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A commanding view of the Pacific: highland land use as viewed from Vainu'u, a multi-component site on Tutuila Island, American Samoa

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ABSTRACT

We discuss recent findings from Vainu'u (AS-32-016), a multi-component highland site on Tutuila Island, American Samoa. Vainu'u is of interest for at least three reasons. First, as the earliest recorded highland site in the Samoan archipelago, this site changes our understanding of the Samoan cultural chronology. Second, as a ceramic-bearing site, material culture recovered from Vainu'u complements assemblages recovered from lowland and coastal sites. Third, the post-ceramic occupation observed at Vainu'u provides interesting insights into residential occupation during the Monument Building Period.

Keywords: Samoa, chronology, radiocarbon, highland settlement, Polynesia.

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INTRODUCTION

In this paper, we examine the occupation of Vainu'u (AS-32-016) – a multi-component site located on Tutuila Island, American Samoa – and interpret the site in light of our broader understanding of Samoan prehistory. Archaeological work at Vainu'u is of interest for at least three reasons. First, as the earliest recorded highland site in the Samoan archipelago, this site changes our understanding of the Samoan cultural chronology. Evidence from Vainu'u shows that the highlands were being occupied, at least for resource procurement and possibly for residence, as early as 2270 BP. Vainu'u is also the first ceramic-bearing site located in the highlands (Figure 1) to be recorded and systematically excavated in the Samoan archipelago. At the time of Vainu'u's discovery, the understanding of the ancestral Samoan cultural sequence had pottery production occurring during 3100–1700 BP, *prior* to residential settlement of the highlands (Davidson 1969, 1974, 1979; Pearl 2004); previously recorded ceramic-bearing sites had all been located along the coast or in the foothills.

Second, as a ceramic-bearing highland site, material culture recovered from Vainu'u provides an important complement to the assemblages recovered from excavations at lowland and coastal sites. Our evidence suggests that cultural activities practised at Vainu'u were somewhat different than those practised at coastal sites. As such, more archaeological work needs to be done at ceramic-period highland sites so as to be able to understand the full range of behaviours practised by the earliest settlers of Tutuila Island.

Third, and finally, the post-ceramic occupation at Vainu'u provides interesting insights into residency during the Monument Building Period. Unlike the larger, more well-known archaeological sites of this period, residents of Vainu'u do not appear to have been at the centre of any prestige building or production specialisation activities. Examination of Monument Building Period sites that were not politically central, as seems to be the case at Vainu'u, has the potential to provide important data to help explain how social complexity developed, was organized and was maintained in late-period Samoan prehistory. Interpretation of such data provides a clearer understanding of the lifeways of ancestral Samoans than we have at present.

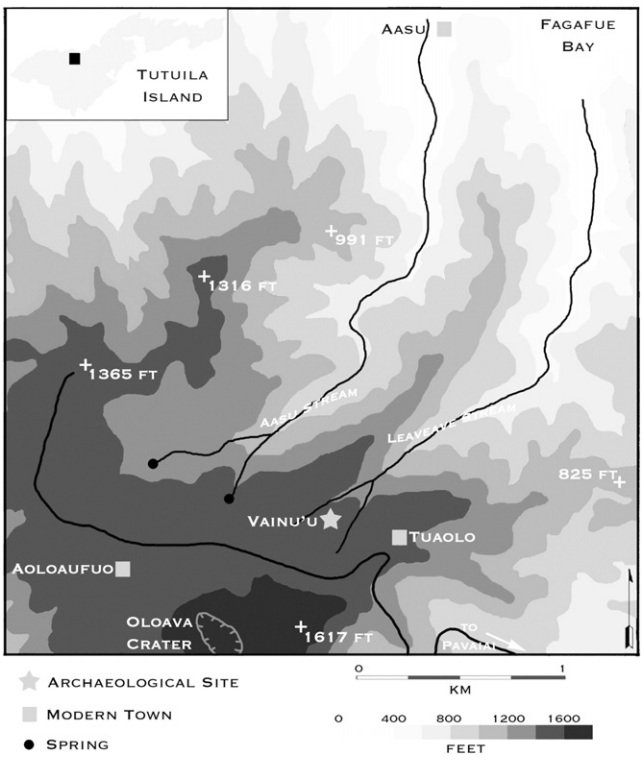
VAINU'U AND ITS CULTURAL SETTING

Vainu'u is located at approximately 1100 feet (335.28 m) above sea level on a ridge between two forks of the Leaveave Stream. First identified as a prehistoric site by David Herdrich, American Samoa territorial archaeologist, Vainu'u was mapped and excavated by a Texas A&M University archaeology crew in 2006 and 2007 (Eckert & Welch 2009). Combined, the 2006 testing and the 2007 archaeological investigations at Vainu'u resulted in the excavation of 23 1 × 1 metre units with a volume of ~17 cubic metres as well as 14 shovel test pits (Figure 2).

The material culture recovered includes 718 basalt artefacts, 24 volcanic glass artefacts and 755 ceramic sherds. Only a subset of artefacts could be assigned to

stratigraphic layers (Table 1); we focus on this subset to interpret cultural activity during each component. The majority of artefacts could not be assigned to a stratigraphic layer because these artefacts were surface finds, were recovered from four excavations units where stratigraphy was not well recorded or were recovered from three excavation units disturbed by historical activity. In addition to artefacts, a total of seven cultural features were identified (Table 2).

Figure 1. A topographic map showing Vainu'u and environs.



The radiocarbon dates discussed below allow us to place Vainu'u within the established Samoan chronology (Addison *et al*. 2008; Burley *et al*. 1995; Davidson 1969, 1979; Green & Davidson 1969, 1974; Kirch 2000) that associates time periods with specific material traits and settlement patterns (Table 3). Vainu'u is multi-component, with Component 1 dating to the Late Eastern Lapita Period/Plain Ware Period transition and Component 2 dating to the Monument Building Period.

The Late Eastern Lapita Period (2700–2300 BP) is characterised primarily by the lack of dentate-stamped pottery and an overall simplification of pottery decoration when compared to the Early Eastern Lapita Period. The Plain Ware Period (2300–1700+ BP) is characterised by a ceramic assemblage that consists almost entirely of undecorated sherds; where decoration does exist, it is usually simple patterns along the rim. Commonly known as the Polynesian Plain Ware Period, it is generally believed that during this period, Polynesian culture began to diverge from a Lapitoid/Melanesian pattern towards a more distinctively Polynesian pattern (Burley *et al*. 1995; Clark 1996; Davidson 1979; Hiroa 1930; Irwin 1992; Kirch 1984, 2000; Kirch & Green 2001; Pawley 1966; Pawley & Ross 1993; Shutler & Shutler 1975). However, this cultural continuity has yet to be established archaeologically (Smith 2002); as such, the term "Plain Ware Period" is used here, so as avoid untested cultural affiliations. Previous studies of Plain Ware Period sites have suggested that occupation during this period was focused along the coast (Clark & Michlovic 1996; Green & Davidson 1969, 1974; Kirch & Hunt 1993b; Kirch *et al*. 1990).

