

# ARCHAEOLOGY OF KAUAI

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# Archaeology of Kauai

By

WENDELL CLARK BENNETT

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## INTRODUCTION

### SCOPE AND PURPOSE

This bulletin, designed to record what is known of the archaeology of Kauai, is based on nine months' field work during 1928-29 supplemented by a study of available collections, of published literature, and of manuscript notes on file in Bernice P. Bishop Museum.

Unfortunately the continuity of culture on the Island of Kauai is broken. The older natives who still remember the sites of the heiaus (temples) are fast dying, and the younger generations are no longer interested. Much can still be learned about such things as fishing methods and folk lore, but the amount of accurate material to be gathered from the Hawaiians about the archaeology is small.

The destruction that has gone on is a handicap to the field worker. Many heiau foundations have been removed for road building, or for cattle pens. The plantations have cleared away such stones as remained. It is only where vegetation has protected the old sites that the structures remain relatively undisturbed. Unfortunately this protection of cactus and lantana also hampers the work of the archaeologist. Still with all this destruction, sufficient material remains to present a fair idea of the culture of the old Hawaiian.

Despite this special study, no doubt some ruins have been overlooked, some features missed. It is hoped that this work will provide a basis on which to classify such discoveries as may yet be made; or at least, a means of adding the new material to this nucleus.

The material gathered today is, for the most part, without historical or traditional records. Thus the work resolves itself into straight recordings and observations with conclusions and comparisons based on them.

### ACKNOWLEDGMENTS

The literature available that relates particularly to the archaeology of Kauai though not of great quantity is of fair quality. A few works deserve special mention. The reports of the Kauai Historical Society, though unpublished, are of exceptional value as they contain much information from persons now deceased. The legends collected by Rice (46)<sup>1</sup> are of value in

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<sup>1</sup> The figures in parentheses refer to the literature cited on pp.

that they are chiefly localized on Kauai. Among the voyagers' accounts the best is by Captain Cook (14) who first landed in Waimea village, and not only described many archaeological features there, but also summed up the culture of the whole island as he saw it at the time. The account of Waimea given by Vancouver (55) is also valuable for its archaeological contents.

Among the later workers Thrum deserves special mention. The names, descriptions, plans, and facts presented in his study of the heiaus (53) can not be duplicated today, even with the most careful study. Kenneth P. Emory and John F. G. Stokes have both made special manuscript reports on Kauai archaeological features, and some members of the Kauai Historical Society have done archaeological work in special regions. It is impossible to list here the individuals who have helped in this work. Without the cooperation of friends on Kauai and in the Museum, the study could not have proceeded.

#### GEOGRAPHY

Though comprising only 547 square miles Kauai is large enough to have figured at all times as a major influence on Hawaiian culture. Together with Niihau it forms a group which is considerably isolated from the other Hawaiian islands. The channel that separates Kauai and Niihau from Oahu is 63 miles wide, while the next widest channel between any two islands—that between Hawaii and Maui—is only 26 miles.

As a result of this isolation Kauai was never captured or ruled by the king of another island. It was little involved in the affairs of the other Hawaiian islands and had little communication with them. Though the isolation was by no means complete—indeed the traditions are full of relationships between Kauai and the islands further south—still for studying the development of a local culture, or in searching for traces of an older culture, Kauai with its greatest degree of isolation is the most satisfactory source.

Nihoa and Necker islands lying northwest of Kauai and Niihau are thought by Emory (19) to preserve the forms of the prehistoric Hawaiian culture. Kauai, located as it is between these islands and the main body of the Hawaiian group, would undoubtedly have been in contact with Nihoa and Necker inhabitants, and should prove an interesting link to the two cultures represented.

The notable feature about the geography of Kauai is the great variety both of topography and of climate. To the west in the Waimea section the Mana flats are dry and sandy. There is very little rainfall during most of the year. The gulches are narrow and irregular, and maintain only intermittent streams. Very little can be grown without artificial irrigation. The great Waimea Valley cuts through this region with its permanent stream, and fertile soil.

In the southern and eastern parts the rainfall is abundant, even excessive

in places, permanent streams are more frequent, and the growth of vegetation becomes copious. The northwest coast, the Napali region, has short valleys, a rocky coast, high bluffs, and numerous other features that today make it inaccessible for dwelling sites. In the mountains around Kokee the climate is cold and crisp, especially during the nights.

Yet in every section the archaeological remains point to former habitation. Probably each section had its own advantages: the Napali coast for ease of protection; the Hanalei section for the ease of cultivation; the Waimea side for its dryness, which helped when living in a grass hut.

The topography and the climate influence the location and type of house site or terrace. Where agriculture is the chief necessity, every available piece of land suitable for cultivation is utilized, and the house sites selected accordingly. But when it is not so essential to devote all the land to cultivation, the better sites can be selected for the houses.

Although the influence of geography is considerable, still to a great extent the Hawaiians made the geographic conditions conform to their particular needs. By difficult feats of irrigation, by a great deal of terracing, and by other forms of ingenuity and industry, they were able to cultivate where cultivation seemed impossible.

Many of the archaeological sites seem today impossible places to live. Since Kauai has been settled by the white man, significant changes have taken place. Captain Cook (14, p. 225) described the *kula* lands (uplands) of his day in the following manner:

From the wooded part to the sea, the ground is covered with an excellent sort of grass, about two feet high, which grows sometimes in tufts, and though not very thick at the place where we were, seemed capable of being converted into plentiful crops of fine hay. But not even a shrub grows naturally on this extensive space.

Today much of this land has been irrigated and cultivated for sugar. The forested area back of this land has suffered from fires and other destructive agencies. The depletion of the forest cover by fire, and the clearing of land for cultivation has wrought changes in the amount and distribution of water. Many springs have dried up and many streams have been diverted into irrigation ditches. The introduction of cactus, algaroba, lantana, and other bushes and trees has made many a once open valley impassible. The effect of these agents in changing the nature of a site can not be overestimated.

Changes in the beach line of 50 to 100 feet have been reported in the last fifty years. Thrum in his 1907 report (53, p. 39) says that the base and lower terrace walls of Polihale heiau (Site 1) were badly damaged by sea storms. To-day 300 feet of sand beach is in front of it. In 1778 there was enough of a sand bar between the ocean and the Waimea river to give Captain Cook the impression that the back-wash of the river was a pond of



questionable source. The small swamp along the Mana flats is the remnant of a great swamp that once extended many miles. Tradition states that the natives could paddle in it from the Barking Sands almost to Waimea. To-day this has been mostly drained and the land planted to cane. Such facts as these indicate the possibility of changes that would make a once desirable country fairly worthless.

Much has been written from time to time about the isolated sections of the island, especially the Napali region. Gregory (26, p. 20) writes as follows:

The Napali district on the island of Kalai, including the valleys of Nualolo, Awaawapuhi, and Honopu, is particularly difficult of access. Its seaward margin is formed by precipitous wave-cut cliffs and inland the area is sharply dissected into box-headed canyons and "knife-edge" ridges. Each of the three ways of access—a "hand hold" trail up the sea cliff at Honopu, the Kamaile cliff trail, and the rope ladder at Nualolo beach—is available only to experienced climbers.

Thurston likewise (54) speaks of the inaccessibility and the ease of defense of what he calls the "Kingdom of Nualolo." There is no question that the ease of preventing intruders from passing over the trails made these Napali valleys desirable, though to think of them as isolated from the rest of the island is perhaps erroneous. The trails seem to have been freely used by the natives. Gilman in 1845 attempted to ascend the ladder trail from the sea to Nualolo valley. His description (25, pp. 5-6) is essentially correct except that the "path" was not "excavated by the natives," and its height above sea is nearer 30 than "60 or 70 feet:"

As we came along, I had noticed a sort of ladder placed against the face of the cliff, for the purpose of reaching the heights above. A native presented himself as a guide, and I let him lead the way. Starting off, I had no doubt that I was going to ascend the ladder at once, but I had taken but a few steps before I found myself halting and reconnoitering. The way which had appeared so easy, now showed itself full of danger. The path has been excavated by the natives with their rude tools, from the face of an overhanging cliff. It is not a level, but is formed like a gouge turned edgewise, so that one's hold is very precarious. It is also too low to admit of any other than a stooping posture, and I was obliged to shuffle along with the utmost caution. My guide seemed quite at home, as he stood upright outside of me, with his body projecting beyond the surface of the cliff, and encouraged me on. I had taken off my shoes, and by degrees had worked myself two-thirds past, when I rested for a survey. There I was, my chief support a little projecting stone, not sufficient to afford a hold for my whole foot, and my hands clinging with a death grasp to the rock, and in this situation overhanging a gulf, that was foaming and boiling, as the surf broke over the rocks some sixty or seventy feet below me and which would have proved my death place, if I had made the least mistake or slip. I had a strong curiosity to go forward, but discretion prevailed, and I returned. I was then told that few white men had gone as far as I had, and that none had ever passed up the ladder. Taking a less dangerous standpoint I took occasion to examine the ladder. It is made of trunks of two coconut trees, one of which stands against the cliff, and the other out from it, like planting the side of a ladder against a house. The outer stick is well secured with ropes, and is the only means of communication between above and below. The natives pass up by it, even

with a load, as unconcerned as if passing by the best bridge. It is surprising to see even the children pass it free and unconcerned, as if on level ground.

