REPORT ON THE SECOND PHASE OF FIELDWORK
AT THE TATAGA-MATAU SITE
AMERICAN SAMOA, JULY-AUGUST 1988

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Contents

1 Introduction ................................. 1
  1.1 History of the investigations at Tataga-matau .................. 1
  1.2 Aims of the 1988 Programme ............................ 3

2 Results of the 1988 Survey ............................. 5
  2.1 Site Interpretation ............................. 9

3 Result of the Excavations at the Lower Ditch .................... 12
  3.1 Introduction ................................ 12
  3.2 Stratigraphy and Chronology ......................... 12
  3.3 Tool Production on the Lower Ditch Terrace ................. 14
  3.4 Conclusion .................................. 17

4 Results of the Excavations on the Star Mound Terrace .......... 19
  4.1 Introduction ................................ 19
  4.2 Excavation Layout ............................ 19
  4.3 Stratigraphy ................................ 20
    4.3.1 Square Unit 1 ........................... 20
    4.3.2 Unit 6 .................................. 23
    4.3.3 Unit 7 .................................. 23
  4.4 Interpretation of Stratigraphy ......................... 24
  4.5 Chronology .................................. 27
  4.6 Artefacts from the Star Mound Terrace ................. 28
    4.6.1 Preforms ................................ 28
    4.6.2 Selected Artefacts ....................... 34

5 Results of the Excavations at the Rubble Terrace Complex .... 36
  5.1 Introduction ................................ 36
  5.2 Stratigraphy and Chronology of the Rubble Terrace .......... 37
5.2.1 Pit 1, Trench 1 ........................................ 37
5.2.2 Pit 2, Trench 1 ........................................ 38
5.2.3 Pits 1 and 2, Trench 3 ............................. 38
5.3 Stratigraphy of the Adjacent Terraces ............... 46
  5.3.1 The Promontory Terrace .......................... 46
  5.3.2 The Off-set Terrace .............................. 49
  5.3.3 The Red Log Terrace ............................. 51
5.4 Conclusion ............................................. 54

6 Re-examination of Adze Production at Tagata-Matau ........ 58

7 Conclusions ............................................. 68
  7.1 Implications for Further Research .................. 69

A Catalogue of the Illustrated Artefacts .................. 71

Bibliography ............................................... 74
List of Figures

1.1 Location Map (revised from Leach and Witter 1985) ............... 2

2.1 Map of Tataga-matau Fort and Quarry Complex ................. 6
2.2 Profile and Plan of Dished Terrace (E of SQ1) .................. 8
2.3 Route of Track from Leone to Asu as shown by Daly 1924;Plate A 11

3.1 Map of SW arm of Tataga-matau ............................... 13
3.2 Lower Ditch Terrace, NE Section ............................... 15
3.3 Artefacts from the Lower Ditch Terrace Excavation ............ 18

4.1 Plan of Star Mound Terrace on SW arm ....................... 21
4.2 Star Mound Terrace, Sections A-B, C-D ....................... 22
4.3 Star Mound Terrace, Square 1, SE Section .................... 24
4.4 Artefacts from Star Mound Terrace and Quarry area 2 ....... 25
4.5 Star Mound Terrace, Trench 6, W Section and Trench 7, E Section 26
4.6 Star Mound Terrace, Square 1, Average flake weight, % of flakes with cortex, and preform weights, plotted by layers. ....... 29
4.7 Star Mound Terrace Preforms ................................. 30
4.8 Star Mound Terrace Preforms cont. ............................ 31
4.9 Star Mound Terrace Preforms cont. ............................ 32
4.10 Star Mound Terrace Preforms and Retouched Flake .......... 33

5.1 Rubble Terrace, Pit 1, Trench 1, W and E Sections ........... 39
5.2 Rubble Terrace, Pit 2, Trench 1, All Sections ................. 40
5.3 Rubble Terrace, Trench 3, Pits 1 and 2, NNE Sections ........ 42
5.4 Rubble Terrace Preforms ....................................... 43
5.5 Rubble and Offset Terraces Preforms and Hammerstones .... 44
5.6 Rubble Terrace Preforms cont. ................................ 45
5.7 Promontory Terrace, Trench 5, N Section ..................... 47
5.8 Promontory Terrace, Trench 6, N and E Sections ............. 48
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.9 Near Offset Terrace, Trench 2, NW and NE Sections</td>
<td>50</td>
</tr>
<tr>
<td>5.10 Offset Terrace, Trench 4, ENE and SSE Sections</td>
<td>52</td>
</tr>
<tr>
<td>5.11 Red Log Terrace, Trench 7, E Section</td>
<td>53</td>
</tr>
<tr>
<td>5.12 Original cut-and-fill model of formation of Rubble Terrace</td>
<td>55</td>
</tr>
<tr>
<td>5.13 Revised model of formation of Rubble and Promontory Terraces</td>
<td>56</td>
</tr>
<tr>
<td>6.1 Tataga-matau basalt adze blank types A, B1, and B2 in schematized</td>
<td>60</td>
</tr>
<tr>
<td>form</td>
<td></td>
</tr>
<tr>
<td>6.2 Adze blank types C1 and C2</td>
<td>61</td>
</tr>
<tr>
<td>6.3 Adze blank types D1, D2, and D3</td>
<td>62</td>
</tr>
<tr>
<td>6.4 Surface collected preforms</td>
<td>64</td>
</tr>
<tr>
<td>6.5 Surface collected preforms cont.</td>
<td>65</td>
</tr>
<tr>
<td>6.6 Surface collected preforms cont.</td>
<td>66</td>
</tr>
</tbody>
</table>
Chapter 1

Introduction

1.1 History of the investigations at Tataga-matau

At the time of Te Rangi Hiroa's visit to Tutuila in 1927, the name Tataga-matau was applied to a stone quarry 'on the spur of a range at the back of Leone' (Buck 1930 : 330). It was not the only archaeological feature he saw in this steep, forested area (Fig 1.1). Dished basalt grindstones occurred in the streambed below the quarry, a spur-end terrace (identified to Buck as a ti'a for pigeon fowling) was passed on the uphill climb, and large quantities of flakes were noticed on the hillside below what Buck interpreted as the quarry proper, extraction pits and a trench (Leach and Witter 1987). Buck commented that very few discarded adzes were to be seen among the chippings (Buck 1930 : 330-1) and this observation is confirmed by the Bishop Museum Accession List for 1927 which has entries for '9 discarded adzes from quarry of Tataga-matau near Leone'. In addition to these few preforms, Buck returned with 4 points, 1 large scraper, 1 small hammerstone and 'stone chippings' (Richards 1988 : pers. comm.). Over 30 years passed before the first site survey began on Tutuila. William Kikuchi stayed in the Leone Valley during his 1961-2 survey and recorded some of the local grindstones, as well as more than 100 adzes from the valley floor and Leafu streambed (Kikuchi 1963 : 84, 138, 154, 162-3). Although Kikuchi did not visit the quarry himself, he recorded comments made about it by elderly informants.

In 1980 Jeffrey Clark updated Kikuchi’s survey of Tutuila. On the basis of finds of flakes and adze preforms in a large crater on Malaloa Ridge, he listed this site as Tataga-matau despite his failure to relocate the pit-trench features described by Buck (Clark 1980 : 86). Recognizing the potential importance of the site, the Historic Preservation Office of the American Samoa Government then commissioned
Figure 1.1: Location Map (revised from Leach and Witter 1985)
Helen Leach and Dan Witter to undertake a more detailed study of the site in August 1985 with the objective of nominating it to the National Register of Historic Places.

Since the Malaloto Ridge crater site recorded by Clark did not match Buck’s description in either its features or amount of manufacturing debris, Leach and Witter (1987) consulted local matai of Leone and Auma to determine if there was still local knowledge of Tataga-matau. Chief Velio Suafo’a took the team to Leafu, the waterfall, where a cliff of fine-grained basalt marks the base of the ridge known to him as Tataga-matau. He then led the way up the same access route which Te Rangi Hiroa had climbed nearly 60 years before. The relative positions and orientation of the features matched the 1930 publication extremely closely.

The mapping exercise which followed this relocation of Tataga-matau in 1985 revealed a complex of terraces and screes of adze-manufacturing debris lying below the pit and trench feature which Buck had believed to be the extraction area. On closer inspection these cuts were found to have been made into highly weathered soft volcanic deposits unsuitable for flaking. Moreover, the combination of pit, trench and adjoining platform looked strikingly similar to ditch and bank features associated with fortifications elsewhere in the Samoan group. Because these defences were only 8m above a screes of high quality basalt blocks which had been extensively worked, the site was described as a fortified quarry complex. The steepness of the narrow access ridge, waterfall cliff and adjacent unstable hillsides would have provided natural defences for the lower parts of the quarry (Leach and Witter 1987: 38).