Figure 2. Vainu'u, showing the location of the 2007 excavation units and cultural features.

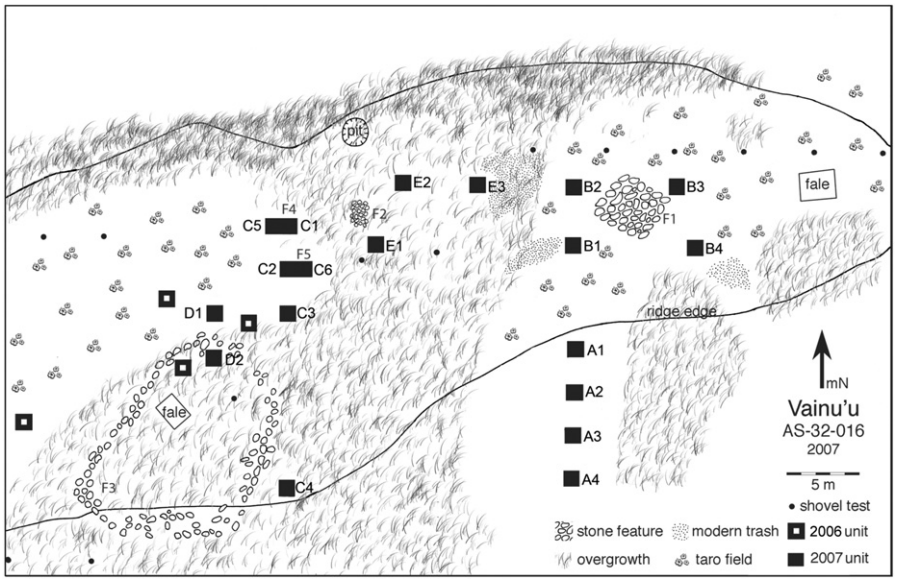


Table 1. Artefacts that can be assigned to a stratigraphic layer.

Layer	Component (features)	Thin pottery	Thick pottery	Volcanic glass	Basalt flakes	Adzes	Basalt scrapers	Basalt blades
O		14	6	4	2	3		
V	Component 2 (F3 house foundation, F6 postholes)	25	6		63	8	3	
IV								
III	Component 1 (F4 and F5 stone ovens)	260	55	24	333	4	2	5
II					12			
I								
Total		299	67	28	410	15	5	5

Table 2. Cultural features identified at Vainu'u during 2006 and 2007 (cmbs refers to centimetres below surface).

Feature	Location	Dimensions	Time period	Comments
Pit (no feature #)	Surface	2 m diameter; 1 m depth	Historic?	Possible *masi* pit
House platform (Feature 1)	Surface	Oval 4.25 × 5.00 m, aligned east–west	Modern (within past 50 years)	Complete stone pavement
Burial? (Feature 2)	Surface and partially buried?	Rectangle 1.5 × 2 m, aligned north–south	Historic?	Low pile of stones
House platform (Feature 3)	Surface and partially buried	Rough rectangle 15 × 12 m, aligned north-east/south-west	Component 2	Kerbstones with dirt fill
Umu (Feature 4)	Units C1 and C5 32–45 cmbs	Round, 90 cm diameter	Component 1	Fired rocks with charcoal and ash
Umu (Feature 5)	Units C2 and C6 26–64 cmbs	Oval, 110 cm at widest	Component 1	Fired rocks with charcoal and ash
5 Postholes (Feature 6)	Unit D2 ~29–49 cmbs	Each ~8 cm diameter	Component 2	Located on north edge of Feature 3

Table 3. Samoan cultural chronology.

Period	Date range (BP)	Material traits
Aceramic periods		
Early Historic	250 – 112	Increase in coastal settlements
Monument Building	1000 – 250	Highland settlements; monumental architecture including fortifications and star mounds
Dark Ages	1700+ – 1000	Absence of pottery and volcanic glass; triangular and trapezoidal-sectioned adzes
Ceramic periods		
Plain Ware Period	2300 – 1700+	Coastal and inland settlements; undecorated pottery
Late Eastern Lapita	2700 – 2300	Coastal settlements; late Lapita decorated pottery (designs simplified)
Early Eastern Lapita	3100 – 2700	Initial settlement(s?) along coast; early Lapita decorated pottery (dentate stamped)

Most of the known prehistoric sites on Tutuila Island date to the Monument Building Period (1000–250 BP). Previous research indicates that a major settlement shift from the coasts and lowlands to the highlands occurred at c.700 BP (Pearl 2004). This period was one of regular warfare, with the building of fortifications and defensible villages common. The building of earthen mounds, especially rayed platforms, probably reflects prestige-building activities by chiefs (Herdrich 1991). Complex craft production organisation is reflected in the archaeological record through evidence for specialised production of basalt adzes on Tutuila Island during this period (Best *et al*. 1992; Enright 2001).

BUILDING A CHRONOLOGY FOR VAINU'U

One of the most interesting aspects surrounding the discovery of Vainu'u and its highland ceramic assemblage was its potential to help refine the prehistoric timeline. As hoped, excavations provided ten radiocarbon samples from solid cultural contexts that have allowed us to confidently place the site within the ancestral Samoan cultural sequence. However, site stratigraphy and integrity need to be considered prior to a discussion of chronology building and cultural interpretation. Unfortunately, site stratigraphy cannot be reconstructed for seven of the 23 excavation units. Due to weather and time constraints, complete

Table 4. Stratigraphic layers described for Vainu'u.

Layer	Thickness (cm)	Texture	Colour	Horizon	Associated cultural material
O	5	Organic soil, small spheroidal granular ped structure (OL/OH)	7.5YR 2/0 black	Ap	Recent debris, lithic artefacts, features
V	10–25	Andison, lean clay (CL)	10YR 3/3 dark brown	Bw	Recent debris, lithic artefacts, features
IV	3–5	Discontinuous welded ash	5YR 3/3 dark reddish-brown	Cm	Culturally sterile, no artefacts
III	10–45	Fat clay with gravels (CH)	10 YR 3/4 dark yellowish-brown	2BC	Ceramic artefacts, lithic artefacts, features
II	85	Clayey gravels (GC)	5 YR 3/2 dark reddish-brown	2C	Few lithic artefacts
I	>35	Well-graded gravels (GW)	7.5YR 4/6 strong brown	3C	Culturally sterile, no artefacts

sediment data were not collected for the four units excavated in 2006. Also, the three units in Locus E were so heavily disturbed by historical cultural activity that the stratigraphic layers were completely mixed (Figure 2). Very limited to no disturbance was evident in Loci A, B, C and D after the first 30–40 centimetres below surface. As such, site stratigraphy, chronology building and cultural interpretations relied on data recovered from these 16 units.