The utter unconcern of the natives compared to the great fear of the foreigner is well brought out in Gilman's account. What to-day is a feat of daring, was then a commonplace event. The communication by sea was also commonplace.

Aside from this ladder there was the landing and trail at Honopu point, also a steep ascent, the Kamaile trail into Nualolo from above, and the trail from Nualolo to Honopu, which, though high, is passable. There is another trail reported from Kalalau into Honopu. A good trail to-day is found from Kalalau to Haena on which horses may pass in dry weather. The trail leading from Kokee in the mountains into Kalalau was in use at the time of the famous leper, Koolau. In the other direction, William Goodwin of Waimea has made his way from the Nualolo flats to Milolii, and the route from Milolii to Polihale has been used many times, though it involves swimming. There is a trail also from Kokee into Milolii. A famous trail led from Waimea up the valley, or up through Kokee, over the Alakai swamps, where the path was built up with sticks (*kipapa*), thence down Maunahina ridge into Wainiha valley. There were doubtless many other trails which lessened the degree of isolation.

It would seem then that the cultural isolation even of the Napali coast was no greater than that of other parts of Kauai. The geographical relations favor the development of a culture essentially the same throughout the island, which is indeed supported by the uniformity of the artifacts and the archaeological ruins.

## HISTORY

Two factors separate the archaeological history of Kauai from the political history: the scarcity and inaccuracy of the genealogies, and the lack of accurate legendary knowledge about the ruins and artifacts. Some of the heiaus are said to have been built by such and such a chief, but it has been possible to place few of these chiefs in chronological sequence.

The mythical origins of Kauai, together with legends relating to its famous chiefs, have been recorded generally by Fornander (23) and locally by Rice (46). Fornander (24, pp. 291-2) writes:

The legendary history of Kauai is very unsatisfactory in any effort to restore historical form and sequence. The legends are disconnected and the genealogies are few . . . . That the ruling families of Kauai were the highest tapu chiefs in the group is evident from the avidity with which chiefs and chiefesses of the other islands sought alliance with them. They were always considered as the purest of the "blue blood" of the Hawaiian aristocracy; . . . . But of the exploits and transactions of most of the chiefs who ruled over Kauai during this period, there is little preserved to tell.

As to the actual history the most significant point is that Kauai remained politically independent up to 1824. The island was never conquered, though in 1810 Kaumualii ceded the island to Kamehameha I to prevent an invasion. With the death of Kaumualii in 1824 the independence of Kauai ceased.

In this report the island of Niihau is considered culturally as a part of Kauai and its archaeological sites are listed on page 153. Fornander (24, pp. 94-5) refers to the relation of Niihau to Kauai as follows:

During these nine generations from Laamaikahiki, the island of Niihau bore about the same political relation to the *moi* (king) of Kauai as the island of Lanai did to the *moi* of Maui—independent at times, acknowledging his suzerainty at others. No historical event connected with Niihau during this period has been preserved, nor any genealogy of its chiefs. Springing from and intimately connected with the Kauai chiefs, there was a community of interests and a political adhesion which, however strained at times by internal troubles, never made default as against external foe.

#### VILLAGES

Archaeological remains indicate many dwelling sites on Kauai in regions unoccupied to-day. The whole of the Napali, or northwest coast, shows the remains of extensive agricultural work and a fairly extensive population in the five largest valleys: Kalalau, Honopu, Awaawapuhi, Nualolo, and Milolii. The Mana region has clusters of house sites in the dry valleys that cut through the cliffs. Nearly all the great river valleys are thoroughly terraced and show evidence of population. Terraces in the Waimea and Hanapepe river valleys are especially abundant. Many scattered sites are found along the coastline. In the mountains are some house sites and small villages. How many sites the extensive cane fields have eradicated can hardly be estimated.

Jarvis (30, p. 121) says: "The natives of all the islands seem very generally to prefer the hot and barren sea side to the cooler and more verdent situations farther up the valley." This preference is not strange in a seafaring people who gained enjoyment and living by fishing. The sites of the villages of any size are near the sea, as well as near the fresh water of some stream. The Mana sites (Sites 2, 5, 9) are exceptional in being far away from permanent streams. The valley bottoms were the next preference to the sea shore. How much of the upland (*kula*) was populated is hard to determine because the traces have been obliterated by modern cultivation, but from the early accounts and the general nature of the Hawaiian life, it is doubtful if many people lived on the high land. The mountain houses were chiefly temporary resting points for bird hunters, wood cutters and travelers, though there are a few small mountain villages, such as Sites 11 and 152. Many temporary camp sites for fishermen and travelers are also found along the coast and on the sand dunes.

Cook (14, p. 233) says in describing the villages: "Though they seem

to have adopted the mode of living in villages, there is no appearance of defence, or fortification, near any of them: and the houses are scattered about, without any order, or their position in any particular direction." In his population estimate, Cook assumes 100 houses to a village. Archaeology reveals no village with 100 houses in a collected group. In Kalalau there may well be 100 houses in all, but they are quite scattered up the valley. However, it must be remembered that many of the house sites were unmarked by stone, and many more have been destroyed. Besides, the continuity of life remains unbroken in those sites which represented the largest villages, such as Waimea, Hanapepe, Nawiliwili, Anahola, Hanalei, and consequently the size of the previously existing villages can not be determined to-day. Now, twenty house sites in a given region is a large number archaeologically.

The size of the population of Kauai has caused much dispute among the historians. Cook (14, p. 230) says:

From the numbers which we saw collected at every village, as we sailed past, it may be supposed that the inhabitants of this island are pretty numerous. Any computation that we can make, can be only conjectural. But, that some notion may be formed, which shall not greatly err on either side, I would suppose, that, including the straggling houses, there might be, upon the whole island, fifty such villages, as that before which we anchored: and that, allowing five persons to each house, there would be, in every village, five hundred; or thirty thousand upon the island. This number is, certainly, not exaggerated; for we had sometimes three thousand persons, at least, upon the beach; when it could not be supposed, that above a tenth part of the inhabitants were present.

It is quite probable that Cook overestimated. There is no historic or archaeological evidence for 50 villages the size of Waimea; 25 villages would be a generous allotment. However, the population up the valleys was fairly large. The following list shows the estimates for Kauai, and the results of the first census, as given by Jarves (29, p. 403):

Estimate of Captain Cook in 1779.....	30,000
A loose estimate for 1823.....	10,000
Census of 1832 .....	10,977
Census of 1836.....	8,934

The relation of the villages to the agricultural fields varies. In the early accounts of Waimea, the village was interspersed among the taro beds. The archaeological remains show this arrangement to apply to other localities. (See Site 30.) In places the top terraces are for houses, and the lower ones are for agriculture fields. (See Site 186.) Elsewhere the taro fields are separate from the village, or at least from a part of it. On Nualolo flats on the Napali coast there are numerous house sites, and the food must all have come from the valley of Nualolo one-half mile off. Also there are taro beds along the trail from Haena to Kalalau valley which must have been cultivated by the people living at one of the two places.

## STRUCTURES

## HOUSES

## FOUNDATIONS AND SITES

Because the material is perishable the Hawaiian grass house leaves little but stone foundations and collections of stones and shells as evidence of dwelling sites. As not all of the grass houses were paved or marked with stone, many of the sites are lost forever. The evidence remaining indicates temporary camp sites, cave shelters, and several types of stone-marked house site foundations.

On the sand dunes and along the sandy beaches are camp sites. (See Sites 7, 88, 89 and 97.) These sites are marked to-day by the presence of large rocks on top of the dunes, which must have been transported there by human agency, by shell heaps, and by the presence of artifacts. The chief artifacts found are small grindstones, broken pieces of large grindstones, sinkers of various sizes grooved and either rough or polished, polishing stones of various kinds, adzes and parts of broken adzes, fish hooks, and cowrie shells pierced at both ends for mounting. Other artifacts known to have been found on the dunes are a ring poi pounder, a shell file, and a shell adz. Fishing shelters are found along the shore. (See p. 18.)

Brigham (8, p. 259) writes of the cave dwelling sites as very old, even though caves have always been used as camps. Menzies (42, p. 28) writes of the Waimea valley at the time of Vancouver's voyage: "It is sheltered on both sides by steep rocky banks, in the caverns of which the natives in many places form habitations." And even to-day the Keaku cave is still used for a resting place on the journey to Waialeale; a cave in Hanalei valley is well known and used for overnight camping; and caves in Kalalau valley show signs of recent occupation. Some of these cave sites are unmodified. Others are built up in front to make the floor level. The cave of Site 202 has a wall 2 feet high and 2 feet wide built up in front of it. Some of the caves in Waimea valley have walls made of the clay and grass plaster that is used in sealing burial caves. In one of these a window and a door were indicated by openings in the wall. Site 3 is the acme of the cave sites, having a platform built up for 10 feet to fill the base of a niche.