At the conclusion of this survey (Leach and Witter n.d.), Tataga-matau was successfully nominated to the U.S. National Register (approved 19 November 1987). To achieve further recognition for the site as a National Landmark, the Historic Preservation Officer of the American Samoa Government encouraged the authors to undertake further fieldwork there. This took place in July–August 1988.

1.2 Aims of the 1988 Programme

The recent phase of research at Tataga-matau had four major objectives. The first was to extend the survey on to the heavily forested ridges and slopes above the site in search of other quarry exposures, terraces and platforms. The second was to establish by excavation to what extent the defensive features and the adjacent quarry were contemporary, and to date some of the different activities that took place at Tataga-matau. The third was to obtain more detailed information on the range of adze types manufactured on the workshop terraces, while the fourth was
to investigate the technology of quarrying.
Chapter 2

Results of the 1988 Survey

The addition of Simon Best to the team for the 1988 season brought a new viewpoint to the interpretation of the field features, based on his extensive site surveys and excavations of fortifications in Fiji. Best and Alison Witter conducted an intensive survey of the ridge and spur system lying above the quarry area mapped in 1985 and they located features along a ridge-top length of 1.4 km. The ridge has two arms bearing SE and SW, with terraces and ditches down some side spurs and large terraces within the bend of the ridge (Fig 2.1).

Some 13 different types of features were identified within the site; these will be discussed under 8 categories.

1. **Mounds consist of:**
   
   (a) stone-edged rectangular mounds.
   
   (b) unlined rectangular mounds.
   
   (c) stone-edged mounds of symmetrical cog, star or flower shapes (where there are no constrictions of space), or irregular shapes where landforms necessitate it.
   
   (d) stone-edged platforms, possibly defensive, based on their shape and tactical position on the site.

2. **Modified high points** consist of artificially-levelled sections of ridge-top, always accompanied by terraces.

3. **Other stonework** takes two forms:
   
   (a) **stone buttressing** along the SE ridge top appears to have been positioned to enlarge the adjacent flat area, while that on the SW ridge,
near to its narrowest point, preserved access along the ridge by acting as a retaining wall;

(b) **Stone lines** running transversely across spurs occur in two places on the site, within Quarry Areas 1 and 3. Based on his experience of the large forts in the Lau Group, Fiji (Best 1984: 56–7, 108–9, plate 2.16B), where similar stone rows served a tactical function, Best interprets these as remains of defensive walls, possibly once earth-cored. Although the stone line in Quarry Area 3 runs from a steep slope on one side of the spur to a similar slope change on the other, the southern end of the stone row in Quarry Area 1 terminates well short of any similar gradient change. Accordingly Leach and Witter prefer an interpretation of this stone row as a boundary marker of a type described by Davidson (1974: 238–9) for Western Samoa. Best considers however that this row merges into defences guarding the access spur.

4. **Terraces** vary in size and almost certainly in function. Some within the quarry areas seem to have been cut for use as platforms for stockpiling and working basalt blocks. Those along the ridge-tops, occurring in series on one or more sides of high points, are interpreted by Best as habitation areas for the retinue of the high-status individuals living on the top platforms. While all terraces are potentially defensive because of their steepened outer scarps, some may have been constructed primarily for defence, especially those low down on access spurs. This is the interpretation which Best prefers for the stone-edged spur end which was identified as a *Tia* by Buck’s informants.

5. **Stone working areas** were concentrated in the vicinity of the three quarry areas, and are characterized by quantities of flakes, discarded cores and preforms. However excavation of the star mound terrace on the ridge above Quarry Area 1 produced evidence for stoneworking in all levels, and this is probably true for many other mounds and terraces further along the ridge top.

6. **Quarry areas** – in relation to the quarry mapped in 1985, two new quarry areas were located on the adjacent spur to the north, and on the flank of the main ridge some 400 m further east. There was insufficient time however to map the quarries and stone-working areas found on spurs along the western side of Leaflu stream. All the quarry areas so far located appear to be of the same type, a talus slope, rather than an outcrop face.

7. **Dished terraces** found in two locations appear to have been associated with
DISHED TERRACE
PLAN AND PROFILES

Figure 2.2: Profile and Plan of Dished Terrace (E of SQ1)

stone extraction and/or stone working. In both cases they were sited on spurs, one at Quarry Area 3, and the other just east of the excavated star mound. The terraces were crescent-shaped and the hollows were separated by a central "bridge". The floor of the former consisted of large, mainly unworked blocks, with the possible remnant of a stone wall along the front on the north end (Fig 2.2). Off the front of the feature and on the "bridge" were scatters of flakes, and at least one hammerstone. Although rocks were not so numerous within the latter example, stone working debris occurred on the front of the cut.

8. Ditch-and-bank complexes were mapped at two locations on the site. The largest was cut at the bend of the ridge and is up to 6m deep and over 100m long, cutting off the ridge from the NE. [Two smaller ditch-like features without banks appear to cut the SW arm close to modified high points. Best now interprets these as shallow depressions.] The bank and discontinuous ditch mapped in 1985 (Leach and Witter 1987: 38, Fig. 2) cuts the SW arm just above Quarry Area 1.
2.1 Site Interpretation

The discovery of more quarries, extensive ridge-top levelling, terracing and mound building, together with an exceptionally large defensive ditch at the top of the site has led to a re-appraisal of the earlier view that the discontinuous ditch and bank had been cut to protect the quarry (Quarry Area 1). It may equally be interpreted as a defence for the platforms, star mounds and terraces which lie above this quarry on the SW arm of the ridge. In turn, these may have been defended from down-hill incursions by the two possible transverse ditches and the marked narrowing of the ridge where it bends round towards the SE arm. If the SW arm was fortified in this way, any group holding it would be in a powerful position to control access to all three quarry areas.

As yet, the relationship of the SW to the SE arm cannot be firmly established. If both arms and their spurs were part of a single fort complex, the central living area would have been that part of the ridge just south of the large upper ditch. As the highest part of the entire site, it consists of a length of flat-topped ridge containing house mounds, one of which has three tiers and dominates the surrounding area. Although surveying access was limited by modern land use, occasional lines and clusters of stones found within the overgrown gardens suggest that a considerable number of structures were probably present. This would have been the equivalent of the 'lomonikoro' of Fijian forts, the heart of the settlement, where status was expressed both by the height of the ridge and by the construction of the largest mound on the site. This SE arm would have been protected by the large upper ditch and its northern outworks, by the steep flanks of the ridge, and by the high-scarped terraces where the ridge joins the crater. With greater areas of flat ridge top available it could have accommodated more people than the SW arm.

Research since the 1988 fieldwork suggests that the upper ditch was known locally at the time of Kikuchi's survey. Although Kikuchi did not visit Tatagamatau, one of his informants described

a large, deep ditch... on the mountain path leading from the village of Leone to the village of Asu. The ditch was excavated by Tongans in order to impede communications between villages. The ditch can be crossed only by placing a log across it. (Kikuchi 1963 : 68)

Kikuchi listed this ditch as T-99 and plotted it above the 1000 ft contour at the NW end of Leitu watershed, some distance from Tataga-matau (Kikuchi 1963 : Fig. 4). However a close examination of an early topographical map of Tutuila (Daly 1924 : Plate A) shows the track from Leone to Asu running up the SE arm
of the site, above the crater, and crossing the saddle where the deep, upper ditch is situated (Fig 2.3). If this ditch is indeed T-99, then the possibility that it was constructed by Tongans and that the adjoining ridge tops were occupied by Tongans, has to be considered. So far nothing found on the site appears to be of Tongan manufacture or design, from the artefacts to the earthworks. Furthermore, as Davidson noted for Western Samoa,

A problem in the interpretation of Samoan warfare is the importance given today to stories about Tongan invasions. Many forts and other field monuments are attributed to Tongans. (Davidson 1974 : 241)

She commented that most fortifications known on Tongatapu and Vava'u are historic and Fijian-influenced, and that Samoa has a long history of fort construction in its own right. A more likely context for the building of the fortifications at Tataga-matau can by taken from the remarks of an informant that 'the villagers from Leone or elsewhere would often fight over the right to quarry and grind their adzes there' (Kikuchi 1963 : 154).
Figure 2.3: Route of Track from Leone to Asu as shown by Daly 1924:Plate A
Chapter 3

Result of the Excavations at the Lower Ditch

3.1 Introduction

Establishing the chronological relationship between stone working and the construction of defensive features was critical to questions of site interpretation. If the ditches were found to have been cut before quarrying and adze manufacture began, or after they ceased, the argument for the existence of a 'fortified quarry' (Leach and Witter 1987: 38) would have to be abandoned. Of course demonstrating that these activities were contemporary does not prove that the defences were built primarily to protect the quarries, merely that at this time access to the stone resources would have been restricted by the presence of both defences and defenders occupying high ground in close proximity to the quarries. Ideally both ditch and bank complexes should have been studied, but present land use ruled out excavation of the large upper ditch. Accordingly Leach chose the discontinuous ditch and bank complex at the end of the SW arm (Fig 2.1:T8) to investigate this relationship.