Site stratigraphy

Five stratigraphic layers are present across the site (Table 4), all of which originated as volcanic ejecta (Nakamura 1984: 52). The thin organic stain of Layer O, the uppermost soil horizon, transitions into Layer V; both Layer O and V are laterally continuous. These layers originally formed as the most recent volcanic event deposited a lens of ash upon Layer IV.

Layer IV is discontinuous across the site and is composed of welded ash; this siliceous material is physically root-restrictive where intact and must be broken with a hand pick when fully intact. Inspection of portions of the welded ash yielded casts of deciduous foliage trapped within several of the laminated clasts. This finding points towards some level of landscape stability prior to the addition of Layer IV. The superheated blanket of ash that created Layer IV would have destroyed the natural environment upon deposition. The once active cultural surface of Layer III below the welded ash would have been rendered devoid of any living foliage for some time.

Layer III is composed of sandy clay loam with gravels and is the product of weathered volcanic ash and ciders. This layer exhibits variable thickness, yet is distinct and continuous across the site. The surface of Layer III is a buried cultural horizon associated with ceramic artefacts. Soil formation is weak, yet the stratigraphic profile illustrates that landscape stability was constant long enough for a small degree of clay translocation within the layer before burial by Layers IV and V. Due to the fact that the welded ash of Layer IV is not continuous, Layer V often rests directly above Layer III, creating a paraconformity in the stratigraphic record in certain areas of the site.

Layer II consists of dark reddish-brown clayey gravels. The volcanic gravels are angular, well sorted and exhibit siliceous, vesicular structure. This depositional unit is devoid of artefacts in primary context. A few small artefacts were recovered from this sediment unit, yet their location is most likely the result of gradual downward movement from the cultural horizon in Layer III.

Layer I is culturally sterile and made of angular well-graded gravels of volcanic origin. The lowest limit of this sediment package was not met, with the deepest excavations ending at a depth of 35 centimetres within the layer. Small (< 0.25 cm) particles of ash-derived clay are interspersed in very limited amounts within the grain-supported matrix of Layer I.

Radiocarbon dates

Seven charcoal samples and three ceramic samples were submitted to Beta Analytic Radiocarbon Dating Laboratory for accelerator mass spectrometry (AMS) radiocarbon dating (Hood 2008) (Table 5). Vainu'u is located within a modern horticultural field, and so it can be assumed that much of the first 30–50 centimetres of the site has been repeatedly disturbed (Custer 1992), probably containing a mix of older and younger organic remains. With this in mind, charcoal samples for radiocarbon dating were selected from below 40 cm. We also attempted to collect datable carbon samples that were in strong association with either cultural features or stratigraphic layers.

We also used sooted ceramic material for radiocarbon dating, which has problems unique to this material class. In theory, soot provides an average date range for the different fuels that were used in forming the soot and so recovered context is not as vital as with dispersed charcoal. However, a carbon core and/or the presence of shell temper can impact a radiocarbon date obtained from surface soot. Therefore, ceramic samples were carefully selected to avoid the presence of these two potential contaminants. Although datable samples were not recovered from all layers, features or units, enough dates were recovered to divide Vainu'u into two prehistoric components and to discuss specific features and layers associated with these components (Table 6).

Table 5. Radiocarbon dates from the 2007 excavations at Vainu'u (unit refers to 1 × 1 m excavation unit; level refers to excavation level; feature refers to cultural feature if relevant; layer refers to natural stratigraphic layer; cmbs refers to centimetres below surface). Data from Beta Analytic Radiocarbon Dating Laboratory (Hood 2008).

Beta#	Provenience	Material	^{14}C age years (BP)	^{13}C:^{12}C ratio (‰)	^{13}C adjusted age (BP)	1-sigma calBP	2-sigma calBP
240798	Unit D2 Level 5 Feature 6 Layer 5 49 cmbs	Charcoal	660 ± 40	–25.9	650 ± 40	660–630 600–560	670–550
240796	Unit C6 Level 4 Feature 4 Layer III 42 cmbs	Charcoal	2320 ± 40	–28.3	2270 ± 40	2340–2310 2230–2200	2350–2290 2270–2160
240794	Unit C6 Level 4 Feature 4 Layer III 45 cmbs	Soot on sherd	1400 ± 40	–19.9	1480 ± 40	1400–1330	1420–1300
240792	Unit C2 Level 4 Feature 4 Layer III 49 cmbs	Charcoal	2340 ± 40	–27.5	2300 ± 40	2350–2320	2360–2300 2240–2180
240797	Unit C5 Level 5 Feature 5 Layer III 50 cmbs	Charcoal	2370 ± 40	–27.8	2320 ± 40	2350–2330	2360–2310
240795	Unit C2 Level 5 Feature 4 Layer III 55 cmbs	Charcoal	2290 ± 40	–28.0	2240 ± 40	2330–2300 2260–2160	2340–2150
240799	Unit C5 Level 6 Feature 5 Layer III 56 cmbs	Charcoal	2280 ± 40	–27.3	2240 ± 40	2330–2300 2260–2160	2340–2150
240793	Unit C1 Level 5 Feature 5 Layer III 57 cmbs	Charcoal	2380 ± 40	–27.9	2330 ± 40	2350–2340	2360–2320
240800	Unit C5 Level 7 Feature 5 Layer 3 63 cmbs	Soot on sherd	2440 ± 40	–25.3	2440 ± 40	2690–2640 2610–2590 2500–2360	2710–2350
240791	Unit B4 Level 4 Layer III 61 cmbs	Soot on sherd	2440 ± 40	–24.9	2440 ± 40	2690–2640 2610–2590 2500–2360	2710–2350

Component 1 dates to the Late Eastern Lapita Period/Plain Ware Period transition; seven radiocarbon samples (Beta #s 240791, 240792, 240793, 240795, 240796, 240797 and 240800) date this component from 2270 to 2440 BP (^{13}C adjusted age). Stratigraphically, this component is associated with Layer III; culturally, this component is associated with Features 4 and 5. Feature 4 has three radiocarbon samples that, when combined, date

Table 6. Vainu'u components placed within the Samoan cultural chronology.