The sites that to-day indicate the location of old houses are classified according to their own physical features, and not because they represent different types of houses. Captain Cook's artist, Webber, pictures a scene of Waimea, Kauai, in which he shows circular houses, and also houses set on poles as a precaution against the common flooding of the Waimea river (Pl. II, B). Neither of these types can be recognized in the present foundations. The classification of the foundations is as follows: 1. cleared, flat spaces;



2. stone outlined sites; 3. platform sites; 4. terraced sites; 5. walled sites; 6. two-terrace division sites; 7. complex and compound sites.

1. Cleared, flat spaces. Such sites are highly conjectural as little remains to identify them. The desirability of the location together with occasional artifacts or shells is the superficial evidence relied upon. Sometimes a fireplace composed of four or more stones, forming a rectangle near the center of one of these cleared spaces, definitely identifies it as a house site.

2. Stone outlined sites. The simplest form of this type consists of stones outlining a rectangle 10 by 15 feet, or larger, on a level space. The stones are waterworn or rough, depending on the locality. In Kalalau valley (Site 164) an additional rectangle in outline marks the lanai (porch). Fireplaces marked with stones were found within the outlined area in several places. Slight variation of this type are the houses (Site 21) near Puu Ka Pele. They are located on the flattened top of a ridge and the outline of stones follows the edge of the ridge, flush with the level of the top, with lines of stones running across the top of the ridge, either as division lines of rooms or houses. Several fireplaces are also found there.

3. Platform sites. The platform sites are completely paved platforms of stone raised from 6 inches to 3 feet from the ground. There are sites of the paved platform type that are flush with the ground, such as the one near Site 151, in Wainiha valley. This classification is far from perfect as many of the terraced sites are in reality platforms, but in this paper, the platform sites are limited to those on level ground. Sites on the lava flows in which the stones have been slightly arranged to form a level platform are a subtype of this group. In some places small stones are filled in between the lava to aid in the leveling. Pavings of small stones on level plots, though poorly delineated, are another subtype of this group. Ellis (18, p. 313) writes: "But the best floors are those formed with pebbles, or small fragments of lava, which are always dry, and less likely to be infested with vermine than those covered with grass."

4. Terraced sites. This is a large group because it includes the many houses built on sloping ground. One form of the terraced sites is a dirt terrace on a slope that makes a flat level space 12 by 15 feet or more. Then some terraces are faced with stone. Another group has a stone facing, and a paving extending back 5 feet or more to form a lanai back of which is an unpaved leveled space for the house. Finally, there is the stone faced terrace with the paving extending over the whole house site. The height of the terrace depends on the steepness of the slope ranging from one foot to 10 feet. If the slope is steep the back of the house site is faced against it for a height of 3 or 4 feet. This facing also extends along the sides in places where the platform space is cut into the slope. Walls of 1 to 2 feet in thickness sometimes are used instead of plain facing.

5. Walled sites. These sites may be paved, unpaved, or terraced. The paved and the unpaved are the same and have walls on three or four sides. The foundations with walls on four sides seldom have any opening that would correspond to a doorway even though the walls are 3 feet high. The presence of bottles, bones, metal, and other modern articles in the walls suggests that the high-walled sites are more recent. Some terraced sites have walls on two sides and the back. In some terraces there is a low wall along the front as well which is a continuation of the front facing, though several have a separate wall added to the front of the platform.

6. Two terrace division sites. These sites are of two divisions, the one being divided from the other by a terrace of from 6 inches to more than 4 feet in height. In some sites the upper platform does not extend the full width of the lower one. In other sites the second platform may be walled on the two sides and the back, and be open at the front. In most places both platform spaces are paved, though in Site 94 the second tier has only dirt for facing and paving. The lower platform may be also of the terrace type.

7. Complex and compound house sites. The special houses described in Sites 5, 35, 52, 57, 86, 161 and 174, are distinct because of their complexities. No single description can include them all as they represent specialized houses. Site 5 is of interest because it has the plain dirt level space of type 1, the outline marking of type 2, the paved platform of type 3, the terrace of type 4, and the walled enclosure of type 5, combined in one compound unit which was probably the site of several houses, although it is represented by one continuous foundation. (See fig. 22.) The rest of these houses can best be studied by referring to the list and description of sites. (Perspective plans of four specialized house sites are shown in figure 1 *a, b, c, d.*)

#### SIZE

There is considerable variation in the size of the house foundation sites. The size of the cleared spaces can not be determined. The outlined sites are on the average about 15 by 25 feet without the lanai. The platform sites are 18 by 30 feet on the average but run as high as 30 by 60 feet. The terraced sites show the greatest range, as they include a variety of sites. Eighteen by 25 feet is about their average size although some are 40 by 20, and 60 by 25 feet. Among the two terraced division sites the typical size of the lower platform is about 18 by 25 feet while the second platform is smaller, about 15 by 15 feet. Larger sizes are found (Site 94). The special house sites average about 25 by 45 feet. This is of course just the size of the foundations, whereas little is known about the size of the houses. Captain Cook (14, p. 233) writes of the Waimea houses: ". . . the houses are scattered about, without any order, or their position in any particular direc-

tion. Neither is there any proportion as to their size; some being large and commodious, from forty to fifty feet long, and twenty or thirty broad, while others of them are mere hovels." Ellis (18, p. 313) is more specific, in speaking of Hawaii:

The size and quality of a dwelling varies according to the rank and means of its possessor, those of the poor people being mere huts, eight or ten feet square, others twenty feet long and ten feet or twelve feet wide, while the houses of the chiefs ran from forty to seventy feet long.

Emory (20, pp. 4-45) has shown that the location of the fireplace, the delineation by terraces and lines of stone, the limitation of the space, and the variation in quality of the pavement, are all criteria for judging the approximate location of the house on the foundation. As none of the criteria is accurate, this discussion will be limited to the foundation themselves.

#### LOCATION

The principal location of the house site is on the shore line, especially near the mouths of the river valleys where the taro was growing. The old accounts of Waimea state that houses and taro beds were plotted out together in irregular order. Along the inclined sides of valleys and talus slopes, from the base up almost to the cliffs, are located terraced house sites. On the flat land on top of the bluffs, and on the low ridges between valleys, the foundations of large houses are often found, these being the desirable locations for the chiefs' houses. Near the heiau, or in conjunction with it, are the markings of house sites, presumably for priests. House foundations are along the shore in dry rocky spots where the attraction of fishing must have been the only inducement. In the mountains along the sides of the old trails are house foundations most of which have fireplaces. In a valley like Kalalau the houses are on the rocky ridges and lava flows where the land can not be cultivated. The base of overhanging cliffs was a favorite locality for house sites, despite the danger of falling stones. On the sand dunes, aside from the camp sites, are remains of platform and walled house sites.

The location of the house foundation has much to do with its type, though such is a limiting and not a controlling factor. A terrace must be built on a slope, but whether the platform be paved, walled, double-terraced, or varied in other ways, is determined by the builder. A level space presents the possibility of an unmarked house foundation, an outlined one, a platform, a walled enclosure, or a complicated structure.

Cook mentions the lack of arrangement or orientation of house sites. Ellis, too, speaks of the relation of the houses to each other (18, p. 313): "Their houses are generally separate from each other: even in their most populous villages, however near the houses may be, they are always distinct



buildings." This may be true of the buildings, but the foundations are often joined. In Site 2 as many as three facing terraces and paved lanai platforms join around one large, flat, dirt area. No proof exists that three houses were located there, but such might well have been the case. In Kalalau valley (Site 169) one ridge is crowded with house sites, all apparently facing the sea. The terraced house sites of Nualolo flats (Site 196) run along the edge of the bluff one behind the other like a series of large steps. (See Pl. V, *A* and fig. 54.) A terrace of 100 feet in length extends along the side of Waimea valley, which must have had several houses fronting on it. In general the foundations are separate, and though close to each other, not arranged.

#### FEATURES OF CONSTRUCTION

Waterworn stones laid end to end are used in marking the outline type of house foundation, if it is found on the flat plains of a river or along the sea beach. Flat slabs of sandstone on edge, about 1 foot high, are used for the same purpose when the house is located on a bluff where the slabs are available, as in Site 88.

The walls of the house foundations utilize the natural boulders where convenient. Stones of the same size regularly piled are favored in wall building though there are exceptions. In one of the dune sites sandstone slabs piled flat formed a wall 2 feet high, and one stone wide. Some walls are a double parallel row of stones set on edge and filled in between. Some terraces are made with large stones 2 to 3 feet in diameter, rolled in line and filled in between. (See Site 19.) The regular terrace walls were made with river stone or mountain stone. Where the flat slabs of mountain stone are used an 8 or 10-foot wall can be made almost perpendicular and very solid. (See Pl. VI, *B*.)

The paving varies in different parts of the foundation as well as in different foundations. The flat sides of waterworn stones make a fine paving if carefully fitted. Flat lava stones filled in with small pebbles are used on some platforms. Flat lava stones of 2 to 3 feet in size are used without small pebbles.

The paved terrace sites were built, in many places, of 1 to 2-foot facing stones and a pebble paving. This same method was used on the true platform foundations, an outline of large stones, and a pebble paving. In many cases the paving is quite rough so that additional sand or grass must have been used to make it adaptable for a floor.