3.2 Stratigraphy and Chronology

Leach selected a small terrace on the SW side of the ditch, opening a 2.0 x 1.0m trench (T8, Fig 3.1) close to the ditch edge, but avoiding the waterlogged slump deposits which partly filled it. With the vegetation cleared away the surface was found to be densely covered in small flakes and occasional preforms. At the northern end (Square A) these were mixed with a sticky clay, while at the southern end (Square B), the matrix consisted of a dark loam containing patches of fine shat-
Figure 3.1: Map of SW arm of Tataga-matau
ter from tool manufacture. This layer of flaking debris varied from 11 to 27cm in thickness (Fig 3.2).

Towards the base of the flake layer, small patches of charcoal appeared, the largest in association with a lens of fine adze-thinning flakes which were pressed into the surface of the underlying layer. A 10.21g charcoal sample from Square A (NZ 7592) gave a radiocarbon age of < 250 yr BP. The underlying layer consisted of 15–29cm of fill deposited on a sloping weathered clay 'natural' to form the terrace. This terrace fill contained orange clay-covered cobbles in a mixed clay and soil matrix. Several medium to large flakes were included. The most likely source of this fill was material dug from the adjacent ditch.

The charcoal sample directly dates the commencement of the last phase of tool making on this part of the site. It may also date the formation of the terrace and by extension the cutting (or recutting) of the ditch, since there is no evidence for soil build up on the terrace surface before it became a flaking floor. In this climate, rapid build-up could be expected if the surface was left exposed more than a few weeks.

### 3.3 Tool Production on the Lower Ditch Terrace

A sample of 45 flakes (>10 by 10mm) was collected from a 10cm strip of the flake layer along the southern edge of square B. It comprised mostly small flakes (mean length = 29.93mm s = 16.43; mean width = 31.27mm s = 14.97). Out of a total of 16 flakes whose length exceeded their width, four were true blades (length > twice width). The presence of blades and elongated flakes among the waste material is an important feature of all the Tataga-matau workshops we have examined.

As well as flakes and shatter, this layer contained a broken hammerstone (Fig 3.3a) and 57 assorted preforms and blanks (Table 3.1). Of the adze preforms, 17 were sufficiently advanced in their reduction to be assigned a probable adze type, while 18 were allocated a possible type. The types included triangular (Type VI), reverse sub-triangular (IV), thin rectangular (III), and trapezoidal (I, II, IX) cross-sections, all of which occur in Samoan adze assemblages of the last millennium (Green 1974: 260–2). In 24 cases these preforms displayed transverse fractures which had presumably led to their rejection. The remainder had a variety of faults ranging from asymmetry, irreducible masses, and excessive curvature, to over-steep bevel angles. For blanks the stone-workers had selected broad thick flakes to make the trapezoidal-sectioned preforms, and thin flakes or blades for the thin rectangular preforms (Type III). The latter showed characteristic anvil-backing scars along their edges (Leach and Witter 1987: 46). Blades had served as blanks for the triangular
Figure 3.2: Lower Ditch Terrace, NE Section

<table>
<thead>
<tr>
<th>ID</th>
<th>Preforms</th>
<th>Flakes</th>
<th>Weathered cobble</th>
<th>Charcoal</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ7592</td>
<td></td>
<td></td>
<td></td>
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</tr>
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preforms. There was a clear preference for orienting these flake or blade blanks so that the ventral surface became the back of the adze preform. While 20 preforms displayed this orientation, in only 2 had the adze bevel been formed on the flake's dorsal surface. One of these had been intended to be a Type IV, a Samoan adze form which reverses the usual situation where front is narrower than back.

Table 3.1: Analysis of Preforms and Blanks

<table>
<thead>
<tr>
<th>Intended Tool</th>
<th>Lower Ditch Toe</th>
<th>Star Mound Toe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adze Type</strong></td>
<td><strong>Probable</strong></td>
<td><strong>Possible</strong></td>
</tr>
<tr>
<td>II</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>III</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>IV</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>V</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>VI</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>VII</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>VIII</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>IX</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Blank Form</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>blade/elongated flake</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>flake</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>natural piece</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

A group of 7 preforms stood out from the rest by their possession of steeply flaked, curved working edges (Fig 3.3b & c). They were significantly shorter (p = .01) and thinner (p = .05) than the adze preforms. In 5 cases the blanks selected for these tools were elongated flakes or true blades. Instead of preparing the cutting edge from a platform on the flake’s dorsal surface (as in the majority of adzes), the stone workers had chipped the steep, curved edge from the ventral surface of the elongated flake. The resulting tool could not have functioned as an adze, nor can it be classified within either Buck’s (1930) or Green and Davidson’s (1969, 1974) system. However Buck did recognize this form as a distinctive class of tool: he was informed by the Samoans that it was a stone coconut grater or tua’i ma’a (Buck 1930: 111, 367–8, Fig 217). More usually made of coconut shell or today in metal, the tua’i was lashed flat side uppermost to the wooden arm of the grater stand. Buck
also noted that old stone adzes were sometimes retouched as graters.

Based on this identification, Davidson (1969a: 199, Fig. 85b; 1969b: 246, Fig. 102e) and Ishizuki (1974: 54, Fig. 33c) described three similar artefacts from Upolu as coconut graters. Clark and Herdrich (1988: 101–2) believe that the original attribution made by Buck's Samoan informants was conjectural. They prefer to include this form as Class I within a classification of non-adze formal flake tools. Attention was drawn to the rarity of this tool on Upolu, and its prevalence in the vicinity of adze-manufacturing areas in American Samoa (Clark and Herdrich 1988: 105). The discovery of these tools in a preform state at Tataga-matau now enables us to say that some were made at this adze quarry by a distinctive technique involving a reversal of the blank orientation used for adzes. Their characteristic shape and technology support the notion of a special function such as that of the tuai, a tool which is as vital to Samoan cuisine as the adze was to Samoan woodworking.

We may speculate that in pre-European times the tuai ma'a would have lasted longer than that made in coconut shell. Transformation into a tuai ma'a would also have extended the 'life' of adze heads which had become too short or misshapen for use in woodworking. The close relationship between the distribution of these flake tools and adze quarry sites may be explained by the fact that symmetrical, elongated flakes were the preferred blank for both the grater and certain types of adze, and that production of such blanks required high quality material and skilled artisans.

### 3.4 Conclusion

Excavations at the Lower Ditch Terrace show that tool production involving both adzes and graters took place close to the period of first European contact. This last phase of flaking closely followed the construction of a terrace using fill from a defensive ditch. The presence of struck flakes within the terrace fill indicates that stone-working also preceded the earthworks in this location.
Figure 3.3: Artefacts from the Lower Ditch Terrace Excavation
a = Broken Hammerstone, b = Possible Grater, c = Possible Grater.
Chapter 4

Results of the Excavations on the Star Mound Terrace

4.1 Introduction

Lying at the end of the SW arm, above the steep access spur and lower ditch complex, was a series of terraces running up to and around a high point. Both the high point and the lowest terrace (Fig 2.1) had been used for the construction of star mounds. Given its position this terrace series would have been an integral part of the fortified SW arm. Best chose the lowest terrace for excavation because of the likelihood of the presence of cultural stratigraphy, arising from the building of a star mound on a terrace which had itself been cut into the original ground surface. A potsherd found to one side of the terrace indicated that activities had taken place there as far back as 1600 years ago at least, assuming that the c 200 – 300 AD estimate for pottery abandonment in Western Samoa also applies to Tutuila.

4.2 Excavation Layout

A 2.0 by 2.0m square (Fig 4.1) was positioned where evidence of postholes could be expected had a house been on the mound. This was also judged to be just on the fill side of the cut-and-fill boundary of normal terrace construction with the possibility of finding and dating pre-terrace activities. Due to lack of time Square 1 was halved after the first 10cm when no evidence of postholes was found. The resulting 2.0 x 1.0m unit was taken down to a depth of 130cm, with test holes to another 50cm.