Period	Vainu'u component	Cultural material at Vainu'u
Early Historic 250 – 112 BP		
Monument Building 1000 – 250 BP	Component 2 c.650 BP	House foundation (Feature 3), postholes (Feature 6), large triangular adzes, basalt scraping tools
Dark Ages 1700+ – 1000 BP		
Plain Ware Period 2300 – 1700+ BP	Component 1 2270 – 2440 BP	Cooking features (Features 4 and 5), pottery, volcanic glass, basalt blades, basalt scraping tools
Late Eastern Lapita 2700 – 2300 BP		
Early Eastern Lapita 3100 – 2700 BP		

from 2240 to 2300 BP; Feature 5 has four radiocarbon samples that, when combined, date from 2240 to 2440 BP. This indicates that these features are contemporaneous and, moreover, are the oldest highland cultural features recorded on Tutuila Island.

There is one sample recovered from Feature 4 that is an outlier from the cluster of seven dates discussed above. Beta #240794, soot residue taken from the exterior of a sherd, dates to 1480 ± 40 BP (^{13}C adjusted age). After checking to make sure that this sherd was from a good context and had no obvious source of contamination, we contacted Ron Hatfield, Deputy Director and Quality Manager at Beta Analytic Inc. After ruling out obvious contaminants (carbon core, shell temper or food residue), Hatfield noted that the "one odd thing I keep coming back too however is the very different C13/12 ratio of c. −19‰ for Beta-240794 which yielded the odd date vs. the −24 to −25‰ of the others that yielded very reasonable and reproducible dates. The residue dated for this sherd is clearly different chemically than that of the others" (Hatfield pers. comm.). Hatfield suggests that humic acids present in the soil *may* have been a source of contaminants, but that is not at all clear from the analysis. Overall, then, until a satisfactory explanation can be provided for the chemical difference between Beta #240794 and the other samples from Feature 4, this sample is considered an outlier and is currently not taken into consideration when creating the chronology for Vainu'u.

Component 2 dates to the Monument Building Period; one radiocarbon sample (Beta #240798) dates this component to 650 ± 40 BP (^{13}C adjusted age). Stratigraphically, this component is associated with Layer V; culturally, this component is associated with a large rectangular house foundation (Feature 3) and associated postholes (Feature 6). The radiocarbon sample dating this component was obtained from charred material recovered from within Feature 6 and encountered *in situ* during excavation. The columnar posthole stains are directly adjacent to basalt kerbstones and were probably support poles for Feature 3's wooden superstructure.

Stratigraphic evidence indicates that these two components were not only divided by a >1500 year time gap, but that at least one volcanic eruption occurred during this time gap, as indicated by Layer IV discussed above. This eruption probably rendered the ridge useless for cultural activity for an undetermined amount of time. Chronological time gaps are evident in the archaeological record at other sites in American Samoa, specifically at the coastal site of Aganoa (Crews 2008; Moore & Kennedy 2003) on Tutuila Island, at the inland sites of Pava'ia'i and Faleniu (Addison & Asaua 2006) on Tutuila Island, and at To'aga on nearby Ofu Island (Kirch & Hunt 1993b). The chronological information and material correlates from Vainu'u, then, fit well within the current archaeological assessment of cultural change on Tutuila Island.

PERIODIC USE OF THE HIGHLANDS DURING THE PLAIN WARE PERIOD

Component 1 material culture recovered from Vainu'u

During Component 1, a visitor to Vainu'u would have been standing on a young, yet stable volcanic soil that would have allowed for the typical suite of highland plant growth. This period is early enough in Samoan prehistory that now extinct species of birds may have still wandered the island (Steadman 1993a,b), and horticulture probably did not yet dominate the landscape.

Two roughly circular stone features, Features 4 and 5 (Figures 3 and 4), were located on average 50 centimetres below the surface, were uncovered about 3 metres apart, and are associated with Component 1. The similarities in depth, associated artefacts and radiocarbon dates suggest that they are associated features and probably served similar functions (Table 2). The stones making up both features were a bit larger than fist size, showed signs of heat stress (fire-reddened and occasionally cracked), and were surrounded by soot and ash. The stones in Feature 5 appear to have been stacked or discarded near a post, as evidenced by their circular placement around a posthole (Figure 4). These characteristics are typical of an *umu*, or Samoan cooking oven.

Figure 3. Top, Feature 4 during excavation; bottom, Feature 4 shown in the north wall profile of Units C1 and C5, with black representing the charcoal stain; the stratigraphic layer is indicated on the left and cm below surface is indicated on the right.

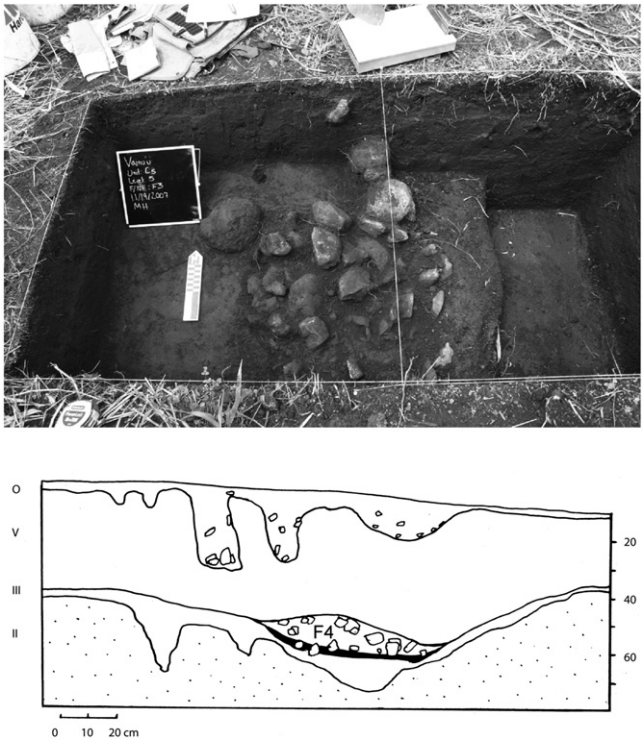
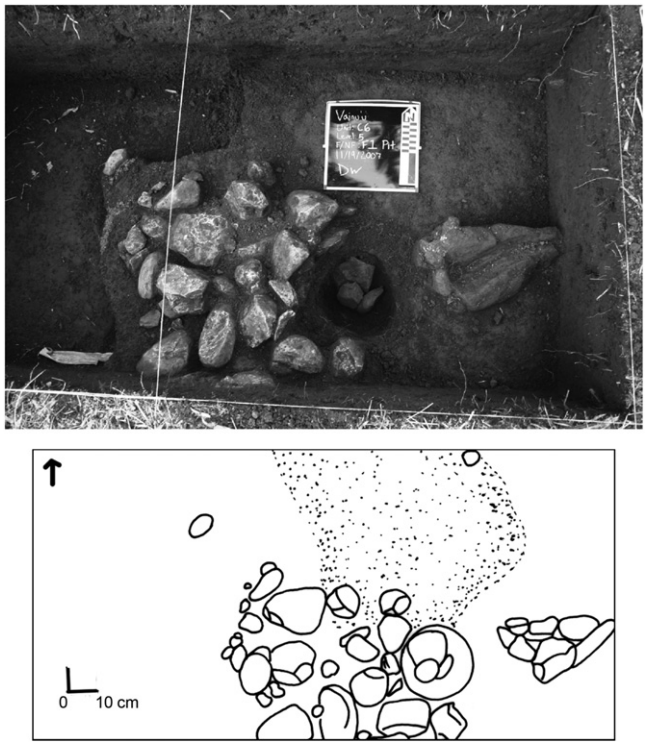


Figure 4. Top, Feature 5 during excavation, showing a posthole; bottom, a composite drawing of Feature 5 showing fired rocks, posthole, and charcoal and ash stain.