Some specialized features are associated with the house sites. Sites 6, 52, and 196 have steps up to their platform. (See fig. 1*a*.) Near several of the house sites are pits. (See Sites 35, 174, 86.) These are not similar in construction. Site 86 shows a square depression 7 feet on a side and 1 foot

deep and a structural part of the house. A small pit, made by rearranging lava stones in a flow, is near Site 174. The pit near Site 35 is 15 feet in diameter, 2 feet deep and has a 2-foot wall surrounding it. In two structures (Sites 86 and 161) there is a raised platform running across the back edge which suggests the special sleeping bench which has been mentioned for some houses by other writers.

Among the things found on house sites, shells, river stone, and coral are abundant. Grindstones, polishers, pounders and sinkers are commonly found. Stray pieces of wood lie about on some. None of the great grindstones that seem so typical of the Nihoa and Necker sites was observed. An occasional poi pounder, or pierced cowrie shell or an adz, sums up the likely finds around house sites to-day. (For the results of excavating see Sites 3 and 196.)

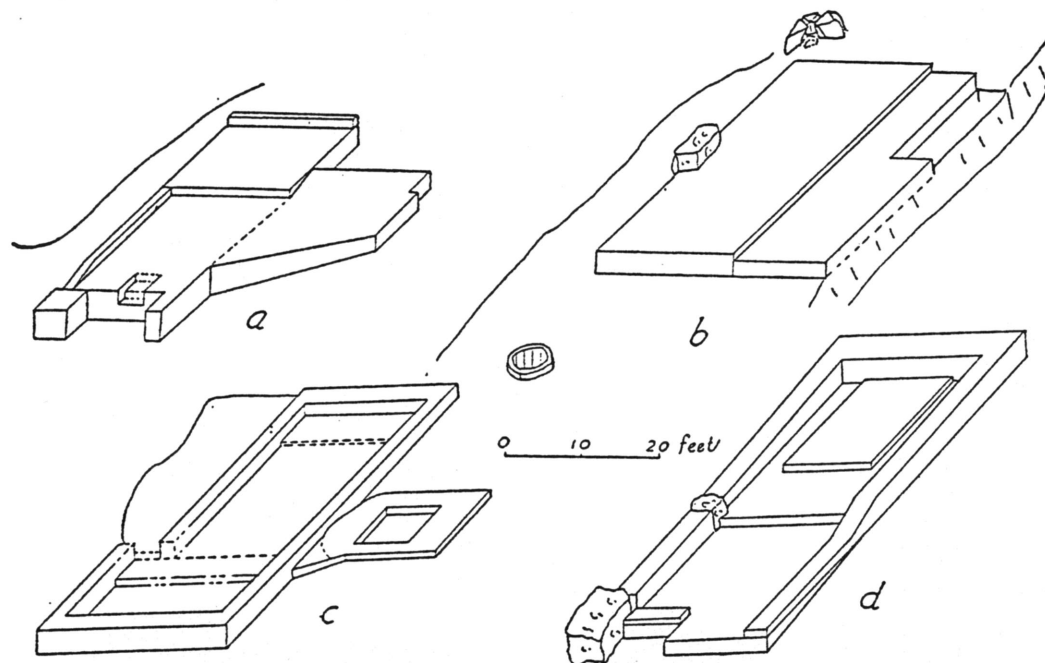


FIGURE 1.—Perspective plans of specialized house sites: *a*, Hanapepe house (Site 52) near the sea; *b*, Kalalau house (Site 174) on a lava flow; *c*, Koloa house (Site 86) on lava outcrop; *d*, Kalalau house (Site 161) on sea bluff. (See also figures 29, 52, 34, and 47 respectively for ground plans.)

## PENS

Small enclosures with rough walls found in many places are roughly classified as "pens". In area they range from 10 feet to 50 feet in diameter. Most of them are irregularly oblong but their shape may be determined by the position of large boulders which are utilized in the wall. In fact the characteristic method of building these walls was to connect boulders 10 to 15 feet apart with walls 3 feet high and a single thickness of stone in width. Some structures consist of three or four divisions. (See Site 162.)

The loose structure of these pens makes them hardly suitable for pigs, though that was probably their chief usage. Some of these small enclosures might have been specially protected garden sites, though few of the agricultural sites are surrounded by walls. No entry ways were found in any of the pens, but in Site 177 a runway had been built beside a large rock that led from the interior to the top of a wall, which, due to the contour of the land in that corner, was level with the outside ground.

These enclosures are to be found in connection with house sites and agricultural plots. Any relation in position to the house sites was not apparent. They are most prevalent in Kalalau and the rest of the Napali coast region, Weliweli section of Koloa district, and Kipu Kai.

There are also cattle corrals found in different parts which are of more recent origin. The larger size, the thick walls well built, the entry ways, the regularity in shape (mostly rectangular), and often the presence of broken stone in the walls; all distinguished the corral from the pen, heiau, or enclosure.

#### WALKS AND PATHS

A few artificially marked paths or walks were recorded. Near Site 151 a path, made by placing flat stones in a line, runs from one corner of a stone-paved house site to the river bluff—about 125 feet. It is in conjunction with remains of recent dwellings and may itself be modern. In Site 177, Kalalau valley, a path crosses an old lava flow from the corner of a house site to a pen—about 80 feet. It is made by rearranging lava blocks to form a level strip about 2 feet in width, and though not clearly delineated on the edges, it is easily followed. Near Site 197 on the Nualolo flats is a walled pathway about 3 feet wide. The walls consist of slabs about 2 feet high set on edge, though the path itself is unmodified. Thurston (54, p. 1) says that the path runs clear back to the heiau (Site 199) but it is hard to trace it that far, due to the extensive *lantana* undergrowth.

#### WALLS

In addition to the walls used in the construction of house sites, heiaus and pens, there are a great number that are independent of any structure. These walls serve a number of purposes. They divide property by marking off the division lines. They enclose the yards of the better houses, much as fences do to-day. They are the result of clearing a field of stone for agricultural purposes. Some of them serve to protect a certain property from being overrun by pigs and dogs.

Most sites containing archaeological remains will have a few of these walls. Some of them form definite divisions, and others meander. The length and the size depend on the function, as a single row of stones will mark a division but will hardly act as a fence.

The variation in structure of these walls is distinct enough to permit of classification. Six types may be recognized (fig. 2).

1. Wall built of stones of about the same size, regularly piled. Either waterworn stones or mountain stones are used, the method is the same and the latter stones give a more solid wall. The stones are about 8 by 8 by 12 inches on the average. Most of these walls are 3 feet wide and 3 feet high. It is the commonest type found. (See Site 85.)

2. Wall built of large boulders, many of them in unaltered position, connected by small stones. The height of many of these walls is determined by the size of the boulders utilized, though in some the small stones are built over the boulders as well as between them. The thickness is the width of the boulder. (See Site 35.)

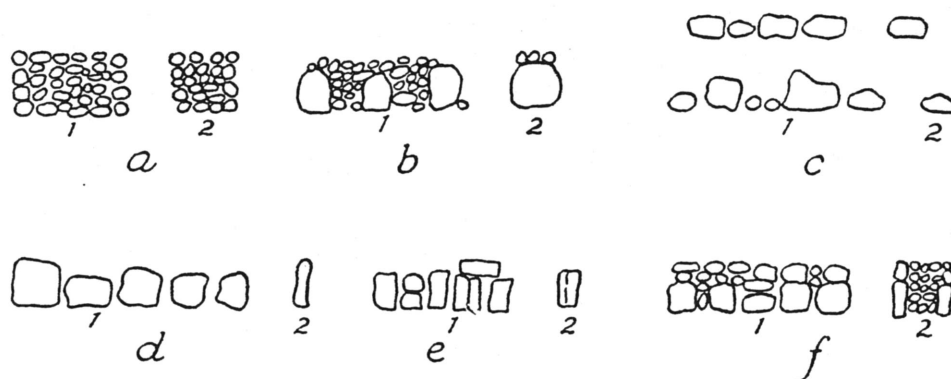


FIGURE 2.—Side views (1) and cross sections (2) of stone walls: *a*, type 1; *b*, type 2; *c*, type 3; *d*, type 4; *e*, type 5; *f*, type 6.

3. Wall consisting of a single row of stones. A single width and a single height of either a waterworn boulder or a rough stone. A variation of this is the single row consisting of large stones and small in line, again at a single width and a single thickness. (See Sites 88 and 130.)

4. Wall consisting of flat slabs of sandstone or coral limestone on edge. (See Site 197.)

5. Wall consisting of lava, prism-shaped blocks on end. The blocks are about 2 feet high and 1 foot wide and thick, and the wall stands accordingly, except that in places it is built a little higher by the addition of other stones. (See Site 85.)

6. Wall consisting of a double parallel row of large stones on edge filled between with small stones. These walls are usually 3 to 4 feet high and as wide. It is a common heiau construction. (See Site 85.)

The modern walls in which broken stones are used can be easily distinguished from the old type walls. However, if modern walls are built in the old way, especially in the common form of type 1, it is hard to distinguish them.

