THE EASTERN TUTUILLA ARCHAEOLOGICAL PROJECT
1988, FINAL REPORT

By

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INTRODUCTION

This report presents the results of the Eastern Tutuila Archaeological Project of 1986. The fieldwork portion of the project lasted five weeks, from June 25 through July 30, 1986. The project was funded primarily by the Historic Preservation Office of the Government of American Samoa, with additional funding and support by North Dakota State University. The investigation of 1986 was largely a continuation of work begun with Eastern Tutuila Archaeological Project of 1985. The combined efforts of 1985 and 1986 have produced a systematic investigation of the eastern tip of Tutuila Island.

The Eastern Tutuila Archaeological Projects (ETAP) of 1986 and 1988 were conceived and carried out with two primary concerns in mind: one focused on historic preservation needs and the other on scholarly research. The aspect of the project that relates directly to the historic preservation program involved the survey of selected areas of the island to expand the territorial site inventory. Furthermore, the survey, and subsequent test excavations, would be used to locate sites that may be eligible for nomination to the National Register of Historic Places. And, the survey results could enhance efforts to predict the likelihood of sites being located in specified environmental settings.

As in 1986, the overriding research interest was in early Samoan settlement systems. The investigations were directed at reaching a preliminary understanding of how prehistoric populations distributed themselves over the landscape, how that pattern of distribution changed over time, and the ways in which human behavior and natural environment have acted upon one another. As data from systematic surveys in the territory accumulate, the better able we will be to address a variety of research questions, such as those involving settlement systems.
ENVIRONMENTAL SETTING

The Territory of American Samoa comprises the islands of Tutuila, Ta’u, Ofu, Olosega, Swains, and Rose Atoll. The study that is the subject of this report took place on the island of Tutuila, which is located at roughly 14° 18’ S latitude and 170° 41’ longitude (Fig. 1). Tutuila is the largest of the islands and supports the largest population. Tutuila, together with nearby Aunu’u, are divided into ten counties (taking eastern and western Vaipava as separate units), which are grouped into two districts, Eastern and Western (Fig. 2).

Tutuila has an area of about 142 sq. km (54 sq. mi), is long (31.9 km) and narrow (from 9.8 to almost 1.6 km), and is oriented with the long axis roughly east-west. A rugged ridge-line, with scattered peaks, runs down the center of the island, and numerous secondary and tertiary ridges and spurs radiate off the central axis and toward the coasts. On the eastern end of the island, Olomoeana Mountain is the focus of several radiating ridges. Also along the ridgertops are 'prominent points,' by which I mean a point on the ascending ridgetop where there is an abrupt shift to a more gradual upward slope for a stretch of many metres, then a shift back to a more pronounced slope. These areas of comparatively gentle slope mark breaks in the the normal ridgetop angle. The highest point on the island is Matafa’o peak at 653 m (2142 ft). Only 34% of the island has less than 30° slope (Atlas 1981), and slump and landslides, especially after deforestation, are common occurrences.

Around the coast are numerous small valleys and coastal plains. The north coast of the island is more rugged, the valleys smaller, and the bays smaller and fewer in number than along the south coast. In some areas, particularly along the north coast, there are stretches of high basalt cliffs while in other areas, particularly on the south coast, there areas of low basalt coasts (less than 3 m) and rubble foreshore between the valleys and plains. The most remote point from any coastline is only 3.36 km (2.1 mi) from the shore, and the island has 128.2 linear kilometers (77.8 linear mi) of coastline (Atlas 1981). Fringing reef is found around most of the coastline with lava, or channels through the reef, where the streams enter the ocean.

Streams are small and often intermittent. These small streams may enter the ocean where there are small coves, small coastal plains, or both, and each of the major valleys (all relatively small) is drained by at least one stream.

American Samoa has a tropical climate with two main seasons, wet (usually from November to March) and dry (actually better termed less-wet, from June through September). The mean annual rainfall over the last ten years at Cape Matatula on the extreme eastern end of the island has ranged from 74.48 inches to 129.17 inches (statistics provided by Steven Ryan of the Samoa GMCC Observatory, Cape Matatula). The prevailing winds are from the east-southeast. The wetter months are when most of the tropical storms and hurricanes blow in. Daily temperatures usually are in the upper 80s F and nighttime temperatures in the mid to low 70s, while relative humidity is very high, with a daily average at 72 to 77 percent (Atlas 1981:Statistical Tables).

Natural vegetation in American Samoa broadly falls into the category of tropical rain forest (Amerson et al. 1982). With Polynesian and later European
Figure 1. Map of Samoan Archipelago.
Figure 2. Map of Tutuila showing district and county boundaries.
colonizations, the vegetation community was substantially altered. Today, in the
valleys and over much of the slopes and ridgetops the vegetation pattern is one
of managed lands. That is, the lands are either in "plantation" (small swidden
or arboriculture plots) or various stages of secondary growth. Even the high
ridges and peaks are largely in disturbed forest (Whistler 1981). Away from the
villages and farmed areas the vegetation can be quite dense.

The Samoan archipelago is situated along a submarine ridge that runs roughly
east-west. To the south is the Kermadec-Tonga Trench, which runs roughly
south-north before bending to the northwest. This trench marks the interface of
the Australian and Pacific Plates. Since the Samoan islands are sliding to the
north of the trench, the islands are not, as claimed by Kirch and Hunt (1988:17),
undergoing subduction at the trench. While there is evidence that the western
islands of Samoa are undergoing deformation, it is not yet clear how the eastern
islands (American Samoa) are being affected by geological conditions in the area
(Hawkins and Natland 1975).

The emerged volcanics of Tutuila generally date back to the early
Pleistocene (McDougall 1985), although the Aunu'u and Leone Volcanics probably
developed during the Holocene (Stearns 1944:1313). No eruptions have been
reported for Tutuila during the historic period, which effectively began in the
early 19th century. The eastern half of Tutuila is formed by Olomoana and
eastern Pago Volcanics (or Alofau Volcanics in earlier characterizations)
(McDougall 1985). The Olomoana Volcanics, which form the far eastern end of the
island, are thin-bedded olivine basalts capped with andesites, and have
associated cinder cones, vitric tuff beds, and plugs, including a trachyte plug
at Lefuluufolua (Stearns 1944:1286-88). To the west are the eastern Pago
Volcanics, which, according to Stearns (1944:1289-90), are thin bedded, chiefly
olivine-bearing basalts with one trachyte plug (Leila Plug), cinder cones, vitric
tuff beds, and several hundred basaltic dikes. The transition line between Pago
and Olomoana Volcanics runs across the interior of the island from the middle of
'Aoa valley in the north to the middle of Amouli in the south. The highest point
in the eastern Pago section is Le'aeno Mountain at 295.5 m (969 ft) above sea
level (a.s.l.), while the highest point in the Olomoana section is Olomoana
Mountain at 327.4 m (1074 ft) a.s.l.

Along most of the eastern end of the island and at each of the valleys are
bands of Ngedebus Series soils (calcareous soils formed in sandy marine deposits)
(USDA 1984:95). The slope is 0 to 15 percent in these areas and the elevation
range is from sea level to 5 m (15 ft). It is on these lands that the majority
of houses are situated today. The floors of the larger valleys are either
leauf silty clay with 0 to 3 percent slopes, or leauf stony silty clay with
comparable slopes. The latter is stonier, but the two groups are otherwise very
similar. Both are "very deep, somewhat poorly drained" and "formed in fine
textured alluvium derived dominantly from basic igneous rock" (USDA 1984:13).
Boulders of the valleys, at least partially, are bands and pockets of Aua
very stony clay loam, ranging from 15 to 60 percent slopes. This soil "formed in
colluvium and alluvium derived dominantly from basic igneous rock" (USDA
1984:10). On the ridges and slopes with 70 to 130 percent slopes there is Fagasa
Family-Lithic Hapudolls-Rock Outcrop association soils (USDA 1984:11, Soils
plate 3). There are also large patches of Fagasa-Ofu silty clays in interior
areas with 30 to 60 percent slopes.
PREVIOUS RESEARCH


Data collected by Clark and Herdich (1988) in the first phase (1986) of the Eastern Tutuila Archaeological Project have provided valuable information on early settlement and the relationship between humans and their environment. That research indicated that eastern Tutuila was settled early, perhaps by 2000 BP or earlier. The initial colonists made and used undecorated pottery, utilized a range of basalt tools to an extent not seen elsewhere in the Samoan archipelago, and also used volcanic glass. At 'Aoa Valley, the only pottery-bearing site on the island was found at the rear of the eastern lobe of the valley, near the base of the surrounding slope. At some point, a water body stood over the area where most of the valley now lays. That water body was probably an embayment or a backbarrier coastal lagoon. Over time, the water body began to fill with sediments and the landscape was transformed from a bay/lagoon to a backbarrier estuary. As sedimentation increased, the valley floor expanded and the estuary was further transformed to a swamp or marsh that continued to shrink with alluvial-colluvial infilling, finally to reach its modern size. Initial human occupation at 'Aoa probably took place when the lagoon or perhaps later estuary or perhaps even swamp existed. As the infilling of the water body continued and the land area expanded, the human settlement became increasingly dispersed, especially throughout the lower and middle valley and onto sections of the valley slope. At some point, however, there was a shift back to greater nucleation in the villages of 'Aoa and Fa'aleleu. There is good evidence that human action--i.e., slash-and-burn agriculture along the valley slopes--played a significant role in the geomorphological transformation. However, geologic tilting, general uplift, and lowering relative sea level remained possible explanations as well.
RESEARCH DESIGN

This project was largely a continuation of the ETAP research carried out in 1986 by Clark and Herdrich (1988). The 1988 project had two primary objectives. One was directed at the needs of the historic preservation program of the Government of American Samoa. That objective consisted of the continuation of the territorial site survey in Eastern Tutuila that was begun in 1986. A systematic survey of the territory is a high priority for the developing historic preservation program in American Samoa. A related goal was to evaluate the sites located during the survey for significance and eligibility for nomination to the National Register. Based on a scarcity of pertinent information, however, the latter goal has been the most difficult to achieve.

The second project objective was to carry out problem oriented research in American Samoa. The overriding research focus of the Eastern Tutuila Archaeological Project was on the prehistoric settlement system of Eastern Tutuila, American Samoa. The concept of a settlement system means more than just the settlement pattern, which is the spatial distribution of archaeological remains over the landscape. As used here, the term settlement system refers to the structural and functional relationships between local populations and between those populations and their ecological contexts. Thus, the notion of settlement system incorporates but goes beyond settlement pattern.

Several research questions dealing with settlement system were of concern for this project. These questions dealt with three primary areas of investigation: settlement pattern, environment-human interaction, and local economies.

The pattern of human settlement over the landscape is an integral aspect of settlement system studies. Thus far in American Samoa, most attention has been given to coastal areas so that our knowledge of inland settlement and use has been very poor. Consequently, the emphasis of this investigation was on inland areas and the distribution of different types of sites, especially tia 'ave (or star mounds), inland villages, fortification or refuge sites, and special resource sites. Following on the 1986 research, the region of investigation was East Vaifanua and Sa'ole Counties (except for Aunu'u), with limited work in Sua County. The intent was to provide systematic survey of the entire eastern end of the island. Given the nature of the terrain, this largely meant coverage of the major ridgetops.

Another research issue was the relationship between environmental conditions and human settlement. The research in 1986 revealed dramatic geomorphological change in 'Aoa, but the precise cause of that change was not fully understood. There was need, therefore, to determine if the changes observed at 'Aoa were purely local, or if similar changes in coastal geomorphology were indicated at other locations. Also, radiocarbon dates for site AS-21-5, Locality 2, were necessary in order to place the human activity and geomorphological changes in time.

The third major concern was with the economic relationships between communities on Tutuila and perhaps beyond. This concern is derived from the larger focus on settlement system since links between populations in a region is
part of the systemic approach to settlement. Questions of interest include but are not limited to the following: Did the availability of valued resources influence the early selection of occupation sites? What sorts of economic relationships were held between different sections of the island and between different islands? Were raw materials—i.e., basalt and volcanic glass—utilized only locally or were they exchanged with other populations elsewhere on the island, in the archipelago, or beyond?

Methodology

In order to implement the research design, there were four critical areas of data collection: (1) site distribution, (2) geomorphology, (3) chronology, and (4) raw material characterizations. Therefore, the project fieldwork consisted of three phases: reconnaissance survey, excavation, and soil coring. In addition to the normal site and artifact analysis, specialized laboratory analyses were needed for radiocarbon determinations, soils characterizations, and basalt and volcanic glass geochemistry and petrography.

Data on site distribution was gathered through systematic pedestrian survey. Since the intent of the survey was to reveal the general distribution of different types of sites within a large area (the eastern end of Tutuila), detailed descriptive information on each site and feature was not needed. Consequently, to maximize the area of coverage in a limited amount of time, the survey was reconnaissance in nature. The aim of reconnaissance survey is to provide an overview of the distribution and types of archaeological sites found in a given area. To precisely measure and accurately map all sites and features—which would often require extensive vegetation clearing—would take a substantial amount of time and would greatly limit the area of land that could be covered.

For some of the sites found, the locations are approximations since the nature of the terrain and the vegetation sometimes made precise determinations impossible. The elevations given for these sites are based on orthophoto maps (at 1 inch equals 200 ft) from the Department of Public Works (DPW), but the illustrated elevations of these maps are not always in agreement with those of the USGS topographic map of Tutuila. Furthermore, we occasionally found that the actual topography did not correspond very well with that indicated by the contour lines of the map. Nevertheless, the DPW maps are the best and most detailed maps available for elevation determinations. In the site descriptions below, elevations have been converted to metres, but foot readings are also given for ease in relocating sites on DPW and USGS maps.

In order to test for changes in coastal geomorphology beyond 'Aoa, limited soil coring was carried out. The specific goal of the coring operation was to examine soil stratigraphy at locations in eastern, central, and western Tutuila for evidence of changing geomorphology, particularly indications of change in the sea stand over time. Three locations were selected for coring: Alao in the east, Pale Lagoon in the center, and Leone in the west. Coring was an effective tool in the 1986 investigation at 'Aoa, and can be done much more quickly than unit excavation. The coring device used is a small probe commonly used in pedological studies. To aid in the interpretation of the coring profiles, a small number of soil samples was collected for limited pedological analyses.
The 1986 excavations at site AS-21-5, Locality 2, in 'Aoa did not yield chronometric assessments. Therefore an attempt was made to secure charcoal from the cultural deposits at that site for radiocarbon determinations. To do that, a single unit, 1.0 by 0.5 m in size, was excavated in the bank of Puna Stream.

For the fourth research concern, a critical aim of the inland survey was to locate volcanic glass and basalt quarry sites. In order to assess the significance of such sites and to address questions regarding the flow of these resources to other areas, raw materials collected from the quarries were to be subjected to petrographic and geochemical analyses. In addition, volcanic glass and basalt samples from the 1986 excavations were also analyzed and all of these results were compared to geochemical and petrographic data from Tutuila and Upolu. That work was carried out by Beth Wright of the Department of Geological Science at the University of Illinois at Chicago.

A final means of data collection was based on informant interviews. The most productive of these were with individuals who have artifact collections. Between the 1986 and 1988 projects, two residents of 'Aoa made collections of artifacts from the 'Aoa area. One of those individuals is Mr. Richard Stevens who served as a field assistant on both of the Eastern Tutuila projects. Mr. Stevens was also an elementary school teacher in 'Aoa, as was our other field assistant, Mr. Siapai Enosa. Both men have made efforts to teach their students about Samoa's past, and have taken their students on field trips to some of the archaeological sites in the area. As a result, some of the children in the village have learned to identify artifacts, and they would often take artifacts they found in the area to one of the two teachers. The collection was kept by Mr. Stevens, and at the time of the 1988 project consisted of 17 pottery sherds and 24 basalt artifacts. The other collection has been made by a boy in the village, Mr. Alofa Christian Togia. Mr. Togia has a collection of 6 pottery sherds and 50 basalt artifacts. Both individuals graciously allowed me to examine and record their collections, and we marked the locations of the finds on the DPW maps. These artifacts are discussed below with the site at which at which they were found.

Site Designations

Site numbers were assigned according to the numbering system outlined by Clark (1980:13-14) and adopted by subsequent researchers. This system—which is based on the system established by the Smithsonian Institution—uses a tripartite code: the first two-character element indicates the state or territory, in this case American Samoa (AS); the second element has two digits, the first designating the district (Manu'a, 1, Eastern Tutuila, 2, and Western Tutuila, 3) and the second designating the county; and the third numerical element refers to the individual site within the county. County numbers were assigned by Clark in 1980 and were numbered from east to west. Counties of concern in this study are East Vaitaniau (#21), Sa'ole (#22), and Sua (#23).

The borders between counties are not indicated on the detailed DPW maps, and on larger scale maps, where the borders are indicated, the border placements differ slightly. The border configurations used for this study are illustrated in Figure 2. Precise placement of sites located near borders is difficult, and it is conceivable that any of the sites indicated along or near borders actually may be in the other county. Since the ridgetops do not conform to county
boundaries, some sites on a given ridgetop fall into one county and other sites fall into another. Therefore, in some instances site listings in two counties must be consulted in order to see the full distribution of sites on a single ridgetop.

Clusters of associated features—such as house foundations and other domestic features, or related defensive features—were regarded as single settlement units and therefore assigned one site number. Discrete and comparatively isolated structural remains (e.g., terraces, tia 'ave, paths, and walls) were given individual site numbers. Furthermore, to single out members of different site categories, specialized sites were assigned individual site numbers even if found in close spatial association with other features. These site categories are tia 'ave and basalt quarries. In some cases, ditches and other features that are in proximity to and were probably functionally related to tia 'ave have been grouped with the tia 'ave.
SURVEY

The presentation of the survey results is organized by county, and in each county section a listing of sites is presented by ridgetop or section of coast. The sites are listed according to numerical sequence, which generally corresponds to their distribution over the landscape. Since this survey was designed to round out our understanding of site distribution for the eastern end of the island, complete site listings are presented that include sites previously reported as well as those found in 1988. Previously reported sites are indicated by an asterisk (*) before the site number if they were not revisited, and by a double asterisk (**) if they were re-examined in 1988 and new information is presented in the discussion. If new information is not available, only a brief summary statement about the site is given along with a reference for the original site report. Sites found in 1988 have no preceding markers. General areas that were investigated yet yielded no sites are also noted. The locations of the areas and sites discussed are indicated in Figure 3.

Several types of sites were found in Eastern Tutuila during the surveys of 1986 and 1988. These types, which represent different activities and different points in time, are the following: fale (house) remains, individually or in groups, represented by foundations with curbing or the surface scatters of 'ililili (pebbles and/or coral rubble) of old floors; surface scatters of artifacts or isolated artifact finds-spots; terraces of uncertain function that could have been used for agriculture or as locations for residential fale or simply for fale o'o (temporary-use field houses); tia 'ave (or star mounds); basalt quarries; ancient defensive features or complexes; old walls; ancient paths/walkways; and modern military features.

Special mention will be made here of one type of specialized site—the tia 'ave. This category of site has been discussed by several researchers, with the most recent and most thorough treatment provided by Herdrich (n.d.; Clark and Herdrich 1988). Structures of this type have previously been referred to as specialized sites, star mounds, cog mounds, or tia seu lype (pigeon-catching mound). In this report, I will follow Herdrich in using the term tia 'ave in reference to these features. The term tia means mound, and 'ave can mean (among other things) ray of sunshine or tentacle of an octopus, giving the name "ray mound" to these structures. The most important defining characteristic of tia 'ave is the presence of at least one and usually several rays, or projections. For the detailed reasoning behind the selection of the term tia 'ave, the reader is referred to the thought-provoking and insightful discussion of Herdrich.
East Vaifanua County

In 1980, Clark listed four sites (AS-21-1 through -4) for this county (Clark 1980:50-51). As a result of the survey in 1986, another 57 sites (AS-21-5 through -61) were added to the list (Clark and Herdich 1988). The 1988 survey yielded an additional 52 sites (AS-21-62 through -113), bringing the total to 113 sites. Many of the previously recorded sites were re-visited by the author in 1988. This review of sites in East Vaifanua will begin at 'Aoa, which is where the most intensive investigation has been carried out. The subsequent discussion will proceed in a clockwise pattern, beginning at the western edge of the county.

'Aoa

In 1986, the valley at 'Aoa Bay was intensively examined by Clark and Herdich (1988). This horseshoe-shaped valley bounded by pronounced ridges has an eastern lobe that stands at a slightly higher elevation than most of the valley floor. The central part of the valley is generally about 380 m deep, from the shore to the base of the rear slope, although the maximum is as much as 457 m. The width of the valley along the shoreline is up to 715 m, while the width at the rear of the central valley is only about 448 m.

Six main streams cross the valley (Fig. 4). In the west-central portion of the valley, three of these streams meet at a small estuary. The ground along the lower portions of these streams is usually muddy, especially after a rainfall, and supports a small area of mangrove. The eastern-most of these streams is the Puna, which used to run through the main part of the village but was was diverted to its present location many years ago. At the rear-center of the valley, next to the ridge slope, is a marsh where there is standing water, though largely covered with a vegetation mat.

It is on the eastern lobe of the valley that most of the modern inhabitants reside, in the village of 'Aoa. West of the estuary is the Olomoana Elementary School, which was built over some fill and is fronted by a high breakwater of stacked basalt boulders. Farther west there are more houses along the shoreline, and west of Le'Iato Point the residents are members of Fa'alalevu village, whose titles are affiliated with Sa'ilele. A few houses dot the valley but not in any large concentrations.

For descriptive convenience, the main valley was divided into three sections—the lower valley, the middle valley, and the upper valley (see Fig. 4). The lower valley consists of a strip of sandy ground that extends inland about 81 m from the shoreline. The middle valley covers the next 182 m inland and the sediments represent a transition between the sand dominated lower valley soils and the clay dominated upper valley soils. The upper valley constitutes the remaining inland portion of the valley, back to the bounding ridge slope, and the soils have a very high clay content and are comparatively stony.

The 1986 survey covered the entire valley floor. A variety of features and surface artifacts were found, but most of the surface materials did not form discrete site areas. Consequently, only two site numbers were assigned, one for 'Aoa Village and the valley (AS-21-5), and another for Fa'alalevu Village (AS-21-6). For convenience of thinking, working, and discussion, however, specific locality numbers were assigned where some geographic marker or spatial
separation existed at these sites. Several features on the narrow coastal shelf at the far east end of the bay were assigned separate site numbers.

**AS-21-5.** This site covers most of 'Aoa valley. As initially defined by Clark (Clark and Hardrich 1988: 36-43), 21-5 comprised fourteen localities. But with additional data from 1988, two new localities have been added (Fig. 5). Localities 1-4 and 14-16 are in the eastern lobe of the valley and cultural deposit probably lies buried throughout this area. Localities 5-13 are west of the estuary. The previously defined localities are summarized below and then the new data is presented.

**Locality 1.** This locality is found at the rear of 'Aoa village, where the Puna Stream meets the valley floor. The ground at this locality appears to be largely colluvial. Located here is a complex of features that includes three house foundations, two low terraces which are possibly residential but may also be horticultural, and a remnant of two adjoining walls that form the corner of an old pig pen.

**Locality 2.** This locality is in the eastern lobe, at the rear of the valley. Survey in the Puna Stream bed revealed a collection of pottery sherds and basalt artifacts, and buried cultural layers were clearly identifiable in the stream bank. Because of the presence of those materials, limited excavations were carried out at this locality. More will be said of this locality in the Excavations section below.

**Locality 3.** This locality was identified on the basis of a small collection of artifacts from the mouth of the stream. Five pottery sherds and one flake tool were collected at this spot. Two of the sherds are very thick, coarse-tempered ware, two are thin and fine tempered, and one is thick but fine tempered. Two of the sherds (one fine and one coarse) are rims from bowls. The single basalt artifact is a Class VII flake tool that has an unusual, purplish, organic residue along the cutting edges.

**Locality 4.** This locality was defined on the basis of a collection of pottery sherds. The collection consists of 6 sherds of thick coarse ware and 2 sherds of thin fine ware. The location of Locality 4 is approximately the spot at which the old route of the Puna Stream reached the ocean. Subsurface coring near this area revealed a buried cultural layer about 67 cm beneath the surface.

**Locality 5.** This covers a portion of the lower and central valley. In this area, pieces of marine shell, occasional basalt flakes, pieces of coral, and waterworn pebbles are widely scattered over the ground surface in a nearly continuous manner that makes individual house floors difficult to identify beyond occasional concentrations of materials. The density of surface materials begins to diminish in the central middle valley, becoming very light in the inland half, and largely disappearing in the upper valley. A remnant of a long wall of stacked boulders in the lower valley extends into Locality 6. No pottery sherds were found at this locality.

**Locality 6.** This portion of the lower and middle valley has a nearly continuous surface scatter of shell, bits of coral, pebbles, and basalt flakes and tools. At some places there are clear concentrations of surface materials indicative of a house floor, and at least one paepepe (house foundation) is also present. No pottery sherds were found at the locality.
Figure 5. Map of Aoa, site AS-21-5 and localities 1-16.
Locality 7. This is the largest locality designated and covers most of the lower and middle valley west of the estuary. Buried cultural deposit was revealed by subsurface coring in an area of the lower valley. Again there is surface scatter of coral, shell, pebbles, and occasional artifacts over much of the area. In the middle valley area there are at least ten concentrations of such materials that appear to mark old house floors. Again, no pottery sherds were observed. Much of this locality was apparently occupied at some time in the past, but the combination of cultural (domestic activity and cultivation) and natural (floodings and crabs) transforms have made individual features and household units difficult to define.

Locality 8. This area of the lower and middle valley is the farthest west of all the localities. As is the case with the other localities of the main valley, over most of the area there is a light surface scatter of coral pieces, pebbles, bits of shell, and some basalt artifacts, but no pottery sherds. There are also clear concentrations of materials marking house floors and some boulder alignments.

Locality 9. This locality is in the upper valley, west of the marsh. Features in the locality are three foundations that represent the residences of two or three households. Some historic materials were present and none of the features appears to be particularly old.

Locality 10. Farther west in the upper valley, this locality consists of the remains of a single household unit and an associated stone wall. Some concrete was used in the foundation and the site may date only to the middle of this century.

Locality 11. This locality is in the far southwest corner of the upper valley and consists of a group of rock piles, a small house platform built of crudely stacked rocks (likely to have been the foundation of a fale o‘o), a large stone-lined pit of unknown function, and at least seven low, parallel terraces formed by retaining walls of crudely stacked boulders. This locality is the site of agricultural activities and is probably historic in age.

Locality 12. The features found in this locality may represent two or three house sites, or perhaps just fale o‘o, from earlier in this century, possibly even in the last century, but probably no earlier.

Locality 13. At this locality there are two to four coral and pebble ili‘ili‘i scatters indicative of house floors. Also present on the surface are pieces of shell and some basalt flakes.

Locality 14. This locality consists of several features: a deep, rectangular depression with entranceways at each end that is recent (probably a domestic storage facility, or possibly a military feature); a smaller depression; a boulder retaining wall one-course high that probably served to inhibit slumping; two or three small terraced areas that probably served as bases for structures; a scatter of pebbles, cobbles, and some coral; a crude terrace with a spotty boulder retaining wall and a surface scatter of coral, pebbles, bits of shell, and an adze fragment; a terraced area; and a stacked-boulder enclosure that probably served as an old pig pen. These features probably represent the remains of two or three households, none of which appears to be very old.
New Data

Between 1986 and 1988, Richard Stevens and Alofa Christian Togia made surface collections of artifacts in 'Aoa. Artifacts from these collections that were recovered from previously defined localities are described below. Also, on the basis of the collections I have defined two new Localities, 15 and 16, where recovered artifacts were numerous. Where only one or two items have been found, I simply describe the location and do not designate a locality.

Localities. On the foreshore at Locality 3, at the mouth of Leculu Stream, Mr. Togia found the following basalt artifacts: one quadrangular adze fragment, with polish on two sides, that appears to have had some modification after initial breaking to create a scraper or chisel; the blade end of a Type I adze; three preform fragments, one of which is a butt of very dark basalt; one trapezoidal preform (Type I or III shape); one triangular preform fragment; one trapezoidal adze (or perhaps preform) butt that was highly waterworn; one secondary decortication flake; and ten reduction flakes. He also found one large rim sherd of thick coarse pottery. The Stevens collection contained four sherds from the foreshore and three from the stream bed; from the foreshore came two thick and one thin (with eroded faces) coarse-tempered sherds, one of which is a rim; from the stream came three small, fine-tempered body sherds of thin-to-medium thickness.

Locality 7. In the collection of Mr. Stevens is one trapezoidal preform fragment with nearly complete flaking and one Type IXa adze, both from Locality 7.

Locality 15. This locality is defined on the basis of artifacts collected by Mr. Togia. It is located on the eastern coastal ledge of the Bay, at the far northeast end of 21-5, and just south of site 21-11. Togia found 14 basalt artifacts, 12 of them in a cluster: one bevel end of a Type III adze that has many chips along the blade; a piece of a broken Type I adze that had been modified to produce a scraper (or perhaps chisel); the butt of a Type I adze that is rather waterworn; one Class IA flake tool; one bevel and of a probable Type IX adze; and seven flakes (five large and two medium-sized). A short distance away from the cluster, he found a Type I adze butt that may have been modified for scraper use, and a fragment of a probable Type II adze. Almost all of these items are of fine-grained, very dark basalt. In addition to the basalt, Togia collected three thick, very coarse-tempered sherds: one body sherd and two rim sherds, one very thick with an expanding lip and the other with a slightly thinning lip.

Locality 16. This locality is based on five artifacts in the collection of Mr. Stevens. It is located at a small arc of the shoreline immediately east of the estuary. From the foreshore came a broken Type III adze and four thin, fine-tempered sherds. These artifacts may have eroded from the shoreline at this spot, or they may have been transported to the shore from slightly inland. With heavy rains, a natural surface runoff route on the western edge of the village malae reaches the ocean at this locality. The resident at this spot sometimes digs a small channel to drain water that puddles in front (malae side) of the house. I suspect that the ground between the estuary and this natural drainage route may be comparatively recent accumulation, and that the pottery deposit is located immediately to the east.
Miscellaneous locations. Artifacts have been found at different locations in the 'Aoa mala‘e, but not in groups large enough to warrant a locality designation. From the mala‘e, just inland of Locality 4, Togia collected two eroded sherds of thick coarse pottery; one is part of an expanding lip but the lip top is eroded away. He also found one Class VIII tool and four large flakes. In the Stevens collection is a Type I adze with chipping along the blade that was found during digging for a cement porch behind a house located between Localities 2 and 16.

The Stevens collection also has artifacts from other locations in 'Aoa. From the foreshore between Localities 3 and 4, Stevens has four thick, coarse-tempered sherds: one a large straight-lipped rim sherd and the other three body sherds, one with a strong angle. In the other direction, on the foreshore between Localities 3 and 15, he recovered three body sherds: two thick and very coarse tempered, one medium thick, less coarse tempered, and a bit eroded. From the ridge slope behind Locality 2 came the bevel half of a Type IXa adze.

Summary. The distribution of artifacts, features, and basalt and coral indicates that the lower and middle valleys of 'Aoa were areas of residential activity in the past. The absence of pottery to the west of the estuary, even due to secondary deposition along the coast, suggests that only the eastern lobe of the valley was occupied in the ceramic period. Eventually, occupation of the valley shifted away from dispersed settlement of the lower and middle valleys and became more nucleated at the current village locations. The upper valley was probably always a zone of sparse occupation.

**AS-21-6.** This site is within the community of Fa‘alefu, in west 'Aoa valley. It was defined on the basis of surface artifacts and was divided into three localities. Two of these localities are surface scatter of flakes and tools, while the third is a huge boulder with one or two grinding facets of the type used for adzes. In addition, two World War II concrete pil‘i boxes are located in the area.

Since the 1966 investigation, Mr. Togia found several basalt artifacts at Locality 1, which is the mouth of Fa‘alefu Stream: one Class V flake tool; two trapezoidal preform butts; one small Type I adze butt; one scraper probably made from a modified butt fragment of a quadrangular preform; two Class Ib flake tools; one pebble tool with a straight bifacial edge but cortex on both sides (similar to Class V implements); one large reduction flake; and eleven reduction flakes. From Localities 1 and 2 combined, many more artifacts have been recovered by Mr. Stevens and his students: one Type II adze; one Type X adze butt; two Type III adzes, broken; one fragment of a trapezoidal adze, largely (perhaps fully) polished; one butt of a Type I adze; one fragment of a slightly pentagonal adze, probably a Type II specimen; one whole Type I preform (fully flaked); and one large reduction flake. In addition, from Locality 3 Stevens found an unusual basalt item that is narrow and comparatively thick, with a trapezoidal cross-section and polish on the narrowest surface. Unfortunately, it is broken off at both ends so its function is not known. It seems too narrow to have been an adze, but may have served as a chisel; given the uncertainty of function, this tool is listed as a unique specimen. Most of the basalt artifacts collected from this site are of very dark, fine-grained basalt.
SUA RIDGE

This is the stretch of ridgetop that runs between Leila and Le'aeno peaks. Le'aeno Mountain consists of one primary peak and what I will call the secondary peak, which is 155 m to the northeast. This secondary peak actually consists of two peaks, one in the southwest and one in the northeast, 30 m apart, and at elevations of 260 m (853 ft) and 261.2 m (857 ft), respectively. A site (23-10) on the primary peak—at 29.8 m (954 ft) a.s.l.—is located principally within Sua County and is therefore described in another section of the report.

**AS-21-35.** This site consists of a complex of terraces located on the ridgetop leading to the secondary peak of Le'aeno Mountain. It covers an area roughly 100 m long (E-W) and 90 m wide (N-S). Only a portion of the site was glimpsed in 1966 (Clark and Herdrich 1968:60-61), and following our visit in 1968, a better description can now be provided.

The sunken path of 21-111, coming from Leila Mountain (and site 21-12), meets the walkway reported by Clark and Herdrich (1968:60). This feature was initially referred to as a "walkway" because it bears some resemblance to the "raised walkways" reported for Upolu (Holmer 1976b). It seems a bit narrow for a walkway, however, and may be simply a broad wall separating north and south sections of the complex. The wall/walkway has sides of large (some up to 60 and 70 cm across) boulders and a fill of rubble and dirt, and is fairly low, generally 0.3 to 0.5 m high (slightly higher in some places).

At the wall/walkway, the path of 21-111 bifurcates, and continues up the slope a short distance on either side of the wall. These paralleling segments of the path, however, may be due to erosion along the wall base, with the sunken path transforming into a raised path/walkway. Farther up the slope it appears as though there may be another transformation, this time to a walled walkway/path. More detailed survey is needed in order to sort out these features.

Several metres up the Le'aeno slope from the Le'aeno-Leila saddle, a series of very large terraces, with retaining walls of stacked boulders, begin. Two sets are present, one to the north of the wall and one to the south. The terraces to the north appear lower on the slope and are more numerous. The northern boundary of the site—and the ridgetop—is marked by the bluff of a deep, old stream valley. The edges of the deep valley have undergone considerable slumping and the sides are much steeper than indicated on the DPW map. The southern boundary is not as abrupt, but it, too, is formed by a very steep slope.

In the north, at least nine terraces were observed, although a few others may also be present. At least three large terraces extend off of the central wall/walkway. The first of these is 0.5 to 1.0 m high at the retaining wall and is extremely long, extending across the ridgetop to near the bluff. The other terraces are scattered up the slope to the north of the wall. To the south of the wall/walkway there are only a few terraces (precise number uncertain) and they are smaller. The slope to the south is steeper as it is nearer the edge of the ridgetop.