Two test holes were placed across the mound in line with the east balk of Square

19
1, with later a connecting trench (4) between Square 1 and the nearest of these (Fig 4.1). In line with these were two other units, a test hole on the edge of the next terrace to the north (5), and a trench just outside the mound to the south (7). A small test trench was also dug through the east edge of the mound (6), and 4 small test holes placed just outside (5,8,9 and 10).

Excavation was by 8 to 10cm spits when no definite surface was present. Sieving was attempted, using a mesh size of approximately 5mm; however the soil and the wet conditions resulted in most of the excavated material remaining in the sieve, where it was sorted through.

The stratigraphy of units 1, 6 and 7 will be described below. The remainder can be seen in Fig 4.2.

4.3 Stratigraphy

4.3.1 Square Unit 1

A 2.0 x 2.0m square, changing to a 2.0 x 1.0m trench after 10cm, (Fig 4.3) situated just SW of the star mound centre.

Layer A A brown sticky clay loam, containing many stone flakes, 3 preforms, 2 fragments of used adze, 3 potsherds, and one obsidian core. At least one possible living surface was encountered, and one charcoal lens.

Layer B A clay loam, slightly harder than the overlying material, containing streaks of blue clay and flecks of an orange soil, with a lens of charcoal, charcoal fragments, flakes and preforms.

Layer D A grey gravelly loam, containing flakes and preforms, also large cobbles, some unworked.

Layer E A compacted gravelly material, with large cobbles. No cultural material was found, and the layer was regarded as natural.

There appear to be three main types of deposit in this excavation unit. Layers D and E are indistinguishable apart from the presence of cultural material in the latter, and seem to represent the original surface which has been disturbed and modified to some extent. The B layer, with its possible organic staining, which runs back over the basaltic ash layer to the north (layer C), and its associated lens of charcoal, appears to be an occupation surface. In the charcoal lens were at least two preforms, also a large blade core (Fig 4.4a).
All the material above this, the A layer, is the result of more than one episode of mound build-up. From the base of the layer to 24cm below ground level most of the flake material encountered was on edge, indicating one period of fill. At that depth a lens of charcoal spread almost 50cm into the square from the NW corner. Immediately beneath this was found a section of a used adze (Fig 4.4b).

At least one probable surface was encountered between this level and the ground surface. At 4cm depth a collection of flakes was lying flat, in groups that suggested that a stone-working activity had taken place close by. One of the potsherds was among the flakes.

4.3.2 Unit 6

A 1.5 x 0.5m trench, (Fig 4.5) cutting through one of the eastern lobes of the star mound.

Layer A1  A friable brown loam, with worked stone material, mainly flakes.

Layer A2  An intermittent lens of light orange loam.

Layer A3  A friable brown loam, containing worked stone material, mainly flakes.

Layer A4  A red rubbly loam, with some yellow flecks. No cultural material found.

Layer C  A dark grey slightly weathered basaltic ash.

Layer A2, the intermittent lens of light orange loam, is taken to represent the start of the star mound construction. It is approximately at the same level as the ground surface outside the mound, and with the charcoal lens at the base of A5 in Square 1. The basal material in this trench, the dark grey basaltic ash, was encountered in all other excavation units under either the mound or the terrace. It was not present in Square 1, where it stopped short a bare 60cm away to the north.

4.3.3 Unit 7

A 1.5 x 0.5m trench, (Fig 4.5) situated as close as possible to the south edge of the mound.

Layer D1  A dark brown loam, with many flakes and preforms.

Layer D2  A similar material to the above, with flakes, preforms and weathered cobbles, the latter up to 17cm diameter.

Layer D3  Orange brown rubbly loam, with occasional flakes and preforms.
Layer E  A hard rubbly orange brown layer, with no cultural material.

Layer D1 appears to be material derived from the front of the terrace prior to the mound construction. The remaining layers are taken to be similar to layers D and E in Unit 1.

4.4 Interpretation of Stratigraphy

The finer points of the stratigraphy are by no means clear. The expected evidence for cut-and-fill procedures was not found, although the scarp in layer C was suggestive of an earlier terrace. However the rubbly material directly to the south of this feature, and which is interpreted as a fill, did not continue to the south edge of Unit 1, and is taken to be a localised deposit of fill, possibly in a depression.

No evidence for a pre-terrace ground surface was recognised. This could only have been present south of the weathered rock scarp, and if consisting of a weathered rock matrix would have been difficult to pick up.

A tentative reconstruction of the pre-terrace surface would be of a slope where rocks were actively eroding (some 5 metres down the slope to the south this is
Figure 4.4: Artefacts from Star Mound Terrace, Square I and Quarry Area 2; 
a = Blade Core, b = Ground Adze fragment, c = Ground Adze fragment, d = Possible Grater, e = Ground Adze fragment from Quarry Area 2 (see appendix for details)
Figure 4.5: Star Mound Terrace, Trench 6, W Section and Trench 7, E Section
what is happening today). Initial exploitation of this, whether purely as a minor source of material, or possibly during the construction of a small terrace, would have resulted in the debris that was found in the lower levels, mainly the large number of weathered cobbles used as cores. This activity may not have preceded the building of the main terrace by very much; it may even have occurred during modification of the front part of the slope during levelling for the terrace itself.

The initial terrace construction in the centre at least, consisted of clearing off all material above the basaltic ash. Occupation at that level is indicated by the organic staining in Layer B and by the charcoal lens associated with it (in Layer B2), also by the worked stone debris scattered throughout the square.

The next stage appears to be a raising of the terrace level, possibly to its present height outside the star mound. In Unit 1 this material contained flakes which were mainly on edge. No living surface was located at this level in any of the excavation units put down within the mound; however extrapolation from the levels outside the mound in Units 6 and 9 (see Figs 4.1 and 4.2), and the charcoal lens (A5) in Unit 1, indicate that the terrace fill would most probably have originated from the construction of the higher terrace.

It is hard to see the scatter of flakes and stones that were present near the surface of the star mound as being anything other than evidence of activities on a genuine surface. It is just possible that a kit containing flaking debris was emptied out during the final stages of mound formation, but that argues for a surprisingly level surface before the final height of the mound was reached. This may indeed have been the final surface, with the 5-8cm of material above it deposited by slopewash from the higher terraces, or as a dressing to raise the surface prior to its last use.

As can be gathered from the above, all interpretation of the stratigraphy is affected by unfamiliarity with the local conditions, and the short time available for gaining experience with these. Certain broad assumptions can be made, however:

1. that pre-terrace stone quarrying and working activities took place.
2. a large terrace was formed and lived on for some time.
3. the terrace was raised, possibly with some activity then occurring.
4. a star mound was constructed.

4.5 Chronology

Two charcoal samples were submitted from excavation Unit 1 (Figs 4.2 and 4.3. The earliest (NZ7598) was from Layer B2. It was a small lens of charcoal associ-
ated with a large blade core and two preforms. The conventional age was 602 ± 50 BP, the corrected age at 1 SD 1308 – 1358 AD (42%) plus 1381 – 1411 (25%). This is taken to represent the occupation of the earliest terrace construction, that directly above the basaltic ash layer.

The second sample (NZ7597) came from a thin charcoal lens 24cm below the mound surface, at the base of layer A5. The conventional age was < 250 BP, with a corrected age somewhat later than 1710 AD. This, on the same level as the ground surface outside the star mound, may well date the building of the mound.

4.6 Artefacts from the Star Mound Terrace

All excavated material, consisting almost wholly of basalt flakes and preforms, was removed from the site and ultimately stored at the Historic Preservation Office of the Dept. of Parks and Recreation in American Samoa. A very small selection of both flakes and preforms was taken back to New Zealand for further analysis. The weights of all excavated material were recorded prior to final storage in Tutuila, and some basic information is available from these. Fig 4.6 shows the weights of flakes and preforms, and the percentage of flakes with cortex remaining.