All kinds of stones are used in the walls, the material depending chiefly on the locality. If near a stream, waterworn stones are used, and where the ground is covered with loose, rough stones, these are used. As the types of walls are examined it will be seen that the form is more a matter of material than of technique. For example, the wall running parallel to the shore on the Nualolo flats, Napali section (Site 197) is of type 4 construction near the east cliff, because of the great ledge of conglomerate that breaks off into fairly large slabs, and the apparent absence of other stone. Farther west where no ledges outcrop and the sandy beach is supplanted by a mass of waterworn boulders, the wall changes from a type 4 to a type 1 construction within a distance of 2 feet. Though possibly built at different times the wall appears as a continuous structure.

#### FISHING SHELTERS

Fishermen's shelters are found on the coast at many points. The usual type is a natural cave formed by rocks and is either used without alteration, or is slightly built up to make the floor level. These are in use to-day for windbreaks and sunshades for fishermen. Another type of shelter, completely built up of a single thickness of rough stone consists of a semicircular wall 4 to 6 feet high and slightly arched forward. These are very temporary structures and few remain that have not been kept in use by modern fishermen. (See Pl. VI, C.) Shells, pieces of rope, boards, waterworn stones, and similar things are found around these shelters.

#### WELLS AND SPRINGS

As Kauai is an exceptionally well watered island, artificial wells and springs did not reach the importance of those described by Emory (20, p. 47) on the island of Lanai. There were, however, a few of some importance. At the base of Polihale cliff, Waimea district, is a small spring. By digging in the sand at low tide a hole can be formed into which fresh water will seep. Formerly this spring is said to have come out in a small cave at the base of the cliff, and cave and spring were sacred. It is one of the few places in this immediate vicinity where fresh water is obtainable.

Within the enclosure of Site 79 is a small spring lined with stones and surrounded by a low wall. It is about 4 feet in diameter and 2 feet deep. Near the corner of Pualu heiau (Site 55) is a well, 15 feet in diameter and 10 feet deep, lined on the edge with stones, and now mostly caved in. Whether this well is modern or ancient is not known. In the corner of the heiau on Nualolo flats (Site 199) is a spring, 2 feet deep and 2 feet in diameter lined with stones, which is the only source of water for the flats. There were probably other wells and springs that have ceased to be known through lack of use.



## AGRICULTURAL TERRACES

The principal cultivated products on Kauai were taro, sweet potatoes, yams and gourds among the vegetables, and banana, breadfruit, coconut palm, and paper mulberry among the trees. Many trees and plants were used which were not definitely cultivated. Arago (2, p. 120) speaks of trees growing in double rows, and Cook (14, pp. 204-5) writes: "On the drier places (at Waimea) were several spots where the cloth-mulberry was planted, in regular rows; also growing vigorously and kept very clean. The cocoa-trees were not in so thriving a state, and were all low; but the plantain trees made a better appearance; though they were not large." The exact location of cultivated areas not definitely marked by walls or terraces, is today scarcely discernible and mainly a matter of conjecture. Many coconut trees were planted around the houses, and some are found on the dirt walls separating the irrigated taro beds. The vegetables were grown both on the *kula* (high, dry land) and in beds, specially irrigated. Vancouver (55, vol. 1, p. 375) says that the taro beds in Waimea valley were "... interspersed with a few sugar canes of luxuriant growth and some sweet potatoes. The latter are planted on dry ground, the former on the borders and partitions of the taro ground . . . ."

The location of the irrigated fields was mainly confined to valley bottoms and the flats along the shore at the mouth of valleys. Through terracing, even the slopes of the valley were cultivated. The dry land, including the valley land too difficult to irrigate and the great flats on top of the ridges between valleys, was cultivated. To what extent this land was used can not be determined to-day because of the extent of the sugar plantations, but it is doubtful if any great percentage was utilized.

Little is known about agriculture on the *kula* land, except the incidental mention by some of the voyagers that it existed. David Malo (41, p. 270) gives the following description:

The cultivation of *kula* lands is quite different from that of irrigable lands. The farmer merely cleared of weeds as much land as he thought would suffice. If he was to plant taro (upland taro), he dug holes and enriched them with a mulch of kukui leaves, ashes, or dirt, after which he planted the taro. In some places they simply planted without mulch or fertilizer. . . . If a field of potatoes was desired, the soil was raised into hills, in which the stems were planted; or the stems might merely be thrust into the ground anyhow, and the hilling done after the plants were grown.

Remains of agricultural terraces are very extensive and quite well preserved. They vary little throughout Kauai, and are similar to those described from other Hawaiian islands. Early accounts of the method of taro planting are given by Macrae (40, p. 9). Stewart (47, p. 143). Malo says (41, p. 270):

On the irrigated lands wet patches were planted with kalo (taro, the *Arum esculentum*, or *Colocasia antiquorum* of the botanists). Banks of earth were first raised about the patch and beaten hard, after which water was let in, and when this had become nearly dry, the four banks were reenforced with stones, coconut leaves and sugar-cane tops, until they were water-tight. Then the soil in the patch was broken up, water let in again, and the earth was well mixed and trampled with the feet.

A line was then stretched to mark the rows, after which the huli, or taro tops, were planted in the rows. Sometimes the planting was done without the rows being lined in. Water was then constantly kept running into the patch.

The taro beds that are located on level ground are surrounded by mounds of earth some of which are faced with stones on the inside, but most of them not. The division walls between the beds are of dirt, some of them reenforced with stone facings. These divisions are about 2 feet high and quite narrow, a point which Vancouver (55, vol. 1, p. 375) complains about in the Waimea valley (Site 25). In Kalalau valley these divisions were in some places just a row of large stones (Site 163) though in one place a wall 2 feet high and 2 feet wide formed the partition (Site 166). Along the flat land by the sea in Kalalau valley the outer dirt mound was reenforced with a heavy stone wall on the seaward side. (See Site 167 and Pl. V, D.)

Where the land is not level the terrace is used. Some terraces had no stone facing on the outside but those terraces with facings predominated, as the absence of stone necessitated a thick, heavy dirt wall. Most of the terrace facings are but a single layer of stone, though some are a double layer. The stone does not extend back from the face of the terrace. House sites are also terraced, but the stonework usually extends back from the face to form a paving, or floor.

The features of the terracing are all dependent on the contour of the ground. The size of the beds ranges from a few feet to several hundred feet, depending on the steepness of the slope. The largest beds are those on the level plains and on the gentle slopes which are even enough to permit the expanse. The height of the facing ranges from 6 inches to more than 10 feet, dependent again entirely on the slope of the ground. Some of the terraces extend in two directions and a few in three. Although the shape of the beds tends to be rectangular, zigzag and curved lines are formed in the endeavor to connect natural boulders and to utilize a level, though irregular, space. The rock used is local and selected for its proximity rather than its shape. The construction of the stone facings is apparently dependent on the height of the terrace. On the lower terraces the work is carelessly done, but on the high facings the stones are selected and carefully laid. Although any handy stone is utilized, few flat stones on edge were used in a facing wall. Most of the facing walls are on a slant.

Some taro beds are walled. In Site 78 a series of three terraces are shut off by a wall on three sides, and a lava flow in the back. The identification of these as taro beds is not certain, though in a country lacking good land, and

as rock covered as this section of Koloa district, almost any trouble might have been gone to for utilizing soil. Site 79 also in Koloa district is a large circular enclosure. There is a ditch line entering at one corner, but no outlet. Probably potatoes and not taro were grown. Site 167 in Kalalau valley is quite similar, though rectangular in shape. It is the last of a series of large taro beds, but unlike the others it has no internal partitions, and is separated from them by a wall 5 feet wide and 2 feet high. The careful construction of this wall and likewise the sea wall, together with the house site behind, gives the impression that this is a special taro bed (Pl. V, *D*, and fig. 50).

The impressive feature of the agricultural terracing is its tremendous extent. In the valleys in which little disturbance has gone on, particularly the Napali section, the maximum of tillable soil was utilized. Even a 10 foot square of soil among a great mass of lava rock will be cultivated. On the sides of the valleys the terraces run almost to the base of the great cliffs, where the nature of the talus slopes is not too rocky. Though all these terraces were not irrigated, a great proportion of them were, and the ingenuity of the engineering is remarkable. (See Pl. VI, *A*.)

#### IRRIGATION DITCHES

With the staple food of the country dependent on correct irrigation, it is to be expected that the irrigating systems will be among the finest of the Hawaiian work. As Perry writes (43, p. 93), the water was distributed to each man according to his labor, as well as according to the amount of land that he cultivated. Though in many places all traces of the original ditches have been removed, in the more protected areas there is sufficient evidence remaining to offer material for study. Dole (17, p. 3) mentions this admirable work: "... great engineering enterprises were undertaken, such as the irrigating systems of Wahiawa, Kapaa, and Kilauea on the island of Kauai, ... The antiquity of some of these is so great that even tradition fails to account for their origin, as in the case of the parallel irrigating ditches at Kilauea, the digging of which is attributed by the Hawaiians to the fabled *moo*, or dragon, ..."

Little remains of the structure forming the intake of the ditches. Perry's notes on dams help to explain this (43, p. 94.): "The dams were always composed of loose stones and clods of earth and grass, and were not made tight but so as to permit of some of the water percolating. No dam was permitted to divert more than one half of the water flowing in the stream at the point of diversion and the quantity taken was generally less." The flimsy nature of the dam, together with the destructive power of freshets, has succeeded in removing the original intake structures.