Above the terraces is an enormous boulder facing/retaining wall that is 3-4 m high and slopes at an angle of about 45 degrees. At the top of the facing is a comparatively narrow terrace, ca. 3.5 m wide, that arcs around the ridgetop. To the south of the wall/walkway the facing extends for approximately 20 m to the
edge of the ridgetop, after which the terrace continues many more metres above an extremely steep slope. To the north the facing continues to near the edge of the bluff. A few basalt flakes were observed on the terrace surface.

There seems little purpose to the massive boulder facing other than defense. Attackers scaling the facing would be at a clear disadvantage and highly vulnerable to defenders on the terrace, which is too small to provide a base for houses. The steep lateral slopes of the ridgetop, which also mark the ends of the facing, inhibit approach from the sides. The terraces below could have served as bases for temporary occupation during times of refuge. They also could have been used for temporary habitation when the basalt quarry of 21-110 was being exploited. As noted below, the *tia 'ave* (21-109) at the top of the slope also has a defensive character to it. Furthermore, the defensive complex of 23-10, centered on the primary peak of Le'aeno, is less than 250 m to the southwest. In short, this site is part of a larger fortification complex.

**AS-21-108.** On the southwest end of the secondary peak of Le'aeno, at an elevation of 260 m (853 ft), is a *tia 'ave*. There are seven rock-faced rays that are variable in condition, from excellent to poor (Fig. 9f). The *tia* is 12.5 m long by 15.0 m wide.

**AS-21-109.** On the northeast portion of the secondary peak of Le'aeno Mountain, at an elevation of 261.2 m (857 ft), is a *tia 'ave*. Included in this site are two low terraces, each made of a single course of boulders and forming parallel arcs at the crest of the ridgetop. Below these terraces, on the ridgetop slope to the northeast, are sites 21-35 and 21-110, while just 30 m to the northwest is the *tia 'ave* of 21-108.

This structure is large, 24.5 by 22.8 m, and has eleven rays that are from 0.8 to 1.5 m in height (Fig. 9f). A shallow ditch surrounds the *tia*, giving greater definition to the rays. In some areas this ditch is faint but in other sections it is clearly a dug-out feature. One ray of this structure stands out from all of the others. It is more widely separated from its neighbors than the other rays, which tend to be close together. This ray is larger than all of the others, with a length of 5.5 m; the other rays are generally 3.0 to 3.5 m long with the largest example at 3.9 m. It is constructed of large, well-stacked rocks and has some soil fill. The other rays, on the other hand, had only scattered boulders as facing. The large ray was also different in that it crossed over the outer ditch to provide a causeway or entrance to the top of the *tia*. There is some apparent collapse on one corner of the stone ray, which could have been part of a step. This ray points to the northwest, perpendicular to the ridgetop and toward the ridge slope. Whatever the primary function of this feature, it could have served as a defensive structure with the surrounding ditch providing greater advantage to defenders on the rays and the entranceway on the least accessible side.

**AS-21-110.** This is a basalt quarry site located about 20 m upslope from the far northern end of the large stone-faced terrace of 21-35. There is a concentration of large basalt flakes over an area about 4.6 m across and 10-12 m long. Few preforms were present and they were small. This concentration is on the edge of the bluff that constitutes the east edge of the deep, old stream valley. The edges of this valley have undergone considerable slumping and the sides are much steeper than indicated on the DPW map. In fact, some portion of the quarry area has probably been lost through slumping.
The flakes found under the leaf litter and vegetation tended to be large, indicating early stages of reduction. In the area of heaviest concentration, the ground surface is completely covered with debitage, although the accumulation is not very thick. It would appear that people were using pieces of basalt that were splitting off of larger boulders in the area. A small sample of artifacts was collected from the site: four preform fragments and four large waste flakes. Two of the flakes were sent for geochemical and petrographic analyses—one to Beth Wright and one to Simon Best. The actual source of the basalt is not clear; presumably it was the boulders in the area, although they are not notably common.

The nearest coastal settlements are Sa'ilele to the north and Fa'alefu, of western 'Aoa valley, to the east (slightly farther than the distance to Sa'ilele). This small quarry may have served one or both of these settlements. It is unlikely, however, to have provided enough stone tools for significant trade.

AS-21-111. A sunken path runs down the slope from Leila Mountain, across the saddle between Leila and Le'aeno, and to the base of the slope up to the secondary peak of Le'aeno where it meets the complex of site 21-35. At the wall/walkway of 21-35 the path may bifurcate to continue a short distance up the slope on either side of the wall, or it may turn into a raised walkway.

WEST 'AOA RIDGE.

The name West 'Aoa Ridge is here applied to the ridge on the west side of 'Aoa Bay and valley, between the coast in the north and the Vaitolu Stream in the south and east. It extends from Motusaga Point on the coast, in the northeast, to Leila Mountain, in the southwest. A reconnaissance survey was conducted on this ridgetop in 1986 (Clark and Herdrich 1988). The sites listed below were all reported previously, but new information has been provided for sites 21-12 and 21-34 based on observations in 1988.

**AS-21-12. This is a tia 'ave located immediately south of a small peak that lies 218 m north of Leila Mountain. It was first reported by Clark and Herdrich (1988:51) and revisited in 1988. The elevation of the site is 195 m (639 ft). The tia is elongated and has six, possibly seven, rays made largely of boulders. The structure measures 24 m by 14 m, and the rays are up to 1.35 m high. There is a shallow depression slightly off-center in the middle of the structure, and off the northeast end an apparent shallow ditch crosses the ridgetop. Just in front of the ditch is a crude ring of stones.

Included within this site is a wall or linear mound of crudely stacked boulders. This feature is on the southern side of the small peak and extends for nearly the entire width of the ridgetop—about 10 to 12 m. There is a very slight arc to the wall, toward the tia 'ave. Three short segments, about 2 m long, project out from the main wall, toward the tia. This is not a well-made wall, but more like a linear mound of rocks. It is possible—though I think not likely—that this may be a set of graves. Alternatively, it may be a defensive structure providing a barrier to ridgetop access to the small peak. Close inspection of the peak, however, revealed no features or other indications of human activity there.

*AS-21-13. This structure is atop Leila Mountain, at an elevation of 214 m (702 ft). The tia is elongated and appears to have eleven rock-faced rays, although
one of these may be a ramp onto the structure. At the western end of the **tia** is a slight depression that is surrounded by a few basalt rocks. At the east end of the structure is an arc of boulders with a concave opening facing west (Clark and Herdich 1988:51).

*AS-21-24. This site consists of two house foundations that are probably prehistoric and three features that appear to have been military in nature (Clark and Herdich 1988:57-58).

*AS-21-25. This is a relatively flat terrace area where there is a light scatter of coral and a Type II adze (Clark and Herdich 1988:58).

**AS-21-26. This site has two components. One is a set of two **male** foundations with a number of aboriginal artifacts: four adzes (two Type I and two unique specimens), two preforms, a chisel, a large scraper. The other consists of five foxhole-like pits and comparatively recent material suggesting U.S. military activity (Clark and Herdich 1988:58-59).

Several more artifacts were collected from this site by Richard Stevens and Siapai Ehosa and their elementary school classes: two Type I adze fragments (one just the bevel end and the other all but the very butt); a Type II adze butt; a preform of somewhat irregular shape; and five small preforms, two of which are of very dark basalt.

*AS-21-27. This is a house foundation on a broad, flat terrace that is covered with basalt cobbles and rubble. A few basalt flakes and a flake tool were present (Clark and Herdich 1988:59-60).

*AS-21-28. This site is a medium-size terrace with a pit in one corner. A flake was found on the surface (Clark and Herdich 1988:60).

*AS-21-29. Here there is a large terrace on which there is a pebble and cobble scatter, two pits, and some basalt artifacts (Clark and Herdich 1988:60).

*AS-21-30. This site is a small terrace on which an adze fragment was found (Clark and Herdich 1988:60).

*AS-21-31. This is a terrace with a scattering of basalt rubble on the surface (Clark and Herdich 1988:60).

*AS-21-32. This small terrace has a partial retaining wall (Clark and Herdich 1988:60).

*AS-21-33. On this terrace there is a scattering of pebbles. Two Type I adzes were found there (Clark and Herdich 1988:60).

**AS-21-34. This site consists of a set of boulder alignments that extend across the ridgetop and are located between Leila Mountain and the small peak to the north. The site was reported by Clark and Herdich (1988:60-61) and revisited in 1988. About 48 m southwest of the **tia** 'ave of 21-12 is a short alignment of boulders and about 1-2 m behind that is a terrace front, only one boulder course high. The first alignment may be an older terrace or perhaps a front, or step, to the larger terrace. On the surface of the terrace is a scatter of pebbles and coral rubble indicative of a house floor. The flattened surface of the terrace
continues beyond the floor to the southwest for some distance, then there is a slight linear depression that crosses the ridgetop, and along the northeast edge of the depression are occasional boulders. On the other side of the depression is another flattened area, smaller than the first, that goes for many more metres before reaching another boulder alignment, this one at the base of the slope up to Leilia. In 1986 an adze butt and some basalt flakes were found on the surface of the first terrace and a couple more flakes were found on the second flattened area.

Between the tia 'ave and the first terrace (ca. 19 m north of the terrace) is a surface scatter of small basalt flakes that was not noted in 1986. This feature probably reflects reduction work on one or two stone tools. A broken adze preform was found closer to the terrace. This artifact was subjected to intense heat, as indicated by a pinkish discoloration and a heat-induced fracture. About 15 to 20 m down the east slope from the ridgetop is a terrace not seen in 1986. Numerous basalt flakes and an adze preform fragment were scattered over the surface, and one flake was collected for a basalt sample.

MISCELLANEOUS LOCATIONS. Mr. Togia has in his artifact collection two large basalt flakes, one triangular preform fragment, and one thin trapezoidal preform that he found by the trail from 'Aoa to Sa'ilale, at or near Motusage Point. Based on the terrain, there is little likelihood that a site is located here. There are, however, sites on the ridge that slopes up from the point, so it seems probable that the point of origin for the artifacts is up the slope. Because of the probable secondary deposition of the artifacts, and the fact that the recovery location is based purely on informant recall, I have not assigned a site number to this spot.

WEST 'AOA RIDGE SLOPE.

This refers to the east slope of the West 'Aoa Ridge, from the ridgetop to the 'Aoa valley floor. A portion of this slope was surveyed in 1986 and only briefly traversed in 1988. A summary of the sites previously found there is given below.

*AS-21-36. This is a large terrace with stone retaining wall and on which sits a small paepae. Several basalt flakes and a triangular preform were observed at this site (Clark and Herdich 1988:61).

*AS-21-37. This terrace is quite crude and badly disturbed by pig rooting. A few flakes and a preform fragment were seen on this terrace (Clark and Herdich 1988:61).

*AS-21-38. This is a very large terrace with basalt rubble and a few flakes on the surface (Clark and Herdich 1988:61).

*AS-21-39. This is a terrace with a largely intact retaining wall but no artifacts (Clark and Herdich 1988:63).

*AS-21-40. This is a terrace without artifacts (Clark and Herdich 1988:63).

*AS-21-41. This site consists of two nearby terraces from which several stone artifacts were recovered (Clark and Herdich 1988:63).
This is a large terrace on which one adze and one preform were seen (Clark and Herdrich 1988:63).

This is a large terrace (Clark and Herdrich 1988:63).

On this terrace only a portion of the boulder retaining wall remains to be seen (Clark and Herdrich 1988:63).

This is a well-defined terrace. Two Type I adzes and a possible chisel were observed on the structure (Clark and Herdrich 1988:63).

Scattered over the surface of this terrace are some chunks of basalt and some flakes (Clark and Herdrich 1988:63).

A scattering of basalt and coral 'ili'ili on the surface of this terrace indicates that a structure of some sort once stood there (Clark and Herdrich 1988:63).

This is a terrace on which are the remains of a small house floor. A boulder alignment bounds the terrace and another marks the edge of the house. The floor is primarily defined by a coral scatter. Just to the northwest of the floor and on the northern end of the terrace is a roughly circular outline of rocks around a slight depression. Two test units were excavated at this terrace by Clark and Herdrich in 1986. That investigation supported the contention that the terrace supported a residence that was probably occupied in the late prehistoric period (Clark and Herdrich 1988:65, 85-91).

This is a small terrace with a coral scatter indicating the presence of a house floor (Clark and Herdrich 1988:66).

**Miscellaneous Locations.** Mr. Siapai Enosa collected and gave me the butt of a Type X adze that he found on the West 'Aoa ridge slope. The precise location could not be pinpointed on the DPW map, but it appears to be somewhere in the vicinity of sites 21-40 to -42. Due to the lack of precision in locating the find spot, I have not assigned a site number.

**LEILA RIDGE.**

This is the name that will be used to refer to the ridge (unnamed on maps) that extends to the east from Leila Mountain to the rear of the 'Aoa valley floor, near the point where Vaitolu Stream enters the valley. Only two sites have been found on this ridge, both in 1986.

This is a seven- or perhaps eight-rayed tia 'ave on a prominent point (169 m, or 550 ft) of the ridgetop. No rocks are apparent around the rays, and a small circular enclosure is near the center of the tia surface (Clark and Herdrich 1988:51-52).

This terrace was found on the ridgetop between the tia 'ave of sites 21-13 and 21-14. A little farther down the slope are two low, wide, linear walls that run parallel down the slope for about 20 m long before arcing to meet each other. The function of this long U-shaped wall is unknown, but it could have served as a bifurcated wall path up to Leila Mountain (Clark and Herdrich 1988:63).

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LEILA RIDGE SLOPE
This is the slope that lies to the north of Leila ridgetop and south of the stream at Fa'alefu. A very small section of this slope, near the base, was surveyed in 1986, at which time a single site was found.

*AS-21-8. This site is a short distance upslope of Le' latno Point, which is on the west side of 'Aoa valley. The site consists of a rectangular terrace (Clark and Herdrich 1988:57).

PATUPATU RIDGE
This ridgeline runs from Asiapapa peak in the southwest to the middle of the rear (inland) of 'Aoa valley in the northeast. The southwestern portion of the ridge is in Sa'ole County, but no sites were found on that segment. In East Vaifanua County, three sites, all tia 'ave, were found in 1986.

*AS-21-15. This is a tia 'ave on a prominent point of the ridge, at an elevation of 147 m (482 ft). The tia is roughly oval, and has ten ill-defined rays with limited rock facing (Clark and Herdrich 1988:52).

*AS-21-16. This tia 'ave is on a small peak at an elevation of 152 m (499 ft). It has eight rays with stone facing (Clark and Herdrich 1988:52).

*AS-21-17. On the last small peak of the ridge is a tia 'ave. It is at about 132 m (434 ft) a.s.l. and overlooks the valley of 'Aoa. The structure is circular and has eight rays with limited rock facing. About 20 to 40 m down the ridge is a wall of basalt that may have been placed there to stabilize the ridge (Clark and Herdrich 1988:52).

OLOMOANA RIDGE
At one locality in Eastern Tutuila, there is but a single ridge separating the north coast, at 'Aoa, from the south coast, at Amouli. That locality is known as Lemafo Saddle (Lemafo means pass) but the ridge itself is not named on maps of the island (there is a ridge named Lemafo but it is located in Sa'ole County and runs inland from Sa'ilele). The ridge on which the saddle is located extends off of Olomoana Mountain in the northeast to Asiapapa Ridge in the southwest. In this report I will refer to this ridge as Olomoana Ridge. The entire ridgetop was surveyed in 1986 (Clark and Herdrich 1988), and re-walked in 1988. Because of the way the border between Vaifanua and Sa'ole counties appears to run, some sites on the ridgetop fall into East Vaifanua County and others are in Sa'ole County.

*AS-21-4. This site was initially reported by Buck (1930:322) as a legendary site. At some time in the past, a local chief frequently climbed Olomoana Mountain to gaze over the magnificent view that it offers. On each trip, an accompanying guard of the chief brought a stone that was left at the summit in a pile. These mementos of the chief's trips also provided a supply of sling stones in case of attack. Kikuchi (1963:55) also reported the site and added that his informants identified the chief as Tui-sa-ona or Tu-sa-ole, and said that he lived on Tapepe Ridge, inland of Alao. Clark (1980:51) listed this site by its current site number. Clark and Herdrich were the first archaeologists to search for the site, and in 1986 they located a pile of stones just below the second
peak of Olomoana that they concluded represents the reported commemorative heap (Clark and Herdich 1988:55-56).

**AS-21-18.** This is an ill-defined *tia 'ave* on a small peak at 137.5 m (451 ft) in elevation. There are seven rays with rock facing, and a projecting lower terrace-like area on the south side of the *tia*. There is also a depression on the south side where it was difficult to define the extent of the structure. In the center of the *tia* are two shallow, rock-lined depressions. In the north-central area is a square, rock-lined pit that was probably part of a military emplacement from World War II (Clark and Herdich 1988:52).

**AS-21-19.** On the west end of a small, elongated peak of the ridgetop, at 175 m (574 ft) in elevation, is a *tia 'ave* with seven or eight rays. At least three of the rays have rock facing and the others are badly eroded. A shallow linear ditch crosses the ridgetop at the east end of the *tia* (Clark and Herdich 1988:52).

**AS-21-51.** This site was first visited in 1986 by Clark and Herdich (1988) who termed it the Olomoana Complex. They identified twelve terraces, two probable military features, and a rock pile (21-4) centered on Olomoana peak. A few recent military features aside, we interpreted the site at that time as either the residential terraces of a refuge site, or the bases for the temporary habitations of a *maloloa*, or a set of features that served both functions. In 1988 we revisited the site, approaching it from Maugaleo'o Ridge. I now think it far more likely that the primary function of the complex was as a hilltop fortification.

The top of Olomoana actually consists of two peaks separated by a short saddle (Fig. 6). The southwest peak is 327.4 m (1074 ft) a.s.l., the saddle drops a bit then rises to the second peak which is indicated on the DRW map at 327.1 m (1073 ft) a.s.l. The second peak is slightly larger in area than the first and both have flat tops but are too small to accommodate *tia 'ave*. Olomoana is a point on the boundary between Vaifanua and Sa'cle counties, but most of the features on the complex fall into the Vaifanua section.

The initial survey of the Olomoana complex located 13 features plus the pile of rocks identified as the previously reported site 21-4. Feature 1 is a terrace with a probable entry-way (boulders along the edges of an apparent pathway) on the southwest of the first peak. There are two depressions on the north side of Feature 1 and a third on the south side. The first peak is flattened and designated Feature 2. Features 3, 4, and 5 are comparatively low terraces located on the saddle between the peaks. The second peak is also flattened and is Feature 6. Features 7, 9, 10, 11, and 12 are five terraces constructed one after the other down Maugaleo Ridge. The last of these terraces is just above a relatively flat but very narrow stretch of the ridgetop beyond which the ridgetop broadens to a prominent point on which is the *tia 'ave* of 21-91 (which is also the point at which Lefutu Ridge meets Maugaleo'o Ridge).

These terraces cover the entire width of the ridgetop and have very steep upslope walls but no rock retainers. The surfaces generally have a scattering of pebbles and cobbles but no real floor surfaces, although on Features 1 and 9 many of the stones are waterworn. The smallest of these terraces is #12 which is about 5 by 4 m, and the largest is #1 at about 18 m long by 9 m wide. Site 21-4 is on the northeast corner of Feature 7. Feature 8 is a rectangular area that is
cut into the bottom of the second peak, and on the southeast corner of Feature 7. The terrace of Feature 13 is on a ridge spur jutting to the northwest of the first peak. Situated on this terrace is Feature 14, which is a rectangular cut into the slope side, similar to that of Feature 8. It and Feature 8 are probably U.S. military emplacements. The only artifact found at the complex was a cobble with hammerstone use at one end and a possible chisel modification at the other.

On re-examining this site in 1988, we found four terraces not noticed previously. All of these are on the Olomoana Ridge access to the first peak and below Feature 1. In descending order, these terraces are designated Features 15, 16, 17, and 18. They are smaller than those previously noted and the ridgetop slope is steeper there than on Maugaleo'o. The terraces are about 3–4 m wide, 5-6 m long, and have rear embankments at least 4 m high.

The terraces of the Olomoana complex are unlikely to be agricultural features since agricultural terracing was not a common practice in Samoa and the ground is rather rocky and poorly suited for agriculture. Furthermore, there is no reason to suggest population pressure on arable lands to require the labor investment for such a terracing system on marginal land. The absence of domestic artifacts, features, and midden clearly argues against interpreting the site as an inland village. Given the difficult access to the site, and the availability of flatter ground on either side of the Olomoana peaks, it seems unlikely that terraces would have been built here to provide a malolaga for travelers or pigeon catchers. The site seems most likely, therefore, to represent a fortification complex. Ascent to the top of Olomoana by way of the lateral slopes of the ridges would be exceedingly difficult, at best. The series of terraces would provide excellent defensive positions against invaders coming up the ridgetop and scaling the steep terrace embankments. Once established as a fortification, the complex could subsequently have also been used as a malolega by those traveling across the island and/or using the nearby tia 'ave.

Although I would not wish to make too much of word meanings, it is interesting to note that the word 'olo means "fort, shelter, tower, castle," or also can be used in reference to the departure of a travelling party (Milner 1986:163). The term olo means coo, as in the cooing of a pigeon, or to rub (Milner 1986:163). Current spellings of Olomoana now lack the glottal, but that may not reflect ancient usage. The term moana can refer to certain fishes or to deep sea water. It can also be used to mean "be devastated," as by a battle (Milner 1986:146). One might therefore suggest that the place name Olomoana refers to a refuge fortification for times of military devastation, or a fortress once devastated, or some such meaning.

AFIMUAC RIDGE

This ridge begins at Olomoana Mountain and runs north to northwest, terminating on the north coast at Soli Point. The ridge was surveyed in 1986 and was referred to in the report by Clark and Herdich as the "East Ridge" of 'Aoa. Sites located on Afimuac Ridge are four tia 'ave, and a series of residential and recent military features on the lower portion of the ridge. In addition, on the lower slopes of the ridge, near the floor of 'Aoa valley, we reported a series of terraces (21-54 through -60). Another area of the lower east slope—south of Puna Stream—was examined but no archaeological sites were found (Clark and Herdich 1986:65). The sites listed below were all reported previously.
This is a ʻiaʻave on a prominent projection of the ridgetop at 205 m (672 ft) in elevation. The ʻiaʻave has four rock-lined rays but does not complete an oval or circle (Clark and Herdich 1988:52).

A ʻiaʻave with eight stone-faced rays, this site is on a prominent point of the ridge, at 196 m (643 ft) a.s.l. (Clark and Herdich 1988:57).

On a low peak of the ridge, at 184 m (603 ft) a.s.l., is a ʻiaʻave that has eight rays with stone facing (Clark and Herdich 1988:57).

This is a ʻiaʻave with six, possibly seven, rays, only three of which have stone facings. The structure is on a prominent point of the ridge, at an elevation of 177 m (581 ft) (Clark and Herdich 1988:57).

This site is located at the northern end of Afiuao Ridge, overlooking Solo Point, and consists of 9 features, all of which appear to be from the U.S. military (Clark and Herdich 1988:66-67).

This site is just above a saddle area at 74.4 m (244 ft) a.s.l. and continues up the ridge to approximately 95 m (312 ft) a.s.l. The site consists of four features: a wide, irregularly shaped paepae with a house foundation that was fairly recently abandoned; a house floor without paepae that is probably older than the first structure (a Type VI adze fragment was recovered); the outline of an umu structure; and a heavily disturbed house foundation on a roughly rectangular paepae that appears to be older than the other structures at the site (Clark and Herdich 1988:68-70).

Since the 1986 research, a single flake of dark, fine-grained basalt was found at this site by Mr. Toia.

This is a small terrace with a comparatively well-made retaining wall on the talus of the lower Afiuao slope (Clark and Herdich 1988:70).

This is another small terrace (Clark and Herdich 1988:70).

This is a terrace (Clark and Herdich 1988:70).

This is a terrace (Clark and Herdich 1988:70).

Similar to the two sites noted above, this is another terrace (Clark and Herdich 1988:70).

This is a terrace with a foundation feature, probably for a house. It is on a prominent point of a small ridge that juts into the eastern lobe of 'Aoa valley (Clark and Herdich 1988:70).

On the ridge a short distance downslope from 21-59 is another terrace that provided the base for a house site (Clark and Herdich 1988:70).

This site is on Afiuao ridgetop, between 21-53 and 21-23. It consists of a paepae with a house floor on top. It does not appear to be very old (Clark and Herdich 1988:71).
'AOA TO ONENOA COAST

The narrow shelf of the east coast of 'Aoa Bay to Palau Point was covered in 1986, and three sites were reported. Passing beyond Palau Point can only be accomplished at low tide, and it was not until 1988 that the coastal shelf from Palau Point to Solo Point and around to Onenoea was surveyed. No additional features were found on that stretch of coastline.

**AS-21-3. This is the Afimuao site reported by Kikuchi (1963:43) as a "probable village" located on the cliff edge on the trail between Onenoea and 'Aoa, and was later listed by Clark (1980:50). Kikuchi described it as a set of platforms and a wall complex that, along with the cliff face, was eroding into the ocean. Neither Kikuchi nor Clark visited the site. With the absence of features beyond Palau Point, it seems likely that this site is the same as site 21-10. It may, however, refer to a residential area between Palau and Solo points—which was thought to be the case in 1986—for which there no longer are surface remains. Although I think this unlikely to be the case, I have not reassigned this number to another site.

**AS-21-9. This site consists of a well-made paepae, a partially terraced area, and a short wall of stacked boulders. These features are near the base of the slope on the east side of 'Aoa Bay. Eight basalt artifacts were collected from the ground surface; included within this group are one Type III adze, one probable Type V adze, and one probable Type VI adze. This site probably represents a single residential unit (Clark and Herdrich 1988:43-44).

**AS-21-10. This site is on a narrow ledge of land just south of 21-9. It consists of three house foundations, one of which is actually on a terrace about 20 m upslope from the ledge (Clark and Herdrich 1988:44).

**AS-21-11. Farther south on the east ledge of 'Aoa is this set of recent features. Two of these features are concrete pillboxes built by the U.S. military during World War II, and the other two are well-built terraces that villagers identified as abandoned foundations for tourist fale (Clark and Herdrich 1988:44, 47).

ONENOA

Onenoea is a small coastal plain and village on the northeast coast. The plain was surveyed in 1986 by Clark and Herdrich (1988:31-32). No cultural deposits were found along the shore or in the banks of the streams, but some surface features and artifacts were reported for the rear of the village.

**AS-21-7. The feature and artifact locations at Onenoea were grouped into two localities. Locality 1 is in the west, at the rear of the village, where Vaise Stream flows onto the plain. In the stream bed there are two boulders with grinding facets and nearby there were a couple of stone tools. Also in this area are two or three probable foundations. A short distance up the slope is a terraced foundation, farther up the slope is a set of three or four foundations, and not far from those is a foundation with an old, small, concrete foundation on one corner. Near the east end of the village is Locality 2, where there are two terraced foundations (on the slope just above the plain) and some basalt flakes and tools scattered in the surface coral and pebble.
OGEFAO RIDGE

This is a small ridge that is unnamed on the DPW maps. It extends to the northwest off of Lefutu Ridge and between the coastal flats of Ogefao and Oenena. In this report I will refer to this ridge as "Ogefao." A single site number (21-95) was assigned for the ten features found on this ridgetop. Those features seemed to constitute a single residential complex. Since this complex is approximately 115 m (377 ft) from the top of Lefutu Ridge, which is also over 20 m higher in elevation, and on a separate ridgetop, the Ogefao complex was differentiated from the Lefutu complex by a different site number. Down the ridgetop from site 21-95 and toward the coast, the slope is comparatively steep and no other sites were found.

AS-21-95. The ten features on this ridgetop consist of three house foundations, two terraces, one grave, an ancient path, a wall segment, and two pits. It was late in the day when this ridge was examined, so comparatively little information is available about the features found there.

Feature 1. This is the largest house foundation at the site. It is oval and measures 12.0 by 8.7 m. The outer foundation ring is between 1.2 and 3.4 m in width and composed of boulders, while the inner floor has a surface of waterworn pebbles. This structure is built on a terrace with an arcing retaining wall of boulders. A probable adze fragment was observed in the foundation and a Class 1a scraper was collected.

Feature 2. A short distance away and slightly downslope from the foundation (Feature 1) is a segment of a standing wall several metres long. It is not clear if this was just a short wall or if the ends have had rocks removed for other constructions.

Feature 3. This is a terrace slightly downslope from Feature 1. While there is no rock retaining wall, the ground seems too flat to be a natural feature of the slope. Features 4 and 5 are situated on this terrace. Strewn over the surface are numerous pebbles and larger rocks; these may represent a disturbed floor surface.

Feature 4. Located on Feature 3 is a large pit similar to those found at 21-2 and 21-94, Locality 2, except this one has an encircling ring of large boulders and pieces of coral. This seems likely to be a masi pit.

Feature 5. This, too, is a large pit. It is located next to Feature 4 and very similar in shape and construction.

Feature 6. This is a house foundation about 24 m northwest of Feature 1. It is smaller and not as well made as Feature 1.

Feature 7. Another house foundation, this one is similar to Feature 6 and is on the ridge slope about 52 m southwest of Feature 1 and 45 m south of Feature 6.

Feature 8. This is a rectangular outline of rocks that is probably a grave. It is located a few metres from Feature 6.
Feature 9. Running along the ridgetop and through the site complex is a rather deep sunken path. This feature was lost in the vegetation on both ends of the site.

Feature 10. This is a terrace that is located down the slope from the terrace of Feature 3. The terrace seems too flat for a natural feature, but there is no retaining wall and there are no features on the surface of the terrace.

LEFAO RIDGE

This is a small ridge that extends to the north-northwest off of Lefutu Ridge and terminates at Panaola Point. Three sites were found on Lefao Ridge. Two of these are tia 'ave and thereby warranted separate site numbers. The third site is a small residential complex that begins only about 90 m from the Lefutu Ridge complex (21-2). The decision to designate the Lefao complex as a separate site from Lefutu was based on the fact that the separation between the complexes appeared to be a real one and not just a space between features. Furthermore, the location on separate ridges, going in different directions, probably reflects more than simple spatial considerations. As far as could be determined from our quick survey, structural remains on Lefutu Ridge--especially in the south half of the site--are not particularly dense, and there appears to have still been room for other house sites. So, the occupation of Lefao was probably not due to overcrowding on, or spill-over from, Lefutu. The type of separation represented on these ridges seems to me to be consistent with village separations that are sometimes found in Samoan settlements today. And, especially if the occupation of Lefutu--as well as Lefao--was related to refuge and/or malolaga, then Lefutu may have been linked to Tula (or Tulauta) while Lefao may have been linked to north coast inhabitants, particularly those of Chenoa.

One last point about the Lefao features concerns the possible relationship between the residential features and the tia 'ave. We have no dates available for any of these features, but since some of the features of 21-94 are built on top of 21-92 (tia 'ave), it is clear that at least some of the residential occupation came after the abandonment of at least one of the tia 'ave. How the features of this ridge relate chronologically to each other and to those of Lefutu ridge is an important question that remains unresolved.

AS-21-92. Where Lefao Ridge meets Lefutu Ridge is a saddle area, then a slight rise to a large prominent point--at 130 m (425 ft) a.s.l.--on the ridgetop of Lefao. On the north portion of this point, and between features of 21-94, is a tia 'ave. This structure has been modified by later activity so it was difficult to precisely define. There are at least five rays with stone facing, a disturbed probable sixth ray, and others were probably present at one time but their rock facing was apparently removed for the construction of a house foundation that sits on top of the mound. Subsequent erosion of the de-faced rays--along with vegetation cover--made it impossible to say with certainty how many rays were originally present. As best as can be determined, the mound measures about 21.8 by 19.4 m. On top of the mound are a house foundation and a small mound of soil that fall into site 21-94.

AS-21-93. Down the ridgetop from 21-92, and at the prominent point where the ridgetop begins to descend rather steeply to the coast (i.e., about 124 m, or
407 ft, a.s.l.), is a *tia 'awae*. It has eight well-formed rays, all of which have stone facing. At least three of the indentations between rays are accentuated by being slightly dug out. The structure measures 23.7 m by 18.0 m and is generally about half a metre high.

**AS-21-94.** This site is a residential cluster. I have lumped several separate features into the same site because of their general proximity, but I have also divided the site into three localities. The subdivisions are based on the geographic clustering of features, along with my suspicion that they may represent different social or chronological clusters. Feature numbers throughout the site are continuous.

**Locality 1.** This is a cluster of three terraces and associated features. It is located on the ascending ridge at about 123 m (405 ft) a.s.l., which is just before the ridgetop slope nearly flattens to a very gentle slope. The features of this locality are probably related, and appear to represent 2-4 household units (2 on the first terrace and possibly one each on the other two terraces).

**Feature 1.** This feature is a large terrace that is probably primarily natural, but has been slightly modified; that is, it appears too flat to be entirely natural, and on the far south end of the terrace there is a short section of a boulder retainer. The terrace forms a large arc that is 46 m long and 14.0 m wide at its maximum. On top of the terrace are Features 2-6, which probably represent two household units--Features 2 and 3 constituting one unit and Features 4-6 constituting the other.

**Feature 2.** This is a house foundation and is located on the north end of the Feature 1 terrace. It is defined by a two-part arc of boulders on the downslope side--near the edge of the terrace--behind which is an area marked by a light scatter of pebbles, cobbles, and boulders. The floor is 8 m long by 6 m wide.

**Feature 3.** Only a couple of metres to the north of the Feature 2 floor is an apparent distinct and more concentrated surface of pebbles and cobbles. It is roughly circular in shape with a diameter of 2.75 m. This may be the base of a cook house for a small residence that stood at Feature 2.

**Feature 4.** On the south half of the terrace, about 15 m from Feature 2, is another house floor indicated by a light scatter of pebbles and cobbles. The scatter covers an area roughly 6 m by 5 m across and lies near the edge of the terrace.

**Feature 5.** This is a probable grave marked by a rectangular outline of rocks, 2.3 by 1.2 m in size. It lies within a couple of metres of the inland edge of Feature 4.

**Feature 6.** This appears to be an old foundation or floor of some sort. There is a short alignment of boulders on the south edge and a couple of separated boulders suggestive of a curbing. This may be a separate house floor, but I think it more likely to be the base of a structure associated with Feature 4, such as a cook house.
Feature 7. About 12 m up the slope from the first terrace (Feature 1) is a second terrace. This terrace, too, may not be entirely artificial but it looks too flat and well-formed to be completely natural. The maximum dimensions are 26 m by 12.5 m. The terrace forms a rough arc and no retaining wall was seen. Two floor features (nos. 8 and 9) are located on the north half of the terrace. Those floors may represent a household unit, or, since they are actually rather small, perhaps the floors of work/rest houses.

Feature 8. This is a small floor surface formed of boulders and cobbles. It is irregular in shape with a length of about 2.5 m and a width that varies from 1.2 to 2.1 m.

Feature 9. A few metres north of Feature 8 is a concentration of rocks that lies in the midst of larger light scatter of stones 3-4 m in diameter that may constitute a floor surface.

Feature 10. To the south of Features 1 and 7, and on the slope about midway between them, is another terrace. This one is smaller than the others, measuring only 12.3 by 5.7 m. There is no retaining wall and no identifiable floor surface, but the feature seems too small to have been a useful agricultural terrace.