Comparison of these two features with modern *umu*s shows similarity in selection of stone size and feature shape (Eckert & Welch 2009). Modern *umu*s are normally covered by a *fale* to protect the ovens from rain; the posthole in Feature 4 may have been part of an analogous structure. We are not suggesting that direct ancestors of modern Samoans made Features 4 and 5, as we have yet to see convincing evidence that there was *not* a cultural hiatus between the ceramic and aceramic periods on Tutuila Island (Table 3). We are suggesting that this type of feature has a long history in the South Pacific and would probably have been brought to the island by the earliest inhabitants. Artefacts associated with these two features include undecorated pottery sherds, basalt blades and flakes.

Although ceramic sherds were recovered primarily from Layer III, associated with Component 1 ($N = 315$), some ceramic material was also recovered from Layers V ($N = 31$) and O ($N = 20$). At this time, we assume that the low densities of sherds recovered from these upper layers were probably originally associated with Component 1, on the basis of three lines of reasoning. First, although basalt artefacts were recovered, no ceramic artefacts were found associated *in situ* with features in Layers V and O. Third, portions of both Layer III (where sherds were recovered *in situ* as well as in stratigraphic fill) and Layer V (where sherds were recovered only in stratigraphic fill) are shallow enough to be in the "plow zone" (Custer 1992) and show evidence of post-depositional disturbance such as root growth; some sherds originally in Layer III could have been pulled into higher layers through this disturbance. Third, and finally, Addison *et al*.'s (2008) recent consideration of the ceramic chronology on Tutuila Island argues for an end date no later than 1200 years ago, which is almost 600 years earlier than our dates for undisturbed features in Layer V. At this time, there is no compelling evidence to suggest that pottery recovered from Vainu'u dates later than Component 1.

Attribute analyses of ceramic sherds reveal a pottery assemblage that is consistent with the Late Eastern Lapita/Plain Ware transition as it is currently understood (Addison *et al*. 2008) on Tutuila Island (Figure 5). Only seven sherds had any observed surface modification. Three sherds – all probably from the same vessel – display decoration (Figure 6). Four other sherds have striations, interpreted as evidence of wiping during the production process. The Vainu'u ceramic data confirm the existence of two Plain Wares as suggested by Green (1974), on the basis of thickness, temper size and paste colour. Thick ware (26% of total site assemblage; $N = 193$) at Vainu'u normally has a light brown paste, very coarse-sized olivine basalt temper and averages 11.9 ± 0.5 millimetres in thickness. Thin ware (74% of total site assemblage; $N = 557$) normally has a dark reddish-brown paste,

Figure 5. The complete assemblage of rim forms recovered from Vainu'u.

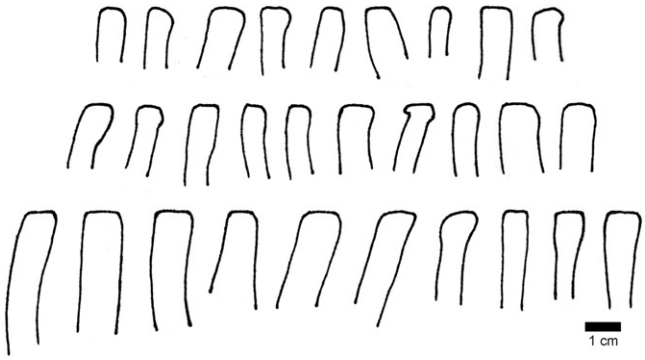
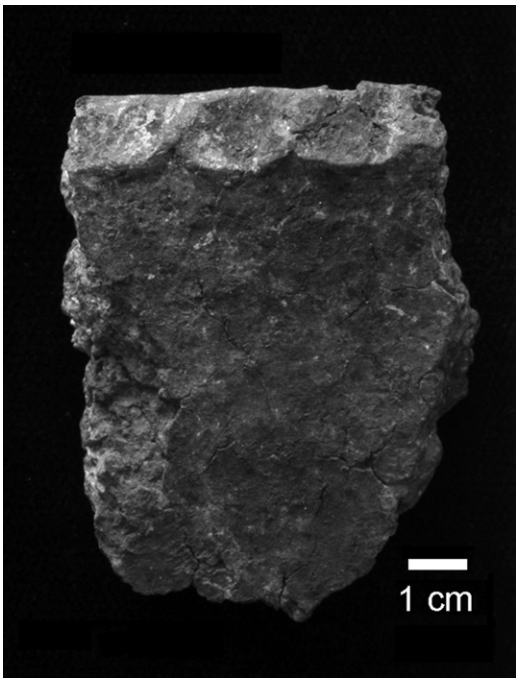