The ordinary ditch line structure was a ditch banked with dirt walls. Some of these approached fairly large sizes such as the one near Kealia home-



steads (Site 111). This ditch is interesting because of a deep cut made through a low ridge to carry the water to the land on the other side of the ridge. The sides of the cut are over 10 feet high. Even when running around a curve on a slope these ditches are dirt terraces banked on the outside. The accuracy in grading is remarkable some of the water being conducted for several miles along a slope. Some of the ditches on level ground, and also those terraced, are lined with stones (Site 172). The outside of many ditch terraces is faced with stones much like an ordinary taro terrace. In Kalalau valley there were two ditches that led to intermittent stream beds (Site 172) to utilize even the occasional rains.

As to the method of irrigating, Perry (43, p. 95) says that most all of the patches were watered directly from the ditches, though he adds: "In still other instances, comparatively rare however, the patches were given water merely by overflow or percolation from adjoining patches, and not directly from any water course." Direct watering was doubtless the prevailing method for large taro beds on the flat lands, such as those in lower Waimea valley (Site 25), where there was no terracing done and the land was level enough to allow for cross ditches. However, the direct method was comparatively rare where the terrace was employed. In Site 172 in Kalalau valley there were taro terraces on each side of the ditch line, and the immediate beds received direct irrigation. Most ditches were in position to irrigate the highest terrace, from which point the water ran from patch to patch, indirectly. (See Site 166.) It is the only practical method for terraced sites. In places more than one ditch line was used to irrigate a long series of terraces.

In some places, where a pali juts out, or the slope is too steep for the ordinary terrace ditch, special stone construction work has been employed. In Kalalau valley there are several places where a steep slope had to be built up with stone to carry the ditch along it. These were all near the intakes, and were washed away almost as badly as were the intakes. They required a fill about 6 feet across and 6 feet high. The little work that was left showed that the bottom part had been filled with fairly large stones, and that smaller stones were used nearer the top, probably finished with a covering of dirt. The principle of carrying water along the edge of a cliff by means of a built up runway is well illustrated in Site 187. On the Koaie ditch line in Waimea Canyon (Site 38) the problem of carrying the water along a perpendicular cliff was increased in complication. In order to carry the runway around a corner the thickness of the base was often buttressed 4 feet in width with stone. Flat stones at the top slanting in and overlapping on the down grade were an improvement on the plain dirt and grass calking. The noted Menehune ditch (Site 26) is the acme of stone-faced ditches. The problem was that of carrying the water, at a high level, around the corner

of a jutting cliff. An added difficulty was the necessity of placing the base of the causeway in the river itself where it was constantly in danger of being washed away by a freshet. It is the Menehune ditch alone that has any record preserved of its construction—and that is a myth. Hofgaard (27, pp. 10-11) relates the tradition as follows:

Pi owned the land at Kikiaola on the western side of the river and he wanted to construct a *mano* or dam across the river, and from the dam a water-course down to Kikiaola. Having settled upon the location for his proposed work, he went up the mountains and made a contract with the Menehunes that were living near Puu Ka Pele to prepare stones for the dam and the watercourse. The Menehunes were partitioned off for the work, some to gather stones and others to cut them. The cutting of the stones was performed at Mokihana on the top of the ridge and some of the stones were left there, some fully cut and others partly cut. All the material was ready in a very little time, and Pi settled upon the night when the work was to be done. When the time came, he went to the point where the dam was to be built and waited. At the dead of the night he hears the noise and hum of the voices of the Menehunes, on their way to Kikiaola, each of whom was carrying a stone. The dam was fully constructed, every stone fitting in its proper place, and also the stone auwai, or water-course, laid round the band at Kikiaola. Before the break of day the work was completed and the water of the Waimea River turned in by the dam into the water-course and through the same on to the flats at Waimea. When the work was done Pi served out food to the Menehunes, which consisted of shrimp, (*opae*), this being the only kind of meat to be had in sufficient quantity to supply each Menehune with one fish or *opae*. They were supplied with food at Puu Opae, a hill half way between Waimea and Halemanu, Mr. Knudsen's mountain residence. They were well supplied and satisfied, and at dawn returned to their home in the mountains rejoicing, and the hum of their voices gave rise to the saying: "Wawa ka Menehune i Puukapele ma Kauai, puohu na manu o na loko o Kawainui ma Koolaupoko, Oahu—The hum of the voices of the Menehunes at Puu Ka Pele, Kauai, startled the birds at the pond of Kawainui at Koolaupoko, Oahu."

Although Captain Cook failed to get far enough up Waimea valley to discover the water-course, Vancouver did, and gives the following interesting description (55, vol. 1, pp. 376-7):

As we proceeded, our attention was arrested by an object that greatly excited our admiration, and at once put an end to all conjecture on the means to which the natives resorted for the watering of their plantations. A lofty perpendicular cliff now presented itself, which, by rising immediately from the river, would effectually have stopped our further progress into the country, had it not been for an exceedingly well constructed wall of stones and clay about twenty-four feet high, raised from the bottom by the side of the cliff, which not only served as a pass into the country, but also as an aqueduct, to convey the water brought thither by great labour from a considerable distance; the place where the river descends from the mountains affording the planters an abundant stream, for the purpose to which it is so advantageously applied. This wall, which did no less credit to the mind of the projector than to the skill of the builder, terminated the extent of our walk.

Menzies (42, pp. 28-9) and Kuykendall (34, pp. 395-6) mention the Menehune ditch and give its height as over 20 feet. To-day the road is built up to within 2 feet of the top of this ditch wall and part of it has been removed. The dressed stone blocks and their jointing are unique features of Hawaiian stonework. A detailed description is given under Site 26.

## FISH PONDS

There are two famous fish ponds on Kauai, the one a natural inland lake, Nomilu (Site 67), and the other, Niamalu (Site 98), built by cutting off a bend in the Huleia River with an artificial wall 0.5 miles long. (See fig. 36.) These were intended primarily for the raising of fish. The Niamalu pond is in use to-day and has been altered by adding cemented intakes and outlets so that the old mechanics are unknown. Other fish ponds are mentioned for the region around the Wailua river, and it is said that fish were kept in the taro beds for a short time. The great ponds (Site 77) which parallel the shore at Koloa were possibly fish ponds. At present they are too shallow to serve for such purpose, but the 12-foot wide, dirt-filled, stone-faced walls that separate them, indicate that the water was at one time higher.

Few actual fish traps are known, though at Wailua, south of the river mouth, low lines of stone in the water near the shore, look like a simple form of fish trap, the nature of which is a bit uncertain.

## SALT PANS

The manufacture of salt has always been important among the Hawaiians, and Kauai was famous for the red salt of Makaweli (Site 49) made by mixing ordinary salt with a little red dirt. Ellis (18, p. 376.) describes the method of salt manufacture on Hawaii:

They have generally one large pond near the sea into which the water flows by a channel cut through the rocks or is carried thither by the natives in large calabashes. After remaining there some time, it is conducted into a number of smaller pans about 6 or 8 inches in depth which are made with great care, and frequently lined with large evergreen leaves in order to prevent absorption. Along the narrow banks or partitions between the different pans we saw a number of large evergreen leaves placed. They were tied up at each end so as to resemble a shallow dish and filled with sea water in which the crystals of salt were abundant.

Mr. Alexander McBryde reports that in his youth he helped the Hawaiians make salt in the beds next to the Nomilu fish pond (Site 67). He remembers that the water was let in from the large fish pond into the small pans where it was allowed to stand for a long time while some of the water evaporated. Special drying pans were used, walled off from the others and paved with clay which the sun baked dry. Over this, just before using, was spread a thin layer of oily clay brought from some special locality. The concentrated salt water was then run into the drying pan. Two kinds of salt resulted; that which crystalized on the top and was blown to one side by the breeze, and that which crystalized on the bottom. The salt was then pounded until fine, and often mixed with red dirt.

Of the salt pans remaining to-day the largest is at Puolo point (Site 49). It is a large, shallow basin with neither internal divisions, nor any pans

marked off around the edge. Whether the whole basin was used for evaporating salt in large quantities, or whether different areas were used can not be accurately determined.

The other salt pans remaining are divisioned beds, from a few feet square to 40 by 50 feet. Many are located near Nomilu, Site 67, and along Koloa beach, Site 76. The partitions are made of stone, though in some of the larger beds divisions are formed by separate depressions. The edges are lined with stones, closely laid. In some places the partition is a single row of stone, in other places it is a parallel row of stones with dirt between, about 1.5 feet wide. The stones are either river stones or slabs set on edge. Most ponds are surrounded by walls to keep out pigs and cattle. These types are illustrated in Plates VII, *A* and VII, *B*.

## BURIAL PLACES

Burials may be found in almost any sand dune on the island of Kauai (Sites 7; 53; 82; 88; 97; 103; 116; also Kilauea river at mouth, Haena dunes, and the sand beach at Nualolo flats.) The shifting of the sand reveals these burials from time to time. If they have not been exposed long they are in an excellent state of preservation, but their original position is disturbed. Of the burials found in undisturbed positions, both flexed and straight interments were noticed. Flexing possibly predominated, though quite a number were stretched out flat on their backs with the heads facing up. The common explanation of so many bones in the dunes is that they are the remains of a great battle, but the skeletons of women and children as well as the presence of flexed burials, together with the absence of weapons around these sites, exclude any such notions. It is not improbable that the easy digging in the dunes favored their use for wholesale burial of the dead after battles, but this is different than having a battle on the dunes.