LOCALITY 2. This is a cluster of four large pits in a row, a fifth pit some distance away, an ancient path, and two house foundations. The large pits seem likely to be massi pits. An alternative explanation is that they are military features. However, the absence of any recent artifacts or concrete in the construction, and the lack of similarity to military features encountered elsewhere leads me to regard the military interpretation as least likely. Three large slabs of coral were found in the vicinity of the four pits and rocks were scattered about as well, especially between Features 11 and 12. The elevation of this cluster generally ranges from about 123 to 128 m (405-420 ft).

Feature 11. This is a large pit, 0.9 m deep and 5.25 m in diameter. There are rocks of both dense and vesicular basalt at the bottom of the pit. It is located on the west side of the ridge top, 40.1 m from 21-93 (Lia Lave).

Feature 12. This is a large pit next to Feature 11. It is 1.3 m deep and 4.3 m in diameter. Rocks are again at the bottom of the pit, but vesicular rocks also are found around the walls of the pit.

Feature 13. The third pit in the series, this feature is 0.8 m deep and 5.0 by 3.8 m across at the top.

Feature 14. This pit is elongated at the top and at the bottom has a central rise that forms a dual-pit base. The overall size is 7.9 m long (with one pit accounting for 3.7 m and the other 4.2), 4.3 m wide, and 1.3 m deep.

Feature 15. This is a house foundation that is badly disturbed by tree growth. It is roughly rectangular, 9.1 m long and about 7.0 wide. A band of boulders define the foundation on three sides. An interior floor surface may also exist, but the disturbance together with dense vegetation made it difficult to identify that floor with certainty. A few pieces of coral are
scattered about, and a couple of metres to the south of the structure is a pile of boulders.

**Feature 16.** This is a paved path that is unlike any other feature that we have encountered on the ridgetops. The paving is of boulders and large chunks of coral. One segment runs a short distance on the south edge of the ridgetop, between Features 15 and 16, and may actually lead to the tia 'ave of site 21-93. Another segment leads off of the ridgetop, down the slope for some 50 m, but was lost in the vegetation. A third segment diverts from the downslope segment and runs roughly parallel to the ridgetop toward Ogefa Ridge and O enumoa. Unfortunately, the ground vegetation is very thick in this area so it was difficult to follow the trail without extensive clearing.

**Feature 17.** This is another possible masi pit. It is 4.4 m in diameter and 0.7 m deep, but the bottom is filled with rocks. It is just a few metres from Feature 18.

**Feature 18.** Sitting atop the tia 'ave of 21-93 is a house foundation. An outer surface of boulders surrounds the roughly oval interior floor with its surface of waterworn pebbles. It looks as if some of the rocks that form the foundation came from the tia 'ave, and therefore the foundation post-dates the abandonment of the mound. The foundation is 11.7 m in length and has a width of approximately 8 m.

**LOCALITY 3.** This is a small group of features at the rear of Lefao Ridge, just before the slope up to Lefatu Ridge. The ground is flat at this location, which lies at 128 m (40 ft) a.s.l.

**Feature 19.** The northern feature of Locality 3 is a house foundation that is badly disturbed. It is oval and about 9.4 by 6.7 m in size, although about one third of the edge is difficult to define. Around about two-thirds of the feature is an elevated paving of large boulders a metre or so in width. One large chunk of coral is incorporated in the foundation. The inner floor is surfaced with waterworn pebbles. Artifacts collected from the surface are one Type I adze fragment, one Type III adze fragment, one preform fragment, and two basalt flakes.

**Feature 20.** About eight metres from Feature 19 is a probable grave. The feature consists of an oval outline of rocks with a scattering of waterworn pebbles over the interior surface. The maximum dimensions are 3.9 m by 1.9 m. Several chunks of coral are scattered about the surface to one side of the feature.

**Feature 21.** The inland-most feature of the site, this is a rectangular terrace. A dense growth of vines on the ground obscured visibility, but it appears that much of the terrace facing is strictly of soil. However, toward the inland end of the terrace there are some coral chunks on the top and some boulders on the sides. The coral area may have constituted the floor area for a house. A little distance up the slope from this feature we found a Class I basalt scraper.
MAUPUA COAST

In 1985, Richard Gould, Kim Honor, and Kirsten Reinhardt (the latter name later changed to Brophy) carried out an investigation of the Tulaute site (21-1). They claimed that the quantity of basalt flakes at Tulaute was so large that Tulaute qualified as "one of the largest basalt quarries and lithic or adze manufacturing sites in all of Polynesia" (Gould et al. 1985:6). Based on observations made during that project, Brophy (1986) later reported the existence nearby of a large basalt quarry. She termed this quarry the Maupua Site but she did not assign a site number. Curiously, the Maupua site is not specifically mentioned in the earlier report. There is, however, the statement that "the seaciffs, located about 1.1 kms from Tulaute, provided an abundant supply of basalt for the extensive adze manufacturing industry which was present at the site" (Gould et al. 1985:7). Furthermore, Brophy (1986:18) later argued that Tulaute was the site for "the complex process of basalt adze manufacturing and experimentation with new technologies in that process," and that the basalt was quarried from Maupua. Thus, it appears that the quarry at Tulaute reported by Gould et al. actually referred to the site later specified as Maupua located over a kilometer away.

According to Brophy (1986), the Maupua-Tulaute complex was a major basalt quarrying-adze manufacturing center. The two large quarry sites--Tataga Matau and Maupua--on Tutuila would supply more adzes than the small population of the island needed, so adzes were probably produced for trade to the other islands of the archipelago (Brophy 1986:52). Furthermore, the environmental conditions in the Maupua-Tulaute area together with "an accessible basalt supply" may have made it a "site of Proto-Polynesian settlement for the purpose of experimentation with new lithic technologies in response to the need to exploit previously ignored resources" (Brophy 1986:53).

Despite the claimed significance of the Maupua site, neither Gould et al. (1985) nor Brophy (1986) provided adequate discussion of the site or its location. From a general map of eastern Tutuila we find that the Maupua site is located northwest of Tulaute, on the slope above the north-coast road between coastal Lauagae (where two houses now stand) and Omenoa. In fact, the only site description provided is as follows.

The quarry area, consisting of huge sea cliffs with abundant talus material and a protected beach front, is located 1.1 kms from Tulaute over level ground. The talus slope area was littered with adzes, adze blanks, and cores [Brophy 1986:37].

Given the suggested importance of the Maupua Quarry site, a goal of the 1988 research in Eastern Tutuila was to locate the Quarry, map the site, produce more detailed descriptions of the site and artifacts, and collect a sample of the basalt for geochemical and petrographic analyses. The latter goal was necessary to test the hypothesis of trade of Maupua artifacts to other villages and islands. However, we were unable to find any prehistoric basalt quarry at the location indicated by Brophy. Three attempts were made to find the site. In the first attempt we were accompanied by Roger Green of the University of Auckland, who was on Tutuila in conjunction with an investigation of Tataga Matau Quarry by a team directed by Helen Leach. We did find a quarry at Maupua, but it was a quarry that was exploited in the late twentieth century by dynamite and heavy mechanized equipment. The ramps used by trucks to get access to higher areas of

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the outcrop are still present, though overgrown. The area is littered with the basalt rubble from the quarrying operation and I can only surmise that this rubble is what Gould and associates thought was prehistoric quarrying debris, debitage, preforms, and adze--astounding as that may seem. A couple of possible waterworn artifacts were found in the boulders along the shore, indicating some activity at this area. We later learned from nearby residents that the quarried basalt was used for the construction of breakwater barriers (as at 'Au'asi boat harbor) and other features.

In order to be certain that a prehistoric quarry--or remnant of a quarry--was not present in the vicinity of Maupua, we returned to the area later in the project and closely examined the entire stretch of coast at Maupua, and climbed as high as possible up and along the cliff face. Again, no trace of a prehistoric quarry. However, on the coastal flat immediately east of the supposed quarry location and next to an existing house, we found a scattering of basalt artifacts among the stone and coral rubble covering the ground surface. This was designated site AS-21-69, but it represents the remains of a residential site and is definitely not a quarry site.

The third attempt to find a quarry involved the survey of the ridge above Maupua. While we found several structures (see Lefutu Ridge, below), there was no trace of a quarry site.

I eventually learned that Kennedy (1988) had examined the Maupua area a few months earlier, and had dug three test pits along the road from Tula to O'neoa. He, too, was unable to locate the prehistoric quarry but noted the evidence of recent quarrying, including the earthen ramps for access to the outcrop. Kennedy (1988:10) reports that one resident of Lauagae (since the 1960s) recalled heavy mechanized equipment in the area many years ago.

The only conclusion that I can reach at this point is that the so-called "Maupua Quarry" does not exist. Instead, there is only the debris from recent mechanized quarry operations that was misinterpreted as prehistoric quarrying remains. I would add that the basalt of the outcrop at Maupua appears to be of excellent quality. It is very dark gray to black in color, very fine grained, and appears similar visually to the material from which some of the artifacts recovered from 'Aoa were made. It is not clear, however, whether the natural outcrop constituted a source area that could have been effectively quarried by traditional Samoan technology; accessibility of outcrop basalt is an important consideration for quarry sources. The question of Maupua basalt use can only be addressed now through geochemical analyses of artifacts, and by excavations at Tulauta and site 21-69. Sample of Maupua basalt were sent to Beth Wright and Bill Ayres for geochemical and petrographic analyses.

**AS-21-69.** In our search for the Maupua quarry, we located a surface scatter of stone artifacts on a stretch of flat ground a short distance to the west of an existing house at coastal Lauagae. No surface features were observed other than those associated with the nearby house. Eleven artifacts were collected from the surface and a number of other basalt flakes were observed but left in place. The artifacts collected are as follows: two Type I adzes, both with chipping along the blade edge indicative of use (the larger adze is more badly damaged); four adze preforms (two trapezoidal, one triangular, and one five-sided); a Class Ia scraper; a Class Ib scraper; and one tool that may have been used as a chisel or
perhaps gouge, indicated by a poll with one end slightly battered and a 'blade' edge that is roughly bifacial and has a cleaver-type angle with a longer end-point—which is opposite the battered end—that is blunted by damage (Fig. 22). One additional artifact—a highly waterworn trapezoidal adze butt (probably Type I)—was found along the shore a short distance to the west and has been included with the collection from 21-69. All of these artifacts are of dark, fine-grained basalt visually indistinguishable from the rock of the nearby outcrop.

Earlier in 1988, Kennedy carried out survey and test excavation along the road from Tula to Onenoo for a road improvement project that will involve paving of the existing dirt road. He did not, however, find the surface scatter of 21-69. Kennedy (1988:9-10) dug a five-foot-square test pit (TP-1) just to the east and north of the site, on the ocean side of the road. That pit yielded no prehistoric artifacts, and the very compact strata revealed were interpreted as fill that had been mechanically tamped. An elderly resident told Kennedy that in the 1940s, U.S. marines had an encampment and a large generator at Lauagae, close to or at the location of this test pit. The soil strats and compaction were due to either the construction of the dirt road or military activities associated with the generator.

Kennedy's interpretation of his test pit seems appropriate, but that unit was located just beyond site 21-69. That location is probably in an area that was low shoreline prior to the road construction, and therefore unlikely to be an area of occupation. The flat area of 21-69, which is immediately inland of the road, is a more likely site for settlement remains, and the abundance of basalt artifacts clearly demonstrates the presence of a site.

Site 21-69 is important because it may yield evidence of past use of the Maupua outcrop as a source of basalt for stone tool making. Previous alteration of the landscape by the military, road construction, and mechanized quarrying has left little opportunity to investigate the suggestion of Brophy (1986) that Maupua basalt was used by the ancient residents of Tula to manufacture stone tools used locally and traded to other parts of the archipelago. While much of the basis of Brophy's claim has been eliminated, the fact remains that the Maupua basalt is of particularly good quality for stone tool making, and artifacts recovered from 21-69, Tula, and 'Aoa valley are of basalt indistinguishable (macroscopically at least) from the Maupua basalt.

LEFUTU RIDGE

From Maugaleo'o Ridge in the interior of the island, Lefutu diverts to the north and, eventually, the northeast, terminating at the north coast between Maupua and Lauagae. It has a comparatively broad ridgetop that in one long stretch rises only gradually. In the central area of Lefutu, two smaller ridges, Zefac and Ogefoa, jut off to the north-northwest. A portion of Lefutu was investigated by Prost (1978) in 1972 and the entire ridgetop was surveyed in 1988.

**AS-21-2. This site was first reported by Kikuchi (1963:42) who apparently did not visit the site. Over a decade later the site was investigated by Prost (1976, 1978:89-101, 241-244) who labeled it site AmSa/tu/55, and carried out test excavations. In Clark's inventory of cultural resources the site was designated
survey found that Frost underestimated the size of the site and, I believe, also misinterpreted it.

Lefutu village is one of the few sites in Eastern Tutuila for which there are historic references, however vague. In a listing of place names on Tutuila, Pritchard (1866) includes Lefutu. Later, Kramer (1902, 1903) referred to Lefutu in his classic study of Samoa (cited by Frost 1978:89), and Watters (1956), drawing from older sources such as Kramer indicated Lefutu on his map of Tutuila. Unfortunately, none of these sources provides any details about the nature of the site, but they do provide good evidence that the occupation of the site continued into the early historic period. The existence of the site is still known by coastal villagers who reported it to Kikuchi and Frost.

Frost's investigation concentrated on the eastern portion of the site, apparently in an area that had recently been cleared for cultivation. As a result of this restricted investigation, Frost failed to observe numerous surface features and artifacts, and underestimated the actual size of the occupation area. Our efforts at Lefutu were reconnaissance only, so we did not take the time necessary to clear vegetation, intensively survey the ridgetop, or map all of the features found. Instead, we conducted a walk-through survey, noting the approximate locations and sizes of structural features and collecting a small sample of surface artifacts. Frost reported the site to be 40-50 m wide and 90-100 m long. Our survey, however, found that structural remains continue along the ridgetop to cover a stretch over 65 m in width and 350 m (1150 ft) in length, with an additional 76 m (250 ft) down to the ditch at 21-67. Furthermore, abundant remains were also found on Lefao Ridge, which juts to the north-northwest off of Lefutu, and on Ogefa Ridge (which also runs off to the northwest) farther to the southwest. Those remains were assigned separate site numbers and are discussed above. The residential remains of Lefutu fade out at a point (ca. 160 m, or 525 ft, elevation) where the gradually inclining ridgetop starts a noticeably steeper ascent to the top of a prominent point on which is located a tia'ave (21-89). A listing and description of the fourteen features (termed structures) reported by Frost as well as those added during the ETAP survey is given below. In addition, brief mention will be made here of nearby sites given fuller discussions elsewhere.

Frost wrote that a local informant reported several naepae to the east of the ditch of Feature 1, but the only structure she found was a "small disturbed structure" about "100 m from the ditch area" (1978:91). I believe that this structure is actually the tia'ave designated here as site 21-66. The tia'ave of 21-65 and 21-64 may also be part of what the informant had in mind, along with, perhaps, two fairly recent house foundations that are indicated on the DPK maps, but which we did not encounter.

Feature 1. This is a ditch that Frost reported as Structure No. 1 and placed on the far eastern edge of the site. She described it as 2 m wide, 15 m long, and 1.5 m deep. Our measurements put it 4 m wide (a difference that I suspect is due to our measurement being taken at the top of the ditch and Frost's at the bottom) and only 1.0 m deep (a difference that could be due to some in-filling since the time of Frost's work and/or differences in where the measurements were taken). A causeway, 1.5 m wide, crosses the ditch as part of a ridgetop trail (21-70). Frost interpreted this ditch as a defensive feature. I agree that it probably did serve a defensive function, but I would add that it may also have served to give a more pronounced character to the tia'ave
that sits just above it. The ditch is more properly included as part of site 21-67.

Feature 2. Frost's Structure No. 2 was described as a terrace with stone and coral slab facing, about 9 m long and 0.23 to 0.30 m high, and "built to provide a levelled area on the sloping ridge" (1978:93). She placed it some 10-15 m above and to the west of Feature 1, and noted no house outline or floor surface. This appears to be a portion of a ti'ave that I have designated site 21-67 (described below). What Frost regarded as the length of the terrace is actually the width of the mound. We did not observe any stone or coral facing, but vegetation cover and erosion could easily account for that observational difference.

Feature 3. Designated Structure 3 by Frost, this is actually two features. Feature 3A is a house foundation that is 10.3 m by 8.3 m in size. Around the structure is a paving of basalt and coral slabs that serve to outline an inner earthen floor 7.7 m by 5.7 m and raised 0.2-0.35 m. Within the inner floor area and just to the west of center is a square, stone-sided enclosure, about 0.4 m on a side, that was probably a hearth. A 1 m by 2 m test unit was dug in the floor area; no artifacts were recovered and a sample of charcoal was collected for radiocarbon dating. A probable grave is also located within the floor, but I have designated that as Feature 3B since it was undoubtedly intrusive and not part of the structure represented by Feature 3A. This is located in the approximate center of the floor and is indicated by a concentration of pebbles and Operculia shell (or cat's eyes) over an area 1.5 by 0.7 m in size. Frost cited informant information in identifying this as a grave.

Feature 4. Identified by Frost as Structure 4, this again consists of two separate features that I will refer to as 4A and 4B. Both are probable graves, the first being a rectangular paved area 2 m by 1 m and outlined by rocks, and the second a small circular alignment of rocks 0.7 m in diameter.

Feature 5. This is Frost's Structure 5, a pit 1 m deep and 1.5 m across. She reports that Samoan informants referred to it as a masi pit, but she also noted that it differed from other so-called masi pits in not having at least some stone lining.

Feature 6. Structure 6 of Frost is a large, oval house foundation measuring 20 m by 13 m and up to 0.3 m high. Features 7, 8 and 9 are located atop this foundation. Frost describes the structure as follows:

The southeast section of the structure is mostly paved with small stones within an outline formed by larger stones to create a platform. The north and west sides are marked by an outline of large stones. Some of the north side of the structure which is just above the ridge edge is marked by stone facing enclosing the earthen fill [Frost 1978:97].

A few meters to the southwest of this feature, Frost dug a 1 by 2 m unit to a depth of 0.5 m. No artifacts or features were encountered.

Feature 7. This feature--Structure 7--is an oval house floor located in the approximate center of Feature 6. There is an outer stone paving on one
side and an inner unpaved floor that is raised about 0.15 m. The overall dimensions are 9 by 7 m, with the inner floor only 6.3 by 5.3 m. A few pieces of coral were scattered on the floor surface, and a probable hearth is represented by a outline of rocks, 0.4 m square, on the west side of the floor. Excavation of a 1 by 2 m unit at this structure revealed a circular outline of stones, 0.2 m across and 8 cm beneath the surface, that Frost suggested may have related to a center post for the house.

Feature 8. Designated Structure 8 by Frost, this actually consists of four separate but similar features that can be differentiated as 8A-D. They are very similar to the suggested hearths of Features 3 and 7; they are square outlines of rocks measuring about 0.4 m on a side. Two are on the southeast side of Feature 6 and two are on the southwest side.

Feature 9. Structure 9 of Frost is a stone-lined pit, 1.0 m deep and 1.5 m in diameter, on the northeast edge of Feature 6. It was referred to as a maui pit.

Feature 10. This is the house foundation that Frost labeled Structure 10. There is an outer paving of stone and an inner unpaved floor, with dimensions of 10 m by 9 m and 5 m by 5 m, respectively. The inner floor is raised about 0.2 m.

Feature 11. Structure 11 is a large house foundation--15.7 by 13.7 m--with a wide outer paving of rocks and coral chunks. The inner floor--7 by 5.7 m--is about 0.2-0.3 m above the normal ground surface, and is earthen fill with a light surface scattering of coral ill'ili and Oenocymbia shells.

Feature 12. Similar to Feature 11, Frost describes this (Structure 12) as 12 m by 10 m in size with an inner floor 7 m by 5 m and up to 0.3 m high. The outer paving is of small stones and the inner floor is earthen.

Feature 13. This structure [No. 13] consists of an alignment of boulders that is about 3 m long. It was interpreted as a terrace, although no house foundation was in the immediate vicinity.

Feature 14. Frost's Structure 14 is a terrace, probably natural, that is about 30 m long and 8 m wide, and is situated a short distance down the slope (ca. 8 m) from the main ridgetop. Located on the terrace are two irregular depressions--0.2 to 0.3 m deep--that are "associated with only a few scattered stones," and some "scattered areas of stones which may have represented paving, perhaps for structures, but they were very disturbed" (Frost 1978:100).

Feature 15. This, as well as the following features, was not reported by Frost. It is a shallow, stone-lined pit, similar to the those reported above. It lies about 15 m south of Feature 12.

Feature 16. This is a large house foundation not unlike those described above.

Feature 17. Several metres from Feature 16 is a linear depression, ca. 3 m long. The function of this feature is not known.
Feature 18. This is another large house foundation with an inner floor area. On the surface are several basalt flakes, a Class I scraper, a Type II adze, an adze bevel, and a giant clam shell.

Feature 19. On the northwest side of the ridgetop and down the slope several metres is what appears to be a natural terrace, similar to that found at Feature 14. There we found a surface scatter of cobbles that may represent the floor of some structure.

Feature 20. This is a house floor marked by a flattened surface, an occasional boulder of a curbing, and a scatter of pebble and coral ili'ili. Also present are a few basalt flakes.

Feature 21. This is a pit, ca. 1.5 m across, lined with coral and rocks. As with similar features at this site, it may have been a masi pit.

Feature 22. Next to Feature 21 is another depression, this one, however, is shallower and no lining was visible.

Feature 23. Although not well defined, this is a house floor with a coral and boulder paving. A large grinding stone (ca. 0.3 m long) was found on the edge of the feature and a smaller faceted grinding stone was located on the other end of the floor. A crude flake tool was collected from the feature surface.

Feature 24. This is an oval concentration of boulders and chunks of coral. It seems likely to represent a grave.

Feature 25. Next to Feature 24 is another pit, this one measuring 3 m across and 1 m deep, and lacking a stone lining.

Feature 26. This is an area of coral and boulders that appears to mark a house foundation, but is rather vague in outline.

Feature 27. This is an enormous pit that is 8.1 m in diameter and 1.2 m deep. No rocks are present in or around this pit.

Feature 28. This is another large pit that lies 4.5 m from Feature 28. It measures 3.8 m in diameter and 1.5 m in depth.

Feature 29. A few metres beyond the two large pits is a house foundation that is about 20 m by 15 m in size. Some boulders are around the perimeter, but they do not constitute a clear curbing. The surface of the feature has a covering of pebbles, cobbles, and coral. From this feature on, the ridgetop starts to ascend more steeply to a prominent point of the ridge.

Feature 30. Another large flattened surface with a covering of pebbles represents a house foundation a few metres beyond Feature 29.

Feature 31. This is a terrace with an occasional boulder along the front. No surface paving is present.

Feature 32. This is a section of sunken path that was found running between Features 30 and 31. It is probably part of the same pathway that is
found farther down the ridgetop and was designated site 21-70. It was not noted on the flatter portion of the Lefutu ridgetop but shows up here where the terrain is steeper.

Discussion. The above listing of features is based on a brief reconnaissance only, and undoubtedly a few additional features would be revealed with more intensive survey. In addition, sites 21-89 and 21-90 are tia 'ave located on the first two prominent points of the ascending ridgetop up from Feature 31. Another tia 'ave, 21-91, is just beyond 21-90, where Lefutu Ridge meets Maugaleo'o Ridge. Three other sites are located on Lefao Ridge. Sites 21-82 and 21-93 are tia 'ave. In the same area as those sites is 21-94, which is a residential complex consisting of 21 features. Only about 90 m separates this complex from Lefutu, but it does appear to be a real separation and the remains are found on a distinct ridge. So, a separate site designation was assigned. The same reasoning holds for differentiating site 21-95, which is a small residential complex on Ogea'o Ridge, consisting of ten features. I do not know what relationship the three residential complexes had to each other socially, functionally, or chronologically.

In Frost's investigation of Lefutu she excavated three trenches covering a total of six square metres. Only one artifact was recovered from the excavation at the site, and this was a preform consistent with the shape of a Type II adze (Frost 1978:101, 157). While Frost did not find any artifacts on the surface, we found quite a few (Fig. 21). Scrapers are the most common tools with six examples: two Class Ia scrapers, two scrapers that appear to have been made from small Type I adzes with the bevel ends broken off and reworked, a scraper made from a broken Type III adze (a trace of the blade remains), a scraper that appears to have been made from an adze preform. The butt of a preform was found that had been fully flaked (or nearly so) to a large Type I form before breaking in half. Also recovered were the bevel fragment of an adze and a hammerstone. Numerous basalt flakes were also observed but not collected, along with four portable fa'a'a (rocks with grinding facets) and another hammerstone.

Frost found little stratigraphic distinction; she identified a thin (4-6 cm) topsoil (Layer I), a cultural layer (12-15 cm thick) that was black at the top but turned reddish with depth (Layer II), and a "red clayey soil" that was sterile (Layer III) (Frost 1978:95). Since only one artifact was recovered during excavation, the identification of Layer II as cultural and Layer III as non-cultural was presumably based on the presence of scattered pieces of visible charcoal in Layer II only. Despite differences within Layer II, Frost concluded that a single occupation was represented. A single radiocarbon date was reported at 810 +/-210 (Frost 1978:206). Frost corrected this to A.D. 1180 +/-210, while a correction according to Klein et al. (1982) yields a date of A.D. 885-1415.

On the basis of Frost's findings, she concluded that (1) the Lefutu settlement was an isolated and fortified refuge site, (2) it represents a single occupation phase, and (3) it demonstrates the occurrence of warfare on Tutuila by the 12th century A.D. (1978:101, 241-244). This interpretation, however, suffers from troubling inconsistencies. When we add to the points above the fact that there is good evidence that the site was occupied into the early historic period, then we would have a single occupation phase--related to
a period of warfare—that lasted some 700 years. Obviously, a reconsideration of the data and a different interpretation are needed.

While Lefutu is situated on an inland ridge, it is not very isolated. It is a short walk from Tula, which it overlooks to the east, and only slightly farther from Onenoa to the northwest. To refer to the slope up from Tula as an "escarpment" is misleading; it is, in fact, a slope that today is cleared and planted, and probably has been so used for centuries. Furthermore, the well-worn sunken pathway (21–70), as well as the "well used trail" of today (Frost 1978:243) suggest frequent travel between the coast and the ridgetop. Indeed, Lefutu is no more isolated than many of the villages along the north coast that can only be reached by a walk up and over ridges or by canoe along the coast.

The site is much more extensive than Frost realized, and probably represents more than a short-term refuge site. It is unlikely that a purely refuge site—with a single phase of occupation—would have such formal, well-made house foundations. Furthermore, the extensive use of coral (large chunks and ill'ilili) in the construction of the house foundations required a substantial energy expenditure (carrying this material up from the coast) that would be surprising for a temporary refuge site. The presence of masi pits is not particularly informative since they are not feature exclusively associated with warfare-related refuge sites. Moreover, the fortifications were not very formidable, especially for a site of which the function was supposed to be defensive.

The single radiocarbon date has a disturbingly large error factor. One cannot claim occupation by the 12th century since the actual date is equally likely to fall within a couple of centuries either side of that time. Apparently the charcoal was collected from dispersed pieces throughout the layer (no specification is given in Frost's account), so it may represent pieces of charcoal separated in age by centuries.

How, then, are we to interpret the Lefutu site? Four alternatives are available. First, it may indeed be a refuge site, but not one represented by only one occupation phase. Instead, there may have been multiple occupations corresponding to the times when warfare threatened this area of the island. Second, Lefutu may have been an inland village that was occupied for several centuries, and finally abandoned in the early historic period. This interpretation is consistent with Davidson's (1969) argument that prehistoric Samoan settlement pattern included dispersed inland settlements, and not until—and largely because of—European contact did the pattern of nucleated coastal villages develop. Given the nature of the terrain in Eastern Tutuila, the only places that could accommodate inland settlements were broad, long, nearly flat ridgetop, and Lefutu is one of the few suitable ridges. The apparent scarcity of cultural remains at the site may reflect poor preservation due to soil conditions, the lack of screen use in Frost's excavation, and the general condition in Samoan archaeology of limited material remains at house sites. Third, the remains may represent a malolaga associated with pigeon catching. David Herdrich (n.d.; Clark and Herdrich 1988) has drawn attention to ethnohistorical evidence that at the time of pigeon-catching festivals, whole populations would move into the bush, often for months at a time. These seasonal encampments were called malolaga and were situated in the area of pigeon-catching mounds (Buck 1930:539). It is interesting to note that the
residential area of Lefutu is within a short walking distance of nine tia 'ave, and Herdrich has presented a strong argument for interpreting tia 'ave as linked to pigeon catching. This explanation would also account for the presence of pani pits as food storage facilities at a time when agriculture was of secondary concern. Recurrent seasonal occupation, in this environment, might not leave a clear stratigraphic record, and would not produce extensive residential debris. The fourth alternative is that the site represents both a defensive retreat and a seasonal malolaga. The tia 'ave, then, would also serve a dual function—at the minimum—of tia for catching pigeons (and all else that that activity entails) and positions for defending the ridge against invaders. The tia 'ave are situated on the periphery of the residential complex rather than in the midst, and thus are well located for defending the complex as well as catching pigeons.

At this point, we are unable to select from among the alternatives, although the first seems less likely than the others. On the basis of current evidence, Herdrich (pers. comm.) is inclined toward the third (malolaga) or perhaps fourth (combination) alternative, while I find the second (inland village) or fourth (combination) more persuasive. Furthermore, I suspect that the date of the remains at Lefutu probably falls toward the later end of the range. It is obvious that additional work must be done at Lefutu before we are able to assign greater probability to one of the alternative explanations. It might be particularly instructive to excavate one of the house fireplaces at the site. Such features potentially could provide subsistence data, charcoal for additional radiocarbon dates, and may yield evidence of seasonal use (malolaga), permanent use (inland village), or occasional but irregular use (refuge).

AS-21-62. This site is on the slope leading up to the ridgetop from Lauaga, and at an elevation of about 26 m (85 ft). It is an old terrace, although there is no clear retaining wall and the flatter area is strewn with rocks. The terrace measures approximately 9 m across by 7 m wide. This seems likely to have been the base for a work area or fale o'o. Some 30 m or so upslope, a piece of a triangular adze was collected and two basalt flakes were observed.

AS-21-63. Approximately 45.7 m to the southeast of 21-62 is another terrace and a small paepae. The terrace is over 13 m long and about 7 m wide. Immediately upslope of the terrace is the paepae, ca. 6.0 m by 3.75 m, and constructed of a single course of boulders and earthen fill. A glass bottle and some metal sheets were found there, and on one end of the structure is a concentration of charcoal. This site probably represents a fairly recently abandoned house (perhaps only a field house and cook house).

AS-21-64. Above Maupua, on a high point of the ridge, at some 105.8 m (347 ft a.s.l.), is a tia 'ave. It is a very low mound with ten rays that are about 30-50 cm high. Cobbles and small boulders provide facing for the rays but are absent from the indented areas. The mound is roughly circular, measuring 20.5 m by 21.0 m.

AS-21-65. To the west of 21-64 some 160 m (525 ft) and on a prominence of the ridge is a tia 'ave. This is only a few decimeters high and in poor condition. The seven rays lack stone facings and on the southeast, south, and southwest the rays are defined by a shallow ditch rather than a build-up of soil (Fig. 7a). The rays and ditch fade to the north, disappearing just before a sheer
bluff that abruptly marks the northern edge of the prominence. Either the north side of the tia has been lost by slumping off the bluff edge, or the bluff itself constituted the north side of the tia. The dimensions of the structure are 21.5 m by 20.4 m.

AS-21-66. Continuing inland from 21-65, the ascending ridgetop slopes gently for a short distance, then steepens somewhat before another stretch of nearly flat ground. At the crest of this flattened area is the tia 'ave of 21-66 (Fig. 7b). It is at an elevation of about 117 m (385 ft). Seven rays are clearly distinguishable and at the rear (inland end) and an eighth ray is probable, although because of the slope and the vegetation cover (thick ferns), we could not be certain of the latter ray. There appears to be a very slight linear depression at the rear of the tia that may provide a border to the structure and/or partially define the possible eighth ray. Basalt boulders and coral chunks provide a fairly good facing on at least two of the rays but are sporadic in occurrence around the other rays. The mound measures 24 m by 19.7 m. This is probably the "small disturbed structure" reported by Frost (1978:91) as located east of Lefutu.

AS-21-67. After a stretch of flat ground, the ridgetop starts to ascend again. Shortly beyond that is another tia 'ave (Fig. 7c). This one lies at about 125 m (410 ft) a.s.l. and on ground that is of a slightly greater slope than usual for tia 'ave locations. On the downslope side of the structure is a ditch that crosses the ridgetop. This ditch actually arcs so as to help define and make more pronounced the front ray. As noted above (21-2), this ditch is the same as the defensive ditch for Lefutu village reported by Frost (1978:92-93) (Structure 1). In addition, Frost identified the star mound as just a terrace (Structure 2) situated just above the ditch. The sunken path of site 21-70 crosses the ditch by way of a causeway (also noted by Frost) ca. 1.5 m wide, then continues on to the village. The ditch is about 4.0 m wide and 1.0 m deep.

Six rays are present around this elongated structure, which measures 17.9 by 10.1 m. The rays along the northwest side of the tia—at the ridgetop edge—are well defined while those along the pathway are comparatively poorly defined. This probably accounts for why Frost misinterpreted this feature. No stone facings were observed, although Frost reported stone and coral facing for her terrace, which appears to have been simply the west side of the tia 'ave. At the rear of the tia is a curvilinear depression about 0.6 m deep that defines the two upslope rays. While the front ditch may well have served a defensive function, the presence of the shallow rear ditch as a purely bounding feature suggests that the front ditch also served a bounding function, at least in part. Furthermore, because of the shallowness of the front ditch, it would not have been a particularly formidable fortification.

AS-21-68. Only about 30 m (100 ft) beyond 21-67 is yet another tia 'ave. This structure was not reported by Frost. It is not a particularly well-formed structure. There are five, possibly six, rays (Fig. 7d). The front ray is the most prominent and a remnant of the former facing of boulders and coral chunks remains there and on three of the other rays. On the far west end of the mound is a concentration of boulders that represents the remnant of a ray that is now collapsing and eroding down the slope. On the southeast side is a very faint projection, lacking boulders, that could possibly have been a sixth ray. A faint linear depression was noticed behind the structure that may have provided
the rear boundary. A slight depression, 1.5 m by 1.0 m across, is located at
the rear, west side of the mound. As best as could be determined, the mound is
about 10.7 m wide by 16.5 m long. The path of 21-70 bows around the mound to
the south.

AS-21-70. This is an old sunken path that appears as a linear depression. It
was first noticed a little down the ridgetop from 21-66, but there it ran
farther down the ridge slope, diverging from the current ridgetop trail. I
suspect that it constituted the old trail up to Lefutu. Just inland of 21-66,
we again picked up the path, there running roughly parallel to the current
ridgetop trail. At a few locations along the path we observed boulders on the
edge of the depression, suggesting that this feature was a rather formal route
of travel. At 21-67, the path is built-up to provide a causeway over the
ditch, and it passes by the southeast edge of the tia. It also bows around the
southeast side of the mound at 21-68, and then continues on to the Lefutu
settlement site where it fades out. Farther into the Lefutu site the pathway
picks up again and continues past 21-89. My guess is that the pathway
continues to Maugaleo'o Ridge, but the vegetation became a bit dense and we
lost track of the path some distance beyond 21-89. Since the path veers around
the tia 'ave and does not extend over the tops, it is probably contemporaneous
with the use of the mounds as well as with the occupation atop Lefutu Ridge.