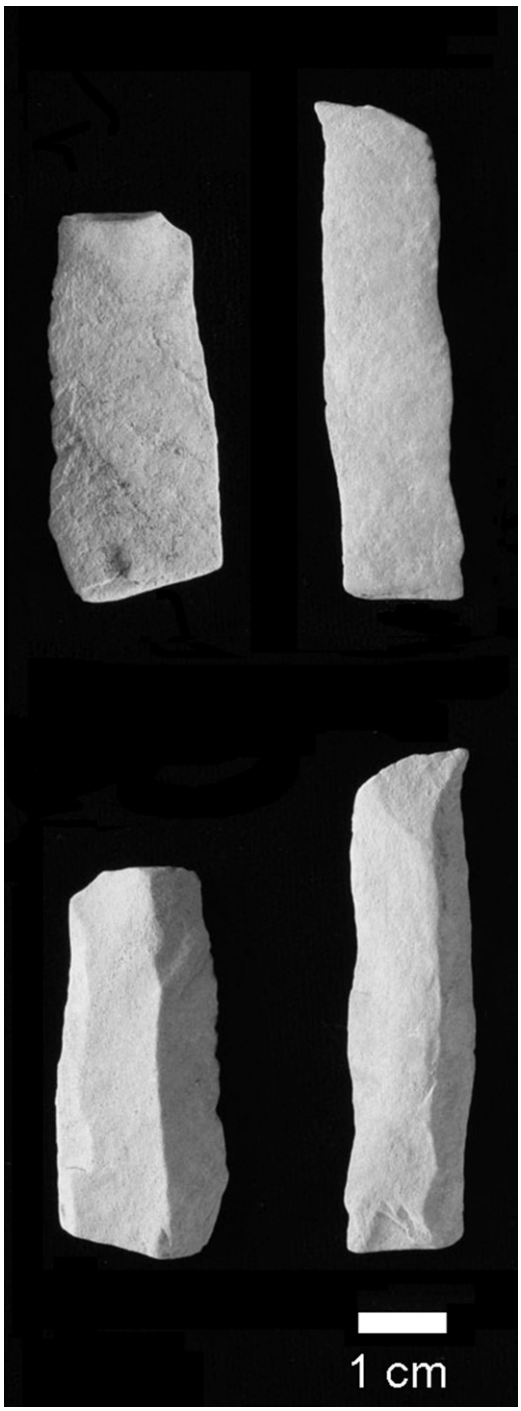
Figure 6. A decorated sherd recovered during the 2006 excavations. (Photograph by Charlotte Pevny.)



medium- to coarse-sized basalt temper and averages 7.8 ± 1.2 millimetres in thickness. About a quarter of the total ceramic assemblage was sooted ($N = 179$). Most (80%) of the sooted sherds were thin ware. This suggests that thick and thin ware may have a functional difference; thin ware being preferred for, but not limited to, cooking activities.

Basalt blades are of special interest, as they are rare on Tutuila Island. The five blades and blade fragments recovered from Vainu'u were all found in direct association with the Component 1 *umu*s (Figure 7). These flakes were the product of removal from a flaked core rather than being a random by-product of adze manufacture. Laminar ridges on the dorsal face indicate that other flakes were removed in a similar fashion prior to the detachment of the blades in the collection. The fact that Component 1 inhabitants employed prepared-core blade technology at Vainu'u in no way suggests that Vainu'u was a workshop for blade production but, rather, that those utilizing the area at one time knew the benefits of isolating striking platforms to produce long thin flakes that maximised the usable surface area along each flake margin.

Figure 7. Basalt blades recovered from Unit C1 Layer III (Component 1): top, ventral face; bottom, dorsal face. (Photographs by Charlotte Pevny.)



Component 1 yielded a total of six basalt tools: three complete adzes, one adze fragment and two scrapers. The lack of exhausted basalt cores and primary flakes indicates that basalt adzes were being brought to the site in finished form. Significant patterning is evident in flake size by time period ($\chi^2 = 27.353$, d.f. = 6, $p = 0.000$), with Component 1 containing a substantially higher frequency ($N = 274$) of smaller flakes (< 3 cm in diameter) than Component 2 ($N = 38$). Significant differences also exist in the distribution of flake type by time period ($\chi^2 = 23.238$, d.f. = 8, $p = 0.003$): Component 1 yielded 302 non-cortical flakes, while Component 2 contained only 47 non-cortical flakes and two cortical flakes. Combined, these findings are indicative of more intensive tool retouch during Component 1 when compared with Component 2.

Excavations recovered 24 volcanic glass artefacts in Component 1; however, only one of these artefacts was found in association with the *umu*s. This suggests that volcanic glass was associated with activities other than cooking on the site. Non-cortical flakes are the predominant volcanic glass artefact ($N = 13$). Secondary and primary cortical flakes are next in abundance, with only two volcanic glass cores recovered. Flakes were removed from cores through a combination of bipolar and handheld methods. While the sample size is small, the collection includes very few flakes with definite attributes of bipolar flake production. Significant patterning exists between flake platform and termination attributes ($\chi^2 = 13.640$; d.f. = 6; $p = 0.034$), where flakes exhibit predominantly smooth platforms and feathered terminations. This relationship may indicate that the volume of volcanic glass carried to Vainu'u met utility requirements to such a degree that extended reduction using bipolar methods was not necessary. As such, while utilised flakes may have been discarded, the cores were expended elsewhere.

Interpretation of Component 1

We interpret the lack of residential features but presence of cooking ovens during Component 1 as evidence of short-term, repeated use of Vainu'u during this time. The two *umu*s and sooted pottery associated with this earliest component indicate that food production was taking place; however, what was being cooked is unknown. The posthole found in association with Feature 5, as well as the scattering of pottery across the entire ridge, indicates either repeated use of the site for some special-activity pursuit or long-term residency associated with an as yet unidentified living structure. Currently, we favour the first interpretation, based on the lack of evidence for a Component 1 residential structure and the limited range of features and artefact classes defined in the Component 1 assemblage when compared to other sites discussed below.

The low frequency of exhausted stone tools, early stage reduction flakes and cores suggests that easily carried tools and materials (including basalt adzes and volcanic glass) were transported back and forth from Vainu'u as need required. If people were spending a few days at Vainu'u on a semiregular basis to fell trees or in pursuit of some other activity, then meals may have been prepared on site using pottery and stone ovens. The ceramic vessels and fire-seasoned oven stones would have then been left on the ridge for the next working session.

Comparison with other ceramic-bearing sites

Two ceramic-bearing coastal sites in American Samoa have produced *in situ* radiocarbon dates placing residency as roughly contemporaneous with Component 1 activity at Vainu'u: Aganoa and To'aga. Aganoa (AS-22-43) is located in a small cove along the south coast of eastern Tutuila Island (Crews 2008; Eckert *et al*. 2008; Moore & Kennedy 2003; Welch 2008) and has a cultural surface, containing ceramic artefacts, with an associated radiocarbon date of 2570 ± 40 BP (^{13}C adjusted age). To'aga (AS-13-1) is located on the south-east shore of Ofu Island (Kirch & Hunt 1993b) and has a buried ceramic-bearing cultural component of continued occupation dating from 3200 to 1900 BP (Kirch 1993a).

When compared with these two sites, the stone ovens identified at Vainu'u clearly represent one type in a range of firing features associated with ceramic component sites in American Samoa. The ceramic cultural surface excavated at Aganoa contained firing features as indicated by rings of basalt cobbles, ash piles and burnt soils; the ceramic-bearing layers at To'aga contained multiple instances of ash lenses and oven stones. Although no unique features were identified at Vainu'u, features not present at Vainu'u were identified at Aganoa and To'aga in association with pottery: an *ili'ili* surface and shell midden were identified at Aganoa; while shell middens, pits and postholes associated with possible residential structures were identified at To'aga. The ceramic assemblages from all three sites consist of both thin and thick ware.