As can be seen in the B and D layers, an apparent change is taking place through time, with the flake weights, preform weights and percentage of flakes with cortex, all becoming less. In addition, the percentage of worked cobbles rises from 7% in B6 to 40% in B4. In the A layer a different type of activity is occurring with no evidence of change, involving small flakes, fewer preforms (and those that are present small in size), and few flakes with any evidence of cortex. As mentioned above, the stratigraphy in the base of excavation Unit 1 was not fully understood; however, it seems that a source of basalt, namely the boulders or cobbles occurring in the natural, were being worked where they occurred. The ensuing changes in the higher B levels are not easy to explain, but might be the result of reworking of the initial quarry area. A certain amount of the material in Layer A probably originated in the fill, so it is not possible to relate this to activities taking place on the terrace itself. This material indicates a different stage of adze production, probably the final flaking prior to any grinding. This is an activity that might be expected on these upper terraces once any initial local source of rock, such as that encountered at the base of excavation Unit 1 had been depleted or buried.
Figure 4.6: Star Mound Terrace, Square 1. Average flake weight, % of flakes with cortex, and preform weights, plotted by layers.
Figure 4.7: Star Mound Terrace Preforms (see appendix for details)
Figure 4.8: Star Mound Terrace Preforms cont. (see appendix for details)
Figure 4.9: Star Mound Terrace Preforms cont. (see appendix for details)
Figure 4.10: Star Mound Terrace Preforms and Flake; a, b, c = preforms, d = re-touched flake (see appendix for details).
4.6.1 Preforms

Nineteen adze preforms and two blanks from layers A4 – B5 were examined and drawn by Leach, all but three from layer B. Of 16 preforms that still carried clues to the original blank type, 9 were made from blades or elongated flakes (Fig 4.7a–b, d, Fig 4.8a–c), 5 from flakes (Fig 4.9a–c), and 2 from naturally fractured blocks (Fig 4.10b–c) (Table 3.1). Both blanks were also blades (Fig 4.7c). So far as it can be judged from the discards, the intended adze types include Types I, II, III, IV, V, VI and IX. Not too much weight should be placed on the suggested Type Vs, as this is a type which took on its characteristic semi-circular cross-section during the grinding process.

4.6.2 Selected Artefacts

Table 4.1: Selected Artefacts

<table>
<thead>
<tr>
<th>Layer</th>
<th>Potsherd</th>
<th>Ground Adze Fragment</th>
<th>Obsidian Core</th>
<th>?Coconut-Grater</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>1</td>
<td>1 (Fig 4.4c)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A6</td>
<td>1</td>
<td>1 (Fig 4.4b)</td>
<td>1 (Fig 4.4d)</td>
<td></td>
</tr>
<tr>
<td>A7</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.1 lists the artefacts recovered that are not directly associated with adze production: Fig 4.4b and c illustrates the two (finished?) basalt tools that had received grinding. The so-called coconut grater (Fig 4.4d) may be a discarded tool, however it may also have been an unused product of the stone working process; certainly Leach found the same tool amongst the Lower Ditch Terrace working floor debris. The degree of weathering makes it impossible to determine whether this example had evidence of usewear. One other finished artefact was found on the upper area of the site. This was the blade section of an adze (Type VI?), which lay among flake debris in Quarry Area 2 (Fig 4.4e).

All potsherds recovered were of the thin-walled so-called fine ware type. A sample of the sherd from Layer A2 was sent to W.R. Dickinson for thin-section petrography. Two thick-walled 'coarse ware' sherds were found outside the excavations: one was on the south edge of the Star Mound Terrace, and the other was 200m east of the upper ditch, up the main Malalolo Ridge, on a terrace which con-
tained a star mound. Samples of these were also sent to Dickinson for analysis. All three were stated to contain temper compatible with a Samoan origin. The sherd from east of the Star Mound Terrace proved similar to sherds from Falefa and Vaiulele on Upolu, Western Samoa (Dickinson 1988).

The flaked obsidian core was included in an analysis of Samoan volcanic glass, carried out by Sheppard, Hancock, Pavlish and Parker (1989). The material analysed consisted of six archaeological pieces from two sites on Upolu, the core from Tataga-matau, and five geological samples from Goat Island in Pago Pago Harbour. All archaeological samples were similar, and different from the geological samples. The chemistry of the former makes it likely that they are derived from a local Samoan trachyte. Like pottery, obsidian also appears to drop out of the Samoan sequence after 200 – 300 AD.
Chapter 5

Results of the Excavations at the Rubble Terrace Complex

5.1 Introduction

The desire for more information on adze and quarrying technology motivated Witter's excavations on a series of terraces on the waterfall spur in Quarry Area 1 (Fig 3.1). The high forest canopy on this spur does not permit heavy undergrowth; so the terraces were selected for their obvious evidence (or lack of it) for tool manufacture and/or stone extraction. The focus of these excavations was the Rubble Terrace (Terrace L in Leach and Witter 1987 : Fig.2), which displayed worked basalt rubble and flakes over its entire 32 x 15m surface. The adjoining terraces, both uphill and downhill, were examined for comparative purposes. They were the Off-set Terrace (formerly Terrace I), and the Red Log Terrace (formerly Terrace F), both uphill, and further down the spur, the Promontory Terrace (formerly Terrace P).

At the Rubble Terrace the first objective was to determine the stratigraphy of the terrace. The working model formed during the previous visit was that this was a cut-and-fill terrace: the slope had been cut into in order to extract suitable basalt (bedrock?), and the spoil and manufacturing debris had been built out in front to create the terrace. By analysing the stratigraphy of the terrace and adjoining slope, it was hoped to determine the stone extraction process and whether the source at this location was underlying bedrock, as in the waterfall cliff, or naturally weathered blocks in a clay matrix.

A second objective was to expand our understanding of adze technology. This involved determining what stages of tool production were carried out on the ter-
race and what adze types were intended. It also included examining the spatial patterns of tool production, whether discrete workshops could be isolated, and whether manufacturing was concentrated around the edges of the terrace or in the middle. From this it was hoped to develop a model of the labour organization required for the quarrying and tool making.

Excavations were carried out by trowelling upper flake layers and removing fill and boulder layers with spade and/or pick. For some test squares sieving was attempted, but the clay proved too wet and sticky to pass through the mesh. Artefacts were then hand-sorted in the sieve.

5.2 Stratigraphy and Chronology of the Rubble Terrace

A baseline 15m long was laid from back to front of the Rubble Terrace, and referred to as Trench 1. Pit 1 of Trench 1 was located on the front edge of the terrace 14 – 15m from the datum, while Pit 2 was situated at 3 – 4m along the baseline, close to the back scarp. Another test excavation cut into the southern side of the terrace was labelled Trench 3.

5.2.1 Pit 1, Trench 1

This 1.0 x 1.0m pit (Fig 5.1) was dug to a depth of 133cm to test the type of fill at the front of the Rubble Terrace, to reach the original forest soil under the fill, and to try to obtain a carbon sample which would provide a date for any activities prior to terrace construction.

Layer 1 A compact layer of flakes and preforms with a brown clay loam matrix, 14 – 26cm thick. The flakes are small and derive from preform reduction, with some possible reworking of earlier discards.

Layer 2 A dense flake layer, 9 – 41cm thick, with little surrounding matrix. The flakes are large and were deposited parallel to the surface.

Layer 3 Red-brown clay terrace fill, 19 – 22cm thick, containing unworked stones, and flakes sometimes lying on edge. A lens of fine chips occurred on the interface between Layers 2 and 3.

Layer 4 Mostly large flakes and a few preforms forming a bed 7 – 15cm thick without any matrix, the result of a single major flaking episode.

Layer 5 Red-brown clay terrace fill, 28 – 54cm thick, similar to Layer 3, but with a lens of large boulders at the base.
Layer 6 Brown, friable loam, 11cm thick, formed under forest. It contains abundant flakes which provide evidence of tool manufacture before the terrace was built up.

Layer 7 Brown soil of natural origin, without flakes. A 10cm diameter posthole had penetrated 12cm into this layer. A sample of charcoal from this posthole (NZ7593) gave a conventional radiocarbon age of 906 ± 157 yrs BP corrected to 1017 – 1269 AD (68% confidence interval).

5.2.2 Pit 2, Trench 1

This testpit was 1.0 x 1.0m and reached a maximum depth of 200cm (Fig 5.2). It was positioned to examine the fill at the rear of the terrace and to reach the original cut surface.

Layer 1 Below a surface zone of large boulders (>20cm), this layer consisted of 43 – 73cm of brown clay, smaller boulders, preforms and flakes. A flake lens 5cm thick occurred in the middle of this layer.

Layer 2 A layer of flakes, preforms and small stones (5 – 10cm across) in a brown clay matrix, 7 – 31cm thick. Flakes varied from small chips to large (>5cm maximum length or width). A boulder lens was found at the base of this layer.

Layer 3 Brown clay fill, 11 – 31cm thick, with some red-brown clay patches and lenses. This fill layer contained small stones, preforms and redeposited flakes.

Layer 4 Large flakes (>5cm), lying horizontally, formed this 30cm thick layer into which almost no clay had permeated.

Layer 5 Red-brown clay fill, 20 – 58cm thick, containing redeposited flakes, stones and preforms, similar to Layer 3. A pocket of loose flakes in the southwest corner may indicate a root or posthole.