AS-21-89. Up the ascending ridgetop about 60 m from the last residential
feature (#32) of the Lefutu settlement (21-2) is a well-formed, ten-rayed tia
'ave (Fig. 9c). It is atop a peak on the ridge at 180 m (590 ft) in elevation.
The structure is round, measuring 18.5 by 18.4 m in size. The rays are quite
clear, faced with rocks (no coral observed), and average about 1.0 m in height.
The ground around at least one of the rays at the rear of the structure has
been dug out slightly, which provides better definition. The pathway of 21-70
runs past the mound, some 15 m away.

AS-21-90. Farther along Lefutu Ridge, on a peak at 200 m (657 ft) a.s.l., are
the remains of another tia 'ave. The vegetation was very dense and we had
insufficient time for an extensive clearing. We were only able to identify
three rays with rock facing, although others may be present. The structure
appeared to be round and small, perhaps 15 m or a little more in diameter.

LUA'AGAE RIDGE

This ridge runs from Lua'agae saddle in the southwest to the tip of Cape
Matatula in the northeast. The southern edge of the central ridge is marked by
a steep precipice down to the ocean. On the edge of this cliff, and just below
the peak at 77 m (254 ft), is the GMCC Observatory (air quality station). Much
of the ridgetop, especially in the vicinity of the Observatory, has been
bulldozed, and no non-recent cultural remains were found on the north half of
the ridge. On the south half, however, there are six sites.

AS-21-99. This site is a complex of recently abandoned residential features on
the slope just south of the southern peak of the ridge. Features 1-4 are
white, tiered, concrete graves on a surface scatter of waterworn pebbles. One
of these tombs had a headstone with the inscription "Hea Tule Leatutufo 1925
-1981." Feature 5 is a concrete slab, 5 m square, that is next to the graves.
Adjacent to this, and connected by a short flight of concrete stairs, is a
larger concrete slab--Feature 6. The dimensions are 20 by 7 m, there is a
concrete bench on one end and a concrete base of a storage area on the other end. Feature 7 is a concrete walkway that leads to the slabs from an old road just down the slope. Immediately above Feature 6 is Feature 8, which is a surface scatter of pebbles on which is a short, linear pile of rocks that may have been an old wall segment. One basalt flake and one basalt preform fragment were collected from the surface. A short distance upslope is Feature 9, a large, dispersed scatter of coral rubble. The concrete features represent recent activities while the scatters of pebbles and coral rubble probably indicate earlier occupation.

AS-21-100. On the northwest side of the southern peak of Lauagae, at an elevation of 56 to 63 m (184-207 ft), is a basalt exploitation site that I have termed the Lauagae Quarry. It is a small quarry area distinguished by a dense carpet of flakes, preforms, and preform fragments covering an area only about 12 m by 14 m. The eastern edge of the quarry is disturbed by a military bunker (21-103).

A small sample of artifacts was collected from the site. These artifacts are three secondary decortication flakes, three bifacially flaked tool preform fragments, and one complete preform. In general, there was a predominance of large waste flakes and large broken preforms, a comparative rarity of complete preforms, and an absence of completed adzes and flake tools. Some cortex is present on each of the randomly collected artifacts. Thus, it appears that this was a site where naturally fractured chunks of basalt underwent preliminary reduction to create large preforms that were then transported to other locations for final tool manufacturing. This site may have been a primary source of basalt for the extensive manufacturing activities taking place at Tulauta (21-1), although it may not have been the sole supplier. One of the flakes collected was sent to Beth Wright for geochemical analysis and a second flake was sent to William Ayres for analysis by a different technique.

AS-21-101. Northeast of 21-100 about 22 m are the remains of a probable residential site. On a terrace cut into the slope is a surface scatter of pebble and coral 'ili'ili, some basalt flakes (not collected), black soil, and some concrete. This site may not be very old, or, there may be two components represented. The area is badly disturbed, perhaps by bulldozing related to the military activities in this area.

AS-21-102. Approximately 37 m southwest of 21-100, in an area now in plantation, is a concentration of coral rubble, a few metres in diameter. It probably marks the remains of an old foundation but it is very badly disturbed. There may have been some bulldozing in this area at the time of military activity. This site may have been residential and/or associated with the quarry site.

AS-21-103. Next to, and perhaps partially disturbing the eastern edge of, the quarry of 21-100 is a military bunker. It is made of concrete, is covered with soil, and has a sunken entry. The inside walls are covered with modern graffiti.

AS-21-104. Down the slope to the southeast of the south peak of Lauagae, between 21-104 and the observatory road, are two very large concrete slabs. These features are probably related to the military activities on the ridge.
AS-21-105. This site consists of five features that have been grouped together because of their probable contemporaneity and similarity of function. On the south slope leading to the middle peak of Lauagae are two large concrete slabs on a base of coral chunks. On the corner of one of these slabs is an electrical fixture. These slabs constitute terraces on the slope, and the downslope sides are about 1.5 m high. Along the slope some 10 m or so is a ditch, 4 m long and 2 m wide, in which is a piece of metal. On the east end of the middle peak of the ridgetop are two more large concrete slabs, each approximately 5 m square. Around one of these is a surface scatter of ili ili. All of these features were probably constructed by the military.

AS-21-106. On the middle peak of Lauagae, at 69 m (227 ft) a.s.l., is the remnant of a much disturbed tia 'ave. This feature is 7.8 m west of the ridgetop slabs of 21-106, and it was probably disturbed by the activities associated with the construction and use of the slabs. Only two rays are visible, both on the south side of the ridgetop and both defined by boulders. Steep slopes constitute the north and east sides of the structure; rays on these sides may have been lost down the slopes. The ridgetop at this location is quite narrow, and the structure is only about 11 m wide.

AS-21-107. This is another tia 'ave and it is on the east end of the same peak as 21-107 (also at 69 m a.s.l.). This structure is heavily disturbed and eroded, and dense vegetation obscured the visibility. Again, only two rays with rock facing can be identified on the south side. The ridge drops steeply to the north. The structure is 9.5 m wide and probably twice as long. A shallow ditch cuts across the narrow ridge to the east of the structure and may have constituted a northern boundary. Consequently, a third ray may be present in the form of a large northern projection ending at the ditch. A basalt flake and a tool fragment were observed on the surface close to the structure.

PAGASA RIDGE

This ridge is not named on the DFWM map but it terminates at Pagasa Point, so I will refer to it as Pagasa Ridge. The ridge juts to the southeast off of Lauagae Ridge, and the valley of Tula is to the south.

AS-21-96. This site is on a slight prominence (25 m, or 82 ft a.s.l.) at the far southeastern end of the ridge. It consists of a burial area with three graves belonging to the family of high chief Iuli. All of the graves are concrete and painted white. High Chief Iuli requested this burial location (no headstone present) and his brother and sister were buried there later. The sister, Saisavaii Percy Barber, died July fourth 1985 and the brother, Togi Iuli, died September 15, 1983. Both of the male tombs have four tiers while the female tomb has three tiers. The tombs of Saisavaii and Togi are on a red concrete slab and under a roof. All of the tombs have the head toward the road.

AS-21-97. On the southern peak and slope of the ridge, at 38.7 to 30.5 m elevation (127-100 ft), is a U-shaped border of boulders, measuring 3 m wide and 2.3 m across, that forms a terrace which may have supported a fale o'o. On and about the terrace are scattered pebbles, a few small pieces of coral, and a basalt flake (not collected). Slightly downslope are three large pits. They are oval, about 1.0 m deep, and have top dimensions of 4.5 by 3.3 m, 4.2 by 3.1 m, and 5.4 by 3.0 m, going down the slope. These may be features related to
the military—who were active in this area—or they may be masi pits, umu ti, or other features associated with Samoan activities.

**AS-21-98.** On the narrow ridgetop (at 30.5 m, or 100 ft, elevation) near the juncture with Lauagae Ridge is a large area of fairly continuous coral scatter. There are also a couple of arcs of coral that may mark graves. Dense vegetation over portions of the ridgetop made it difficult to identify specific features. At the northwest end of the ridgetop is a section of rock wall 13 m long. On the west side of the wall and down the slope is a scatter of pebbles and cobbles, and a large number of basalt flakes, tools, and preforms. On the other side of the wall is a flattened area over which are scattered waterworn pebbles, apparently providing a floor. This floor runs the length of the wall and is 7.2 m wide, but the east side appears to have been destroyed by the road leading to the Observatory (air station) on Lauagae Ridge.

Only six of the artifacts observed were collected: two adze preforms and one preform fragment; two possible chisels, one of which has a slightly convex blade edge suggesting possible use as a gouge; and a Class VII flake tool. Of the collected artifacts, only one (a preform) does not have a highly waterworn surface. It is likely that these tools were inadvertently brought to the site as part of the floor surfacing of stones and coral, and therefore may have come from a nearby coastal site. This would explain the waterworn character of the tools.

**TULA**

On the east coast of Tutuila, just south of Cape Matatula, is the valley and village of Tula. There is a broad sand beach on which sits the modern village. At the rear of the valley is the old site of Tulauta, which at one time was thought to be the oldest site in American Samoa. Although that assessment no longer appears to hold, Tulauta is an important site and, therefore, will be discussed at some length.

*AS-21-1.** This is the old settlement of Tulauta, which is located about 500 m inland of the coast at the modern village of Tula. In the mid 1970s limited test excavations were conducted at Tulauta by Janet Frost (1976, 1978) who referred to it as Tulotu, Site AMB/tu/175. Frost dug five trenches covering a total of 11 sq. m. A few years later the site was visited by Clark (1980) who reported some features not listed by Frost, and noted abundant debitage and artifacts on the surface. More recently, Gould, Honor, and Reinhardt (Gould et al. 1985; Brophy 1986 (formerly Reinhardt)) re-investigated Tulauta; they did some mapping and began digging a 2 sq. m unit that they were unable to finish. They, too, noted a larger site area than reported by Frost and many more basalt artifacts on the surface and in excavation. A larger summary and evaluation of the work done at Tulauta is given elsewhere (Clark and Herdrich 1985); here I will only summarize the important conclusions.

From her excavations, Frost reported one radiocarbon date of 2560+/-140, which can be corrected (according to Klein et al. 1982) to 1030-400 B.C., and another date at 630+/-70, corrected to A.D. 1260-1605 (Frost 1976:206). I have argued elsewhere that the earlier of those dates is probably unreliable and should be rejected (Clark and Herdrich 1988). Gould, Honor, and Reinhardt reported that radiocarbon dates obtained from their work "demonstrate that the site was inhabited at least 400 years before European contact," which would be
consistent with the latter end of the range of Frost's more recent date (Gould et al. 1985:6). Unfortunately, Gould and colleagues do not report what the actual dates are.

While Prost recovered very few basalt flakes from the site surface, Clark noted the presence of surface flakes in 1980, and Gould and associates claimed that flakes were so abundant that "the sheer quantity of lithic material at Tuala makes the site one of the largest basalt quarries and lithic or adze manufacturing sites in all of Polynesia" (1985:6). Unfortunately, this extravagant claim is not backed up by any reported numbers of flakes recovered or by providing any basis for claiming the existence of a quarry. Nevertheless, Prost, Clark, and Gould et al. concurred on the relative abundance of stone tools, if not debitage, at Tuala. According to Brophy (1985:49), over 200 adzes (presumably this includes fragments and preforms) and over 100 flake tools have been collected by the various investigators of Tuala. This large quantity of basalt tools suggests that a quarry is probably somewhere in the vicinity. Brophy (1986) claimed that the quarry was at Maupua, although that claim was not borne out by my investigation in 1988.

After reviewing all of the information available on the Tuala site, Clark and Heidrich (1986:26-31) concluded that while the site is important for understanding Samoa prehistory, it was probably misinterpreted by Prost and Gould and colleagues. The date of 1040-400 B.C. obtained by Prost is almost certainly in error, and the deposit she and Gould et al. excavated is more likely to date to post A.D. 1200, or perhaps even post 1400. In addition, while the quantity of flakes at the site is far greater than reported by Prost, Tuala is not likely to be the actual quarry site. Instead, it is a village site where the final stages of basalt tool manufacturing was carried out. Although not much more than a suspicion at this point, it further seems likely that many of the tools produced were used locally, perhaps for specialized processing of some resource. At the same time, the abundance of lithic materials also suggests that some tools were being manufactured for trade to other communities.

VAIMUMU RIDGE

Although no name is indicated for this ridge on the DPW map, I have designated it the Vaimumu Ridge since it generally runs parallel to the adjacent Vaimumu Stream to the north. The ridge may actually be a southeast extension of Haugale'o Ridge but that is not clear from the map. The valley at Aloa lies to the south. This ridgetop was walked from the coast road to the point where it meets Haugale'o Ridge. Due to the dense vegetation and terrain, we had a difficult time placing on the map some of the sites encountered.

AS-21-71. This site is located a short distance up the ridgetop from the road and at an elevation of about 35 m (115 ft). It consists of six concrete slabs on edge, or ribs, about 0.5 m apart. They are widest at the base (0.4 m) and narrow slightly toward the top, which is a little under a metre high. The central two slabs are the longest, the next rib on each side is slightly shorter, and the outer ribs on each end are the shortest. These slabs constituted the foundation for a structure that is now represented only by some scattered roofing shingles. This was probably an old U.S. military structure, perhaps an observation station since the view of the ocean is excellent.
AS-21-72. This is a tia 'ave that is located at a spot (49 m, or 160 ft a.s.l.) where the gradually up-sloping ridge begins a steeper ascent, and where the ridge begins to broaden substantially. This is a rather unusual structure. There are seven projecting rays, but the rear of the structure, which is on the upslope side, is marked by a faint ditch—most pronounced on the east end—that appears to bow out in the form of a rear ray (Fig. 7e). Ditches have been noted as defining rays on other tia, and I suspect slope erosion has nearly filled in the traces of the eighth ray of this mound. The front and side rays are faced with large coral chunks and occasional basalt boulders; a boulder and chunk of coral were also found along the possible inland border. The mound is roughly circular, measuring 22.7 m perpendicular to the ridge by 23.6 m along the ridge. The maximum height is at the rays on the downslope side, which are up to 1.0 m high. The surface of the tia slopes noticeably, in accord with, though not as pronounced as, the general slope of the ridgetop. Located 10.5 m upslope and to one side of the tia is a shallow depression, 0.65 m deep and 2.5 m in diameter.

AS-21-73. Further up the ascending ridgetop, at about 69 m (235 ft) a.s.l., is the most unusual and impressive tia 'ave that I have encountered in Eastern Tutuila. It is about 22.5 m by 30.0 m in size and has seven well-defined rays around the sides and front (Fig. 7f). The front rays are about 3.0 m in height while the side rays progressively diminish toward the rear (inland) of the tia, where the ascending ridgetop rises so that an elevated ray could not have been constructed without sloping the surface of the mound considerably. A fascinating feature of this structure is an apparent compromise in construction wherein an indentation was dug into the slope at the proper location and of the proper size for a rear ray. This indentation, impresses me as a negative image of a ray, and, consequently, I believe this structure is actually an eight-rayed tia.

Another unusual feature of this structure is that the rays are faced with large coral slabs rather than basalt boulders. While coral predominated in the facing of site 21-72, at this site the facing is exclusively coral. Furthermore, the coral slabs are very large (one example is 0.6 by 0.7 m and quite thick) and extremely heavy. The task of carrying such loads up the ridge to this location would be formidable, indeed. Mr. Siapai Enosa informed me that the type of coral, called lapa, used is the same as was used traditionally to line graves.

AS-21-74. This is a terrace with a flat surface covered with locally available (not waterworn) pebbles and cobbles, and lacking a retaining curb. It is located at about 80 m (262 ft) a.s.l., and is approximately 9.0 m wide and 12.5 m long. It is possible that this feature and the terrace of 21-76 served as house terraces for people temporarily using the nearby tia 'ave.

AS-21-75. This site is simply a spot at which an artifact was found on the surface, at an elevation of approximately 84 m (275 ft). The artifact is a thick scraper or possibly a chisel. There is polish on both the front and back suggesting that this was initially an adze [Type I] that broke and then was modified to make a new tool. Small chips along the cutting edge indicate use damage. The site is located 20-25 m up the ridge from 21-73.
AR-21-76. This terrace is at an elevation of 91 m (300 ft). It is about 7 m wide by 14 m long, and there is a scattering of pebbles and cobbles on the surface.

AR-21-77. Another unusual tia 'ave is on the ridge at about 100 m (330 ft) in elevation. Three large rays—nearly 4 m high—project outward on the seaward (downslope) side while the sides of the structure are straight (Fig. 8a). The dimensions are 16.0 m along the ridge by 16.0 m across the ridge. The rays and portions of the sides are faced with large chunks of coral and some basalt boulders. The rear of the structure meets a slightly arcing, earthen embankment over 3.0 m high. Atop the embankment and toward one side is a projection formed of two courses of basalt boulders and an earthen fill. This feature has the shape and appearance of a low ray, and measures 5.6 m long by 4.3 m wide at the base. This may represent a single-rayed tia, but no structural features could be discerned at the rear of the projection.

AR-21-78. Coming up from the lower tia of 21-77 and passing along one side of the embankment projection is a linear depression that continues up the ridgetop (Fig. 8a). This feature appears to be a sunken path that tends to run along one side of the ridgetop rather than down the center. In places, particularly where the ridgetop was comparatively level, the path fades from view only to reappear farther along, especially where the ridgetop is ascending. The fact that the path runs past the sides of two tia 'ave farther up the ridge and not over the tops (as the current trails, such as they are, run) suggests that the path may date to the time of the tia use rather than post-dating them.

AR-21-79. At about 129.5 m (425 ft) a.s.l. is another tia 'ave. This structure is small, low, poorly defined, and was almost missed. The path of 21-78 passes along the side and continues past the mound. There are six rays, two on the front and two on each side (Fig. 8b). There are no rays or other features at the rear; the structure just grades into the ascending ridgetop. The rays have a maximum height of 0.75 m, and some boulders and a few chunks of coral were found around each ray. The tia measures only 12 m long by 10.1 m across.

AR-21-80. Farther along the ridgetop, at an elevation of 137 m (450 ft), is a poorly defined tia 'ave with seven rays (Fig. 8c). The rays are low—a maximum height of 0.5 m—and faced with rocks. The basalt is unusually vesicular, which may relate to the presence in this area of a trachytic plug (Atlas 1981:Geology Plate 3). The sunken path of 21-78 extends past the south side of the tia. The structure measures 29.6 m long by about 21.0 m wide. A short distance up the ridgetop from the tia is what may be a low, linear mound, but it is so indistinct, and the vegetation so dense, that certainty of identification was precluded.

AR-21-81. Another tia 'ave is on a small peak—about 152 m (500 ft) a.s.l.—at the approximate juncture of the Vainumu and Maugahe'e Ridge. It has six rays arranged on the rear is marked by an alignment of boulders that arcs slightly into the mound (Fig. 8d). The front two arms are up to 2 m high and faced with large boulders (some 60-70 cm in length). Smaller and fewer rocks border the side arms.
SAILILAGI RIDGE

The inland beginning of this ridge is at the juncture of Vaimumu and Maugaleo'o Ridges. From there the ridge extends to the east, ending with a steep drop to the ocean. Only one site was found on this ridgetop.

AS-21-112. This is a set of four terraces. The upper two terraces are located at about 92 m (302 ft) a.s.l. and form arcs roughly following the contour of the ridge. One of the upper terraces is about 27.0 m by 6.5 m and the surface has a scattering of cobbles. At one end of the terrace is a pile of rocks. The other terrace is slightly lower and to the north of the first and measures 22 m by 5 m. It too has a surface scatter of cobbles, but they are not as common. The lower terraces are about 20 m down the slope, at 87 m (285 ft) and 88 m (289 ft) a.s.l. They are about 10 by 5 m each and are separated by about 5 m, with one above the other. The functions of these features is not known, although they seem likely to have been rest areas for people working in the plantations.

TOILOTO RIDGE

The inland end of this ridge is at the juncture of Vaimumu, Maugaleo'o, and Saillilagi Ridges and extends to the north, descending to the rear of Tula valley. Survey of this ridgetop produced no archaeological sites.

WEST TOILOTO RIDGE

Unnamed on the DPW maps, this ridge lies immediately west of Toiloto Ridge. It extends north from Maugaleo'o Ridge and terminates at the point where the southern stream of Tula flows onto the talus at the inland-most extension of the valley. Only one site was found on this ridgetop.

AS-21-113. This is a broad terrace at approximately 92 m (302 ft) a.s.l. The feature is about 14 m at its maximum width and about 10 m in length. The front of the terrace is in the form of an arc that for about 6 m has a boulder facing. Situated on the terrace are two rows of rocks, one about 4 m in length and the other about 2 m long, and in front of the latter is a pile of rocks. The only artifacts present were a piece of tin and a plastic bottle. This terrace has probably served as a relatively recent work/rest base during slope cultivation.

MAUGALEO'O RIDGE

This is a primary ridge radiating off of Olomoana Mountain. It runs northeast from Olomoana to the juncture with three other ridges: Toiloto (coming from the north), Saililaggi (from the northeast), and Vaimumu (from the southeast).

AS-21-82. This site is an elongated tia 'ave that is in extremely poor condition. It is located on a prominent point of the ridge, at 161.5 m (530 ft) elevation. There are five wide, broadly-spaced rays, two on each side and one at the front; the rear simply meets the slope of the ascending ridgetop with no identifiable boundary (Fig. 8e). The sides of the ridge are quite steep and the rock facings of the side rays are collapsing down the slope. The structure measures about 24.4 by nearly 13.0 m. In the approximate center of the mound is a circular (ca. 1.5 m diameter), slightly depressed feature with a
surface of pebbles and cobbles. The sunken path (21-78) extending up Vaimumu Ridge disappears just before this tia.

**AS-21-93.** This is one of the worst examples of a tia 'ave yet found. It is located at 192 m (630 ft) a.s.l. There are five faint rays--two on a side, one at the front, and none at the rear (Fig. 8f). The side rays appear to be eroding down the slopes, although they were probably never very large. Very little rock remains to mark the ray outlines, but the gentle curves indicate the presence of rays. The structure measures 18.7 m long by a little over 14 m wide. On top of the tia is a very low pile of pebbles and cobbles (the cobbles primarily on the end toward the rear of the tia), about 3 m long by 2 m wide. A smaller scatter of pebbles lies just to the rear of the larger pile.

**AS-21-91.** Where Lefutu Ridge meets Maugaleo'o Ridge, on a prominent point at about 262 m (865 ft) a.s.l., is a tia 'ave. It is a circular structure--21.0 m by 20.5 m--with nine rays, generally about 0.75 m high (Fig. 9d). Boulders provide a facing, although there are only a few rocks on some of the rays. The rays on one side of the tia are less pronounced than on the other sides.

**ALAO**

In 1986, we investigated the discharge fan at Mulivaitele Stream, along with the shoreline for about 30 m either side of the stream. We found no evidence of prehistoric or early historic activity along the shoreline or in the dune front. However, the broad beach and low dunes seem likely to reflect a prograding shoreline, which would mean that early occupation remains would be buried well inland. Because of the evidence of significantly changing shoreline at 'Aoa, Alao was selected as a good location for limited soil coring to check for evidence of changing coastal geomorphology. The description and results of the coring operation are discussed in the Coring section below.

**MOTUSAGA RIDGE**

Motusaga Ridge begins between the coastal flats of Utunea in the south and Alao in the north. The eastern segment of the ridge is in East Vaianu County, while the majority of the ridge is in Sa'ole County. The sites in Sa'ole are discussed in the following section. A short unnamed spur that juts to the north off of a small peak will be included in this discussion. Two sites were found on the spur, both near the peak. This spur is immediately inland of Vaea Hill.

**AS-21-84.** This is a tia 'ave on a low peak at 84.5 m (277 ft) elevation. There appear to be eleven rays, although the rays on the southeast side are in very poor condition as they are eroding off the steep slope. The rays toward the ocean are the most prominent. Boulder facing is present on most of the rays, and on three of them there is a chunk of coral. Roughly circular in appearance, the tia measures 19.1 by 16.4 m. On top of the structure and slightly off-center is a circular depression 1.5 m across and 0.3 m deep.

**AS-21-85.** Extending off of the peak of 21-84 is a ridge spur that juts to the north, ending at Taufsui Marsh in the rear of Alao. About 60 m down the north slope from 21-84 is another tia 'ave. This structure is very low and badly eroded. Four rays are identifiable, two on one side, one in front (downslope), and one on the other side--we could not discern a fifth ray that would
establish symmetry (Fig. 9a). Very few rocks were found in the facing of the
rays and no coral was present. The rear of the structure blended into the
ascending slope. The structure is small with dimensions of 12.5 by 10.7 m. On
top and to one side of the tia are two depressions. One is circular, 1.1 m in
diameter, and 0.3 m deep. The second depression is rectangular, 2.2 by 1.3 m
and 0.5 m deep. The circular depression is quite similar to features found on
many other tia 'ave and is probably directly associated with the tia. The
rectangular feature, on the other hand, is unique and may be intrusive.

AS-21-86. Nearly 20 metres down the spur from 21-85 are two terraces at about
61-62.5 m (200-205 ft) a.s.l. The larger terrace--Feature 1--is slightly lower
and forms a large arc 17.7 m wide and 12.7 m long, oriented parallel to the
ridgetop. Occasional boulders can be seen in the retaining face, and the
surface is covered with pebbles and cobbles. Also found on the surface were a
couple of flat pieces of coral and three artifacts. The artifacts are one
Class Ib scraper, and two tool fragments, one of which is possibly a scraper
and the other was probably from an adze that was fractured by intense heat.
Feature 2 is smaller, at 16.0 m wide and 6.7 m long. It is on the side of the
ridgetop and slightly above Feature 1. A few boulders of a retaining curb are
on the south end of the arc, and the surface has some scattered pebbles and a
piece of coral.

AS-21-87. This is simply an artifact find-spot at about 68 m (223 ft) a.s.l.
and on the slope of the ridge peak, about halfway between the north spur and
the western extension of the main ridge. The artifact is the blade end of a
Type I adze that was thin, wide, and probably long. The blade edge is chipped
from use.

AS-21-88. On the main segment of the ridge, just before the border of East
Vaifanua County, is a prominent point beyond which the ridgetop slopes more
gradually to the top of the principal peak of the ridge. On this point, at
about 92 m (302 ft) a.s.l., is a tia 'ave. It is an elongated structure, 22.2
m by 10.7 m, with seven, perhaps eight, rays; seven rays are well defined by
rock facing but at the upslope end there is either an eighth ray, now obscured,
or an entranceway onto the tia from the upslope side (9b). Near the rear of
the structure is a short alignment of three boulders. The rays at the front
are up to 1.2 m high while those on the sides, especially toward the rear, are
only 0.25 m high. Just off of the tia at the upslope end is a sunken path that
extends for a long distance on the ridgetop. Since most of this feature is in
Sa'ole County, it was assigned site number 22-22 and is discussed below.
Upslope from the tia 18.6 m is an arcing alignment of boulders 0.8 m long and
with an arc depth of 0.5 m; the function of this feature is unknown.
Figure 6. Map of site AS-21-51, the Olomoana Complex: (a) plan view showing 25 ft contours; (b) profile view showing terrace positions.
Figure 7. Tia 'ave in East Vaifanua: (a) AS-21-65; (b) AS-21-66; (c) AS-21-67; (d) AS-21-68; (e) AS-21-72; (f) AS-21-73.
Figure 8. Tia 'ave in East Vaifanua: (a) AS-21-77 and -78; (b) AS-21-79; (c) AS-21-80; (d) AS-21-81; (e) AS-21-82; (f) AS-21-83.
Figure 9. Tia 'ave in East Vaifanua: (a) AS-21-85; (b) AS-21-86; (c) AS-21-89; (d) AS-21-91; (e) AS-21-108; (f) AS-21-109.
Sa'ole County

In 1980, Clark (1980:52-54) listed seven sites (AS-22-1 to -7) for Sa'ole County. From the ETAP 1986 investigation, five additional sites (AS-22-8 to -12) were added, all from inland ridges. In 1988 the survey of Sa'ole again concentrated on inland ridges and another 29 sites (AS-22-13 to -41) were found, bringing the total number of sites now recorded for Sa'ole County to 41.

AUNU'U ISLAND

Aunu'u Island is approximately 1.3 km southeast of the southeast tip of Tutuila. It is a small island, only about 1.65 km long and 1.16 km wide, with the highest point at 71.6 m (235 ft) a.s.l. The island was visited by Buck (1930), Kikuchi (1963), and Silva and Palama (1975), but their investigations were limited and thus far only four sites have been reported for Aunu'u. The island was not investigated in 1988 but should be a high priority for future survey.

*AS-22-1. This is a defensive wall located along the seafront at Aunu'u (Buck 1930:322-23; Clark 1980:52; Kikuchi 1963:47-48; Silva and Palama 1975:16).

*AS-22-2. This is a well on Aunu'u that was still in use in the 1960s, but it is not known if it is still used today (Clark 1980:52; Kikuchi 1963:78).

*AS-22-3. This is the Sina and Tiguiloa legendary site. It consists of two large boulders on the eastern side of Aunu'u crater that are said to be the petrified bodies of the lovers Sina and Tiguiloa (Clark 1980:53; Kikuchi 1963:86).

*AS-22-4. This is a legendary site that consists of two large boulders on the rim of Aunu'u crater. These boulders represent the sisters Teine and Taunu'u, who were turned to stone by two demi-gods (Clark 1980:53; Kikuchi 1963).

UTUMEA

The small valley at Utumea has not been systematically surveyed, but Kikuchi (1963) reported two sites that hold little archaeological potential. The absence of a stream at this location makes it unlikely that Utumea was an area of early settlement.

*AS-22-5. This is an old well in the far western end of Utumea village (Clark 1980:53; Kikuchi 1963:78).

*AS-22-6. Two whetstones near Utumea compose this site (Clark 1980:54; Kikuchi 1963:152).

MOTUSAGA RIDGE

The eastern segment of this ridge begins in Vaifanua County, just inland and north of Matuli Point. It runs to the northwest a short distance, then turns to the west-northwest, running into Sa'ole County until it meets Tiatele
Ridge. This is the principal ridge bounding Utumea. The sites located in Vaifanua are discussed above.

AS-22-22. This is a sunken path that first appeared in Vaifanua, immediately behind (west) the tia 'ave of site 21-88, but most of it runs along the ridgetop in Sa'cle. The path fades away on the steep slope up to the principal peak of Motusaga and the tia 'ave of 22-23.

AS-22-23. This is a tia 'ave on the principal peak—121 m (397 ft) a.s.l.—of the ridge, which is inland of Utumea village. The structure measures 19 m by 16 m and there are eight low rays bounded by a single boulder course, about 0.3 m in height (Fig. 10d).

TIATELE RIDGE

This is a short ridge that extends from the rear of Auasi village in the south to Motusaga Ridge in the north, and is between Vaisa Stream in the east and Leaifu Stream in the west.

AS-22-24. This site consists of two or three foundations located at about 91 m (298 ft) in elevation and at the base of the slope up to the southern peak of the ridgetop. Feature 1 is a rectangular house foundation, 14.5 m by 8.9 m. It is defined by a single course of waterworn boulders, one of which has a grinding facet on top. Just 2.8 m to the southwest is Feature 2, an oval foundation, 5.0 by 3.5 m in size, made of a single course of waterworn boulders. A third possible foundation similar to Feature 2 is a short distance to the west. It is rather disturbed and covered by dense vegetation, so a precise measurement could not be made. These features probably represent the remains of a single household unit.

AS-22-25. This is a tia 'ave atop the southern peak of Tiatele Ridge, at 93.5 m (307 ft) a.s.l. It is roughly circular in shape, with dimensions of 16.3 by 14.8 m and 0.4 m in height (Fig. 10c). There are five rays with facings of boulders one course high. Slightly off-center on the mound top is a circular alignment of boulders about 1.4 m in diameter. On the edge of the trail a short distance to the east of the structure was a preform or very large scraper made by relatively little flaking of a natural chunk of basalt (Fig. 26).

'AU'ASI

A survey of a small section of the coast at 'Au'asi was made by McCoy (1977) prior to and because of the construction of the small boat harbor that now provides service to and from Aunu'u. No sites were found, however.

MAUGAELE RIDGE

Maugaele Ridge was walked from its beginning on the south flank of Olomoana Mountain to its abrupt end at a bluff overlooking the ocean at Taulactega Rock. For the first 215 m (705 ft) or so from the flank of Olomoana we found no surface remains. However, the ground surface was densely covered with grasses, vines, and other vegetation, so ground visibility was poor. At the same time, given the narrowness of the ridge and the absence of prominent topographic features, the absence of structure is not surprising and probably reflects the actual conditions rather than simply a product of poor visibility.
If anything was in fact missed on this section of the ridge, it would have been an isolated field house foundation or perhaps—though not likely—a very low tia 'ave.

AG-22-17. On the first (inland) prominent point—at 179 m (587 ft) a.s.l.—of the ridge is a seven-rayed, elongated tia 'ave that measures 23 m by about 9 m (Fig. 10c). This feature covers nearly the entire prominence, with the side rays extending to the edges of the slopes. The rays are low and those on the west side are in good condition while those on the east are highly eroded and barely visible. It is conceivable but not probable that an eighth ray previously existed on the east side. The north (inland) ray is the largest and is faced with rock boulders. Rock facing on the other rays is indicated by comparably few boulders, although most of the rocks are likely to have been lost down the slopes. The tia has an earthen fill and there are some rocks scattered over the surface. The size and shape of this tia is clearly constrained by the topography.

AG-22-18. This site consists of a cluster of five features, the first of which is about 15 m (50 ft) from 22-17. The terrain immediately off of the south ray of 22-17 drops down to a small saddle. At the base of the slope is a shallow ditch that crosses the ridgetop. It is only a metre deep, 9.5 m wide, and 18.8 m long from slope edge to slope edge. Presumably this ditch was a defensive feature, although it is not as deep or distinct as other examples of defensive ditches.

About 9.5 m south of the ditch, still on sloping ground, is a crude, faint terrace, 5.5 m long and nearly as wide, that is marked by flattened area of the slope but no stone retaining wall.

Several metres down the ridgetop (which is descending to the south) is a small depression about 2 m in diameter and less than a metre deep. About 15 m farther down is a similar small depression and within a couple of metres from it is a large, elliptical pit that is 18 m long and 9.5 m wide. This pit is deepest at one end, where it goes down nearly 3 m. Each of these features is dug into reddish-brown (10YR 4/4) clay. Clay of this type appears in patches in this area, and the ground within 1.0-1.5 m of these pits is the more common brown clay loam, which is also present at the base of the deepest pit. The most likely explanation for these features is that they were produced by digging for clay, perhaps for pottery, but more likely to be used as a source of dye. Mrs. Mary Pritchard, who is widely known for her skills in traditional manufacturing of siapo (bark cloth), told us that reddish clay was used to make a dye for siapo, and clay samples seen at her house were visually very similar to the clay present at these pits. Furthermore, the term mauga (mau) can be translated as clay mountain—mauga meaning mountain and 'ele glossed as "a kind of compact brown or red soil" (Milner 1966:41), or, according to Mr. Siapai Enosa, simply as clay. A sample of this soil was collected for analysis (Table 3).

AG-22-19. On the next prominent point of the ridge, at 180 m (591 ft) in elevation, we were surprised not to find a tia 'ave. Instead, there was a curbing of boulders aligned perpendicular to the ridgetop, extending for about 3.9 m, and located near the south end of the prominence. On the comparatively flattened area above the curbing, especially on the east side, is a scatter of
pebbles and cobbles that probably represents an old floor. No artifacts or other features were observed, but the vegetation was rather dense.