Sherds at each site display a variety of tempers and pastes pointing towards mostly localised production. Some vessels at each site reveal evidence that they were used for cooking, including sooted vessels at Aganoa (Eckert 2006) and Vainu'u, and carbonised residues at To'aga (Hunt & Erkelens 1993: 137). Rim forms recovered from the three sites represent primarily wide-mouthed vessels. The general consensus of researchers is that pottery vessels were probably used in a variety of ways, including to store, cook and serve food items.

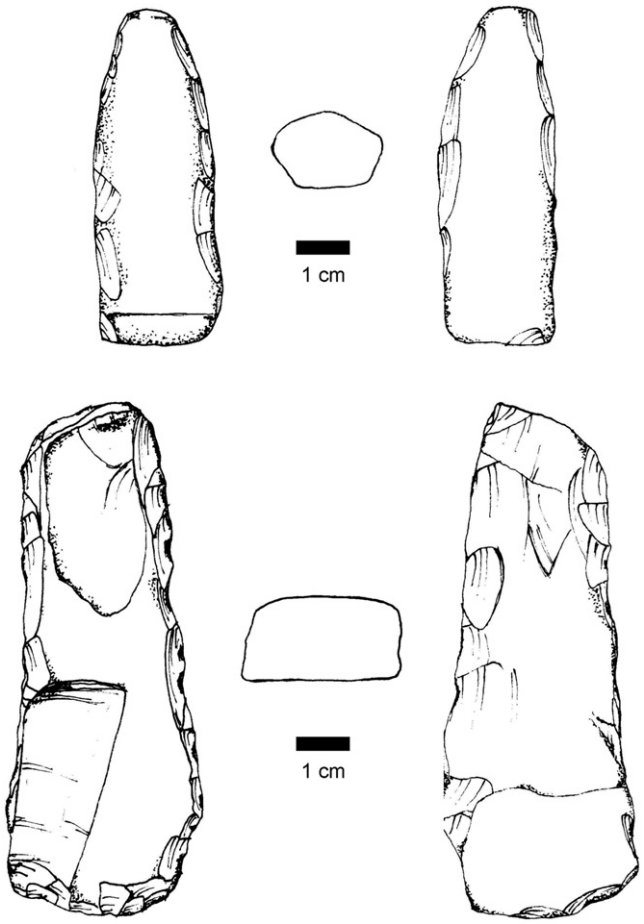
Although there are some similarities between the lithic assemblages from these sites, there are also some obvious differences. The Component 1 lithic assemblage at Vainu'u is characterised by basalt blades, basalt scraping tools, volcanic glass and adzes. Aganoa contained adzes and adze fragments, basalt flake tools identified as scrapers and gravers, and volcanic glass (Crews 2008). Even though both Vainu'u and Aganoa have substantial lithic assemblages, no basalt blades were identified at the coastal site, while no gravers were identified at Vainu'u. To'aga, on the other hand, has a much smaller lithic assemblage when compared to the sites on Tutuila Island. To'aga's assemblage includes a few flakes, awl-like tools and three

adzes; very few pieces of volcanic glass were found and those that were recovered were assumed to be natural (Kirch 1993b).

One obvious difference underlying the lithic assemblages is the range and types of activities that were taking place at each site. The presence of adzes at all three sites probably indicates that woodworking was occurring at each location; however, the differences in adze forms and other lithic tools may indicate differences in the nature of the woodworking. There are many steps in the woodworking process, and many different types of items that can be made through woodworking. The tools used to hollow out a wooden boat, for example, are not the same as the tools used to put the finishing touches on a wooden bowl. A second possible reason for the differences in the lithic assemblage at each site is differences in access to shell. Material from Aganoa and To'aga indicated that a variety of tools – including abraders, fishhooks and scrapers – were made from shell. Shell and lithic scrapers may reflect different scraping needs, personal preference or use of the closest available resource as the need for a scraper arose.

To summarise, Component 1 at Vainu'u falls well within the range of variability in terms of material culture when compared to roughly contemporaneous coastal sites. Differences between the three sites considered may be the result of either functional or temporal factors. If Vainu'u was a special-use site while the coastal sites were permanent settlements, this could account for variability in features and artefact types. However, differences may also have a temporal component. Other than evidence from To'aga that thick pottery increases in frequency over time (Kirch & Hunt 1993a), we do not have a clear understanding of how most material culture changed over the approximately 1000 years considered here.

Figure 8. Basalt adzes recovered from Vainu'u: top, specimen V030, recovered from Unit B3, Layer III (Component 1); bottom, specimen V043, recovered from Unit C2 Layer 5 (Component 2).



A DIFFERENT VIEW DURING THE MONUMENT BUILDING PERIOD

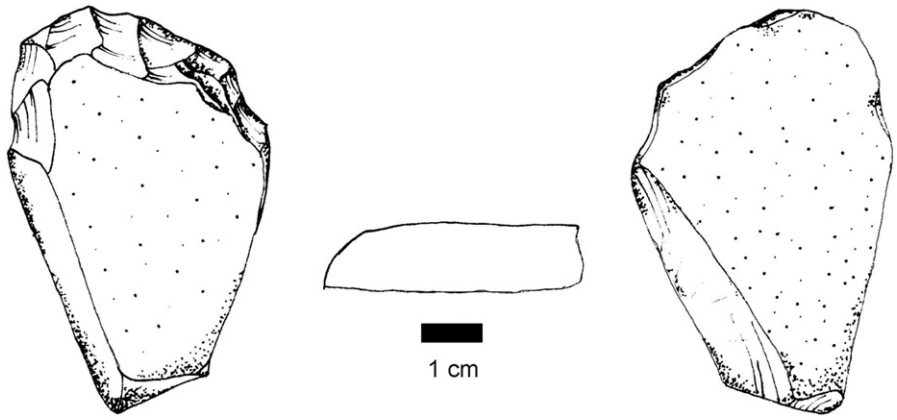
Component 2 material culture recovered from Vainu'u

During Component 2, a visitor to Vainu'u would have been presented with a different landscape than 1500 years earlier during Component 1. After at least one volcanic eruption that covered the ridge in a layer of welded ash, the modern-day soil layer had begun to develop. Horticulture now dominated the subsistence practices of the island's residents, and the ridge on which Vainu'u sits may already have been at least partially terraced for local gardens. Chances are, however, that wild vegetation was still also readily available. As evidenced by Features 3 and 6, at least one family chose to build a house structure on the ridge.