Layer 6 Natural weathered red scoria, into which the terrace base had been cut.

5.2.3 Pits 1 and 2, Trench 3

This trench was 2.0 x 0.2m and was dug to a depth of 163cm (Fig 5.3). It was excavated in two phases: Pit 1 was cut to expose the stratigraphy of a length of the
Figure 5.1: Rubble Terrace, Pit 1, Trench 1, W and E Sections.

39
Figure 5.2: Rubble Terrace, Pit 2, Trench 1, All Sections
side of the terrace, hopefully to reveal the point at which the rear of the terrace had been cut into the scoria. When the scoria edge did not appear, Pit 2 was excavated on the uphill side to intersect this cut.

Layer 1 A flake layer, 35 – 40cm thick, consisting mostly of small (<5cm) preform reduction flakes, lying horizontally. It included lenses of very small (1cm) and larger (5 – 8cm) debitage, also small preforms. The matrix was a dark-brown clay.

Layer 2 This layer consisted of exceptionally large flakes (mostly >10cm) without any matrix for the upper 10cm, and with only a loose clay matrix in the lower 20cm. Total layer thickness was 30 – 38cm. The massive broken preforms and blank cores derive from a single blank production event. Two charcoal samples were submitted from this layer: NZ75594 gave a conventional radiocarbon age of 580 ± 63 yrs BP and corrected age at 1 SD of 1310 – 1356 AD (33%) plus 1382 – 1429 (36%); NZA375 was dated by accelerator to 580 ± 110 yrs BP.

Layer 3 A fill layer of red-brown clay, 26 – 53cm thick, containing stones, flakes, preforms and charcoal. A sample of the charcoal (NZ7595) gave a conventional radiocarbon age of 448 ± 70 yrs BP, and corrected ages at 1 SD of 1421 – 1519 AD (36%) and 1591 – 1622 (12%).

Layer 4 A 19 – 31cm thick layer of boulders (10 – 25cm across) within the same red-brown fill as Layer 3. These boulders lay on the base of the terrace cut and against the rear scarp.

Layer 5 Natural weathered scoria out of which the back of the Rubble Terrace had been cut.

The three excavations on the Rubble Terrace show that although the terrace was cut into underlying scoria, little of this material was used to build up the front of the terrace. Instead the fill layers consisted of red-brown clay, boulders, stones and redeposited flaking debris. Flake layers left by one or more major production events interrupted the building-up process. Although there was insufficient time to join the trenches, some correlations can be suggested and a sequence proposed.

The earliest evidence of activity are the flake found in the natural soil buried under the front of the terrace (Pit 1, Trench 1, Layer 1). They may result from limited and opportunistic use of basalt boulders naturally exposed on the surface. A structure requiring a posthole was erected at this time (1017 – 1269 AD). The next stage involved cutting the terrace and removing the freshly exposed scoria fill.
Figure 5.3: Rubble Terrace, Trench 3, Pits 1 and 2, NNE Sections
Figure 5.4: Rubble Terrace Preforms
Figure 5.5: Rubble and Offset Terraces Preforms and Hammerstones
a, c–e = Preforms from Rubble Terrace, b = Complete Hammerstone from Rubble Terrace, f = Broken Hammerstone from Offset Terrace
Figure 5.6: Rubble Terrace Preforms cont.
to another location. Boulders were piled on the floor of the cut (base of Layer 5 in Trench 1, Pit 1 and Layer 4 in Trench 3), some of which were used to produce blanks while others remained unworked.

Clay fill was then dumped on top, probably derived from weathered scoria clays from the slopes above. This fill contained flake debris, preforms and small stones but no large boulders. It provided a platform for a major phase of stone working which involved both blank and preform manufacture. For the former, boulders were completely reduced, providing huge flakes suitable for blank cores. Preform production is represented by a range of exceptionally large reject preforms of triangular and trapezoidal cross sections (Fig 5.4a and b). Both stages gave rise to quantities of large waste flakes which accumulated into a layer up to 40cm thick. Horizontal overlapping of these flakes prevented clay from filling the gaps between them. If the large-flake layers represented by Layer 4 in Pits 1 and 2, Trench 1, and Layer 2 in Trench 3, can be correlated, this production event can be dated between 1310 and 1622 AD. A brown clay fill was then deposited over most of the terrace, providing a platform for more episodes of flaking, but not at the same scale as the earlier ones. Selected preforms from these later flaking activities appear in Fig 5.5 (Pit 1, Trench 1) and Fig 5.6a–d (Pit 2, Trench 2). Two preforms from the first clay fill layer are shown in Fig 5.6e–f.

### 5.3 Stratigraphy of the Adjacent Terraces

#### 5.3.1 The Promontory Terrace

The next terrace below the Rubble Terrace, the Promontory Terrace, has a clay surface about 40m long and 20m wide. In contrast to the Rubble Terrace, no stone working debris was visible on the surface and only a small cut scarp showed at the back of the terrace. Two excavation units were located on this terrace: Trench 5 was dug towards the centre back, close to a large isolated boulder, and Trench 6 was excavated in the side of the terrace above the waterfall cliff.

**Trench 5**

This consisted of two adjoining pits (Fig 5.7). Pit 1 was 1.0 x 2.5m and reached a depth of 90cm. Beneath a 20cm friable brown clay loam topsoil, a homogeneous red-brown clay was encountered with no stratigraphic change reached when the digging ceased at 90cm. Flakes and small stones were present but uncommon in both layers. Another 1.0 x 0.5m unit (Pit 2) was extended from Pit 1 to the large boulder to determine whether any unusual material was present. Only the topsoil
was removed, consisting of 17cm of friable brown clay loam with scattered flakes and small stones. Apart from a pair of blade-like flakes in the southwest corner, no unusual items were found.

Trench 6

On the south side of the Promontory Terrace, Trench 6 (0.9 x 1.5m) was excavated to a depth of 95cm (Fig 5.8). It was dug to provide details on the construction of the terrace and the underlying substrate.

Layer 1 Friable brown topsoil, 20cm thick, with few flakes.

Layer 2 Compact red-brown clay fill, 39 – 49cm thick, also with rare flakes.

Layer 3 Naturally formed brown, friable forest topsoil, 5 – 10cm thick.

Layer 4 Brown subsoil containing weathered basalt boulders, 20cm thick, overlying basalt bedrock.

These excavations showed that the Promontory Terrace was formed by depositing a layer of reddish-brown clay fill, at least 1m thick, directly on top of the existing thin soil mantle of a spur of solid basalt. A scarp at the back of the terrace shows that some cutting was done to form the terrace, but this would not have provided all the fill necessary. The reddish colour of the fill, and the scatter of flakes within it, suggests that it is derived from the cutting of the Rubble Terrace, the nearest major earthwork feature uphill.

5.3.2 The Off-set Terrace

The small Off-set Terrace, 22 x 6m, lies above and to the southeast of the Rubble Terrace, in the middle of a steep slope which has been subject to slumping and cutting. Trench 2 was positioned on the steep face and Trench 4 was dug into the front part of the terrace. Neither slope nor terrace showed evidence of concentrated stone working, although there were scattered flakes.

Trench 2

This was 2.0 x 2.2m and reached 165cm maximum depth (Fig 5.9). It was cut into the slope to determine if this area had been the location of a basalt outcrop quarry face subsequently obscured by slumping. The back wall (northeast) had the following stratigraphy:
Figure 5.9: Near Offset Terrace, Trench 2, NW and NE Sections.
Layer 1  Brown clay soil, 30cm thick, with stones and boulders.

Layer 2  Red-brown clay, homogeneous for at least 135cm. It contains large basalt boulders (up to 30cm) as well as numerous smaller stones (<10cm).

This trench appears to have exposed the original quarry face which has since been covered by slump deposits. However this face was not basalt bedrock but a clay solifluxion mantle which has been working its way downslope carrying large blocks of basalt. The clay surrounding these boulders seems to have provided the fill for the Rubble Terrace below, while the boulders themselves became the source material for tool production.

Trench 4

This trench was 0.9 x 0.8m and was dug to a depth of 127cm, (Fig 5.10) to determine whether this terrace had been cut into the slope in order to extract basalt boulders.

Layer 1  Brown clay soil, 55 – 99cm thick, with flakes and stones.

Layer 2  Red-brown clay fill, 46 – 70cm thick, with very few flakes and stones. A 30cm thick lens of large boulders, some reddened, was found in association with a patch of charcoal in the upper zone, sampled for dating.