AS-22-20. On the highest point (148 m, or 487 ft, a.s.l.) of the last major peak of Maugaele Ridge before the ocean is a tia 'ave with eight rays, all faced with rocks. The height of the tia ranges from 0.3 to 0.75 m and the structure measures 28.8 m by 21.6 m, but appears more rounded than elongated.

AS-22-21. Down the ridge from 22-20 roughly 170 m (558 ft), there is a stretch of gently sloping ground about 44 m long and 34 m wide, over which are scattered several features and artifacts. This area is currently in a coconut plantation, so ground visibility was fairly good. Eleven features were observed, but measurements were taken only for the two that are best defined, i.e., numbers 1 and 2.

Feature 1. This feature is a house terrace, 15.5 m long by 8.3 m wide. It is bounded by a boulder curbing and the surface is covered with pebbles, cobbles, and broken rock. A smaller platform, 4.0 m long, 4.4 m wide, and one boulder course high, is atop the terrace, slightly east of center. It, too, has a stone surface, but there are also numerous pieces of fire-cracked rock and much charcoal dispersed through the stones. This platform has been used as a cook-house foundation in the not-too-distant past, and a coconut grating stool with metal grater stood nearby.

Feature 2. Roughly 15 m in front of Feature 1 is another terrace with stone surface, but it lacks a curb. It measures 9.4 by 5.0 m. On this feature we recovered the butt of a Type VII adze and a Class Ia scraper made by modifying a flake off of an adze (Fig. 24). Between Feature 1 and Feature 2 are several basalt flakes and we collected one Type I adze fragment, one scraper (or perhaps chisel) made from a broken Type III adze, a triangular preform fragment, one Class IV flake tool, and one basalt flake. This terrace may have been a work station for stone tool making/reworking.

Feature 3. This feature consists of two linked terraces located about 10 m to the southwest of Feature 2. Beyond this structure, the slope steepens and the ground surface is very rocky. This feature lacks a curbing and there is no floor surface.

Feature 4. Approximately 14 m to the southeast of Feature 3 is the terrace of Feature 4. This is a flattened area several metres long and a few metres wide, but it is not clearly bounded.

Feature 5. About 15 m to the southeast of Feature 2, this is a terraced area quite similar to Feature 4.

Feature 6. Some 30 m east of Feature 2 is a large terrace that again has some surfacing stones. The ground vegetation here was rather dense, however, so the view was obscured.

Feature 7. This terrace is about 15 m upslope and east of Feature 6. It, too, appears to have a floor surface of pebbles, but the vegetation limited visibility. This is the eastern-most of the features at the site.

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Features 9-11. These are four pits, less than 2 m across, less than a metre deep, and with rock lining or fill. These are situated several metres east of Feature 2 and several metres north of Feature 5. It seems likely that they served storage or perhaps cooking functions.

Discussion. This is an interesting complex that may represent the occupation site of an 'aiga with 3-5 faletama, or households. Since Feature 6 is the largest terrace and has a surfaced floor, it may have been the residence of the matai. The households would have been centered on a central work area--at Feature 2 and the pits--and have a single cook house--Feature 1--at the rear (inland) of the complex. While the site is still being visited by people working in the plantation, the rarity of historic materials and the presence of stone artifacts suggest that the residential occupation of the site was prehistoric.

LEO'O RIDGE

This ridge runs from a peak on Olomoana Ridge (at the location of 21-18) to the southeast, reaching the coast between Amouli and Siufaga. Most of the length of the ridge roughly parallels the road from Amouli to 'Aoa. Three sites were found on this ridge.

AS-22-14. At about 110 m (361 ft) a.s.l., in the midst of dense vegetation, there is a double arc of rocks, each about 1.5 m long. The function of these features is unknown. As a guess, they might have provided a surface for resting huts for people utilizing the tia 'ave that are down the ridgetop and up the ridgetop.

AS-22-15. At an elevation of about 96 m (315 ft) a.s.l. is an elongated tia 'ave with five rays, two on each side and one on the front (donslope) (Fig. 10a). Very few rocks are around the rays, although a large boulder rests at the end of the prominent front ray. The side rays, particularly those on the east, are eroding down the steep slope of the ridge sides. Ditches bound the structure to the rear and the front, suggesting that the mound served a defensive function, at least in part. The rear (upslope) ditch is very large; it extends across the entire ridgetop, is 1.3 m deep from the top of the mound, and is 9 m wide at the top. The front ditch is smaller, but it, too, crosses the ridgetop and it is 3.3 m wide and 0.4 m deep. From ditch to ditch the mound is 17.9 m long and it is 8.7 m wide.

AS-22-16. Farther down the ridgetop, on a prominent point at about 84 m (276 ft) a.s.l., is another tia 'ave. It appears to have seven rays--two on the east, three on the west, and one at each end--but the side rays are eroding down the steep side slopes on the ridge (Fig. 10b). Only the front ray still has a rock facing. The structure is 15.5 by 9.1 m in size. Near the center of the tia is a slight depression, about 0.15 m deep and 0.75 m in diameter. Lying about the surface of the tia is some corrugated roofing, indicating that a structure of some sort--probably a fales o'g--was erected here not too long ago. Just off the upslope end is a large ditch 8.7 m wide, 2.5 m deep, and crossing the ridgetop. About 11 m from the downslope end is another ditch crossing the ridgetop, this one 7.5 m wide and with a depth of 2.2 m to the upslope surface but only 0.2 m to the downslope surface.
AMOULI

The only archaeological investigation to take place at Amouli village was an inspection of the discharge fans at Televai and Fusilca Streams by Clark and Herdrich (1988:23). No archaeological remains were found. The only site listed for this village is an architectural site recorded in Clark's (1980) inventory of cultural resources.

*AS-22-7. This architectural site is the historic period U.S. Naval dispensary in Amouli. It is still in use as a medical clinic, though no related to the Navy (Clark 1980:54).

OLONOANA RIDGE

As discussed in the East Vaifanua section of this report, this is an unnamed ridge that is referred to here as Olomoana from the highest point on the ridge. The ridgetop was first examined in 1986 by Clark and Herdrich (1988), and revisited in 1988, at which time two new sites were found. The new sites are 22-34, on a previously unexamined spur, and 22-13, which was obscured by a recent house foundation. Also located on this ridgetop but in East Vaifanua County are sites 21-18 and 21-19, both tia ‘ave (see above).

*AS-22-8. About halfway between 22-10 (on Asiapa Ridge) and 22-11 is an alignment of boulders (several metres long) that constitutes this site. The function of this alignment is not known, but it may have served as a retainer for a small terrace area, or perhaps was the edge of an ancient path (Clark and Herdrich 1988:24).

*AS-22-11. This is a tia ‘ave located on a low peak at 188 m (617 ft) a.s.l. The structure is roughly circular, 18 m in diameter, and is very low and ill-defined. It has seven rays with no visible rock facing (Clark and Herdrich 1988:50).

*AS-22-12. This tia ‘ave is on the east end of a prominent point at 133 m (435 ft) in elevation. The tia is oval and has ten rays, most of which have rock facing (Clark and Herdrich 1988:50). Adjacent to the east edge of the structure is a deep ditch that runs the width of the ridge and is 15 m wide and at least 3 m deep. Another ditch of about the same width and 2 m deep crosses the ridge about 60 m farther to the east. The size of these ditches indicates that they were defensive features.

*AS-22-13. This site is on a low peak of the ridge, at 145 m (475 ft) in elevation. This ridge was first surveyed in 1986 but no site was found then. The lack of a tia ‘ave at this location, however, was surprising since such geomorphological features nearly always have tia ‘ave on them. So, in 1988 we re-examined this spot and did indeed find the remnant, though badly disturbed, of a tia ‘ave. The reason we missed the tia in 1986 is that a house floor constructed over most of the structure had nearly obliterated the tia. On the southeast side of the tia is a rectangular house foundation built with a curbing of large boulders and a fill of cobbles, pebbles, and coral ili ili. A couple of metal 55 gal. drums and some other recent materials were scattered about. This site is illustrated as a standing house on the DPW map. There is a porch-like extension at one end of the house foundation and the other end has a floor paving of coral slabs.
At least five rays can be identified and a sixth and a seventh ray postulated to provide a complete structure. The rays are low and poorly defined, and it seems likely that the boulders used in the house construction were taken from the ray facings. Scrubby vegetation also created a problem in identifying the rays. The probable dimensions of the structure are 17.6 by 11.8 m.

**Lalo'i Ridge**

This is an unnamed spur of Olomoana Ridge that juts to the east between Lalo'i Stream in the south and Fusilao Stream in the north. The ridge ends with a steep slope down to the rear of Amouli. Only one site was found on this ridgetop.

**AG-22-34.** This is a poorly defined tia 'ave located on a prominent point (116 m, or 380 ft, a.s.l.) just before the steep drop down to the valley at Amouli. The tia has six rays with some rock facing, but the side rays are eroding down the slope. There are three rays on one side, two on the other, one on the downslope end, but no ray on the upslope side, which grades into the ridgetop (Fig. 11b). It is an elongated structure measuring 23 by 11.5 m.

**Leauga Ridge**

This ridge begins at Sinatapu Point on the south coast and runs inland to a small peak where it is joined by a small ridge segment that comes in from the east. This eastern segment--Fogausa spur--begins at Sea Point of Cape Fogausa and is north of the coastal flat of Fogausa. One recent site (22-26) was found on the Fogausa spur and no sites were found on the lower Leauga segment. From the DPW map contours, I expected to find a tia 'ave on the peak, but none was present. What I did find was that the top of the peak was much smaller than is indicated on the map and was probably too small to accommodate a tia 'ave. Beyond the first peak, Leauga ridgetop turns to the northeast until it reaches Asiapa Ridge. (A smaller ridge that runs from Maugaеle Ridge to the rear of Amouli is also named Leauga Ridge on the USGS map.)

Beyond site 21-30 there is a long stretch of ridgetop in East Vaifanua and Sa'ole counties on which no sites were found. This includes a prominent point--at 161.5 m (530 ft) a.s.l.--at which I expected to find a tia 'ave. This absence of sites continued onto Asiapa Ridge. It is conceivable that because of erosion down steep slope edges and vegetation cover we missed structural remains, but I think, instead, that sites were simply not present. This absence may reflect the fact that the nearest stretch of coastline, to the south (between Amouli and Alofa'u), is poorly populated, and probably always had a small population.

**AG-22-26.** This site is on the Fogausa spur at about 73 m (239 ft) a.s.l. It consists of a scatter of coral 'ili'ili that indicates an old house floor. Close by are now-abandoned pig pens made of wire fence. The house site is probably not very old.

**AG-22-27.** Another historic site was found on the ridgetop northeast of the first peak and at an elevation of about 117 m (385 ft). The site is represented by sheets of corrugated metal that served as roofing, probably for a fale o'o.
AS-22-28. The top of a small peak at the juncture of Leauga and Avapui Ridges, 138 m (453 ft) a.s.l., has been modified to create a mound/platform. This feature is similar to some of the "specialized sites" discussed by Davidson (1974b) for Western Samoa, and fits the category defined by Herdich (Clark and Herdich 1988) of single-rayed tia 'ave. The feature is roughly tear-drop shaped, with the large end defined by a boulder facing, but only a few boulders on the small end and occasional rocks around the sides (Fig. 10f). The feature is 25.2 m long and, at about the middle, is 12.8 m across. The slope all around the peak drops very steeply, and the approach from up the ridge hits a pronounced rock face. Toward the small end of the feature are two series of spaced boulders that appear to form parallel arcs, about 3.5 m apart. The smaller arc is toward the end and is 5.5 m long, and the second arc is 5.5-7.0 m long. The end rock of each arc is rectangular and laid on edge, and a few other rectangular boulders may be present as well, though nearly buried. These boulders may represent an old foundation that is now largely covered by soil and vegetation.

AS-22-29. At an elevation of 137 to 131 m (449-430 ft), on the slope just down from the peak at 22-28 and just before a short saddle is a set of three terraces. The first of these is immediately below 22-28. It appears to have a rear curbing of boulders, although there is some disturbance from erosion and vegetation. The terrace is about 6.5 m long and 3.5 m wide. The soil at this location is reddish-brown clay. About 10-15 m down the ridgetop is a second possible terrace, but it is small and poorly formed. Another 10-15 m down the ridgetop is the third terrace, which has no stone curbing but is defined by a flat surface over which are scattered numerous pebbles and cobbles. No artifacts were found at any of these features.

AS-22-30. Farther along the ridgetop, on a prominent point at about 137 m (449 ft) a.s.l., and where the ridgetop takes a turn to the east, is a small tia 'ave. This structure is poorly made and the rocky ground creates a slightly elevated center. There are only four large rays with crude rock facings, and an enormous boulder sits at the end of one of the rays (Fig. 11a). The feature measures 15.6 by 14.7 m and the height ranges from 0.3 to 0.7 m.

ASIAPA RIDGE

This is a ridge that is not named on the DFW map, and the name used here is taken from the high central peak of the ridge. The ridge runs from Le'aeno Mountain in the north to the southeast and continues for some distance beyond the intersection with Leauga Ridge. A portion of this ridgetop was surveyed in 1985 and two tia 'ave were found. The 1988 survey expanded the area of coverage slightly, added one site from the new area, and added two new sites from the previously surveyed area. No sites were found on Asipapa Ridge southeast of the juncture with Leauga Ridge.

*AS-22-9. This tia 'ave was first reported by Clark and Herdich (1988:50). It is on Asiapa Peak—at an elevation of 263 m (863 ft)—which is also the point from which Patupatu Ridge descends to the northeast. The rays vary from 0.6 to 1.6 m in height, and this is perhaps the best-defined tia 'ave found thus far in the Eastern District. It has a circular shape, 21.5 m in diameter, and ten rays with rock facing that are 3 m wide and 4 m long and have a squared-to-rounded appearance (Fig. 12). The structure lies on a relatively broad, flat area, near the crest of the southwest approach.
AS-22-10. This tla'ave is located on a prominent peak—237 m (779 ft) in
elevation—of Asila Ridge (Clark and Herdrich 1988:50). The structure is
oval, has eight rays with rock facing, three each on the slope sides and one
each on the ridgetop ends.

AS-22-31. On the ridgetop leading up to 22-9 from the southeast is a basalt
quarry site consisting of three flaking localities (Fig. 12). The elevation of
the site ranges from 239 to 255 m (785-836 ft). In 1986 we walked over this
section of the ridgetop but did not notice the flake concentrations. Because
of the steepness of the ridgetop ascent we were not anticipating any features
there. In addition, the leaf and vegetation cover of the ground surface
completely obscured the localities, which are concentrations of lithic material
rather than high piles. In 1988 we first noticed a few flakes, then, on
clearing away more and more surface litter, found the lithic concentrations.
The fact that we were specifically looking for quarry sites may also have been
a factor since areas with rock outcropping were inspected a little more closely
than in 1986, and this is an area with large boulders scattered over the
ridge top.

The site can be spatially divided into three localities of reduction
activity. The first is the lowest and consists of a scattering of basalt
flakes, preforms, and preform fragments amidst a collection of very large
boulders, some of which are up to 2 m across. There is a zone of heaviest
concentration that is about 5 m long by 4 m wide. On one edge of this
concentration is a depression about 0.3 m deep and 1.5 m across, adjacent to
which is a low mound of soil and rock. For a few metres around this
concentration the flakes are noticeably less dense, and farther up the slope
there are occasional flakes until the second locality is reached.

The locality where flakes preforms and preform fragments are thickest is
Locality 2, which is about 8.8 m from the edge of the lighter scatter of
Locality 1. This concentration extends across the ridgetop and a short
distance down both side slopes for a total length of 14.5 m and a width of 14.2
m. Down the west slope, some 4-6 m from the edge of the ridgetop, is a cluster
of large boulders; the flakes in that area appeared to be a little larger. A
small collection of flakes and preforms was made from this locality.

Locality 3 is 16.8 m up from #2 and 17 m down the ridgetop from 22-9. It
is a rather dense build-up of large flakes and a small number of preforms. The
area of concentration is 13.1 m long (parallel to the ridgetop) and about 8 m
wide.

At each of these localities the majority of flakes are rather large and
there are occasional crudely roughed out preforms and preform fragments. No
flakes or tools showed any signs of grinding. Fifteen artifacts were collected
from the site: five preforms, two primary decortication flakes, two secondary
decortication flakes, and six large reduction flakes (Fig. 25). Eight of these
artifacts had cortex present, which indicates early reduction of exposed raw
material. Three of the flakes were sent away for geochronological analyses, one to Simon Best, one to Bill Ayres, and one to Beth Wright.

This is clearly a site at which the initial reduction process took place,
and the preforms were then carried elsewhere, probably to the residential
areas, for final reduction and polishing. The basalt source appears to have
been the boulders scattered over the ridgetop, especially at Locality 1 and the side of Locality 2. While this quarry site is nowhere near the size of Tataga Matau, it probably was an important source of basalt for the local area.

It is interesting to note that 'asi means either a coconut-shell scraper used on taro or a shell scraper (Milner 1966:24); 'apa can refer to metal (tin or others) or to beat or lash, as of a bird's wing or turtle flipper (Milner 1966:23). I was also informed by a local resident—who provided me with the name of the peak—that 'asipa means a metal coconut scraper of the type commonly used today. Thus, the name of this peak provides a faint clue to its prehistoric use.

AS-22-32. This site is an old path that is visible in stretches where it is sunken. We first noticed it near Locality 2 of 22-31, where it runs along the east side of the ridgetop (this location accounts for our failure to see it in 1986) (Fig. 12). At the crest of Asiapa the path becomes nearly level and bends to cross the ridgetop from east to west, then continues around the tia 'ave of 22-9 but soon fades out of view. A short distance beyond, however, on the ridgetop slope down to the tia 'ave of 22-33, the path is visible again, only to disappear in the vicinity of 22-33. It is not known whether the path ends at that structure or was simply lost there due to infilling and the dense vegetation along the ridgetop.

AS-22-33. At 22-9, the ridgetop turns more sharply to the northwest, descends a short distance from the top of Asiapa, then rises again to a smaller peak at 251 m (823 ft). On that peak is a tia 'ave in poor condition. This area was undergoing vegetation clearing for a plantation, so the ground was densely littered with fallen trees and brush piles that obscured the view. Nevertheless, we were able to define ten rays that appeared to lack stone facing. The tia is circular and approximately 19 m in diameter.

AS-22-40. On a peak at 256 m (840 ft) a.s.l.—where Pillimaoi Ridge meets Asiapa Ridge—is what appears to be a foundation for a house or some other structure. There is a nearly-circular curbing of small boulders that is 9.8 by 8.6 m in size, but there is no discernable floor paving. Two basalt flakes were collected from this site. On the Pillimaoi side of the peak there is a deep linear depression running down the slope for about 4-5 m. This ditch may be an eroded section of a sunken path, but no other traces of such a path were found farther down the slope. The presence of this structure at the top of the peak was rather surprising. I, instead, expected to find a tia 'ave, but on reaching the peak it was clearly smaller than indicated by the map. Only a very small tia 'ave could have been accommodated by the peak, so perhaps the area available fell below a minimum space requirement for tia 'ave construction (see Herdrich n.d.).

AS-22-41. Down the ridgetop from the peak, toward Le'aeno Mountain, on a prominent projection at 244 m (800 ft) elevation, is a tia 'ave. There are six well-formed rays, two on each side and one at each end (Fig. 11e). A rock facing is all around the structure and both end rays are given better definition by shallow arcing ditches, about 0.3 m deep. The tia is 23.5 m long, 15.2 m wide, and 0.4 m high.
SIUFAGA RIDGE

This ridge runs roughly east-west, from Siufaga at the coast (adjacent to Anouli) to Asiapa Ridge in the west. The ridgetop is very narrow and the sides of the ridge are quite steep in places. Only one site was found on the ridgetop.

AS-22-35. This is a tia 'ave on a prominent point of the ridgetop, at 168 m (551 ft) a.s.l. It is very poorly formed with six to eight rays; six are definite, a seventh is probable, and an eighth possible (Fig. 11c). The most pronounced ray, which also has the best rock facing, is on the downslope end, and the others are eroding off the sides of the ridgetop and/or disturbed by tree growth. There is no ray on the upslope end. The structure is about 21 m long (measured to where the ridgetop slope noticeably ascends again) and 12.5 m wide, with greatest ray height at only about 0.3 m.

FILIMAOI RIDGE

This ridge is between Punaomanuia Stream in the north (at Pagai) and Fogalilimu Stream in the south (at Alofa). It extends for a comparatively short distance before meeting Asiapa Ridge at a small peak between Asiapa Peak and Le'aeno Mountain. The ridgetop was walked from Asiapa Ridge down to an elevation of about 150 m (492 ft) or less, and four sites were found.

AS-22-36. A tia 'ave with ten rays is located on a small peak at 229 m (751 ft) in elevation. Two of the rays on the upslope side are rather faint and difficult to discern. Most of the rays are without rock facing, although occasional boulders are present. The structure is 25.5 m long and 15.7 m wide.

AS-22-37. An earthen terrace, this feature has no stone retaining wall. It is 7 m by 7 m in size. Two pieces of coral were found on the surface in the middle of the terrace.

AS-22-38. On a prominent projection of the ridge, at 199 m (653 ft) a.s.l., is a tia 'ave measuring 23.5 m by 18.5 m. There are seven rays--three on each side, one on the front (downslope), and none at the rear (Fig. 11d). A faint ditch provides additional definition of the front ray. All of the rays have rock facing, and at the front the height is about 0.75 m.

AS-22-39. This is a small terrace, 3.5 m wide and 5.0 m long. It has a steep back that is cut into the slope. It may have served as a resting spot on the climb up the ridgetop. The site is at an elevation of about 205 m (672 ft), and below this point the ridgetop is rather steep.
Figure 10. Tia 'ave in Sā'ole: (a) AS-22-15; (b) AS-22-16; (c) AS-22-17; (d) AS-22-23; (3) AS-22-25; (f) AS-22-28.
Figure 11. Ti'a'ave in S'a'ole: (a) AS-22-30; (b) AS-22-34; (c) AS-22-35; (d) AS-22-38; (e) AS-22-41.
Figure 12. Plan view of sites AS-22-9, AS-22-31, and AS-22-32.
Sua County

Comparatively little archaeological investigation has been carried out in Sua County. In 1980, Clark (1980:55-56) reported four sites (AS-23-1 to -4), three of which had been mentioned previously by Kikuchi (1963). The first actual survey, however, was not carried out until 1986 by Clark and Herdrich (1988). The 1986 work consisted of a reconnaissance survey of the coastal plain of Sa'ilele, brief reconnaissance checks at Fagaitua and Masausi, and intensive surveys of the small coastal plains at Fagaititi Cove and Fagatele Cove. As a result of the 1986 investigation, four sites (AS-23-5 through -8) were recorded by Clark and Herdrich (1988).

In 1988, survey in Sua was expanded somewhat, although Sua was not a target county. The focus of the investigation was Le'aeno Mountain, which constitutes the point where the boundaries of East Vaifanua, Sa'ole, and Sua meet. Our approach to and descent from Le'aeno were largely within Sua County. Furthermore, since most of a fortification site that is centered on Le'aeno falls within Sua, it was assigned a Sua number. No coastal survey was carried out. The product of the 1988 survey was the addition of twelve new sites (AS-23-9 through -20) to the site inventory, bringing the total number of sites for Sua County to twenty.

FAGATELE

In 1986, the small valley at Fagatele Cove, on the north coast of Sua County, was surveyed and one site reported.

*AS-23-3. A series of walls and depressions constitute this site. The functions of these features are not known, but they are relatively recent (Clark and Herdrich 1988:20).

FAGAITIITI

The tiny valley on the north coast east of Fagatele was identified by informants as Fagaitiiti. It was surveyed in 1986 but no sites were found there (Clark and Herdrich 1988:19-20).

MASAUSI

This is a small valley on the north coast. The valley has not been systematically investigated, but a quick check along the coast in 1986 revealed one site.

*AS-23-7. The only site reported for Masausi is a find-spot along the coast, between Vaipito and Panota streams, where two basalt artifacts were found (Clark and Herdrich 1988:23).

SA’ILELE

The only investigation to take place at this long coastal flat was a check of the shoreline and stream mouths by Clark and Herdrich (1988). Two sites have been reported for Sa’ilele.
*AS-23-2. This was initially reported by Kikuchi as a "temple" in the malae of Sa'ilele village, but it was destroyed after the turn of the century (Clark 1980:55; Kikuchi 1963:124).

*AS-23-5. This site was identified as a cultural deposit—consisting of dark soil, charcoal, bits of shell, and some basalt flakes—in the bank of Aonoi Stream (Clark and Herdich 1988:22).

SUA RIDGE

Extending through the length of Sua County from Le'aeno Mountain in the east to North Pioa Mountain (also known as The Rainmaker) in the west is a rugged central ridge. This ridgeline continues into East Vaifanua County, from Le'aeno Mountain to Leila Mountain. Along the ridgetop in Sua are three other major peaks—Filiae Mountain, 'Etemuli Mountain, and Palapala Mountain—and numerous smaller peaks. This ridge is not named on the DPW and USGS maps, so I will simply refer to it as Sua Ridge. Radiating off of Sua Ridge are numerous smaller ridges. Our survey of Sua Ridge was limited to a segment between the road to Masausi and Le'aeno Mountain, and a section from Le'aeno to Leila (in East Vaifanua). It was thought that the approach to Le'aeno from the ridgetop would provide easiest access; quite the contrary, however, proved to be the case as the climb to the top of Le'aeno was the most difficult of many difficult climbs during the course of our ridgetop surveys.

AS-23-9. On the ridgetop near the road to Masausi, on a prominent point—168 m (551 ft) a.s.l.—where the ridgetop levels off for a short distance, is a tia lave. The structure was in the midst of a pineapple plantation and the obscuring vegetation could not be cleared. Nevertheless, we were able to identify at least six, and probably eight, rays, all with rock facing. As best as could be determined, the structure measures 18.5 m in length, 15.0 m in width, and 0.8 m in height. About 8 m inland of the tia is a shallow linear ditch that runs across the ridgetop. At only 1.3 m across and 0.5 m deep, the ditch could not have provided a very effective defensive feature.

AS-23-10. This site is focused on Le'aeno Mountain and is a defensive complex consisting of sets of ditches, banks, and terraces. The site is centered on the primary peak of Le'aeno, which is at 290.8 m (954 ft) a.s.l., and continues over the ridgetop to the nearby secondary peak, at 261.2 m (857 ft) a.s.l. This secondary peak, which is in East Vaifanua County, is occupied by two tia lave (21-108 and 21-109) with associated sites (21-110, 21-35) close by. Le'aeno peak is elongated in a southwest-northeast direction, and the secondary peak lies to the northeast, with a small ridgetop saddle between the peaks.

Le'aeno peak is surrounded by extremely steep slopes, with the northwest side marked by a sheer drop. At the southwest edge of the peak there is a deep ditch (Feature 1) that provides an impediment to peak access. The ditch is actually not very deep on the downslope side, where the depth is only about 0.6 m, but on the peak side the ditch face rises 2.5 m. This impediment seems almost superfluous since the approach from the west-southwest (which was our approach) is exceedingly difficult and not one likely to be taken by an attacking force. The ditch reflects the effort that was expended in fortifying the peak but it may also serve other functions, such as conceptual bounding of the complex or perhaps a boundary marker for larger geopolitical units.
On the northeast edge of the peak is Feature 2, which is another ditch that crosses the ridgetop. The peak-side bank is up to 2.75 m high and the other side is only 0.75 m high. The peak between these two ditches is too small to accommodate a tia 'ave, and no other structural features are present. To the northeast of the second ditch the ridgetop slopes downward toward the saddle. Feature 3 is a third ditch, some 2 m or more in depth, that crosses the ridgetop about 24 m from the second. A fourth deep ditch—Feature 4—is approximately 34 m from the second. About 31 m beyond the fourth ditch is an abrupt drop (Feature 5) of some 8 m—to a narrow terrace (Feature 7)—that may have been artificially steepened to create a more formidable bank. Several metres farther to the northeast along the ridgetop is Feature 6, which is another ditch, roughly 2 m deep. This one, however, does not completely cross the ridgetop; instead, there is a section of normal slope that provides comparatively easy, though limited, access to the terrace of Feature 7.

Feature 7 is a long and comparatively narrow terrace that extends along the southeast edge of the Le'aeno peak-top, from just below the end of the second ditch (Feature 2) to just below the drop of Feature 5. This gives a total length of about 38 m, with a width of 2-3 m. Feature 8 is a large pit at the southwest end of the terrace (below Feature 2) that is 0.5 m deep and 2.0 m in diameter. Since the pit takes up the entire width of the terrace, and is at the very end, it seems likely to have served a defensive function rather than food storage. The slope from the terrace to the peak-top is extremely steep—too steep to climb in most places.

On the ridgetop between the last ditch and the saddle are five terraces, Features 9-13, that are several metres long and a few metres wide. The rear embankments of these terraces are high and steep (ca. 20 to 40 degrees). No other features were found on the saddle between Le'aeno and the secondary peak.

Features 14-18 are four small terraces located southeast of the peak, on the slope up from Asispa Ridge. These are indicated as flattened areas, a few metres in length and width, and none has observable rock facing. Two of these features are rather poorly defined, but it is difficult to imagine natural features of this type on a slope such as this. More intensive survey with vegetation clearing may reveal additional small terraces in this area. These features are actually within Sa'ole County but are discussed here because they appear to be part of the Le'aeno Complex.

In summary, this complex occupies the naturally defensible position of Le'aeno Mountain. The steep slopes around the peak provide difficult if not nearly impossible access to the top. The peak top itself was a final defensive position and not a place of refuge habitation. The principal defensive features are five deep, wide ditches that cross the ridgetop. The terraces around the peak probably provided temporary house terraces for the population that took refuge at the complex. At the same time, the inland banks of the terraces also served defensive functions by limiting the paths up the ridgetop. This complex is probably linked to the defensive features of 21-25 and possibly 21-109.

USI RIDGE

From the secondary peak of Le'aeno, an unnamed ridge runs to the north for about 488 m, then turns to the northwest and continues to the coast at Usi
Point. In the absence of an identified name, I will refer to this as Usi Ridge. The only survey carried out on this ridge was of a short segment (ca. 153 m long) of the upper ridgetop, between the secondary peak of Le‘aenu and the point of divergence of Vaipito Ridge.

AS-23-11. This is a tia 'ave at a prominent point on the ridgetop, at 250.5 m (822 ft) in elevation. This is an unusual structure in that there are three well-made rays (up to 1.0 m high) with boulder facing, one on the downslope end and two on the northeast side, and there are two slight bulges on the northeast side that appear to be ill-formed or perhaps incompletely or disturbed rays that lack boulder facing (Fig. 13a). On the opposite (southwest) side the ridge edge is a precipice with a long drop. I suspect that this precipice constituted the edge of the tia, although it is possible that rays on that side could have slumped off. A shallow ditch (less than a metre deep and about 1.5-2.0 m wide) crosses the ridgetop on the inland end of the tia. The fact that the ditch is immediately beyond the last of the faint bulges further suggests that the bulges may have been disturbed or incomplete rays since such ditches have been found elsewhere very near the rear of tia 'ave. If measured to the edge of the ditch, the structure is 33 m long, but if measured only to a point corresponding to the far edge of the last well-formed ray, the structure is only about 18 m long. The width is only 9.5 m, making this a long and narrow tia.

AS-23-12. This is a small basalt quarry that is located next to and on a tia 'ave that has been assigned a separate site number (23-11) (Fig. 13a). This site consists of four small concentrations of basalt flakes. The inland-most of these is simply a small concentration of large flakes. Several metres away, around and in the ditch of 23-11, is a second, larger concentration of flakes with many more large flakes. One very large core or blank was observed. This concentration covers an area of about 5 m by 3 m. On the last bulge/ray of the tia 'ave, some 2-3 m from the second concentration, is a third flake concentration. This one is over an area about 3 m in diameter. The flakes here are fairly dense and one preform was collected. The fourth concentration is just a few metres away and slightly in from the other bulge/ray. It is over an area about 3-4 m long and 2-3 m wide. Between the bulge edge and the concentration is a depression about 1.5 m in diameter and ca. 0.3 m deep.

Only four artifacts were collected from this site. Two preforms and two large flakes. Many of the artifacts at the site had some cortex, and both of the preforms had cortex on two flat sides. This indicates the use of angular chunks of exposed basalt. One of the flakes was sent to Beth Wright for geochemical analysis.

I can only surmise that the naturally occurring boulders in the area were being used as a basalt source. One can speculate that at some point during or after the construction of the tia 'ave, the boulders nearby and perhaps even around the rays were used as raw material for basalt tools. In all of the concentrations, nearly all of the flakes were large and none showed signs of grinding. It seems clear that tool preforms were roughed out here and then taken elsewhere for final reduction.

AS-23-13. About 21 m along the ridgetop from 23-11 and at an elevation of about 246 m is a tia 'ave with five, possibly four, low rays with boulder facing (the fifth ray may actually be due to displacement of some rocks by a
large tree, but I think not) (Fig. 13b). Two rays are on the downslope end and three are on the southwest side of the ridgetop. On the northeast side there is the precipice with a sheer, long drop. Additional rays may have slumped off. The structure is 19.6 m long and 13.0 m wide.

AS-23-14. On the ridgetop just off the downslope end of 23-13 is another basalt quarry (Fig. 13b). This is the largest of the three quarry sites on this ridge. The area of lithic scatter extends for about 24 m, although the heaviest concentration is the first 6 m or so. Flakes are scattered over the 10 m width of the ridge and down the southwest slope for 5 to 10 m. Although the flakes throughout are generally large, a notable concentration of large flakes is located along the precipice.

Seven artifacts were collected from the site: two preforms, two preform fragments, one primary decortication flake, and two reduction flakes. This is not particularly good quality basalt; it is not as fine-grained as basalts from the other quarries on the island. Cortex is present on all of the collected preforms indicating the use of chunks of basalt split along natural plains. One of the flakes was given to Simon Best and another was sent to Beth Wright for geochemical and petrographic analyses. The large size of the flakes suggests that only the initial shaping of preforms was taking place at the site.

AS-23-20. This is a terrace located between the tia 'ave of 21-108 and 23-11, near the point where Usi Ridge meets Sa Ridge (at 251.5 m, or 825 ft, a.s.l.) and just below the secondary peak of Le'aeno. The feature is at the edge of an abrupt drop that constitutes the northwest side of the deep narrow valley mentioned above. Across the valley from the terrace is the basalt quarry of 21-110. The terrace is several metres long and a few metres wide and there is a scatter of small basalt pebbles and cobbles on the surface.

AONOI RIDGE

A short distance from where Usi Ridge diverges from Le'aeno, another ridge diverges from Usi and runs to the north-northeast. This ridge runs between Aonoi Stream in the west and an unnamed branch of the Aonoi in the east, and terminates at the rear of the coastal plain at Sa'ilele. Since no name is given for this ridge on the DPW maps, I will refer to it as the Aonoi Ridge. Darkness was approaching when we found these sites, so little time could be spent in examining them and determining locations because of the need to reach the coast while there was still light. Consequently, the locations indicated for the last two sites are approximations.

AS-23-15. This is a small tia 'ave on a slight prominence of the ridgetop, at about 184 m (604 ft) a.s.l. There are five rays, two on each side and one at the downslope end, although one of the side rays is disturbed by a tree and not well-defined (Fig. 13c). The rays have boulder facing that is particularly well-made on two of them. The tia is 21 m long and 13 m wide, and the maximum height of 1.5 m is at the end ray.