Alexander (1, p. 74.) says that the common people were buried in the dunes and that the graves were little thought of. However, the ivory pendants (*palaoa*) are sometimes found, and these were symbolic of chiefly rank. The dunes were probably used as the most convenient location for quick burial, and mostly, though not exclusively, used by the common people.

Many cave burials are reported but few are found, both because of the careful original concealment, and the secrecy of the natives even to-day. (See Sites 3; 13; 17; 24; 88; 185; 198; and one in Waimea valley.) The caves are located on the cliffs, some high and difficult to reach, others high, but rather easy to get at, and others, of more recent use, at the base of the cliffs or but short distances from the ground level. Thurston (54, p. 8.) mentions a cave in Nualolo valley in which the old approach had been broken away to prevent access. In later days the idea of burying in a cave has been preserved, while the idea of concealment has been lost.

Most of the caves were sealed. The practice of closing the opening is referred to as "sealing." Some of the caves show no sign of sealing, and from the size of the mouths, it would have been difficult. The old method of sealing was to pile stones carefully, making a wall which filled the whole mouth of the cave. So artfully was this done, that the camouflage was often effective at a few feet. A later method of sealing is shown in the use of a mixture of clay and grass for a plaster with which to cement stones together, or, in some cases, to wall up the whole opening of the cave without additional stone. In still later times, wooden doors have been built to close the caves and to keep out prowlers.



The size of the caves has a wide range. All the caves examined were natural and furnished no evidence of artificial enlargement. Some were just large enough to contain one burial while others were quite large and had numerous burials in them. In some the opening was small while the cave itself widened out on the inside. Fornander (24, p. 106) says, "These burial caves seem to have been either private family property, or the property of the commune living on the land where they were situated." Jarves (29, p. 82) adds that they were used for many generations. This is substantiated by the remains which show that the more recent burials have pushed the older ones back.

The method of burying in these caves varied. Canoes cut in half were used. Site 13 has such burials, the canoes having the boards sewed together with old grass cord. The end where the cut was made was either left open or closed with an additional board. The burial, flexed and wrapped in tapa, was placed in the canoe and cords were wound tightly around the outside. In Site 13, pink, white, and black tapa was used, and also some modern blue cotton cloth. A pillow of moss was placed under the head. The idea of the semi-canoe burial has persisted until rather recent times as is shown by the burials in other caves. In one a long, hollowed-out log was used. In another an imitation canoe squared at both ends was made with thin boards and nails. There are also coffins with lids, resembling a canoe in shape. This apparent transition is very interesting though the stages may not be exact. Many burials are wrapped in folds of tapa cloth. Others show no signs of a tapa wrapping. The burials which retain their original positions are mostly flexed, though burials laid out straight were found in caves which had never been opened. Fornander (24, p. 106.) mentions embalming and burying in a sitting posture, but this was not found. Though there were scattered and piled bones, no true tapa-bundled burial was found unwrapped.

In the caves, aside from the tapa, many things are found. Mr. Eric Knudsen found an idol in a burial cave. Two kahilis; one with a *kawila* wood handle, made with sea bird feathers, artificially colored, and wrapped with old grass cord, were found in one burial cave (Site 13). A *palaoa* pendant was found by Mr. William Goodwin in a cave, as well as two shallow wooden plates, unpolished. Sticks, pointed on one end and about 6 feet long, were found in a number of caves. These might have been used for carrying the body up to the cave. The leg bones of a dog were found wrapped together in a piece of stiff tapa of a brown color which apparently had been varnished. Evidence of recentness in some caves is shown by cloth, shoes, coins, combs, buttons, beads, and modern coffins.

Some graves are marked with stones covering the top. Some of these

are fairly recent, as they are surrounded with wooden fences, but others are of greater antiquity. These consist of rectangles, about 4 by 9 feet, covered with stone to a height of about 6 inches. Those in Kalalau valley (Site 164) are outlined with large stone and filled with smaller stone, though others are covered with about the same size stone. One of those of Site 164 was simply outlined with stones, while another in the same site was oval in shape. Sites 129, 164, and 175 contain these graves. Excavation of one in Site 164 revealed a skeleton laid out on the back with the head facing up. Some traces of cloth and buttons were found with it.

Another type of grave is the stone cist. (See Sites 36 and 178.) These graves are essentially the same in construction and are described in detail under the special sites. The two in Site 36, are marked with a design of stones on the top, while the two in Site 178 are apparently disguised. (See figs. 28, 53, and Pl. VIII, *A*.) Both are close to house sites—a common location mentioned by Jarves (29, p. 82). The graves excavated revealed skeletons laid out straight with the heads facing upwards. The skeleton of a girl with several strings of beads in one of these cists excludes the idea that these were the burying place of priests. One grave (Site 178) had the burial apparently roughly thrown in, which seems strange use for a well built cist.

Literary reference to the custom of covering graves with stone and of burying in heiaus, though slight, is interesting in this connection. Alexander (1, p. 74.) says that the priests and lesser chiefs were laid out straight, wrapped in tapa, and were buried near their temple. A pile of stones or a circle of high poles marked the graves. Jarves (29, pp. 81-2) adds that they were buried in the temple. Captain Cook (14, pp. 200-202) refers to a "burying-ground, or *morai*":

In the middle of this house, and before the two images, was an oblong space enclosed by a low edging of stone, and covered with shreds of cloth so often mentioned. This on inquiry, we found, was the grave of seven chiefs, whose names were enumerated, and the place was called *Heneene*. For, on coming out of the house, just on one side of the entrance, we saw a small square place, and another still less, near it, and on asking, which they were? our guide immediately informed us, that in one was buried a man who had been sacrificed . . . and in the other a hog, which had also been made an offering to the divinity. At a little distance from these, near the middle of the *morai*, were three more of these square inclosed places, with two pieces of carved wood at each, and upon them a heap of fern. These, we were told were the graves of three chiefs; and before them was an oblong, enclosed space to which our conductor also gave the name of *Tangata-taboo*; telling us . . . that three human sacrifices had been buried there.

Thrum (53, p. 42.) in referring to Kihei heiau (Site 137) writes: "Its walls were 8 feet high, and at his (the chief that built the heiau) death its

paving was removed and he was buried in his canoe in the enclosure." And in referring to Hikinaakala heiau (Site 105) Thrum writes (53, p. 66.): "A number of graves mark the middle and outer sections, said to be the remains of an entire family in consequence of their desecrating the temple by living and cultivating within it."

These references serve to indicate that the heiaus were places of burial, and that the stone covered graves are the types used on heiaus.

The circular platforms, 12 feet in diameter and 3 feet high, and the platform tombs found on Lanai by Emory (20, pp. 73-4.) were not found on Kauai, though the small stone cists are of a somewhat similar type.



## HEIAUS

## DESCRIPTIVE CLASSIFICATION

A heiau is the religious structure or temple of the Hawaiian. To-day it consists only of the stone foundations on which grass houses, idols, towers, and other features once stood.

With the exception of indefinite and incongruous functional classifications no attempt has yet been made to divide Hawaiian heiaus into types. Kamakau (32) in referring to the foundations says: "Many shapes were adopted in building heiau,—rectangularly parallel, four sides equal (square), canoe shaped, irregularly oval; such were the ground plans of the heiau." But this classification is far from adequate. Two important factors influenced the temple forms, and make the classification extremely difficult: (1) many old heiaus were remodeled by a later chief, at which time other features might be added and the old destroyed; (2) the temple architect was a special priest whose business it was to study the plans of all heiaus, and design new ones. He would pick out the features that he supposed had brought success to some important heiau and incorporate them in his plan. Stokes (51, p. 10 a.) stresses the importance of this priest called *Kahunā kuhikuhi puuone* (priest pointing out sand-heaps—temple designer in the sand). Instead of following the common plan he might recall some ancient plan, or even add new features of his own. Consequently a great confusion of forms and features was the result. In spite of these difficulties some classification of heiaus is needed if for no other reason than convenience of description. In that which follows it is obvious that the groups are not mutually exclusive; some heiaus exhibiting two or more types of construction. But this classification serves to differentiate the outstanding characteristic features, and has been found helpful in describing the structures on Kauai.

## CLASSIFICATION OF HEIAUS ON KAUAI

Types	Number	Representative sites
I. Natural sites	6	8; 28.
II. Small heiaus	29	
A. Open platforms	20	11; 14; 29; 34; 40; 45; 59; 70; 90; 138; 142; 144; 145; 149; 150.
B. Walled enclosures	7	44; 54; 69; 113; 136; 141.
C. Terraced platforms	2	12; 30.
III. Large heiaus	66	
A. Platforms	18	
1. On level ground or terraced against a slope.	7	4; 6; 10; 55; 56; 120; 183.
2. Crowning the top of a hill or rise.	7	18; 41; 72; 125; 139; 140; S24.
3. Two or more terraced divisions.	4	32; 129; 170; 164.