Layer 3  Natural dark-brown clay soil containing stones but no flakes, dug into for 20cm.

The charcoal sample (NZ7596) gave a conventional radiocarbon age of 521 ± 55 yrs BP for the fire which marked the last stage of build-up of the terrace surface using fill from the adjacent quarry slope. The corrected age at 1 SD is 1396 – 1458 AD. This feature, like the Promontory Terrace, seems to have been a fill rather than a cut terrace.

5.3.3  The Red Log Terrace

This is a large terrace occupying a prominent position at the top of the quarry face, above the Rubble and Off-set Terraces. It has extensive basalt workshop deposits around its outer edge, as well as scatters of flakes and preforms over the rest of the surface. The back of the Red Log Terrace is marked by a steeply cut scarp. Trench 7 was positioned on the south edge of the terrace.
OFFSET TERRACE
TRENCH 4
SCHEMATIC SECTIONS

Figure 5.10: Offset Terrace, Trench 4, ENE and SSE Sections
Figure 5.11: Red Log Terrace, Trench 7, E Section
Trench 7

This trench was 1.0 x 0.7m, reaching a depth of 80cm (Fig 5.11). It was excavated to examine the type of fill used in forming the terrace.

Layer 1  Concentrated flakes in a brown soil matrix, 20cm thick, lensing out on the edge of the terrace.

Layer 2  Brown clay fill, 20 – 25cm thick, containing stones and flakes. This fill layer graded into Layer 3.

Layer 3  Red-brown clay fill, 30cm thick.

Layer 4  Brown natural clay soil with boulders. This layer followed the original slope of the ridge.

The Red Log Terrace appears to be of straightforward cut-and-fill type, with the size of the cut scarp at the rear roughly matching the built-out front. The fill does not have any special association with boulder extraction or adze manufacture. The workshop debris around the outer edge may represent a secondary use of the terrace.

5.4 Conclusion

Excavations conducted on the series of terraces making up the Rubble Terrace Complex showed that the simple model of cut-and-fill terrace formation (Fig 5.12) applied to only one, the Red Log Terrace, which seems to have been built for purposes unrelated to quarrying or preform production. Two terraces can be described as predominantly fill: the Off-set Terrace was constructed of clay fill derived from the quarry slope above and beside it, while the Promontory Terrace seems to have been built up with fill from the cutting of the Rubble Terrace. Although the Rubble Terrace was subject to cut-and-fill processes, the material from the cut was apparently transported downslope, and the Rubble Terrace fill came from the quarry directly above it (Fig 5.13).

On the basis of our limited excavations it is difficult to determine the primary functions of each of these terraces. The two built of clay from the quarry slope, from which the boulders had been extracted, were not used as working floors, and cannot have been designed as clay dumps since it would have been much easier for the quarry workers to tip the clay residue down the sides of the spur than to build

1NB: This conclusion represents the views of Witter and Leach, but not of Best.
Figure 5.12: Original cut-and-fill model of formation of Rubble Terrace
Figure 5.13: Revised model of formation of Rubble and Promontory Terraces
it up into terraces. The Rubble Terrace, however, can be satisfactorily explained as a stage for several major episodes of blank and preform production. Its layer sequence can be closely correlated with both quarrying and tool-making activities.

A crucial part of the extraction process would have been the technique by which the basalt boulders were separated from the clay and smaller stones. A possible clue to this technique was supplied by the land-owner Mr Tony Willis. He said that in road building in Samoa it was common practice to set up a post and rail fence along the slope. This allowed the clay (which was always wet) to pass through the rails, while the boulders were retained as in a giant sieve. Witter believes that a similar device could have been used above the Rubble Terrace, with the clay and small stones being forced through the screen and spread over the terrace, and the boulders intended as blank cores stored up behind it. The stock-piled boulders would then be released onto the terrace surface, for sorting and flaking. Whether or not this screening technique was employed, some type of boulder retaining device would have been necessary, since the slope is too steep for safe stacking of boulders as they were dug out of the clay mantle.

These earth-moving and boulder extraction events were associated with large-scale reduction of basalt boulders to blanks and large preforms. The final stages of preform production were concentrated around the outer edge of this and other terraces, perhaps to facilitate the disposal of the small sharp flakes. The scope of these activities, both in space utilized and volume of material moved, indicate that considerable labour organisation was involved in quarrying and adze manufacture. We can envisage one group of men digging into the hillslope and forcing the clay through the rails, while another carried it down to the terrace floor to be spread out. Then once the boulders were released, the difficult operations of blank and large preform production would have required specialists or at least specialist direction. Some smaller preform types could be manufactured by less skilled workers. Man-power was also required for packing completed preforms down to the stream-bed and sea-shore grindstones, for the laborious task of grinding the adze fronts and bevels. Other specialists were probably required to shape appropriate-sized halves and to lash the adzes before use.
Chapter 6

Re-examination of Adze Production at Tagata-Matau

The clearance of undergrowth from large areas of Quarry Area 1, together with the excavations, provided new opportunities to observe blanks and preforms in both quarry and working floor locations. Witter also obtained fresh basalt from the base of the waterfall to expand the replication trials begun in 1985.

It became clear that struck flakes or blades served as the blanks for most preforms. There were no obvious cases of cobbles or weathered-out boulders serving as core blanks. Some opportunistic selection of suitably shaped blocks was evident, but the blanks concerned had fractured along zones of weakness, probably during flaking attempts. They were therefore technologically more akin to flake than to core blanks. The flake or blade blanks underwent three main manufacturing stages to become preforms:

1. Bimarginal reduction (narrowing, usually of the sides) - this stage involved the loss of the greatest amount of mass.

2. Bidirectional reduction (thinning, shaping and trimming to achieve maximum cross-sectional symmetry).

3. Bevel flaking. The bevel was usually made on the same side as the surface used as the platform for the first stage of reduction.

(By convention the side with the bevel is referred to as the back, and the adze is presumed to have been hafted with the back and bevel facing towards the user.)
However it should be noted that this hafting convention may not have been rigorously applied to all adzes, in particular to the Samoan Type IV which may sometimes have been hafted with the bevel to the front (Buck 1930: 362-3; Firth 1959: 151). Certainly some Samoan Type IV adzes in New Zealand collections examined by Leach appear to have haft polish on the side opposite the bevel. Most Polynesian adzes develop this type of polish on the same side as the bevel.

The excavations increased our understanding of the process of blank production by the discovery of blank types not often found on the surface. The scheme presented by Leach and Witter (1987: 44-50) has therefore been expanded. In the terms used below, axial length refers to the length of the flake from the proximal (platform) end to the distal end. The axial width is the greatest measure at right angles to this, even though it may exceed axial length. In relation to a flake the ventral surface is the side where the fracture occurred at the time the flake was struck — it usually displays a positive bulb of percussion. The dorsal is the opposite surface. In the first stage of reduction either the dorsal or the ventral surface may serve as a platform for further flaking.

Blank Type A (Fig 6.1): Small flat blanks with a weak percussion bulb and no prominent dorsal ridging. Axial length may be greater than axial width. The main stage of reduction, usually steep anvil-backing, used the dorsal surface as striking platform, but not invariably. The bevel was usually formed on the dorsal surface. Finished adze cf. Type III. For example, see Fig 4.9 b,e and Fig 5.6c.

Blank Type B1 (Fig 6.1): Pronounced bulb of percussion, hence ventral surface very curved, no dorsal ridge, axial width much greater than axial length. First stage of reduction is on ventral surface from a dorsal platform. Preform cross-section roughly trapezoidal or may have a keel-like ridge down the back. Bevel formed on dorsal surface. Finished adze cf. Type I, II. For example, see Fig 5.6 f.

Blank Type B2 (Fig 6.1): Weak bulb of percussion, hence ventral surface relatively flat, and dorsal surface protruding and massive. Axial width greater than axial length. First stage of reduction is from a ventral platform. If bevel is formed on the ventral surface, preform cross-section is trapezoidal or rounded. Finished adze cf. Type L, IX. If bevel is formed on the dorsal surface, preform cross-section is reversed sub-triangular or reversed triangular. Finished adze cf. Type IV. For examples, see Fig 6.4.

Blank Type C1 (Fig 6.2): Blade blank with pronounced dorsal ridge, and axial
Figure 6.1: Tataga-matau basalt adze blank types A, B1, and B2 in schematized form. Orientation is longitudinal. P = platform, D = dorsal, V = ventral.
Figure 6.2: Adze blank types C1 and C2
Figure 6.3: Adze blank types D1, D2, and D3
length more than twice the axial width. First stage of reduction is from ventral surface. Bevel made on ventral surface. Preform cross-section is triangular. Finished adze cf. Type VI, VII. If bevel is made on dorsal surface the rare Buck Type VIII would result. (Green and Davidson include several adzes in Type VIII which we would classify as Type IV, reverse triangular or subtriangular with thickness much less than width. In our view Type VIII should be reserved for the true trilaterally flaked reverse triangular adze with thickness greater than or equal to width.) For examples, see Fig 4.7 a,c,d, Fig 5.6 c, Fig 6.5, Fig 6.6 a,b.