AS-23-16. This site is a cluster of at least seven terraces located at an elevation of between 107 m and 122 m (351-400 ft). Beyond this point the ridgetop simply turns into a general slope down to the rear of Sa'ilele. As
darkness was approaching, there was insufficient time to examine the terraces closely, but they looked similar to those found on the slopes around 'Aoa.

**AS-23-17.** Farther down the slope, and at an elevation of about 64 m (210 ft), is a set of two or three terraces. These features probably correspond to what the DFW map indicates as a structure at about this location. We have frequently found it the case that inland, isolated structures shown on the DFW maps are no longer standing. This is probably a rather recent site.

**WAIPITO RIDGE**

From Usi Ridge, a small ridge segment juts to the west, a short distance (153 m) down from the secondary peak of Le'aeno. Immediately inland of the ridge, Waipito Stream cuts its way parallel to the ridge, then bends to the north, abruptly terminating the ridge, and then flows to its mouth at Masausiri. This ridge is unnamed on DFW maps and I will refer to it as the Waipito Ridge.

**AS-23-18.** This is a *tia 'ave* located on the west end of a very low and elongated peak at 154.8 m (508 ft) a.s.l. The ground was covered with a dense growth of ferns and other vegetation that obscured surface visibility. There appeared to be ten low rays only a few decimeters in height (two rays were less clear than the others so it is conceivable, though not as likely, that only eight rays are present). The *tia* was comparatively small at approximately 17 m in length and 10 m in width.

**AS-23-19.** On another low peak, about 70 m from 23-18 and at 154.2 m (506 ft) a.s.l., is another *tia 'ave*. This one is in very poor condition and dense vegetation limited the visibility of the structure. Only four rays—with some stone facing—could be positively identified, one on one end and three on one side. The other side and end, however, apparently were disturbed by slope erosion so the original number of rays is not known. Symmetry and size would suggest a maximum of 3-4 other rays, so the number of original rays is between 4 and 8. The *tia* is approximately 18 m long and 13 m wide.

**MAUGA'OALI'I RIDGE**

This ridge extends from Le'aeno Mountain in the interior to the southwest, reaching the coast on the east side of Fagaitua village. The ridge has not yet been systematically surveyed, but two sites were reported previously for it.

*AS-23-1.** This site is on the northwest slope of the ridge and consists of a large boulder on which are two turtle petroglyphs. Other faint images may be present as well. The site was visited and reported by Clark (1980:55).

*AS-23-3.** Kikuchi reported a burial area for high chiefs located on Mauqa'oali'i Ridge, but he did not visit the site so its existence has not been verified (Clark 1980:55; Kikuchi 1963:126).

**FAGAITUA**

A brief check of the stream mouths is the only archaeological investigation to be carried out at the village of Fagaitua, on the bay of the same name on the south coast.
*AS-23-6. The only site recorded for Pagaitua is at the mouth of the Siapapa Stream where an adze butt and some basalt flakes were found (Clark and Herdrich 1988:22-23).

APULEI

This refers to a location along the south coast of Tutuila, between Auto village in the west and Amaua village in the east, where a single site was reported.

*AS-23-4. Afulei Cave, on the south coast, was used and modified by the U.S. Marines during World War II. The cave has not been checked yet for prehistoric deposit (Clark 1988:55; Kikuchi 1963:56).
Figure 13. Tia 'ave in Sua: (a) AS-23-11 and AS-23-12; (b) AS-23-13 and AS-23-14; (c) AS-23-15.
EXCAVATIONS

In 1986, a ceramic site was discovered in the southwest corner of 'Aoa village. This area was designated Locality 2 of site AS-21-5. Limited test excavations were carried out there by Clark and Herdrich (1988), but that investigation did not yield chronometric assessments of the site. A goal of the 1988 research, therefore, was to collect charcoal from the site for radiocarbon age determinations. To accomplish that, an additional unit was dug into the stream bank. In order for the new discussion of the site to be fully understood, it is necessary to summarize the work done in 1986 as well as describe the 1988 investigation.

Locality 2 is on plantation land controlled by High Talking Chief Olomua Taua. According to local residents, the land to the immediately west of the site—now with a luxuriant growth of elephant grass—and to the north of the stream—now the location of the LMS Church, minister's house, and yard—used to be low ground, similar to the area just west of the road into the village. When the church buildings and road were built a few decades ago, this low ground was infilled. In addition, Puna Stream is actually an artificial channel that was dug a few decades ago. The stream used to run through the main part of the village, which created problems whenever it flooded. The diversion takes the stream flow behind and then west of the village. Today, surface runoff during heavy rain tends to follow the old original stream route, along with a more western channel (see Fig. 5).

The cultural deposit begins just northeast of the infilled zone. Beyond that the ground rises slowly over a distance of about 42 m before the slope quickly rises, then nearly levels off some 12 m farther east. Another 137 m to the northeast, the natural flow of Puna Stream emerges from the ridge slope onto the valley floor and is immediately diverted, by way of a concrete bank, to its current westward flow. A dirt road and a few houses are along the base of the valley-forming ridge to the southwest, which is only about 25 m from the excavation area. There is an old concrete slab in the center of the site that is probably the remains of one of the three structures on the DPW map from the 1950s.

In 1986, Clark and Herdrich (1988) recovered 21 sherds of plain ware pottery, 2 adze fragments (a Type I and a probable Type V), 1 Class X tool, 1 informal flake tool, and 19 basalt waste flakes from the bed of Puna Stream. With the discovery of those artifacts, vegetation was cleared from the south bank, which was straightened and cleaned. Three one-meter squares were dug—two to the south of the stream (IS,1E; 7S,2E) and one to the north (12N,4E). All of these units were in the western portion of the site where the overburden is only 20-30 cm thick, as opposed to the eastern portion where the overburden is over 1 m thick. Excavation in 1986 was by arbitrary 10 cm levels within larger soil layers, and the soil was water-screened through one-quarter inch mesh hardware cloth.

Because the excavation units did not link with each other or with the stream bank, layer numbers were assigned independently in each unit. Therefore, Layer II in the stream bank is not necessarily the same as Layer II in unit 7S,2E. When future excavation at the site fully clarifies the
relationships between layers, new strata designations can be assigned. Features throughout the site were numbered sequentially.

Stream Cut Profile

The excavation in 1988 began with a new cleaning of the stream bank face and an identification of the strata defined previously. In 1986, we had dug a one metre square into the stream bank, through the overburden (Layer I) to just above the cultural deposit. Time did not permit then the excavation of that unit, so it was covered with plastic sheeting and partially refilled. In 1988, that unit was cleaned out and re-opened. The bank face was cut back 10-15 cm to reveal a clean, straight wall (Fig. 14), which became the north wall of a unit 1.0 m long by 0.5 m wide. Excavation was carried out by strata as defined in the wall cross section. Because project time was limited, screening was restricted to 50% of the soil from excavation. A water screening process was used in which the soil was washed through a fine-meshed window screen.

STRATIGRAPHY

The soil stratigraphy in the stream bank was quite complex, especially given the abundance of features. In cleaning back the bank face, the postmold of Feature 2 was removed. Even so, three previously defined features remained in the wall—Features 1, 8, and 9. In excavation, two new features (14 and 15) were identified. These features, together with the six cultural layers and some possible disturbances, all in such a small area, complicated interpretation of the unit. The strata and features defined in the stream bank in 1986 and 1988 are summarized below (Fig. 15).

Layer I. This layer of overburden increases in thickness substantially from west to east, toward the ridge. The deposition of this layer occurred after the abandonment of domestic activities at this locality. As a whole, the layer is very dark grayish brown (10YR3/2) loam, with abundant gravel. However, there are six sublayers (Fig. 14; not illustrated in Fig. 15) that are described primarily from the location in the bank of the excavation unit.

The six sublayers of Layer I differ primarily in the partial size and gravel content, and broadly alternate coarse and fine sediment layers, which represent high energy and low energy deposition forces, respectively.

Ia—The top sublayer is dark brown (10YR3/3) coarse sediment with abundant gravel (over 25%) that diminishes to the west (to ca. 10% at the beginning of the profile), and the thickness at the unit is 20-30 cm.

Ib—This is coarse brown (10YR4/3) sediment with very abundant gravel (ca. 50%) that is 30 cm or more thick east of the unit but thins to the west to 25-18 cm thick at the unit, and it disappears by the beginning of the profile.

Ic—This is very dark grayish brown (10YR3/2), comparatively fine sediment that has very little gravel (less than 10%) and is generally 15-20 cm thick.

Id—Very similar to Ib, this brown coarse sediment with abundant gravel is 20-15 cm thick but, again, thins to the west.

Ie—Comparable to Ic but more fine-grained, this sediment has little or no gravel, and is 21-14 cm thick, thinning to the west.

If—This is a thin sublayer of coarse sediment and gravel similar to Ib and Id, but it is found only to the west of the unit.
Figure 14. Stream Bank Unit profile prior to excavation.
Figure 15. Puna Stream bank profile (from Clark & Herdrich (1988)).
Layer II. This is the highest cultural layer in the profile. It is discontinuous, with separated eastern and western segments, and the thickness ranges from 0-30 cm. The soil is black (10YR2/1) (darkly stained by charcoal) loam with ca. 15% gravel. Five features (nos. 1-5) were identified in this layer in 1986.

In the area of the unit, the top of the cultural deposit actually is represented by Feature 1, which is a shallow basin of very dark soil with scattered charcoal. In the wall profile, Feature 1 is underlaid by Layer II, although the distinction between the two deposits was sometimes difficult to follow, especially during excavation. In from the north wall, the bottom of Feature 1 dips to cut through Layers II, III, IV, and into V. Twenty-five artifacts (23 basalt flakes, 1 flake tool, and 1 pottery sherd) were found in Feature 1, but it is possible that some of these may have come from Layer II. A charcoal sample from Feature 1 produced a calibrated age range of AD 1453-1651.

Layer III. This is a very dark grayish brown (10YR 3/2) loam with abundant gravel (at least 30%). The layer is generally 10-20 cm thick but has a maximum thickness of 45 cm to the west of the unit. Two sublayers (a and b) can be differentiated in places, with the lower (IIIb) showing a reduction in the gravel content. Scattered along the base of this layer are waterworn gravel that are comparatively large in grain size. The deposition of this layer was by a high energy flood, or perhaps more than one flood but with very little time between them.

No artifacts were recovered from this layer and no charcoal was seen in the soil. In 1986, one Feature (#6)--a concentration of charcoal flecks--was defined as a possible firepit at the base of this layer several metres to the west of the unit.

Layer IV. This is a very dark grayish brown (10YR3/2) to dark brown (10YR 3/3) loam. The sediment has a fine grain--notably different from the above layer--and there is a near absence of gravel. The thickness ranges from 0-8 cm. No charcoal staining or other indicators of cultural activity were seen in the wall or indicated in excavation. This layer appears to represent a low energy deposit, probably from a flood.

Layer V. This layer is a very dark brown (10YR2/2) loam with very little gravel (ca. 1%). It is generally about 10 cm thick, although the layer fades to the west, eventually becoming indistinguishable. Charcoal staining and scattered bits of charcoal mark the layer. At the top of Layer V in the bank face, there is a band of slightly darker soil about 4 cm thick. This band was not visible in the stream bank prior to the cleaning for excavation, which cut the bank back about 15 cm. Excavation revealed that farther into the unit, this dark band had coarse sediment and gravel, which increased in quantity and grain size toward the south wall. Furthermore, this coarse sublayer drops abruptly to form a depression, about 15 cm deep, in the southwest quarter of the unit. Whether this new soil zone constitutes a sublayer of V or a feature of some sort could not be determined on the basis of the small area revealed. Consequently, I have designated this zone simply as sublayer Va in contrast to Vb which is the only portion of the layer seen in the original stream bank. In this area of depression, Vb is absent and the overlying Layers III and IV are thicker. Pieces of charcoal are scattered through this sublayer,
especially in the area of the depression. In the northwest corner of the unit at the top of the layer (Va) is a stone-edged fireplace (Feature 14) and in the southwest corner of the unit, at the base of the depression, is an area of reddened soil and charcoal concentration that represents another fireplace (Feature 15).

The differentiation of Va and Vb shows up best in cross-section and where Va cuts through Vb and into Layer VI. Consequently, there undoubtedly was some mixing of materials from Va and Vb. In 1986, one pottery sherd was found in Vb and four features (7-10) were identified, all from the base of the layer. The digging in 1986 produced thirteen basalt flakes and one thick coarse-tempered sherd. A charcoal sample collected from Va yielded a calibrated age range of AD 1440-1650.

**Layer VI.** The lowest identifiable layer in the profile, this is a very dark grayish brown (10YR3/2) to dark brown (7.5YR3/2) clay loam with three sublayers: VIa, the upper darker portion with bits of charcoal; VIb, the lower portion, lighter color, with no visible charcoal; and VIc, which consists of a couple areas where charcoal bits are somewhat heavier. The layer thickness was 50 cm, but that measurement could only be taken to the top of the water line of the stream. One pottery sherd was recovered from VIb in 1986. The 1988 excavation produced eight pieces of volcanic glass, and a ninth piece was found at the interface of Layers Vb and VI. Also found were six basalt flakes and two thin-to-medium fine-tempered sherds. The scattered charcoal flecks were too small to provide a sample adequate for radiocarbon dating.

**FEATURES**

Ten features (nos. 1-10) were identified in 1986 from the stream bank cross-section, and an additional two features (14-15) were revealed in the excavation of 1988.

**Feature 1** is a firepit that begins at or near the top of Layer II. It is 1 m across and has black soil with abundant pieces of charcoal and a burned rock at the base. Excavation of this feature produced 19 reduction flakes, 1 primary reduction flake, 3 secondary reduction flakes, one possible flake tool, and 1 thick coarse-tempered body sherd.

**Feature 2** is a postmold, 17 cm across and at least 18 cm deep, that extends from the base of Layer II into Layer V. The fill is similar to the soil of Layer II.

**Feature 3** is a large apparent postmold, 36 cm across and 42 cm deep, that begins in Layer II, cuts through Feature 4, Layer V, and into Layer VI. The gravelly (ca. 30%) fill is similar to Layer II.

**Feature 4** is probably the remnant of a small firepit that begins at the base of Layer II but is cut through by Feature 3. The fill is very dark with a high ash content.

**Feature 5** is a firepit, probably a small earth oven, 79 cm across by 35 cm deep. The top of the pit is at the base of Layer II and the fill has some pieces of charcoal and several stones along the base of the pit.
Feature 6 is a small basin-shaped firepit, 53 cm across and 15 cm deep, in the lower portion of Layer III, with charcoal-stained fill.

Feature 7 is the edge of a steep-walled earth oven, 63 cm across by 40 cm deep. The dark fill includes charcoal, some basalt flakes, and many stones, several of which show signs of high heat. The top of the feature is in the lower portion of Layer V.

Feature 8 is a small pit, 34 cm across by 17 cm deep, with lots of charcoal flecks, suggesting that it was a small fire pit. It began at the base of Layer V and cut into Layer VI.

Feature 9 is a fireplace 70 cm long by 14 cm deep, but the east and west edges are disturbed by Features 7 and 8, respectively. It is at the top of Layer VI and the fill consists of thin lenses of fire-reddened soil, ash, and charcoal. Excavation yielded a piece of a trapezoidal adze that is fire-reddened and fire-cracked. It appears to have been fully polished which, together with the shape, suggests that it was a Type III adze. A charcoal sample from this feature produced a radiocarbon age calibrated to a range of AD 1650-1955.

Feature 10 is a fireplace 140 cm long and 22 cm thick with the top of the feature in the lower portion of Layer V. The fill consists of lenses of oxidized soil, ash, and charcoal, indicating repeated use.

Feature 14 is a fireplace in Layer Va that is defined by a rock border and a dark soil with ash and pieces of charcoal. One of the border rocks is reddened and was clearly subjected to heat. The east side of the feature extends into the east wall of the unit while the south side extends into the south wall. The dimensions revealed in the unit are 35 cm east-west by 22 cm north-south. This feature was left intact.

Feature 15 is another fireplace, but this one is in the southwest corner of the unit, and in Layer Va. It consists of reddened soils with some ash and abundant pieces of charcoal. Revealed dimensions are 13 cm by 13 cm.

Previously Excavated Units

UNIT 12N, 4E

This unit, which is north of the stream, appears to be in an area that was greatly disturbed by bulldozing that took place when the nearby LDS Church and pastor’s house were built. That disturbance, however, does not appear to have extended across the stream. The cultural layers identified for the other units and in the stream bank are not present in this unit.

Layer I. Very dark gray (10YR3/1) slightly sandy loam with little gravel; visible sand and charcoal in upper few centimetres; 10 to 14 cm thick; contains some recent trash.

Layer II. Very dark grayish brown (10YR3/2) clay loam, with about 10-15 % gravel; no sand, and very few charcoal bits; 131 to 135 cm thick; 6 basalt waste flakes.
UNIT 18,1E

The interpretation of this unit was complicated by land crab disturbances and the presence of multiple features. Five soil layers and three features were identified at this unit, and 109 artifacts were retrieved, 13 of which were sherds. Layer V produced more artifacts than any other layer of the unit. The features, scattered bits of charcoal, the charcoal stained soil, and the many pieces of fire-cracked stones suggest that this was an area of cooking when Layers II and III were deposited. Although Layers IV and V provide evidence of occupation in the vicinity, there are no identifiable house floors.

Layer I. Very dark grayish brown (10YR3/2) loam, ca. 5% gravel; 14 to 25 cm thick; charcoal bits common in the upper few centimetres; some items of recent garbage near surface.

Layer II. Black (7.5YR2/0) loam, about 5% gravel; 8 to 20 cm thick; abundant bits of charcoal and pieces of fire-cracked rock; land crab disturbances; 1 broken Type I adze, a possible informal flake tool; small pieces of plastic and metal, probably there due to crabs.

Layer III. Very dark grayish brown to dark brown (10YR3/2-3/3) clay loam, with ca. 5% gravel; occasional charcoal flecks; 10-25 cm thick; land crab disturbances; 1 sherd and 35 basalt flakes.

Layer IV. Dark brown (7.5YR3/2) silty clay loam, gravel approximately 5%; 28 to 40 cm thick; land crab disturbance; 2 sherds and 4 basalt flakes.

Layer V. Very dark brown (10YR2/2) clay loam, 3% or less gravel; more than 45 cm thick; abundant charcoal but in small bits; 1 probable Type VI adze fragment, 17 basalt flakes, 11 pieces of volcanic glass, and 9 pottery sherds (7 thin fine-tempered, 2 thick coarse-tempered); artifacts were still being recovered when excavation stopped at 140 cm bs due to unit flooding.

Three features were identified for this unit. Feature 11 is a lens of black (10YR2/1), gravelly loam with a noticeable ash content, and includes a probable postmold indicated by very dark soil with a few pebbles. It begins at the top of Layer III and cuts through the one edge of Feature 13. This may have been a feature associated with a cookhouse. Feature 12 is a shallow basin, probably of a fire pit, between Layers III and IV that cuts into the top of Layer IV and appears to have one edge cut by Feature 13. Bits of charcoal were scattered throughout this apparent firepit. Feature 13 is a firepit or earth oven that extends nearly 50 cm into the unit from the east wall. The fill includes few fire-reddened and fire-cracked stones, bits of charcoal, two basalt flakes, and a pottery sherd.

UNIT 78,2E

The strata of this unit were not as dark or charcoal rich as the stream profile layers or unit 15,1E, but they did yield more artifacts, producing 67.6% of the pottery, 57.1% of the volcanic glass, 45.5% of the basalt tools, and 71.9% of the debitage found at the locality in 1986. The density of artifacts was greatest in Layer II with 262, but below about 70 cm bs the quantity dropped substantially.
Layer I. This layer consists of two sublayers. It is a very dark grayish brown (10YR3/2) loam with abundant gravel (ca. 20%); 16-40 cm thick; 1 basalt flake. It is similar to Ia but is slightly lighter in color and has a higher gravel content (ca. 30%) with gravel larger in particle size; 9-16 cm thick; 13 basalt flakes.

Layer II. Very dark gray (10YR3/1) clay loam; gravel at about 10-15%; 21-36 cm thick; bits of and carbonized organic material; 28 pottery sherds, 5 volcanic glass flakes, 2 basalt flake tools (both Class IX), and 227 basalt flakes.

Layer III. Very dark grayish brown (10YR3/2) clay loam; about 3% gravel, smaller in size; a lens (IIIb) of dark brown (7.5YR3/2) clay-clay loam with ca. 7-10% gravel; 39 sherds, 1 adze, 2 preforms, 27 basalt flakes, and 11 pieces of volcanic glass from IIIa, and 4 sherds from IIIb.

SITE DISCUSSION

Bank Layer VI appears to be the same as 18,13 Layer V, and 78,2E Layer III. The absence of cooking features from this stratum, and the presence of ceramics and volcanic glass, suggests residential activities other than cooking. Because of unit flooding and stream flow, the base of the cultural deposit was not reached in any of the units. The fine sediments (clay loam) of these layers indicate slow, low energy, probably alluvial, deposition of soil in the early years of human occupation. The increase in particle size in higher layers suggests higher energy depositional force. This higher energy deposition probably relates to an increase in soil erosion on the slopes brought on by vegetation clearing for cultivation.

For Layer V (a and b) of the stream bank, the dark staining and fine fire related features indicate a focus on cooking activities at that location. This may correlate with Layers IV and perhaps III of 18,1E, where two additional fire features and a postmold were identified. Layer II of 78,2E may also correspond to these layers, but it differs significantly in a much higher artifact count. This is particularly notable in the comparatively higher shard count. In addition, cooking features are not present in 78,2E, and charcoal is not common in the soil. Clearly there is a difference in activities being carried out in the area of 78,2E (Layer II) versus 18,1E (Layers III and IV) and the stream bank (74 and 76).

Stream bank Layers III and IV, with their absence or near absence of cultural materials, probably represent rapid deposition. Both layers lens out to the southwest, with neither present in units 18,1E and 78,2E. If the locality had been abandoned for a great length of time during the formation of Layers III and IV, one would expect to find an abandonment layer throughout the site. The abundant large gravel of Layer II indicates the first high energy flood of the area, while the finer sediments of Layer IV suggest an earlier low energy flood. The layers at the site seem to slope down to the north, toward what was low ground--possibly near the shoreline. Thus the flood deposits were restricted to the lower and easterly areas of the locality.

Layer II of the stream bank probably corresponds to Layer II of unit 18,1E, but it is not identifiable in 78,4E, although it may correspond to 1b.
In the area of the stream and 13.1E, this layer reflects localized cooking activity. In the stream bank, there are three fire features and two postmolds, and in 13.1E the soil is very dark and has abundant charcoal. The alluvial deposition of this layer was probably due to slope wash and low energy flooding related to slope agriculture. The single pottery sherd from Feature 1 of this layer is probably secondary deposition.

Layer I of the stream bank is the same as Layer I of 13.1E, and probably correlates with Ia of 78.2E. There is a dramatic and fairly abrupt increase in the thickness of this layer from the beginning of the deposit in the west toward the east, where Puna Stream flows onto the valley floor. In the stream bank, sublayers Ia, Ib, Ie, and If, with abundant large gravel, represent high energy deposition from flooding and slope wash. The finer sediments of sublayers Ic and Id represent low energy alluvial depositions. The severe flooding represented in Layer I probably brought about the abandonment of residential activity at the locality in favor of areas of the site that were geomorphologically more stable. The increased instability at the locality—due to flooding—probably relates to increased agricultural activity on the slopes. Deforestation would bring increased erosion, greater surface runoff, heavier stream flow, and greater sediment load.

Table 1 presents a list of artifacts recovered from AS-21-5, Locality 2, in 1988, and Table 2 is a total tabulation of aboriginal artifacts collected in 1986 and 1988. Of the 576 artifacts, 109 (about 18.9%) are pottery sherds. Close to 2% of the artifacts are adzes or preforms, about 1% are basalt flake tools, and 6.4% are small pieces of volcanic glass. The remaining items—almost 72% of the total—are basalt waste flakes.

In the pottery collection from Locality 2, ten of the sherds are rim sherds and 99 are body sherds. None show any decoration but some have possible slip and floating treatments of the surface. The majority of the pottery sherds are thin to medium in thickness and have a fine temper, but thick coarse-tempered sherds are also present.

The artifact counts from the units indicate that basalt working increased substantially in importance in later years. At the same time, volcanic glass and pottery fade in representation and drop out of the material inventory at about the same time, which was prior to the final abandonment of occupation at Locality 2. It was further noted by Clark that "the small size of the basalt flakes, the low counts of decortication flakes, and the somewhat high percentage of flakes with polish or multiple dorsal flake scars all indicate that the initial stage of raw material preparation was carried out elsewhere, and most of the basalt working at the site was either the final stage of tool reduction and shaping or tool reworking" (Clark and Herdich 1988:85).

The results of excavations at 21-5 are extremely interesting and quite puzzling. While the ceramic types represented suggest a date of 2000 BP or earlier, the radiocarbon dates indicate a much later date for occupation. The possibility is unmistakably present that pottery was in use in Tutuila until the late prehistoric period, perhaps around AD 1650. Unfortunately, too little has yet been done at this site to sort out properly the stratigraphic relationships between units and the precise chronological placement of pottery use.
Table 1. Artifacts recovered from AS-21-5, locality 2, in 1988.

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Table 2. Total tabulation of artifacts from AS-21-5, Locality 2, from 1986 and 1988.

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CORING

In the ETAP of 1986, a subsurface coring program was undertaken at 'Aoa valley, and the results were very rewarding for interpreting geomorphology. It was revealed that the valley has undergone substantial geomorphological change, from an embayment to backbarrier water body (lagoon or estuary) to swamp/marsh to the modern valley formation. This raised the question of whether that transformation was specific to 'Aoa or reflected a broader pattern of changing relative sea level. Therefore, three hypotheses were formulated to account for the changes at 'Aoa.

One hypothesis is simply that the change in relative sea level evidenced for 'Aoa was a localized phenomenon brought about by the specific environmental conditions at 'Aoa in conjunction with the actions of early human farmers. Slash-and-burn farming on the steep slopes around 'Aoa brought greatly increased soil erosion and infilling of the water body with colluvial and alluvial sediments. The existence of the barrier accelerated the infilling process by trapping and ponding erosional sediments.

A second hypothesis postulates that geologic tilting of Tutuila, since initial human settlement, resulted in uplift of the eastern end of the island. Therefore, at 'Aoa and other locations on the eastern end of the island, marine embayments or lagoons were transformed into valley floors, while the old western shorelines were inundated. The uplift from such small-scale tilting (1-2 m) would not be evidenced much beyond the extreme eastern end of the island.

The third hypothesis is that there was drop in relative sea level 2000-3000 years ago that affected the entire island and beyond. The cause of this drop (eustasy, tectonic uplift, or isostasy) is an important but secondary issue; what is of concern here is whether there is evidence of an island-wide change in relative sea level in the mid-to-late Holocene (see Clark 1989). The drop in sea level would be only about 1-2 m, but that would mean a substantial difference for most of the small valleys around Tutuila.

Whichever of the hypothesized processes of change was dominant, it has significant implications for understanding Samoan settlement systems. There are also important implications for where archaeologists should look for the earliest sites in American Samoa. Consequently, a goal of the 1988 project was to provide preliminary tests of the hypotheses outlined above. Those tests required coring at other locations around Tutuila to determine whether the change in sea level was localized (hypothesis 1), characteristic of only the eastern end of Tutuila (hypothesis 2), or found in the central and western portion of the island as well (hypothesis 3). Consequently, limited coring was undertaken at Alao on the east coast, Pala Lagoon on the south-central coast, and Leone on the southwest coast. Before discussing those corings, a brief review of the 1986 coring results will be given.
1986 Coring in 'Aoa Valley

In addition to the survey and excavation at 'Aoa valley in 1986, Clark and Herdrich (1988:128-141) carried out a coring program designed to systematically examine subsurface soils throughout the valley. Four coring transects--CT1 through CT4--with sequentially numbered coring stations at set intervals, along with three miscellaneous coring stations (MCS), were established to check for buried cultural deposit and buried calcareous sand. All of the coring stations are illustrated in Figure 15. The soil descriptions of the cores were based entirely on field observations by the author, and hydrochloric acid was used to test for the presence of calcareous sands.

Coring Transect 1 was a roughly north-south transect line, running from the shore to the ridge at the rear of the valley, with primary coring stations (19 in all) every 15.25 m (50 ft). Coring Transect 2 ran across the malae (village plaza), from the shore to site AS-21-5, Locality 2. The malae was too compact and the ground farther inland--with one exception--was too rocky to allow deep coring, so only four cores could be taken along this transect. Coring Transect 3 crossed the valley from site AS-21-5, Locality 2, in the northeast, to the bounding ridge slope in the southwest. Coring stations came at 30.5 m (100 ft) intervals, except where ground or vegetation conditions forced deviation. Coring Transect 4 angled into the southwestern corner of the valley and consisted of five coring stations. None of the Miscellaneous Coring Stations penetrated very deeply before hitting rock, and none was particularly informative.

The coring transects revealed dramatic geomorphological change in the valley at 'Aoa. The buried calcareous sands demonstrate that an embayment once stood over most of the valley. Although the actual bay shoreline cannot be precisely determined on the basis of available data, a postulated shoreline, based on coring data and current geomorphological conditions, is presented in Figure 17. A spit, or perhaps barrier, probably extended across the western side of the bay. Cores of CT1 and the Soil Conservation Service indicate comparatively shallow rock. This may be a buried projection of the basalt spur forming Le'iato Point, or could be simply the rocks of an old boulder beach. This projection promoted the accretion of calcareous sand around it. It is not known how far to the east the spit extended but I would guess that it ended somewhat before the small estuary, in the area where the Olomoana Elementary School now sits. The estuary area probably remained a small passage from the backbarrier water body to the larger bay, and this opening may have been something on the order of 100-200 m wide. The depth of the sand layer indicates that the water body was shallow in the east but gradually deepened to the west. Along the spit it was deeper than along the east shore and it deepened from the spit back toward the rear valley ridge, with the deepest part in the southwest corner.

The sands of the water body floor are overlaid by loamy sands and/or sandy loams, which reflect the infilling of the water body. In the middle and upper portion of the valley, the loamy sands were overlaid by a mucky silt/silty clay that was not found along the spit or the eastern shore. This deposit probably represents lagoonal or estuarial mud. Above this are silty clay loams and silty clays. The barrier probably grew as sand accumulated along it and erosional sediments from the surrounding slopes washed in. As the bay shallows
filled with colluvial and alluvial sediments and the accretion barrier closed the opening to the bay, the infilling process accelerated. The deeper portion of the lagoon was eventually transformed into a backbarrier estuary, and eventually into a marsh that shrank with increasing alluvial and colluvial deposition. The absence of a peat layer suggests that the infilling process leading to the development of the valley floor was rather rapid.

1988 Coring in Alao Valley

Alao was selected for coring because it is one of only two valleys on the east coast, and it presented a better coring opportunity than Tula (the other valley) (Fig. 18). Also, there is a small marsh at the rear of the valley, and it was thought that this feature might reflect changing geomorphology, as at Aoa. There is a broad calcareous sand beach at Alac that probably has been prograding, and most of the shorefront houses lie along the transition between the sandy beach and the largely alluvial valley. If there was evidence of changing relative sea level at Alao, that would argue against hypothesis 1 and for hypothesis 2 or 3. As noted above, no sites have been reported for Alao and an examination of the discharge fan of Muliwaiatele Stream did not reveal any prehistoric artifacts.

Nine cores (C-1 through C-9) were attempted at Alao, but only three were able to penetrate deeper than 1.5 before hitting rock (Fig. 19). The core sediments were described from field observations, but eight soil samples were collected from three cores for detailed soil descriptions by the soils lab at North Dakota State University. The results of the soils analysis are given in Table 3. In addition, a sample of organic matter was collected from the peat layer of C-9 and submitted for a radiocarbon determination. The use of the term "shoreline" below refers to the five foot (1.5 m) contour on the DPW map, which roughly corresponds to the landward edge of the foreshore.

CORE #1

This core was established 140 m west (inland) of the shoreline and 41.5 m due north of Muliwaiatele Stream. This put it roughly 45 m from the sand zone and at an elevation of about 2 m (6-7 ft) a.s.l.

The first 1.8 m consists of silty clay (Stratum I), then there is a change to a predominantly coral and sand stratum (Stratum II). The silty clay diminishes with depth and the last 10 cm are of coral and sand. The core could be taken to a depth of only 2.0 m, beyond which the coral could not be penetrated. The last few centimetres of the core had little or no clay and this (together with the impenetrable zone) probably constitutes a new deposit of coral and sand, or Stratum III. Three soil samples were collected from this core for lab analysis.

**Lab # 675.** Stratum I. 60-75 cm bs. Brown (7.5YR 5/2) (dry) silty clay; no coarse fragment; no mottles; very few fine white (7.5YR 8/0) snail shells; matrix non-effervescent; effervescent around snail shells.

**Lab # 676.** At base of Stratum I. 74-80 cm bs. Brown (7.5YR 5/2) (dry) silty clay; no coarse fragment; many medium faint brown (7.5YR 5/4) mottles; non-effervescent.
Figure 18. Map of Tutuila showing locations of 'Aoa, Alao, Pala Lagoon, Leone, and other valleys.
Figure 19. Coring locations at Alao valley.
Table 3. Soils analyses carried out by the Soil Characterization Lab of North Dakota State University.

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SiC—Silty clay  
SiCL—Silty clay loam  
L—Loam  
C—Clay  
VCOS—Very coarse sand  
COS—Coarse sand  
FS—Fine sand  
VFS—Very fine sand  
FSi—Fine silt  
COSi—Coarse silt  
CO3-C—Carbonate clay
Lab # 677. Top of Stratum II. 180-195 cm bs. 50% white (7.5YR 8/0) rounded (weathered) coral fragments, 50% brown (7.5YR 5/2) (dry) silty clay; coral material violently effervescent; clay strongly to violently effervescent; few (1%) fine prominent red (2.5YR 4/6) vesicular chips (unidentified).

The coral and sand at the bottom of the core (Stratum III) represent a coastal marine floor, or perhaps an old beach area. Clearly, then, the sea level at Alao was formerly higher than at present. The mix of clay and sand-coral (II) reflects a lowering of relative sea level as terrigenous sediments prograde and filter into the upper portion of the sand and coral layer. If there had been a drop in sea level, an offshore bar may have become something of a barrier creating a lagoon that then filled with terrigenous sediments. The top stratum (I) represents the accumulation of sediments through alluviation. The motles at the bottom of the stratum are probably due to the presence of the water table, or could reflect sediments filling a water body. By the first soil sample in Stratum I, there was probably a valley environment.

CORE #2

Farther to the west, some 180 m inland of the shoreline, and 9.7 m south of the middle of the inland-running village road, was C-2. The ground surface had risen slightly to just under 3 m (under 10 ft) a.s.l. Stratum I is a black (10YR 2/1) (wet) loam to clay loam, 0-0.37 cm bs. Stratum II, at 0.37 to 0.49 m bs, is a transitional layer between I and III. There is a higher silt and clay content than in Stratum I, and small pieces of charcoal are numerous. Stratum III is silty clay loam with some bits of charcoal visible. The base of the layer could not be precisely determined because the water table was reached at 1.55 m bs, and the sediments between there and 1.8 m were washed out. Between 1.8 and the bottom of the core, at 2.8 m, only about half (sometimes a little more) of the sediment remained in the core with each extraction. This is very dark gray (10YR 3/1) (wet) clay that constitutes Stratum IV. Thus, the transition between Strata III and IV is in the area of 1.55 and 1.80 cm bs. Some bits of charcoal are in the sediment. At 2.6 m bs there was no effervescent reaction to HCL. Two soil samples were analyzed from this core.