Feature 3 is the largest of the stone features identified at Vainu'u (Figure 2). This approximately rectangular feature is aligned north-east/south-west along the ridge and is about 180 square metres in size (15×12 metres). Its size, shape and composition suggest that it served as a house platform. Data from the excavation units placed along the eastern and northern portions of Feature 3 show that it stood only a single course of stones high. Fire-reddened rocks and charcoal flecking in the upper levels of these units suggest the presence of ovens or other firing features in association with Feature 3. Feature 6 consists of five postholes found in association with Feature 3. As discussed above, a single piece of charcoal from Feature 6 radiocarbon dated to 650 ± 40 BP (^{13}C adjusted age, Beta #240798). This date, combined with the associated material culture, suggests that Features 3 and 6 were both part of a Monument Building Period house foundation.

The occupants of this ridge-top residency had a different toolkit than their Component 1 counterparts: gone were basalt blades, volcanic glass and ceramic vessels. The lithic assemblage (Figures 8 and 9) was still dominated by scrapers, adzes and retouched flakes. Component 2 yielded a total of eight adzes and adze fragments and three basalt scrapers. The medium-sized flakes in the collection (3–5 cm) are present in a much higher frequency in Component 2 than Component 1. This may be related to the observation that larger tools were utilised at the site during this later occupation.

Figure 9. A basalt scraper recovered from Vainu'u: specimen V048, recovered from Unit C3 Layer V (Component 2).



Interpretation of Component 2

Although the features and lithic analyses do not provide specifics on what activities were happening at Vainu'u during Component 2, they do provide evidence for what was *not* occurring. The Monument Building Period was a time of intense craft production on Tutuila Island, including the specialised production of basalt adzes for inter-island and inter-archipelago trade (Best *et al*. 1992; Enright 2001); however, there is no evidence that the residents of Vainu'u were participating in specialised production of any kind. The lithic assemblage does not have the high density expected of a lithic workshop (Winterhoff 2007), nor the high frequency of a narrow range of tool types expected if these tools were being used in the intense production of a perishable craft. This is not to say that residents of Vainu'u did not have access to specialised goods. Some of the basalt tools in the Component 2 assemblage are made from the fine-grained, high-quality basalt associated with specialised production during this time. What social networks the residents of Vainu'u participated in to gain access to these presumably controlled goods is not at all clear, but it does suggest that they were tied into the island's social and political landscapes.

Comparison with other Monument Building Period sites

Component 2 at Vainu'u dates within the Monument Building Period, a time period in which there was intensive residency in the Tutuila highlands (Pearl 2004). This period has probably witnessed the most extensive archaeological investigations on Tutuila Island due to the high visibility of sites, the rich oral traditions that exist to help in interpretations (Henry 1980; Stuebel 1896) and the social complexity of the period, which resulted in production intensification and exchange between archipelagos (Best *et al*. 1992). In his study of building a chronology for the mountain settlements, Pearl (2004) focused specifically on three highland residential sites due to their size and preservation. Because of the chronology Pearl established for these sites, they are used here for comparison.

Lefutu (AS-21-02) is located on a ridge overlooking the most eastern coastline of Tutuila Island. Despite prior claims that the site served as a defensive outpost (Frost 1976, 1978), extensive mapping (Clark & Herdrich 1988) of the site's surface features has led to the reinterpretation that this highland site was a residential village. Old Vatia (AS-24-02), located on Faiga Ridge overlooking the north-central coast, is probably the largest highland site on Tutuila Island (Clark & Herdrich 1988). Levaga Village (AS-25-27), located approximately 1.5 km south-west of Old Vatia and at a slightly higher elevation, also overlooks the northern coast. Both Old Vatia and Levaga Village have been interpreted as primarily residential complexes. Pearl (2004) has estimated that all three villages were established between 680 and 640 years ago, exactly at the time Component 2 of Vainu'u was occupied.

Unfortunately, it is meaningless to directly compare the Component 2 features and material culture of Vainu'u with Lefutu, Old Vatia and Levaga Village. These latter three sites continued to be occupied for a few centuries, but their construction sequences are not understood (Pearl 2004). We do not know if these three sites were established as the large villages that we see on the ground today, or if they began as one or two residential units that eventually expanded into the largest highland villages on the island. What we can say with certainty is that Vainu'u never obtained the village size of Lefutu, Old Vatia or Levaga Village.

Geographically, the locations of the three large sites do not seem to have an advantage over Vainu'u. While each large village holds a commanding view of a coast, Vainu'u holds a commanding view of both the north and south coasts of the island. While each larger site is spread over a ridge, Vainu'u is located on a ridge that would have allowed for continued expansion. There are other geographical factors that may have played a role in why some locations were chosen for expansion while others were not. Specifically, proximity to controllable resources important to the developing social order may have played a role with regard to which villages grew. Politics may also have been important; the social and political dynamics

of chiefs vying for power may have played a role in which ridge-top sites developed and expanded and which did not. These various scenarios are testable, as more data from both small and large highland sites are collected.

CONCLUSIONS

Our work at Vainu'u has important implications for the interpretation of ancestral Samaon lifeways. Our findings indicate that people were in the highlands during the earliest occupation of Tutuila Island. Pearl (2004) argues that highland *residency* happened late in Samoan prehistory. Evidence from Vainu'u does not dispute this argument, in that no residential foundations were found; the presence of cooking ovens does not necessarily reflect long-term residential activities. That the earliest residents of the island were in the highlands, probably procuring specific resources, does not come as a surprise. A question that our research raises but does not answer is: how extensive and intensive was early highland activity? This question can only be answered through discovery, excavation and dating of more ceramic-period highland sites across the island.

Our findings also indicate that, although within the range of variability of previously excavated sites in American Samoa, the material culture of Vainu'u differs from these sites in some important ways. These differences can be explained in terms of at least three possible factors. Functional factors, such as permanent settlements versus temporary use or procurement of highland versus coastal resources, may account for differences observed between the Component 1 occupation of Vainu'u and contemporary coastal sites. Differences observed between Component 2 residency of Vainu'u and contemporary highland sites may be explained by either political factors such as proximity to high chiefs or geographical factors such as proximity to fine-grained basalt or other natural resources.

We have envisioned the early occupants of Vainu'u as a group of workers who used the ridge regularly, but intermittently, as an activity area. We have described later occupants of the ridge as having built a house and lived there on a more permanent basis than the previous occupants. Although these latter occupants were clearly tied into social networks across the island, they do not appear to have been at the centre of any prestige building or production specialisation activities. Of course, this is just one of a number of possible scenarios; a scenario we think is most probably based on current available data, but one that is still fairly speculative.

Our work also leads to more questions about prehistoric Samoa, the answers to which are beyond the scope of this paper. The information recovered from Vainu'u provides a glimpse of the past, suggesting that life on the ridge changed over time. Although the excavations at Vainu'u were successful in terms of broadening our understanding of pre-contact culture on Tutuila Island, there is still much to be learned at this and other recently discovered highland sites (Bartek 2009; Welch 2009).

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