequately addressed. In the long term, it is my goal that analysis of pottery production will augment our understanding of the roles that production and exchange played in the development and maintenance of chiefdoms. Although Polynesia is the model society for which the development of chiefdoms in other parts of the world is compared and contrasted, and production is recognized as an important aspect of such development, very little is known about production in pre-contact Polynesia. This research provides one opportunity to evaluate organizational variability in production and exchange in the archaeological record, rather than simply relying on ethnographic analogy.

Acknowledgments

Jordan Acheson, Chris Crews, Eleanor Dahlin, Phil Johnson, Justin Scott, Lowell Kane, and Andrew Roberts all helped with different aspects of the Aganoa ceramic analysis. Thanks to American Sāmoa Power Authority, James Moore and Joseph Kennedy for providing access to the Aganoa ceramics, documents and reports. Paul Boni and Sheila Goff made the beautiful thin sections preparation during my desperate time of need. Special thanks to Fred Pearl, who got me interested in this project and continues to be my primary source of discussion and ideas concerning all things Sāmoan.

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