Lab # 678. Stratum III. 80-95 cm bs. Brown (10YR 4.5/3) (dry) silty clay loam; common fine prominent yellowish-red (5YR 5/8) iron stains and concretions; 2-5% black (5YR 5/8) (dry) coarse fragment with yellowish-red iron stains on faces (possibly volcanic-glass pumice); non-effervescent.

Lab # 679. Stratum IV. 200-225 cm bs. Dark grayish brown (10YR 4/2) (dry) clay; massive structure; extremely hard dry; few prominent strong brown (5YR 5/8) (dry) iron stains and concretions; no apparent coarse fragment; non-effervescent.

The clay of the lowest stratum (IV) is the same type of sediment found at 'Aoa overlying the sand stratum. The iron concretions and stains again indicate an aquatic environment during deposition, and I suspect that this is an old coastal or lagoonal mud. The overlying stratum (III) similarly suggests an aquatic environment, but the higher silt content and the presence of coarse fragments indicate higher energy depositional forces. The top layer (I) is a rather recent formation and probably is an old garden area, while the second
layer (II) reflects the transition between III and I. The bits of charcoal throughout Strata II, III, and IV suggest human activity, probably slash-and-burn agriculture.

CORE #3

To the southwest of C-2 about 103 m was C-3. It was 254.5 m west of the shoreline and only 3-4 m north of Mulivaitele Stream. The elevation was over 5 m (over 16 ft) a.s.l.

Two cores were attempted within a metre of each other. One hit rock at 1.0 m and the other at 1.31 m bs. The soil is very dark grayish brown 10YR 3/2 (wet) silty clay with gravel.

Not much can be said of the soils at C-3 other than that they probably represent alluvial deposit. It is possible that mucky clay and/or sand strata are buried deeper than 1.31 m bs, but I doubt it. Given the modern elevation of this location, I suspect that this was inland of the old shoreline. Because of the proximity of the stream, there is too much alluvial gravel to permit deep coring.

CORE #4

Sixty-one metres north of C-3 and 252 m west of the shoreline was C-4, at just under 5 m (16 ft) a.s.l. The ground surface at this location was noticeably higher than at the previous locations, and this may have been due to some infilling for the construction of the nearby house or a predecessor.

Several attempts were made to core in this area, but the deepest penetration was down only 0.99 m bs before hitting rock. Stratum I constitutes the upper 80 cm, and is loam with visible calcareous sand and small bits of coral; occasional pieces of charcoal are also present. Stratum II, from 0.8 m to 0.99 m bs, has a higher clay content, but sand and coral are still present, giving a violent effervescent reaction.

The sand and coral at this location are anomalous and were probably brought in for a house in this area at some time in the past. The stoniness of the ground in this area may also be due to the presence of fill.

CORE #5

This core was 24 m southeast of C-4, 243 m west of the shoreline, and at about 4.3 m (14 ft) a.s.l. Several cores were attempted in this area but the ground was so stony that the deepest penetration was only 1.18 m bs.

Two strata were defined in the 1.18 m-deep core. Stratum I is loam that extends from the surface to 1.0 m bs. Small flecks of charcoal are present and a slight concentration of flecks was noted at 0.52-0.56 m bs. Below about 0.7 m, the small grit and gravel content increases noticeably. A pronounced and abrupt difference in soil marks the beginning of Stratum II. The silt and clay components increase, making this stratum a silty clay loam. The grit content is again high just above the rock that terminated coring. A single soil sample was analyzed from this core.

Lab # 680. Base of Stratum I. 85-100 cm bs. Brown (10YR 5/3) loam; 5-10% coarse fragment including white (7.5YR 8/0) rounded gravels, gray (10YR 5/1)
vesicular volcanic material (hardened ash?); some vesicular material, angular with rounded edges (colluvial-alluvial); non-effervescent.

This core could not penetrate deeply enough to rule out the possibility of buried calcareous sand at this location. The apparent absence of charcoal from the lowest stratum (II) hints that this may be pre-human settlement soil. The alluvial-colluvial nature of the upper layer (I) together with the scattering of charcoal suggests human action--slash-and-burn agriculture leading to accelerated erosion and water transport of sediments (containing charcoal).

CORE #6

Thirty metres northeast of C-4 and 243 m west of the shoreline, at an elevation of just under 4.3 m (14 ft), was C-6. Again, several coring attempts were made but none could penetrate very deeply before hitting an impassable rock.

The deepest core reached only 0.91 m bs. A single stratum could be defined in the cores. This is a clay loam to silty clay loam with fairly abundant small gravel and bits of weathering volcanic material.

Little can be said of this core because of the lack of depth. It appears to be of typical valley soil, probably alluvial-colluvial in nature.

CORE #7

This was located 235 m west of the shoreline and 32 m northeast of C-6, and was at 4-5 m (12-14 ft) a.s.l. It is only about 9 m south of an old intermittent stream bed that used to flow into the Mulivaiatele.

A single stratum was identified in this core, which was terminated at 1.65 m bs. The soil is clay loam/silty clay loam, and small gravel and bits of weathering basalt are not uncommon. The rock at 1.65 m gave no resistance and bits of weathering rock were brought up at the end of the core.

The sediments at this coring station are generally similar to those of C-6. The rock at the base of the core may represent weathering bedrock, but that is only a guess.

CORE #8

This core was 27.4 m south of Mulivaiatele Stream and 109 m west of the shoreline. At only 2 m (6 ft) a.s.l., the coring station was in an area that appears to flood periodically.

One stratum of clay loam was encountered in this core. Below about 0.75 m bs the soil is very compact and coring was very difficult. The core was terminated at 1.36 m bs by rock.

As at most of the other locations, this core could not penetrate deeply enough to determine whether there is buried peat or sand at this location. This is a low area that often floods and is therefore too stony to allow for deep coring. The sediments present reflect long-term alluvial deposition.

CORE #9

The last core was moved much farther south, into a section of valley separated from the northern valley by Vaea Hill. The core was 252 m south of
Mulivaitale Stream and 131 m west of the shoreline. This whole area is low ground, with the core at only about 1.8 m (6 ft) a.s.l. An area of slightly lower and wetter ground lies about 35 m to the west and continues to the base of the surrounding talus slope. This wet zone becomes mucky toward the slope and could not be crossed.

Stratum I is dark brown (7.5YR 3/2) clay loam. At about 1.10 m bs the color starts turning slightly lighter and the clay component increases. Stratum II begins at about 1.15 m bs and is a brown-dark brown (7.5YR 4/2) clay. The water table was reached at 1.25 m bs, after which the sediments were wet. From 1.55 m to about 1.63 m bs there is an increase in the organic content of the clay, and probable pieces of charcoal were visible. By 1.63 m there is peat, which constitutes Stratum III. Stratum IV, which extends from 1.83 m to the end of the core at 2.5 m bs, is a dark, organically rich clay, or mucky peat, with visible bits of landshail shells and white sand. Two samples were taken from the core for soil analysis, and a sample of organic matter was collected for radiocarbon measurement.

Lab # 681. Stratum II, immediately overlying peat. Matrix of brown (10YR 5/3) clay; common fine prominent yellowish brown (5YR 5/8) iron concretions; 1-2% black (5YR 2/1) coarse fragment resembling charcoal and/or volcanic glass; few medium prominent deposits of white (7.5YR 8/0 carbonate (secondary); matrix slightly effervescent in carbonate deposits and around shells.

Lab # 682. Stratum IV. 200-227 cm bs. Matrix highly organic, very dark gray (10YR 3/1) clay, black (7.5YR 2/0) when moist; occasional yellowish-brown (10YR 5/8) iron concretions; many (15-20%) light gray (10YR 7/1) snail shells; matrix effervescent, violently effervescent around snail shells; some resistant plant material observed; few (<1%) light-colored pebbles resembling dolomite.

Radiocarbon Lab # Beta-28213. A sample of organic matter was collected from Stratum IV, at a depth of 227-247 cm bs. This presumably would date the marsh environment prior to the heaviest peat build-up and the subsequent infilling. The age determination came in at 3310 +/-90 BP, which has a calibrated age range of 1875-1420 BC.

This was a very informative core. The mucky peat and the iron concretions of the lowest stratum (IV) indicate a swampy environment. The possible dolomite may again reflect a lagoon or swamp with some open water, but that is still strongly debatable. The sand particles may represent overwash from an offshore bar or barrier, or perhaps just storm transport from beyond the swamp edge. The overlying peat (III) reflects heavier vegetation cover, as with, perhaps, a marsh with grass mat. Above this there is a diminution of organic matter and the clay sediment probably represents alluviation. The charcoal indicates human activity by this time that probably involved clearing the surrounding slopes for agriculture, which in turn brought a significant increase in slope erosion. A comparatively rapid rate of alluviation--associated with sudden human intervention--would have inhibited the build-up of plant matter necessary for peat development. The fact that it was still a partially aqueous environment is indicated by the iron concretions and possibly the carbonate in the soil. The clay loam of the top stratum (I) is typical valley alluvial-colluvial development and indicates the formation of the valley soil.
In summary, the suggested shift from swamp to marsh environments could reflect a drop of relative sea level. The radiocarbon determination gives a date of 1875-1420 BC for the early swamp, but the lowering of sea level could have been long underway by that time. This would probably place the marsh/peat stage in the first millennium BC or slightly earlier. That would put the onset of human activity perhaps as early as the mid-to-late first millennium BC.

1988 Coring in Pala Lagoon

Pala Lagoon was selected as a coring site for two reasons. First, it is centrally located and thereby would provide a view of the coast between the east and west ends (Fig. 18). If geologic tilting had occurred in the Holocene, this area should show little effect along the coast. Second, if there had been a drop in relative sea level, the mangrove marsh that fringes the shallow lagoon would probably be a good environment for reflecting such a change. No archaeological sites have been reported for the area around the lagoon, but there has not been any survey of the area.

The ground bordering the lagoon to the north and east is Ngerunor Variant mucky peat, which is largely a swampy area with mangrove as the dominant vegetation (USDA 1984). The area lies very near sea level and is often covered with water. The west and south borders of the lagoon have been substantially altered by cutting and filling for residential and industrial development (west) and the Pago Pago Airport (south). Two cores were put in at Pala Lagoon (Fig 20), one on the ocean edge and one farther inland. No soil samples were collected for analysis.

CORE #1

The water's edge was too stony for coring so this core was sunk on the mudflat some 15 m from the shoreline. This location required us to wade into the water and mud, and to core through five centimetres of water. The maximum depth reached was 1.88 m bs.

Stratum I is mucky peat with some calcareous sand grains. Stratum II begins at 0.75 m bs and ends at 1.13 m bs. It is a mucky peat with a high sand content. The organic (plant) content, to a degree, appears in bands of greater and lesser density. Stratum III, at 1.13 to 2.27 m bs, is a loamy sand with some plant material. Stratum IV, from 1.27 to 1.35 m bs, is sand with some plant material, while Stratum V is very coarse sand—with identifiable bits of shell and coral—with no plant matter. The final probe (1.67 -1.88 m bs) was washed out, leaving only traces of sand.

The sand of the lowest stratum (V) probably represents an old bay bottom. The overlying thin layer (IV) of sand with some plant material and the loamy sand (III) represent the beginning of the transformation to a coastal swamp or marsh. By stratum II the swamp environment was established, although the organic bands may reflect fluctuating periods of heavier (possibly drier conditions) and lesser (possibly wetter) vegetation that could correspond to episodes of marine regression and transgression. The top stratum represents the development of swamp conditions similar to those of today.
Figure 20. Coring sites: (a) Pala Lagoon; (b) Leone.
CORE #2

This coring station was at the inland edge of the mucky peat swamp. The main highway runs just north (inland) of the swamp, and some modern houses stand between the road and the swamp. There has probably been some infilling of the inland edge of the swamp for the house and road construction, but, based on the topography, not much of the inner swamp edge has been covered by fill. The first coring attempt hit rock at 0.55 m bs, but the second core was taken to 1.85 m bs.

Stratum I is a six-centimetre thick layer of silty clay. Stratum II, at 0.06-0.26 m bs, is dense peat. From 0.26-0.38 m bs is Stratum III, which is mucky peat with grains of sand. Stratum IV, at 0.38-0.55 m bs, is also a mucky peat, but the sand content is substantially greater than in the overlying stratum. In the next ten centimetres the organic (plant) content dramatically reduces and the sand component becomes dominant; thus, Stratum V is a loamy sand. The next stratum, VI, is very coarse calcareous sand with identifiable bits of shell and coral, and it has a small amount of clay particles and some small bits of plant matter. Stratum VII, which begins at about 1.45 cm bs, consists entirely of coarse sand. Much of the clay and organic material in VI could have simply been carried down in the coring process, so the distinction between VI and VII may be rather artificial.

The lowest stratum (VII) at this coring site demonstrates that a sandy beach formerly stood where there is now mangrove mud. The overlying stratum (VI) reflects the beginning of change as alluvial sediments and plant material were washed in, or that plants started to take hold and terrigenous sediments were being trapped and accumulating. The loamy sand layer (V) represents the transition from open water body to swamp, and the mucky peat layers (IV and III) indicate a swamp, probably mangrove. The dense peat (II) represents a well developed swamp or marsh. The top layer of silty clay probably indicates a recent period of alluviation.

1988 Coring in Leone

Leone was selected for the western coring station because it was an important population center ethnohistorically and, more importantly, it has a sheltered embayment inland of which is an area of mangrove swamp (Ngerungor Variant mucky peat in the USDA (1984) soil survey) where evidence of changing sea level is likely to be found in the buried sediments (Fig. 20). If hypothesis three is correct, there should be evidence of a formerly higher sea level at Leone. Hypothesis 3 would be supported if there is some indication of subsidence, while no evidence of a change in sea level would support hypothesis 1. The coring at Leone could not be undertaken until late in the project and was limited to only one core.

CORE #1

This coring station was established toward the rear (inland) of the swampy zone, and access to the site was through a local resident's yard. I was told that the swampy area used to continue a little farther inland but has been filled for house construction. The ground where the core was placed was low and wet.
Four strata were identified in this core. Stratum I is wet silty clay loam with some iron concretions and extends from the surface to 0.49 m bs. Stratum II is a slightly darker silty clay. At 0.61 m bs, water was encountered and from there to 1.0 m bs only small amounts of sediments could be retrieved with each core. Stratum III is a five centimetre band of sediment transitional between Strata II and IV. Stratum IV extends from 1.05 to 2.08 m bs. It is predominantly a coarse basaltic grit with silty clay that varies in amount. The grit is rather angular indicating that it was not transported or significantly rolled by water action. I suspect that this grit is volcanic ash. From 2.08 m to the end of the core at 2.47 m bs is the silty clay of Stratum V. Other than a two centimetre band at 2.13-2.15 m bs, the basaltic grit is absent from this stratum.

Unfortunately, the one core at Leone is insufficient to provide an adequate basis for testing the hypotheses, and the data retrieved from that core is inconclusive. The lowest stratum (V) may represent a mudflat, estuary, or lagoon (perhaps backbarrier) because of the fine sediments and the absence of substantial plant material. The meaning of the next stratum (IV) is not clear but it seems likely to have been deposited as the result of a volcanic eruption, or perhaps a period of volcanic activity. The small band of grit near the top of Stratum V may mark an early volcanic spurt. Above this is a narrow band of sediment (III) transitional to the next major stratum (II), where the sediments and the scarcity of organic matter again suggest a mudflat, estuary, or lagoon rather than a marsh or mangrove swamp. The soil of the top stratum (I) may represent alluvial deposition, and the iron concretions suggest a regularly wet environment. Thus, this stratum may reflect the infilling of a water body; a process that is not yet complete. Whether Strata V and II represent a backbarrier water body from a time of higher sea level cannot be determined on the basis of available data. Further coring, especially from nearer to the coast, and detailed soils analyses should prove rewarding.

Discussion

At 'Aoa there was clearly a formerly higher relative sea level. From the location of the ceramic site, initial human settlement occurred when either (1) the old embayment was still present, (2) there was a backbarrier water body (lagoon or estuary), or (3) a swamp was developing in the area that is now the valley. The time of that occupation is not clear. Ceramic typology suggests settlement around 2500-2000 years ago, but the recent radiocarbon dates suggest that a more recent date might be more likely. On the basis of evidence from throughout the south Pacific, Clark (1989) has suggested that a eustatic drop in sea level, from a high of one to a few metres above present, may have occurred about 4000-2000 years ago. If this is so, then 'Aoa valley at the time of human settlement (perhaps 2000 BP) was a backbarrier estuary-swamp environment.

Coring at Alao also illustrates a formerly higher relative sea level. The radiocarbon date on the peat layer indicates that the transformation from a swamp to marsh took place sometime since about 3500 years ago, which is consistent with Clark's suggested sea level drop. After a period of marsh existence (peat build-up, there was an onset of marsh infilling that may correlate to human settlement and horticultural activities. That settlement could well correspond with the suggested settlement of 'Aoa.
Coring at Pala Lagoon again demonstrated a change in relative sea level. The area that is now the inland edge of a mangrove swamp was at one time a sandy ocean bottom, probably near the shoreline. The area has changed from an open embayment to a swamp, and the mangrove mudflat has prograded substantially. The timing and cause of this change in coastal geomorphology are unknown, but the occurrence of substantial change is significant.

Little can be said for Leone where the core sediments suggest that the area has long been swampy. However, at some times it may have been a more open environment, such as a mudflat, a backbarrier estuary, or a lagoon. It is simply not clear whether there is evidence here of a change in relative sea level.

As it was initially stated, the hypothesis (#1) of geomorphological change at 'Aoa due to local environmental conditions and the onset of human activities—particularly farming the slopes—must be rejected because of the data from Alao and Pala Lagoon. A reformulated hypothesis, however, is still viable: human settlement, and the initiation of horticultural activities, consistently brought about accelerated erosion, colluvial-alluvial deposition along the coasts, and prograding shoreline or infilling of coastal swamps and lagoons. This hypothesis shifts away from a unique occurrence at 'Aoa to a broad pattern of change, while still keeping the focus on human actions. The hypothesis is supported by the evidence from 'Aoa and probably from Alao. It is also consistent with the evidence of change from Pala Lagoon, however there is no indication of human action there. The absence of charcoal may reflect our failure to see it in the core sediments; alternatively, it may indicate that the geomorphological change was unrelated to human activity. The same is true for the Leone sediments, although there the evidence of sea level change is rather weak.

The geologic tilting hypothesis (#2) is substantially weakened by the coring data. The geomorphological changes at Pala Lagoon reflect a drop in relative sea level affecting the central portion of the island, which should be beyond the area of uplift by tilting. However, that change in relative sea level may be due to local dynamics rather than an island-wide process. The evidence from Leone is ambiguous, but there is no indication of submergence of the west end of the island.

The hypothesized island-wide drop in relative sea level (#3) is supported by the evidence from 'Aoa, Alao, and Pala Lagoon, especially with possible contemporaneity of the change at 'Aoa and Alao. Furthermore, at all three locations the magnitude of the drop is comparatively slight, as a lowering of 1 to 2 m could probably account for the change. The hypothesis is weakened by the absence of supporting data from Leone, but not refuted because of the uncertainty regarding the meaning of the Leone sediments.

In summary, the limited coring undertaken in 1988 was not sufficient to allow us yet to unambiguously choose one of the stated hypotheses over the others. It is clear, however, that significant shoreline changes have taken place around the island. Furthermore, there is no doubt that human actions were significant factors in bringing about those changes at some locations. The question that remains is whether human actions constituted the only variable responsible for coastal changes, or was just one factor.
ARTIFACTS

Relatively few artifacts were collected during this project. Naturally, all artifacts recovered during the limited excavation were saved for analysis. During survey, complete adzes were always collected, as were isolated finds. At sites where numerous artifacts were present, however, only a sample of preforms, adze fragments, flake tools, and, rarely, waste flakes were collected. There are two reasons for this approach to collection. First, haphazard surface collections of artifacts—other than complete adzes and pottery—can provide very little meaningful information about a site. Should excavations ever be carried out at the site, on the other hand, information on the distribution of surface materials could prove useful. Second, the survey process involved long excursions over inland ridgetops that sometimes presented difficult passage due to vegetation, and often required difficult climbs up and down steep slopes. Walking all day under those conditions and carrying packs filled with rocks collected from sites was simply not practical.

A listing of all artifacts recovered or examined (the collections of Togia and Stevens) is given in Table 4. The majority of artifacts, of course, are of basalt. The pottery sherds and volcanic glass pieces all came from site 21-5, and all of the latter group was collected during excavation.

Basalt

Throughout the Pacific, basalt is the single most important stone for tool making. Adzes are the most most common, most studied, and most informative of the stone tools, but a variety of other tools are also produced in basalt. Unfortunately, studies of basalt tools other than adzes have been too few and there is still much to learn about prehistoric basalt use.

Most of the tools and flakes collected in Eastern Tutuila have a light gray weathered exterior but when broken reveal an interior that is darker in color. The actual color range of the unweathered basalt is from medium gray to dark gray, with the darkest pieces generally appearing to be more fine-grained than the lighter colored rock.

In 1986, a preliminary petrographic study was run on six rock samples that indicated that they were all non-andesitic. As part of the 1988 project, an additional set of 12 to 14 samples are undergoing geochemical and petrographic analyses by Beth Wright of the Department of Geological Science at The University of Illinois at Chicago. Wright is also carrying out geochemical analyses of a small set of volcanic glass samples. The results of that work are not yet available but will be presented at a later date. In addition to Wright's analyses, four pieces of basalt were sent to William Ayers of the University of Oregon and a few additional flakes were given to Simon Best of the University of Auckland. Both of these archaeologists have carried out research on Tutuila and they will conduct independent analyses of the basalt samples by different techniques. The result will be slightly different data sets that can be compared with Wright's data.
### Table 4. Listing of artifacts collected and examined from Eastern Tutuila.

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<th>Site/Locality</th>
<th>Adzes (whole &amp; fragments)</th>
<th>Preforms</th>
<th>Chisels</th>
<th>Scrapers</th>
<th>Modified adze or preform (scraper/chisel)</th>
<th>Other Tool Classes</th>
<th>Unique Tools</th>
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ADZES

Green and Davidson (1969b) modified an earlier classification of Buck (1930) to produce what is now the standard typology for Samoan adzes. Following that typology, 31 adzes and adze fragments collected or examined (from the collections of Togia and Stevens) during this project could be typed but six of these had been modified after breaking to create another tool. An additional 11 adze fragments could not be classified because they lacked diagnostic characteristics. There were also 51 preforms (incomplete implements, lacking any grinding) that ranged from very early stages of reduction to specimens that were fully flaked but remained to be ground; three of these specimens had been modified to make another tool. The distribution by site of classifiable adzes is given in Table 5 and the distribution of unclassifiable adzes and preforms is given in Table 6. Illustrations of some of these tools are provided in Figures 21-26.

As can be seen in Table 5, Types I, II, III, VII, IX, and X are represented, with Type I the most common category at over 48% of the total collection. Also listed in Table 5 are the adzes found in 1986. These collections are broadly similar, with the greatest difference in the absence of Types IV, V, and, especially, VI adzes from the 1986 collection and the absence of any type IX and X specimens from the 1986 group. Over all, there is a high representation of Types I and III, followed by II and VI, and minimal representation IV, V, VII, IX, and X (Type VIII adzes have not yet been found). This representation of adze types is quite comparable to Frost's (1978:150) collection from Tualauta, and the entire adze collection from Eastern Tutuila is broadly consistent with the adze collections from Western Samoa (Green and Davidson 1969b; Hewitt 1980b).

CHISELS

In Buck's (1930:364-67) early discussion of Samoan material culture, he identified the stone chisel, or "tofi," as a long narrow implement, although "no accurate information could be obtained as to how they were hafted, or whether a mallet was used" (Buck 1930:364). He further observed that Samoans used metal chisels hafted as adzes. Buck suggested that Samoan tofi were "probably hafted as adzes, and such as might have been hafted in the same axis as the haft were used with pressure and not with a mallet," and longer examples "were probably used with pressure without hafting" (Buck 1930:364). Earlier, Kramer also noted chisels--along with axes--as Samoan tools.

Moreover the Samoans not only had an adze with a horizontal blade but also a hatchet form (to'ifafao, Pratt), indeed according to my informants, special axes, called to'isali, which could be set vertically or horizontally as needed, such as are known to exist f.f.i. [sic] on Ellis Island. They also constructed chisel-form instruments (to'itu'i, Pratt) with handles (va'ai, Pratt) according to the position and fineness of the wood to be worked [Kramer 1902-03:206; translation by Verhaaren 1978, vol. II:264].

Green and Davidson (1969b:32) later eliminated the category of chisel because there was no way of knowing how tools that physically fit Buck's category were actually used. Following the ETAP 1985 work, however, I felt it useful to revive the category of chisel for classifying artifacts. I defined
Table 5. Distribution of classifiable adzes and adze fragments.

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<td>1986</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>26</td>
<td>6</td>
</tr>
</tbody>
</table>

* Modified to make a scraper  
** Two of these modified to make scrapers
Table 6. Distribution of unclassifiable adze fragments and preforms.

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<th>Site/Locality</th>
<th>Polished Fragments</th>
<th>Preforms</th>
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<td></td>
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</tr>
<tr>
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<td>AS-21-3/2</td>
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<td>AS-21-100</td>
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<td>AS-21-110</td>
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<tr>
<td>TOTALS</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

*One preform modified to make a scraper or chisel.
Figure 21. Basalt artifacts from site AS-21-2, Lefutu Ridge:
(a) bevel fragment of adze; (b) adze (probably Type I)
modified to make a scraper; (c-d) Class Ia flake tools;
(e) preform fragment (fully flaked in Type I form but no
ground surfaces on this piece); (f) adze (Type I) modified
to make scraper; (g) preform modified to make scraper (top
edge); (h) adze (Type III) modified to make scraper; (i)
hammerstone (note slight depression about one-third on the
way in from right end; also noted that right end is flattened
from battering).
Figure 22. Basalt artifacts from site AS-21-69, Maupua Coast:
(a) triangular preform fragment; (b) preform; (c) possible chisel with cleaver-like blade and damage on upper left point; (d) Class Ia flake tool; (e-f) Type I adzes; (g) preform fragment; (h) Class Ib flake tool.
Figure 23. Basalt artifacts from site AS-21-110, Quarry at Le'acme: (a and f) preform fragments; (b-c) flakes; (d-e) preforms.
Figure 24. Basalt artifacts from site AS-22-21, Maugaele Ridge:
(a) adze (Type III) modified to make chisel (note damage at poll, which is possible from pounding) or scraper; (b) Class Ia flake tool; (c) Class IV flake tool (modified along curving edge on left half); (d) Type VII adze fragment; (e) triangular preform fragment; (f) Type I adze fragment.
Figure 25. Basalt artifacts from site AS-22-3t, Asiapa Quarry: (a-b and e-g) preforms; (c-d) flakes.
Figure 26. Basalt artifacts from different sites: (a) Class Ia flake tool, AS-21-95; (b) possible chisel, AS-21-75; (c) Class Ib flake tool, AS-21-86; (d) very large scraper or preform, AS-22-25.
chisel, however, slightly differently from Buck [Clark and Herdrich 1988:92, 99]. Chisels are comparatively thin and narrow, rather crudely made although there may be some polish, and have a slightly bevelled cutting edge. Both bevelled surfaces are relatively short (one may be more so than the other) and the bevels tend to be crudely flaked and not polished. I would also employ the traditional definition of a chisel as a tool whose working power was supplied by a mallet or by pressure.

In 1986, four tools were classified as chisels. From the 1988 investigation, four additional specimens were classified as possible chisels. The two specimens from 21-98 resemble preforms, but both have blade ends with damage that appears to be from use. On one of these the blade edge is slightly concave in shape suggesting use more similar to that of a gouge. The specimen from 21-75 (Fig. 26b) is similar to the implements from 21-98. The tool from 21-69 has some battering on the poll suggesting hammer blows. The blade of that implement is at an angle, forming a cleaver-like edge, with the distal end-point blunted from use (Fig. 22c). This damage suggests use as a chisel or gouge. Some of the tools classified as modified adzes or preforms may have served as chisels as well.

FLAKE TOOLS

Clark and Herdrich (1988:99-110) observed that the artifact collections from eastern Tutuila indicated extensive use of flake tools. This provided a contrast with the comparatively minor use of flake tools in Upolu (e.g., Green and Davidson 1969a, 1974a; Jennings et al. 1976; Jennings et al. 1980). Flake tools can be identified on the basis of edge modification from retouch or from use wear; the former can be seen macroscopically but the latter may require microscopic examination.

In a discussion of artifacts collected in 1986, I presented a preliminary classification of flake tools (Clark and Herdrich 1988:99-105). Ten classes of tools were defined in that system, and those classes were regarded as representing formal tool types rather than informal, ad hoc, flake tools. Flake tools are not as common in the 1988 collection, so only the most numerous type, Class I, are indicated as a separate category (scrapers) in Table 4. Only three of the ten classes are represented in the 1988 collection. This smaller representation of flake tools largely reflects the surface collection strategy discussed above. The observation of Clark and Herdrich of heavy flake tool use in Tutuila is still valid.

Eleven artifacts are Class I tools, which are scrapers. This class was divided into two subclasses based on form: Ia forms are horseshoe-shaped (or expanding) and Ib forms are U-shaped (parallel). The working edges are flaked to create comparatively steep-angled, unifacial edges. The dorsal surface has flake scars but rarely the ventral surface, and the cross-section is trapezoidal to rectangular. Buck (1930:367) referred to tools of this type as "coconut graters" (tual ma'a) (1930:367). Class I scrapers have been found in Western Samoa but are far more common in Tutuila (see Clark and Herdrich 1988:101-102). In the ETAP 1988 sample, seven of the specimens are of the Ia variety and four are Ib. One of the la examples (site 22-21) appears to have been made from a flake off of an adze since there is polish on the top surface and on the striking platform (Fig. 24b).
One of the ten flake tools (site 22-21) was a Class IV specimen (Fig. 24c). This is a fully rounded flake with modification to create a slightly steepened edge by chipping along the dorsal surface. Slicing or scraping uses seem likely for such tools.

One tool (site 21-6) is broadly similar to Class V implements in that it has a blunted back (Fig. 27a). However, it is made from a pebble rather than a flake and has a straight rather than curved edge for slicing or chopping. The back and sides of this tool still have cortex.

Two of the tools from 1988 fall into the Class VII category: one of these was collected by Togia from 21-6 (Fig. 27b) and the other was found at 21-92. These are large, elongated, prismatic flakes, trapezoidal or triangular in cross-section, with the lateral edges showing use damage. The type of use for which they were employed was probably heavy slicing or light chopping, but scraping may also have been done with them.

MODIFIED ADZES

In addition to the flake tool scrapers, there are nine implements that were made by modifying broken adzes (seven) or preforms (two). The new tools appear to be modifications to make scrapers, although some specimens could also have been used as chisels. This type of tool has not been given much attention, although other examples of adzes modified to scrapers have been reported by from Western Samoa (Buck 1930:368; Ishizuki 1974:54) as well as American Samoa (Emory and Sinoto 1965). A preform modified to make a scraper was reported by Clark and Herdrich (1988) for site 21-41.

Of the nine tools listed in this category, four come from site 21-2 (Lefutu): two from a Type I adze, one from a Type III adze, and one from a preform (Fig. 21). The latter tool has a bulge on what presumably was to be the back surface, but it is clear that the removal of the bulge would have been difficult, at best. This problem in the final flaking of the implement may have brought the shift to scraper use by modifying the blade—the bevel angle was steepened and the blade edge minutely chipped. Two examples are from 21-5, Locality 15—both from Type I adzes—and one is from Locality 3 (an untyped adze). Another specimen was found at 21-6 (from a preform). A specimen from site 22-21 (Fig. 24a) is a modified Type III adze that has damage at the poll that may have resulted from pounding, and the working edge is rather rough with flake scars suggestive of heavy use. This implement may have been used as a chisel as well as (or perhaps instead of) a scraper.

UNIQUE TOOLS

Two unique tool specimens were found that do not fit into any of the defined categories. At first glance, one of these tools looks to be a trapezoidal preform that still has a surface predominantly of cortex (Fig. 26d). With closer inspection, however, one end is much too steep to form a bevel and it has edge damage that suggests scraper use. Thus, this may have been an enormous scraper for a specific task. The other implement (from 21-6) is the mid-section of a trapezoidal tool with polish on one surface. It was thick, narrow, and probably long. This shape simply does not seem appropriate for an adze, although it may have been suitable for a chisel. I have never
Figure 27. Basalt tools: (a) pebble tool from AS-21-6, cortex over most of tool surface; (b) Class VII tool from AS-21-6.
seen a form quite like this and can therefore only classify it as a unique specimen.

**HAMMERSTONES**

One example of a hammerstone was collected from site 21-2 (Fig. 211). It is a long, narrow, waterworn piece of slightly vesicular basalt. It has a slight curve at one end giving it a banana-like appearance. There is battering at both ends, but that on the short end is most pronounced. On one side, near the short end, is a slight depression that is perfectly suited for the thumb when held in the right hand.

**BASALT WASTE FLAKES**

Waste flakes, or debitage, are fairly common at sites in Eastern Tutuila but are comparatively rare on Upolu. This difference may to some degree reflect the fact that many past researchers in Samoa have not screened excavation soils (Clark and Herdich 1988:110, 118, 121). At the same time, the abundance of basalt tools in Tutuila relative to Upolu clearly indicates that less basalt tool making was being on Upolu.

Three types of waste flakes were distinguished in the artifact analysis. These are primary decortication flakes, which have cortex on the entire dorsal surface, secondary decortication flakes, which have cortex on only part of the dorsal surface, and reduction flakes that have no cortex. Both primary and secondary decortication flakes represent early stages in the tool manufacturing process.

Not surprisingly, flakes observed and collected at the quarry sites tended to be large and often were cortical. The comparative scarcity of small flakes at these sites indicates that the early roughling out of preforms was being carried out there but the final shaping was done elsewhere. The clear majority of the flakes recovered from excavation at 21-5 were reduction flakes, as was the case in the previous investigation of the site (Clark and Herdich 1988:112-118).

**Volcanic Glass**

The first volcanic glass found in American Samoa was reported by Clark and Herdich (1988) from site A6-21-5. Archaeological data from Western Samoa led Green (in Terrell 1969:168) to the observation that volcanic glass (sometimes referred to as obsidian) in appreciable quantities occurs only in association with pottery, and its use declines over time as thick-walled coarse-tempered pottery is displaced by thin-walled, fine-tempered pottery (Green 1974a:148). Eventually, use of both pottery and volcanic glass ceases completely in Samoa. This pattern appeared to hold at 21-5 in 1986 and is seen again in the 1988 collection.

Excavations at 21-5 in 1986 yielded 28 pieces of volcanic glass (Table 2). Of those, 25 were flakes or chips and 3 were probable cores. The more limited digging in 1988 produced another 9 pieces, all flakes and chips except for one small, flaked chunk that looks to have been a piece of a core. All of the
pieces are very small--as is the case throughout Samoa--and some are very tiny chips, the retrieval of which was made possible by the water and fine-screening process (Fig. 28). No edge damage could be discerned on any of the pieces. Elemental analysis of glass recovered in 1986 is underway by Beth Wright.