Blank Type C2 (Fig 6.2): Blade blank with a blade scar or natural surface down the dorsal ridge producing a trapezoidal cross-section, and axial length over twice the axial width. First stage of reduction is from ventral surface. Bevel also made on ventral surface. Preform cross-sections can range from subtriangular to trapezoidal. Finished adze cf. Type I, VI, IX. For examples, see Fig 4.7 b, Fig 4.8 a, Fig 5.5 c, Fig 6.6c,d.

Blank Type D1 (Fig 6.3): Elongated flake blank with a dorsal ridge, axial length greater than axial width but not twice as great. First stage of reduction is from the ventral surface. Bevel made on ventral surface. Preform cross-sections usually trapezoidal. Finished adze cf. Type I, IX.

Blank Type D2 (Fig 6.3): Elongated flake blank like D1 but with previous flake scar or natural facet down the dorsal ridge. First stage of reduction is from the ventral surface. Bevel made on the ventral surface. Preform cross-sections usually trapezoidal. Finished adze cf. Type I. For example, see Fig 5.6b.

Blank Type D3 (Fig 6.3): Elongated flake blank with rounded dorsal surface. First stage of reduction from ventral platform. If bevel is made on ventral surface, preform cross-sections are trapezoidal or possibly plano-convex cf. Type I, V, IX. If bevel is made on dorsal surface, cross-section is reversed cf. Type IV. For a possible example, see Fig 5.6a.

Blank from a tabular fragment fractured along natural cleavage planes rather than a conchoïdal flake, or else from a large block fragment or quarry splinter, without a flake orientation. Preform cross-section usually rectangular or trapezoidal. For examples, see Fig 4.10b,c.

Blank from a stream cobble or weathered out stone, with no flake orientation. This type was not encountered at Tataga-matau.
Figure 6.4: Surface collected preforms
Figure 6.5: Surface collected preforms cont.
Figure 6.6: Surface collected preforms cont.
In the large-scale operation undertaken on the Rubble Terrace, Blank Types D1 – 3 seem to have been the objective, and it appears that the cores from which the blanks were struck were systematically reduced in such a way that the flake scars left dorsal ridges. Corner blades (C1) and subsequently C2 blades also resulted from this reduction process where block dimensions were suitable. Although the lengths of the large, elongated flake blanks are unknown because of transverse fracture, in width some reached 100mm. Judging by the measurements of some completed Samoan adzes the blanks could have exceeded 320mm in length. In his replication experiments Witter could not match the size of these flake blanks. It is possible that the adze production operation represented on the Rubble Terrace was organised for the manufacture of large preforms for exchange.

This situation contrasts with that commonly observed on the surface and upper layers of workshops. Here the boulders used as blank cores show only a few flake scars, mostly for the Blank Types A, B1, and small C1. Such blank production was replicated experimentally and does not require the same expertise and manpower as the large Type C or D forms. The existence of small preforms made from Type D blanks in the workshop debris at the Lower Ditch and Star Mound Terrace, as well as in the Rubble Terrace upper layers may also suggest some gleaning of Type D blanks rejected during an earlier phase. When these short blanks are flaked experimentally, they take on a ‘hump-backed’ appearance, which matches discards on the working floor and some adzes from local collections (e.g. Jack Uhrle’s collection from the gardens at Mapusaga).

In our earlier report (Leach and Witter 1987 : 45) we argued that blank type is an important determinant of preform shape, and that the source of the stone and the form in which the parent block occurs are determinants of blank shape. Following the 1988 fieldwork we can now re-affirm the significance of these factors and draw attention to three more which appear to have influenced production at Tataga-matau: the organization of labour for extracting the material, the levels of skill available, and special demands put upon the craftsmen (such as for ‘export’ quality adzes).
Chapter 7

Conclusions

In relation to the aims of the 1988 fieldwork programme, we were able to

1. extend the survey, locating more quarry areas, defences, four star mounds and numerous terraces;

2. (a) show that at the lower ditch and bank complex, stone working occurred both before and after the earthworks, and continued into the 18th century AD.;
(b) obtain evidence of human activity at the end of the SW ridge (Star Mound Terrace) at a period when both pottery and obsidian were still in use; this activity was followed by terrace building and stone-working from about the 14th century and terminated in the construction of a star mound in the 18th century AD.;
(c) demonstrate (to Leach and Witter's satisfaction) the existence of a period of well-organized boulder extraction and terrace formation on the waterfall spur during the 14th to 16th centuries, preceded by more limited adze manufacture using surface blocks, and followed by possible gleaning of earlier discards;

3. clarify the range of blank types produced at Quarry Area 1, expand the 1987 classification, and show that the most highly organized stone-working episodes revolved around the production of massive elongated flake and blade blanks (which were probably intended to become adzes of Types I, VI, and IX);

4. show that stone extraction at Quarry Area 1 did not involve outcrop quar-rying. In Leach and Witter's view, the chief extraction techniques were a combination of surface block selection and the separation of basalt boulders
from the clay subsoil mantling the spur. At times the latter operation involved earth moving on a major scale.

7.1 Implications for Further Research

Although we obtained new information relevant to each major objective, some major issues remain unresolved. Foremost among these is the interpretation of the surveyed features as integral components of a single ridge-top fort. Leach and Witter's (1987) notion of the fortified quarry is now seen as too simplistic, given the existence of other defensive features, possible habitation terraces and mounds, and two other quarries within the surveyed area. But just as our original conclusion required revision when the survey was extended, we are very conscious that future surveys may change the interpretation of the ridge and spur features as a single fort. Two star mounds situated uphill from the upper ditch, in addition to the stone-working debris in the crater (Clark 1980), suggest that Malalo Ridge may have a similar density of features as Tataga-matau. It undoubtedly has a comparable time depth, given the finds of potsherds at the uppermost star mound terrace as well as in the crater. Until the wider area has been subject to intensive survey, we cannot regard our present understanding of the site boundaries as final, nor assign to the site a more precise label than the current 'fort and quarry complex'.

This uncertainty extends to the interpretation of particular features within the site. While we have demonstrated the existence of a purpose-built industrial terrace, of slope quarries, of numerous tool working floors, of a late star mound and probably late defensive ditch, we are no closer to learning the function of some of the non-industrial terraces, the stone lines and earthen platforms, nor the age of the upper defensive ditch. However, in Best's view there are reasonable grounds for interpreting the terraces clustered around the high points as living areas. Given the evidence for nearly two millennia of human activity on the ridge, we should expect many parts of the site to have had multiple uses. Only further excavations will unravel them.

Although the purpose of the fortifications needs further study, the importance of Tataga-matau as a quarry complex has been enhanced by the discovery of more quarry areas and working floors within an area more than twice the size of our original site. The discovery of the massive flake and blade blanks on an industrial terrace constructed about 600 years ago highlights the special qualities of the Tatanga-matau basalt which may have led to its export. But when was this potential first exploited? So far the petrographic and element analysis studies have been unable to pin down the quarry source of adzes found in archaeological sites of earlier
millennia. Technologically many of the larger adzes collected in Western Samoa display the high levels of skill we have observed in the Tataga-matau preforms, and where they have been recently chipped they also reveal the fine grain and intense black coloration of Tataga-matau basalt. Determining just how many Samoan quarries were capable of producing such adzes must be a major research priority.

Kirch and Green (1987: 442) have recently commented that many islands in the southwestern Pacific have been part of extensive long-distance exchange systems for hundreds or even thousands of years. The teasing out of these prehistoric networks from archaeological data is a major task facing Oceanic prehistory today.

We now have sound technological evidence for the important position of Tataga-matau during the last millennium of Samoan adze manufacture. Although we still need geological confirmation of the distribution of Tataga-matau adzes, this site remains the most promising candidate in Samoa for the role of an export centre.
## Appendix A

### Catalogue of the Illustrated Artefacts

**Table A.1: The Location and Dimensions of the Illustrated Artefacts**

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**Surface Collected Preforms**

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All measurements are in mm unless otherwise stated.

(...)=fragmentary artefact. Sq=square, Lay=layer, Sp=spit
Tre=trench, No.=Best’s artefact number.
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