Pottery

From the analyses of ceramic collections from several sites in Upolu, Green (1974b:250) proposed that Samoan Plain Ware developed out of decorated Lapita Ware. That development was characterized by a disappearance of body decoration and a restriction of vessel form to simple bowls of various sizes (Green 1974b:249). The Plain Ware continued to developed "from a predominantly thin, fine ware variety...to a thick, coarse ware pottery" (Green 1974b:250). According to Green, the transition from thin-walled, fine-tempered pottery to thick-walled, coarse-tempered pottery was largely complete by the first century AD, and by AD 200 to perhaps AD 600 pottery use had ceased in Samoa (Green 1974b:248). Unfortunately, the distinction between the two types of plain ware is not always easy to make. Thus, Clark and Herdrich (1988:122-125) referred to some of the sherds in the 1986 collection as 'medium thick' and 'medium tempered.'

Clark and Herdrich (1988:122-125) reported that the 1986 ceramic collection from 21-5 consisted of 119 sherds, most (105) from Locality 2 and others from Localities 3 (5 sherds) and 4 (9 sherds). The rim sherds (11) and the shapes of the body sherds corresponded with simple bowl shapes of various sizes. None of the sherds showed any decoration other than possibly a slip on two (possibly more) sherds and clay floating or wet smoothing of several sherds. The sherds were mostly thin and fine tempered, with a small number of thick and coarse sherds, even fewer thin and coarse-tempered sherds, and some thick and fine- to medium-tempered pieces. Also, there is no sharp difference between the two categories of plain ware; the thin fine-tempered ware grades into the thick coarse ware, although intermediate sherds are not common.

In 1988, a total of 27 sherds from site site AS-21-5 were examined by the author, and their distribution and type are presented in Table 7. Four sherds were recovered from the excavation unit at Locality 2, and another 24 sherds in the collections of Togia and Stevens from several locations in 21-5 were examined and described (Figs. 29, 30, and 31).

Of the excavation sherds (Locality 2), two are thick and coarse tempered and two are thin and fine-tempered, although one of those is on the thin side of the thin range. The sherd recovered from Feature 1 may have been there due to secondary deposition and therefore would not represent pottery use at the time of layer deposition. The one sherd from Layer V may also be out of place. In 1986, cleaning of the stream bank produced one sherd that appeared to come from Layer V and another from Layer VI. So, it was thought that both layers dated to the ceramic period. In 1988, however, only one additional sherd and no volcanic glass were found in Layer V, while a smaller excavation area of Layer VI yielded two sherds and nine pieces of glass. This suggests, then, that Layer V (and VI) may in fact be post-ceramic.
Figure 28. Volcanic glass artifacts from site AS-21-5, Locality 2, Stream Bank Unit, Layer VI. Specimen in lower right is piece of small core.
Table 7. Distribution and type of pottery sherds recovered from site AS-21-5 in 1988.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Thick Rim</th>
<th>Coarse Rim</th>
<th>Thin Body</th>
<th>Fine Body</th>
<th>Thick Rim</th>
<th>Coarse Rim</th>
<th>Thin Body</th>
<th>Fine Body</th>
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<td>27</td>
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</table>
Figure 29. Selected pottery sherds from site AS-21-5; (a-b) thin fine-tempered sherds from Locality 16; (c) thin fine-tempered sherd from Locality 2, Stream Bank Unit, Layer VI; (d) medium thickness coarse-tempered rim sherd from between Localities 3 and 4; (e) thick coarse-tempered sherd from between Localities 3 and 4; (f) thick coarse-tempered sherd from Locality 2, Stream Bank Unit, Feature 1.
Figure 30. Profiles of coarse-tempered sherds; top two rows rim sherds, bottom row body sherds: (a, b, f, k) Locality 3; (c, h, i) between Localities 3 & 4; (d, e) Locality 15; (g, l) malae; (j) between Localities 3 & 15.
Figure 31. Outlines of fine-tempered body sherds: (a, b, c, h) Locality 3; (d, e, f, g) Locality 16.
Of the surface collection sherds, 13 are thick coarse-tempered pieces, 7 are thin fine tempered specimens, and 3 are thin and coarse tempered. The fact that the majority of these sherds are of the thick coarse-tempered variety could be due to two causes. First, the collections could simply reflect collector bias. Since the thick coarse sherds tend to be larger than the thin fine sherds, they are more readily seen and collected. Second, the locations of sherd recovery could have been where vessels of the type represented by the sherds were more commonly used. That could reflect either different activity areas (with the thick coarse-tempered vessels serving functions related to activities carried out at those locations), or different times of occupation of the site localities, with Locality 2 (where thin fine-tempered sherds were dominant in 1986) occupied earlier than the localities producing thick coarse sherds (following Green’s typological sequence).

As with the 1986 assemblage, no surface decoration is present on any of the sherds. The vessel shapes were probably bowls of different sizes, although one sherd (coarse but not very thick) has an angle (Fig. 30h) similar to Green's (1974a:119, Fig. 57c) Category II bowl. Seven specimens are rim sherds (Fig. 30a-g): five are thick and coarse-tempered and two are comparatively thin and coarse tempered (Fig. 29d). Three of these have broadly expanding lips, two have expanding lips, one has parallel sides, and one has a slightly narrowed lip.

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CHRONOLOGY

Artifact typologies have long provided indicators of site age. The most useful artifact class for chronological assessment in Western Polynesia is pottery. Clark and Herdrich (1988:122-125) compared the 1986 'Aoa assemblage with pottery collections from Western Samoa and Manu'a. They noted that the high occurrence of comparatively thin fine-tempered sherds, along with the presence of some thick coarse-tempered sherds, suggested that the initial occupation of AS-21-5 was likely to date to the first half of the first millennium BC.

The lack of chronometric dates for 21-5 prompted the search for datable organic remains at the site in 1988. The result was the submission of three charcoal samples for radiometric determinations. A fourth radiocarbon measurement was made on a sample of plant material (peat) collected from core C-9 at Alao. The samples were submitted to Beta Analytic Inc., and Table 8 presents the data on the samples and their calibrated ages (2 sigma). The radiocarbon years (at half-life 5568 years) were calibrated according to Stuiver and Pearson (1986).

The ages indicated for 21-5 are somewhat puzzling. The suggested date for Layer II, Feature 1, is consistent with expectations, which is to say late prehistoric. Surprisingly, however, that date is indistinguishable from that from Layer Va, and, statistically, not much different from even Layer V, Feature 9. It may be that Layer II actually falls at the recent end of the range and the Layer Va and Feature 9 dates fall at the earlier end of their ranges. Even so, this gives a surprisingly late date for Layer V, at about AD 1850. Layer V overlies the pottery-bearing Layer VI, which was expected to be about 2600 years old. If the dates indicated are correct, Layer Va in the Stream Bank Unit is unlikely to correspond with Layer II in unit 7S,2E as was suggested. If the layers do correspond, however, it would indicate that pottery use continued much longer in American Samoa than was suggested by Green (1974b) for Western Samoa. Even if Layer V is aceramic, the dates suggest pottery use at 'Aoa until the fifteenth to seventeenth centuries rather than the third to seventh centuries as argued by Green.

The possibility that the Layer V and Feature 9 dates are in error was discussed with Murray Tamers of Beta Analytic, and was determined to be highly unlikely. Both samples were large (see Table 8) and consisted of large pieces of wood charcoal, and the Feature 9 sample was from a fireplace. Isotopic fractionation is unlikely to be a factor, and in any case would not cause a difference of more than about 50 years. Nevertheless, I suppose it remains a possibility that for some reason, one or two of the dates are somehow in error. If that is the case, then the Feature 9 date and perhaps the Layer Va date could be too late.

The single radiocarbon date for the peat layer of Core #9 at Alao indicates a marshy environment at that locale some 3300-3700 years ago. There is no reason to suggest that the radiocarbon age is not accurate.

Even with the radiocarbon dates, the age of the earliest occupation of the site (the bottom of Layer VI, or perhaps lower) is still unknown. It may yet
prove to be as early as suggested by Clark and Herdrich. If the date for Layer V proves to be accurate, however, that would suggest that initial occupation may have been more recent. At this point, I suspect that the radiocarbon assessment is too recent—even though Layer V may well be aceramic—and that 'Aoa was first occupied at least 2000 years ago. What is needed, however, is a re-examination of ceramic sites and associated dates, and a re-assessment of the timing of the abandonment of pottery in Samoa.
Table 8. Radiocarbon samples and calibrated ages. Calibration according to Stuiver and Pearson (1986), at 2 sigma.

<table>
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<th>Unit</th>
<th>Layer</th>
<th>Depth (cm bs)</th>
<th>Material</th>
<th>Weight (gr)</th>
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<th>Calibrated Age (2 sigma)</th>
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<td>Stream Bank</td>
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<td>113-123</td>
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<td>330 +/- 40</td>
<td>AD 1453-1651</td>
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<td>AS-21-5</td>
<td>Stream Bank</td>
<td>Va</td>
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<td>Charcoal</td>
<td>29.0</td>
<td>350 +/- 50</td>
<td>AD 1440-1650</td>
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<td>170 +/- 40</td>
<td>AD 1650-1955</td>
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<tr>
<td>Beta-28213</td>
<td>Also</td>
<td>Core #9</td>
<td>Core</td>
<td>IV</td>
<td>227-247</td>
<td>Peat</td>
<td>23.1</td>
<td>3310 +/- 90</td>
<td>1875 BC-1420 BC</td>
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</tbody>
</table>
DISCUSSION

This section of the report constitutes a preliminary discussion of the major categories of sites found in the study area. With the completion of the Eastern Tutuila Archaeological Project of 1988, a substantial body of data has been collected relating to Samoan settlement systems. While some observations are offered here, continued study of these data, especially in conjunction with data gathered by other researchers working in the islands, will bring new understandings of Samoan prehistory.

Residential Sites

Today, the population of Tutuila is concentrated in villages along the coast. This has probably always been the case. Davidson (1969a) has written that prior to the early historic period, the Samoan settlement pattern was much more dispersed, with extensive inland settlements. Although that appears to be the case in Western Samoa, it does not hold for American Samoa where the terrain inhibits inland settlement. The eastern islands are much smaller than their western neighbors, and generally lack gentle tablelands and large valleys. In Western Tutuila there may yet prove to be substantial prehistoric inland occupation in Tafuna Plain and valleys inland of the plain, but elsewhere the topography largely precludes much inland settlement. At 'Aoa there is archaeological evidence of rather dispersed occupation of the lower and middle valley areas, with a later shift to the nucleated village areas still occupied today. But even when the settlement was dispersed, the valley is so small that the houses farthest from the coast were still effectively coastal.

At a few locations in the study area there are isolated inland house sites, but all of those are probably historic, if not quite recent. There are also some places where there is a small cluster of house sites, for example at 22-21, but those sites are very few in number, they were occupied by small groups of people, and they may not have been permanent occupation sites. There is only one substantial inland settlement, Lefutu, on the ridgetops in East Vaifanua and Sa'ole. Since all but the very small ridgetops have been surveyed in these counties, I am quite certain that no other sites of this type exist in the region. It is still not known with certainty what the Lefutu site represents, but I think the best assessment is that it was a permanently occupied inland settlement rather than a seasonal occupation site or a temporary refuge site (the least likely possibility).

Beyond East Vaifanua and Sa'ole, only two other inland, ridgetop settlement sites (both in Eastern Tutuila) have been verified by archaeologists; these are Mt. Alava Ridge (88-25-1) and Fa'iga Ridge (Old Vatia) (88-24-2). Frost (1978) argued that Mt. Alava Ridge was a refuge site, but that assessment is questionable. Access to the site is difficult and the ridgetop narrow, but Frost reported no unquestionably defensive features, only two natural ravines that "appeared to have been modified by additional ditching and banking efforts" (Frost 1978:77). Kikuchi (1963) initially reported the site (as Pago Pago) and his informants indicated a larger area and more features than described by Frost. He also reported a series of defensive ditches along the ridgetop, but apparently not in the immediate vicinity of the
residential site (1963:68). Kikuchi (1963:43) also reported that an informant told him that the village had been abandoned for six or seven generations. Frost (1978:206) reported radiocarbon dates of 380 \(+/-80\) and 90 \(+/-80\) for lower and higher charcoal samples, respectively. These dates, together with the presence of both prehistoric and historic materials at the site, and the informant information of Kikuchi, indicate that the site was occupied in the late prehistoric and early historic periods.

The Fa'iga Ridge site was initially reported by Kikuchi (1963:43) as Old Vatia, and was listed and given a site number by Clark (1980). It was not examined first hand, however, until 1986 when Clark and Herdrich (1988:16-19) visited and described the site. The site is on Fa'iga Ridge, between Vatia Bay and Tafeu Cove, and at an elevation range of about 152-244 m (500-800 ft). The site consists of at least 30 surface features, including at least 23 house foundations and a possible religious feature (a floor of coral slabs). These foundations are large and well made, and no defensive features were found in the reconnaissance survey of the site.

As I argued above for Leleu (21-2), the evidence for a refuge/defensive function for these sites is weak, and both are likely to have been inland villages or perhaps seasonal occupation areas associated with pigeon catching activities. Further investigation is necessary before the nature of all three of these sites can be determined with satisfaction. At this point, I suspect that all are inland settlements. In any case, it is clear that prehistorically—as is the case today—there was comparatively little permanent settlement of inland areas in Eastern Tutuila.

Data collected from site AS-21-5 indicate that eastern Tutuila was probably settled by 2000 BP, possibly earlier. That assessment is based on pottery typology, however, and may be too early. Other locations probably were settled at around the same time, although evidence of those settlements is not yet available. The evidence of changing coastal geomorphology, as revealed through coring, is instructive in this regard. Early sites, as at AS-21-5 in 'Aoa, may well be located along ancient shorelines that are inland of the existing shore, and are probably buried under alluvium. The change in relative sea level could be due to (1) a drop in sea level from a previous high; (2) prograding shoreline caused by alluviation brought on by human cultivation of valley slopes; or (3) geological tilting or uplift of the island. Regardless of the cause of the change in relative sea level, the effect of that change must be taken into consideration when searching for early settlement sites.

Terraces

As in 1986, the survey of 1988 was largely on the ridgetops with little coverage given to the ridge slopes. The investigations that did take place on the slopes in both seasons revealed that most sections of the ridge slopes lacked structural features, but in some areas, especially in the vicinity of coastal valleys, there are areas with numerous structures. Those features are predominantly old terraces formed by arcing rows of boulders. Terraces were also found occasionally on the ridgetops.

The majority of terraces lack clear evidence of residential activity, but a few have some 'iili ili scatters indicative of house floors, or scatters of
basalt artifacts, or both. Fale o’o are likely not to leave identifiable surface remains other than perhaps some basalt tools (more likely broken tools) or debitage (from reworking tools), but such items may also be present at purely agricultural terraces. Since agricultural terracing was seldom practiced in Samoa, and the terraces present are individual structural features rather terracing systems, it does not seem likely that many of the terraces found were for cultivation services. Thus, in most cases, especially on the ridge slopes, terraces were probably the sites of work and/or rest associated with the cultivation of the ridges. Where small clusters of terraces were found they may have been malolaga—places where parties traveling overland rested, or where groups cut for pigeon catching stayed while engaged in the activity. In some cases—i.e., at the defensive complexes of 21-51 and 21-110—terrace were defensive features, and some may have served dual roles as temporary occupation sites and defensive features.

**Tia ‘Ave**

Prior to 1986, nine tia ‘ave had been reported for American Samoa, all from the Tafuna Plain of Tutuila (Frost 1978; Clark 1980). As a result of the 1986 survey of Clark and Herdrich (1988), sixteen other tia were reported. In 1988, an additional 46 tia were located, bringing the total in eastern Tutuila to 62, and on the entire island to 71. The combined data from 1986 and 1988 reveal patterns in the distribution and construction of tia ‘ave, and the discussion that follows deals with the Eastern Tutuila structures only, unless otherwise specified. A listing of tia ‘ave sites and selected characteristics is given in Table 9.

The first point to make is that the tia ‘ave are not evenly distributed in the counties. Thirty-seven tia are in East Vaifanua, nineteen are in Sa’ole, and 6 are in Sua. While East Vaifanua is a little larger than Sa’ole, this size differential cannot account for the occurrence of nearly twice the number of tia ‘ave in the former county. The survey coverage in the two valleys was comparable so that is not a factor, either. I suspect that the reason lies in the population sizes of the two areas, with East Vaifanua supporting a larger and more evenly distributed population. Very little of Sua has been surveyed thus far, but given the presence of six tia in the small area examined, it seems quite probable that Sua also contains a large number of these sites.

There is a clear pattern in the placement of tia ‘ave on peaks and prominent points of ridgetops. This pattern is so dominant that one can predict with very high success where such sites will be found on the basis of topography; one can look at a ridgeline on the horizon or study the DPW contour maps and pick out the locations at which tia ‘ave are probably present. This is so for the counties surveyed and there is no reason to believe that the same pattern will not hold for the other counties of Tutuila.

A critical defining characteristic of tia ‘ave is the presence of at least one ray, or projection. In the vast majority of cases, the number of rays is five to eleven, with no structure having more than eleven rays. In many instances, the precise number of rays could not be determined because (1) the vegetation on and around the structure was very dense and complete clearing was not possible due to time constraints, (2) in some cases it was not clear whether a bulge along the side or end of a tia was a ray or was created by
Table 9. Characteristics of tia 'ave in East Vai'ana'a, Sa'ole, and Sua Counties.

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*Denotes most likely number of rays
Table 9 (continued). Characteristics of tīa ‘ave in East Vaifanua, Sā'ole, and Sua Counties.

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*Denotes most likely number of rays.
disturbance from tree growth, (3) the tiia sides are frequently along the edge of the ridgetop and the side rays are often slumping down the slope so that it is not clear if rays are present at some spots, (4) many of the mounds are very low (20-30 cm high) and some rays lack boulder facing, so erosion has precluded definite identifications of rays, and (5) a few tiia have been altered by post-abandonment disturbances.

The construction of the tiia 'ave is rather consistent in the use of earthen fill and rock facings around the rays. In many cases, the construction technique appears to have been simply to build up a series of rays along the edge of a ridgetop and add very little earthen fill, so that the interior of the tiia is simply ridgetop. In just a few cases, the ridgetop upslope of a tiia is comparatively steep, and it looks as if there may have been some cut-and-fill construction (cutting upslope and filling downslope). The heights of the structures vary from 0.2 m to 3.0 m, with most tiia at less than a metre high. On a single structure, however, height is variable; the rays along the ridgetop sides and the downslope end may be high while the upslope end is very low or at ground surface. This construction technique is similar to that reported by Davidson for ridgetop tiia 'ave on Upolu (1974a).

For the majority of tiia 'ave the rays have a facing of basalt boulders, from one to several courses high. In many cases very few rocks are actually present and they appear to be little more than a token presence. In other instances the rays are high and bounded by several courses of well stacked boulders. In still other examples, the rays are composed almost entirely stacked rock, although the central mound is still earthen. On the same structure, some rays may have well-made rock facings and other rays have only a few rocks present. For five tiia the rays are entirely soil with no rock facing. I suspect that the differences have a lot to do with the local availability of rocks.

At seven structures, chunks of coral were present in the facing. In some cases (21-66, 21-79) only a few coral chunks were used, in one instance there was a mix of coral and basalt (21-56), in two cases (21-72, 21-77) the facing was predominantly coral with some basalt, and one tiia (21-73) was faced entirely with coral. The coral used in the facings was usually in large slabs (or plates), especially at those structures where coral was the predominant or sole facing material. At 21-73, for example, one coral slab was 70 cm long, 60 cm wide, and extremely heavy. Tremendous effort was required to carry the coral up the ridgetop from the coast. All of the tiia 'ave with coral in the facings are in East Vaianua, and the structures with most or all coral are all on the same ridge—i.e., Vaimumu (Motusa and Leafu are the other two ridges).

Clearly, the use of coral in the facing had important meaning. Herdrich (Clark and Herdrich 1988; Herdrich n.d.) has argued that tiia 'ave were associated with religious/supernatural entities, and the number of rays reflected which entity was affiliated with that structure. If that is the case, the use of coral may further signify the entity of concern, and that entity may have been one with a marine form. Three of the coral tiia have eight rays, two have six, one has three, and one has eleven. Herdrich has argued that eight rays are associated with the octopus entity and six rays with the turtle entity, but no entities have yet been identified for three and eleven rays. Turner (1986:145-46) observed that every Samaon village had its own
deity. It may be, then, that the villages responsible for these tia 'ave were associated with a deity that had a marine incarnation. For six of the seven coral tia 'ave, the probable associated village is Ala'i.

In many cases, the tia 'ave did not have complete closure by rays; that is, one side—sometimes more—lacked rays. Such structures are usually found on the prominent points where the inland (upslope) end lacks rays, and the top of the mound simply grades into the ascending ridgetop. At some tia the edge of the ridgetop is a very steep to sheer drop, and there the bluff edge itself appears to have provided the boundary to the structure. Tia 'ave on peaks display full closure by rays.

At ten structures, all but one of which is in East Vaifanua, shallow ditches were present around (fully or partially) the tia rays, or were linear ditches running across the ridgetop. Where the ditches went around the rays, they provided greater, and in some instances the only, definition of the projections.

At six structures, linear ditches crossed the ridgetop on the upslope (rear) side of the tia. In some cases the ditch was at the immediate rear of the last side rays, and in other cases it was a short distance away. With one possible exception (dense pineapple growth precluded certainty of ray identification) where these linear ditches are found, the tia lacked closure. A function of these linear ditches, therefore, may have been to provide closure, or a rear boundary (Clark and Herdrich 1988:151; Herdrich n.d.). Not all tia 'ave that lacked closure by rays had ditches, but those structures were found where the ascending ridgetop rises markedly behind the structure, and therefore the pronounced shift in slope provides, in effect, a sense of closure. The linear ditches were found where the ridgetop inland of the structure was still comparatively gentle in slope. This further supports the notion that the linear ditches provided closure.

Both the linear and defining ditches are very shallow (ca. 0.2-0.5 m deep) and not very wide (ca. 1-2 m). Furthermore, the linear ditches are on the inland side of the tia rather than the downslope approach. Consequently, these two types of ditches would not provide very formidable defensive features. One exception is the arcing "defining" ditch on the downslope side of 21-67, which is wider and deeper than most, but still not on the order of the large defensive ditches seen elsewhere. At the same time, these ditches would enhance the defensive character of the tia, if the tia were so used.

Another type of ditch associated with some tia 'ave is clearly defensive in function. Such features have been found at three tia 'ave sites. These ditches are a few metres wide and over two metres deep on their highest face. Two tia 'ave with associated deep ditches are on Le'o Ridge and each has a deep ditch off both ends. A third example is on Olo'mana Ridge, not far from the juncture of Olo'mana and Le'o, where two deep ditches were found, both on the east side of the tia 'ave. Le'o Ridge constitutes the shortest and easiest overland route from the south coast to the north coast on this end of Tutuila. It is apparent from these examples that at least some tia 'ave functioned in part as defensive positions.

Another type of feature found at thirteen tia 'ave is a small circular feature that comes in one of two forms: a slight depression, 1-2 m in diameter
and less than one metre deep, sometimes with a border of rocks; or simply a ring of rocks of about the same diameter. In nine cases, one of these features was found on the top of the tia, usually in the approximate center or slightly off-center. In another four instances these features were found off of the tia but only a short distance away. What may be a similar feature type is a short alignment (usually arc) of boulders, again found either on (three cases) or just off (three cases) the tia. Only two examples of tia 'ave with similar features have been reported for Western Samoa: a structure with a circular pit 1.2 m in diameter from Mt. Olo, Upolu (Holmer 1976a:18), and the other tia with a central rectangular depression (with a fine gravel floor) from Savai'i (Scott 1969:86). The function(s) of these features is not known, but it seems likely to have been related to some ceremonial activity, probably associated with pigeon catching, or perhaps with divination regarding war (see Clark and Herdrich 1988; Herdrich n.d.).

The tia 'ave on the Tafuna plain differ considerably in construction. They are very high and appear to be almost entirely of stacked rock and rubble. This construction technique is not surprising since rock is plentiful on the Tafuna plain while soil is not. A similar construction technique was used on the gently sloping Mt. Olo Tract of western Upolu (e.g., Holmer 1976a, 1976b; Hewitt 1980a). The ridgetop tia 'ave of Upolu (e.g., Davidson 1974b), however, are of similar construction to those in Eastern Tutuila. This strongly suggests that the keys for construction technique are topography and availability of rock.

Defensive Sites

A large number of defensive features and fortification sites have been reported for Western Samoa (Buist 1969; Golson 1969; Green 1969a; Scott and Green 1969; Scott 1969; Davidson 1969b, 1969c, 1974a, 1974b, 1974c). Defensive ditches—with or without earthen embankments—have been found in Western Samoa as isolated features crossing a ridgetop. In addition, Davidson (1974b:181, 191) reported a couple of ridgetop sites on Upolu where there is a tia 'ave with a defensive ditch just off the end. Several hilltop fortifications have been reported for Western Samoa, but Davidson (1974c:241) noted that they are not as common as isolated or small groups of defensive features.

The best information on hilltop fortification sites in Samoa is from Scott and Green (1969) for the large complex at Liatauamu' u (site SU-1U-41). This complex is high on a ridgetop and consists of a variety of features strung out along a long, sometimes very narrow, ridgetop. The features consist of earthen embankments, pits (some probably borrow pits for the embankment), deep ditches, and terraces. This site probably dates to the middle of the first millennium AD (Scott and Green 1969:208).

In American Samoa, however, the numbers are much fewer. Leach and Witter (n.d., 1987) concluded that defensive features were present at the large basalt quarry site of Tataga Matau in Western Tutuila. Presumably, these features were to defend the valuable resources at the quarry. Frost (1978) reported two refuge sites—Le'ufufu and Mt. Alava—with defensive features, but as I have argued above for both of these, the evidence of defensive features is questionable, and these sites are more likely to be inland villages than refuges.
The survey of Eastern Tutuila has revealed seven sites with defensive features: one defensive ditch without other defensive features; three (possibly four) tia lave-defensive ditch combinations; and three fortification sites, two of which are hilltop complexes. The earthen embankment defensive feature common in Western Samoa has not yet been found in American Samoa.

In the area surveyed, each of the two largest hills, Le'aeno Mountain and Olomoana Mountain, and one other high peak, Leilani Mountain, have fortification complexes. I would expect to find other hilltop complexes on the other pronounced peaks along Sua Ridge. None of these sites is a fortified village, but, instead, a fortified position of last defense. Two of these sites lie on the border of counties, which may well be roughly equivalent to traditional socio-political units. Le'aeno is at the juncture of three counties, and it supports the largest complex. This complex is even more impressive when one considers that the fortification complex at Leilani would also provide a defensive position against attack of Le'aeno from the east. These sites demonstrate that devastating, potentially annihilating, warfare was a recognizable possibility for the ancient residents of Tutuila.

Paths

Ancient trails have been reported by previous investigators in Western Samoa. Some of these are marked by paving, curbing, or walls; others are sunken (appearing as linear depressions), while still others are raised (Davidson 1974c:239-240). For Mt. Olo, Holmer (1976b) reported "raised walkways" and "walled walkways" as the most common paths, but also noted one example of a "trenched walkway" (sunken path). Probable representatives of all of these types have been found in Eastern Tutuila. On the ridgelines of Eastern Tutuila and Upolu the sunken paths are the most common form. This is probably due to the fact that with use, these paths come to form drainage channels for surface flow of rain water, and the result is greater erosion.

Resource Exploitation Sites

Resource exploitation sites are places where valued resources were collected. The resources of concern here are basalt and volcanic glass. The sites from which these materials were collected are usually referred to as quarries. However, true quarry operations involve digging for the resource, usually in pits. Since digging is not indicated at these sites, they are not formal quarries. Nevertheless, I will follow common usage in referring to these sites as quarries with the caveat that this does not imply true quarrying for resource extraction.

Despite extensive archaeological research in Western Samoa, particularly Upolu, only one possible basalt exploitation site has been reported. According to Golson (1969:18), that site is located on the lower western slopes of Mount Vaea and was reported by the general manager of Samoan Estates, but it could not be relocated by archaeologists in the 1960s. The site may have been destroyed by a stone crusher, or it may not have been a quarry at all. Since the time of Buck's (1930) early work on Samoan material culture, the best known and only securely documented quarry site for the archipelago has been Tataga Matau. The scarcity of basalt quarry sites in Samoa lead Green (1974a:141) to
state that, "quarry sites, it would appear, are not well known and therefore presumably not a common feature of the Samoan landscape." Green's presumption now appears not to hold for Tutuila.

The large basalt quarry of Tataga Matau has long been known as a major source of high-quality basalt. Green (1974a:141) cites the missionary Heath who reported in 1840 that Tutuila was the source of the hard basalt that Polynesians used for making adzes prior to the introduction of iron. The primary source of that stone was probably Tataga Matau, which is located inland of Leone, in Western Tutuila (Fig. 20). Recent work by Leach and Witter (n.d., 1987) has thrown light on the nature of the site and the adze manufacturing process, and a second round of investigation carried out in 1988 by Leach, Witter, and Best (report in preparation) promises to substantially improve our understanding of this important site. The importance of the Tataga Matau quarry is demonstrated by the geochemical analyses by Best (1985) that show that basalt from this quarry was transported as far as Lakeba, Fiji, prehistorically.

Six new quarry sites were found in Eastern Tutuila in 1988, although none matches Tataga Matau in size and basalt production. These sites appear to represent basalt sources for local exploitation. Only the roughing out of tools, to make preforms (or blanks), was carried out at the quarry sites, with later reduction and finishing elsewhere, probably at the villages of the tool manufacturers. Given the nature of these sites, the often poor ground visibility, and the many smaller ridges (and slopes) not surveyed, there are probably other quarry sites in the region that we did not find. As noted above, it is possible that basalt from the Maupua area was extensively used since it is of such high quality. However, there is no sound basis for claiming that a large quarry ever existed there. From an examination of artifact collections from the various sites throughout Eastern Tutuila it further seems to me that some tools were made from comparatively poor quality basalt that was probably found as isolate prismatic chunks or boulders and not from repeatedly exploited quarry sites. In short, contrary to Green's presumption regarding Upolu, basalt exploitation sites on Tutuila were probably fairly common on the landscape, but they were small and probably for local use. Once iron was introduced such sites were quickly forgotten, with only Tataga Matau well remembered because of its uniqueness and renown.

It has been observed repeatedly by recent researchers that the quantity of basalt tools recovered from sites on Tutuila is much greater than at sites reported for Western Samoa (Frost 1978; Brophy 1986; Ayres and Eisler 1987; Clark and Herdrich 1988). This is shown by the number of artifacts collected during surface surveys (Clark and Herdrich 1988) and, especially, from excavations at Maloata (Ayres and Eisler 1987) in western Tutuila, and 'Aoa (Clark and Herdrich 1988) and Tulauta (Frost 1978; Gould et al. 1985; Brophy 1986) in eastern Tutuila. At these sites, adzes, preforms, flake tools, and debitage are extremely abundant. In fact, the investigators of each of these sites argued that the quantity of lithic material indicated that a basalt quarry must be located in the vicinity of the sites. And for Tulauta and Maloata, it was further suggested that basalt adzes were being manufactured for export (Ayres and Eisler 1987:74; Brophy 1986:52).

The suggestion of adze manufacturing for trade to other communities and islands remains to be demonstrated. What has been shown is that basalt from
Tataga Matau was being exported to other islands. An interesting characteristic of the village sites mentioned above is the abundance of flake tools, which are apparently not present at Tataga Matau. The scarcity of flake tools in Western Samoa indicates that such items were not part of the putative trade. Furthermore, where flake tools have been examined for edge damage—i.e., at 'Aoa and Maloata—use wear is present in very high frequencies, which indicates that these tools were being used locally. As stated above, the known quarries other than Tataga Matau are small and not suited for exploitation for extensive export. Therefore, I suggest that the availability of basalts suitable for tool making on Tutuila resulted in frequent exploitation and local use of this resource for adzes, scrapers, knives, and other tools. Some of these tools may have been for trade, but local use was probably more important in generating the accumulation of debitage and tools at village sites. The comparative scarcity of debitage and flake tools at Upolu sites suggests that such local exploitation and use of basalt was not practiced on Upolu; thus, Green's comment that quarry sites were not common in Samoa may well be valid for the western islands of the archipelago.

Volcanic glass was a resource used by the early settlers of the island, and it has been shown to have been an important resource and item of exchange for Lapita populations throughout the Western Pacific (Green 1979). Investigations by Green and Davidson (1969, 1974) and colleagues have shown that volcanic glass use in Western Samoa ceased at about the same time that pottery dropped out of use. The same pattern has been shown for 'Aoa by Clark and Herdich (1988) and in this report.

The source of the volcanic glass from Upolu and Tutuila is still not known, but geochemical analyses are providing some clues. At the time of the Western Samoa research of Green and Davidson, Ward (1974) showed that the glass from those sites was not from Tafahi in the Tongan Group, which is the only known source of volcanic in West Polynesia. Ward further concluded that the "siliceous magma required for the formation of a true rhyolitic obsidian appears to be absent from Western Samoa," although a source for volcanic glass similar to rhyolitic obsidian may still be present, especially in the Fagaloa Volcanics (Ward 1974:157). Tutuila, on the other hand, is mentioned as a possible source because of the presence of siliceous volcanics.

Despite our attempts to locate a source for volcanic glass in Eastern Tutuila, no such source was found. The only known location at which glass can be found is a sevice on Goat Island (near the Rainmaker Hotel in Pago Pago) that was found by Helen Leach and Dan Witter. Geochemical analyses by Sheppard, Hancock, Pavlish, and Parker (in press) and by Elizabeth Wright (pers. comm.) indicate that Goat Island was not the source for the Upolu and Tutuila glass (nor was Tafahi, as previously noted by Ward). All of the archaeological glass may well come from the same island, and Tutuila is at least if not more likely to be that island.

Samples of basalt and volcanic glass from several sites on Tutuila were submitted to Dr. Elizabeth Wright of the Department of Geological Sciences at the University of Illinois at Chicago for geochemical and petrographic analyses. The results of those analyses will shed some more light on the distribution of these valued resources, and perhaps aid in future efforts to find quarry sites. Those results are not yet available but will be made
available in a subsequent report. A few samples of basalt from the quarry sites in Eastern Tutuila were also sent to Simon Best of the University of Auckland and to William Ayres of the University of Oregon for analyses by different techniques.

CONCLUSION

The Eastern Tutuila Archaeological Projects of 1986 and 1988 have concentrated on the systematic survey of the eastern tip of Tutuila Island. The region investigated covers East Vaifanua and Sa'ole Counties, with limited survey in Sua County. The intent of that work has been to provide an overview of the cultural resources in two large land units. Previous investigations in American Samoa have been extremely spotty in coverage. As a result of the work in Eastern Tutuila, a picture of traditional settlement systems in American Samoa is emerging. This information is essential for establishing an effective data base for the development of a cultural resource management plan for the territory. It is also essential for providing an understanding of the historic context of sites in American Samoa.

The issue of historic context is fundamental to evaluating the significance of archaeological sites. But until quite recently there has been so little archaeological research in American Samoa that there has not been an adequate information base for legitimately and effectively assessing the significance of more than a few exceptional sites. The patterns of community development in these islands are only now beginning to be revealed. The data produced by the extensive surveys in Eastern Tutuila will be critical for attempts to organize historic and prehistoric properites in American Samoa according to theme, place, and time. There is still, of course, a tremendous amount to learn about prehistory in American Samoa, but with the groundwork that has been laid by the Eastern Tutuila Archaeological Projects and other recent archaeological investigations, we can now more realistically evaluate site eligibility for the National Register.
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