Types	Number	Representative sites
B. Walled enclosures	21	
1. Square and rectangular	17	23; 51; 62; 80; 87; 104; 107; 124; 128; 132; 146; 151.
2. Divisioned enclosures	3	66; 81; 105.
3. Compound enclosures	1	108.
C. Terraced heiaus.	6	
1. Two terrace types	2	16; 123.
2. Three terrace types	3	65; 199.
3. Four terrace types	1	1.
D. Round heiaus	5	114; 126; 133.
E. Unclassified heiaus	16	
1. L-shaped	1	119.
2. Community houses	2	93; 160.
3. Large structures	13	48; 63; 68; 83; 92; 99; 102; 106; 112; 134.
IV. Unidentified heiaus	21	
Total	122	

I. Natural sites. Some flat spaces in desirable and prominent localities were deemed sacred. Thrum (53, p. 38.) speaks of Kopahu and Kaleina-kauhane at Pokii, Waimea, as being flat sacred places "whence the souls took their plunge to Po,—the nether world." Unenclosed piles of stone as in Site 28 were also sacred places, and at Elekuna (Site 8) an outcropping ledge of sandstone was a famous heiau.

II. Small heiaus—those less than 50 feet on the longest side.—Few features distinguish these small heiaus and information identifying them comes from published records, or from native informants. Emory's statement about the small heiau of Lanai may well be applied to Kauai (20, p. 68.):

Presumably these heiaus were used in private family worship, or in the practices of an inferior order of the priesthood. Most of the structures for worship of this kind were single houses surrounded by a paling fence or a stone wall, or a simple, unroofed enclosure—structures which would leave ruins similar to those of an ordinary house site, or so inconspicuous as to escape notice.

A. Open platforms.—The open platform sites are usually paved, though Site 22 was a cleared space in the forest with a line of stone on one side. The platforms on flat spaces are level with the ground or slightly raised while those on the slopes are terraced on the front side to maintain the level platform. They are built with river or mountain stone, depending on the location. Some of them are strewn with coral fragments. The average size of nine of these platforms is 17.5 feet by 23.5 feet, with a range of 12 by 12 feet to 30 by 50 feet.

B. Walled enclosures.—These are platforms with walls on the four sides. The average size of four of these sites is 24.5 by 30 feet. Some of the walls are high in proportion to the size of the structure, though most of

them are 2 to 3 feet wide and high. The heiau at Site 141 has a paved lanai extending 5 feet in front of one wall.

C. Terraced platforms.—Only two heiaus of this type were found: that at Site 12 consists of two platforms at different levels; the other at Site 30, is a three terraced structure that could almost be classed with the larger heiaus, though no special features are associated with it.

III. Large heiaus.—Though some heiaus are difficult to classify as large or small, most of the large ones are sufficiently distinguishable both in size and structural features. Though the foundations of the large heiaus had houses on them, they were never covered over completely as were many of the smaller heiaus, and so are seldom confused with house sites.

A. Platforms.—Although this group includes a great variety of styles, the one feature in common is the open platform. Whether on a plain, a slope, or the top of a rise, the open platform is characteristic. Platforms with walls on one, two or three sides are grouped in division A, but large heiaus with walls on four sides are classified as "walled enclosures" (III B). The combination of the platform and the enclosure is quite possible, though not clearly represented on Kauai. The platform crowning the top of Niukapukapu hill, Lawai, (Site 72) has two walls of what seemingly was a small enclosure on the center of the platform, though the other two walls are missing. The possibility of combination of other types is ever present. The distinction between the open platform of two or more terraces and the terraced heiaus, is more marked when examining the actual heiaus than can be shown in the classification. (See fig. 4a.)

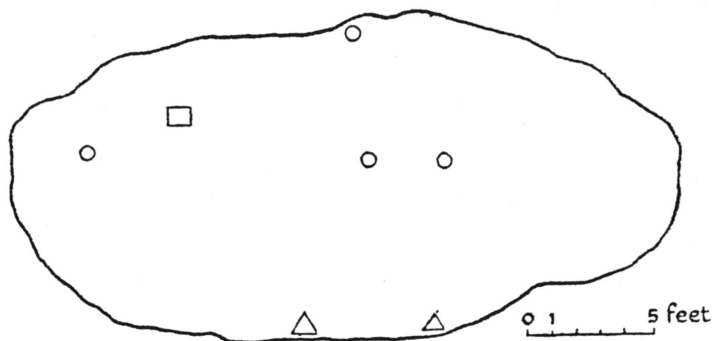


FIGURE 3.—Kahili fortification or lookout. The leveled area shown by the outline has a maximum length of 27 feet; the position of a large post 13.2 feet high is indicated by a square, of other posts by circles, and the possible positions of two posts by triangles (after a plan by Charles Dole).

1. On level ground or terraced against a slope.—There is no essential difference between the platform built up on four sides, and the platform in which the rise of the ground makes it unnecessary to build up in the back to maintain the level. All the Kauai heiaus of large size examined utilized the slope. Most of the platforms are rectangular, though Site 56 has a square

platform. In Site 55 the shape is rectangular with a notch taken from the outside corner of the seaward side. In size these platforms vary greatly. An average of five is 41 by 75 feet. The height to which the front side of the platform is built ranges from 3 to 15 feet with the average about 5 feet. There is little variety in the class. Small walls are at the back or the side of some heiaus.

2. Crowning the top of a hill or rise.—Hilltops are favorable sites for making an imposing structure with the minimum of labor. The sides of the hill are usually faced to the desired height, and the top, possibly artificially leveled, is paved with stones. An average dimension of four heiaus of this class is 59.5 feet by 71.5 feet, though Site 139 is reported as containing 2 acres.

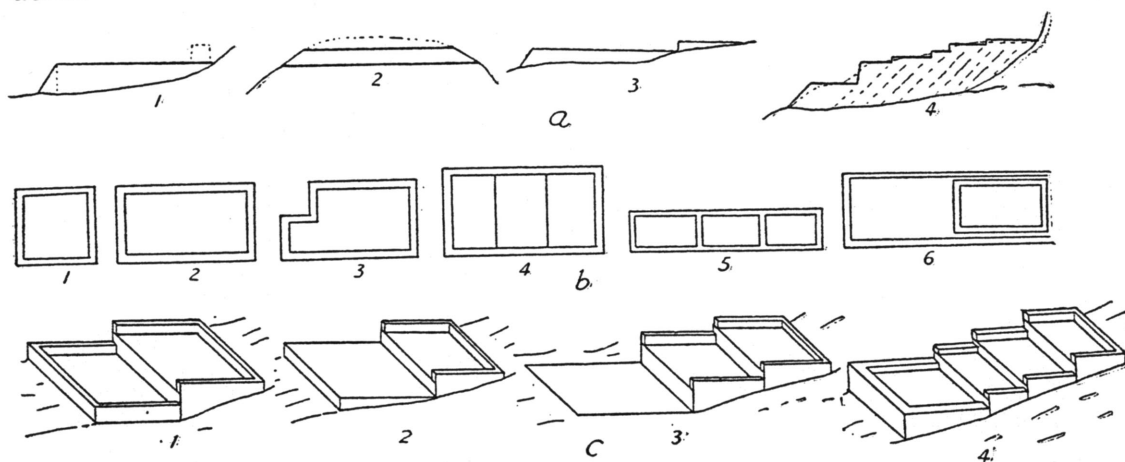


FIGURE 4.—Types of large heiaus. *a*, platform types: 1, on level ground or against a slope type (III A, 1); 2, crowning the top of a hill (type III A, 2); 3, open, with two divisions (type III A, 3); 4, open, with several divisions (type III A, 3). *b*, enclosure types of large heiaus; 1, square (type III B, 1); 2, rectangular (type III B, 1); 3, rectangular, with notch out of one corner (type III B, 1); 4, with terraced divisions but continuous walls (type III B, 2); 5, with walled divisions (type III B, 2); 6, compound enclosures, (type III B, 3); *c*, terraced types of large heiaus: 1, two-terraced and open (type III C, 1); 2, two-terraced and open (type III C, 1); 3, three-terraced (type III C, 2); 4, four-terraced (type III C, 3).

3. Two or more terraced divisions.—In the true terraced heiaus the divisions are quite distinct—usually with a stone-faced, perpendicular terrace, 4 or more feet high. Also the true terraced heiau has, ordinarily, walls on more sides than one. The heiaus at Site 129 and Site 170 are of two divisions at different levels but the division is not prominent. The heiau at Site 32 has 9 small, unwall, open platforms at different levels placed on a rising ridge, the sides of which are faced with a double layer of stone. Site 154 has three terraced platforms but the great mass is an open platform that eclipses the effect of the terraces.

B. Walled enclosures.—Most heiaus of the walled enclosure type are on

level ground with walls, averaging 6 feet in width, and 5 feet high. Though the structures of this group vary greatly the enclosing walls remain a constant feature. The affiliation with the terraced type is marked, for an ordinary, walled, two-terrace heiau is little more than a walled enclosure placed on sloping ground. The distinction is possible, however, in a descriptive classification. (See fig. 4*b*.)

1. Square and rectangular.—Though most of the walled enclosures are square and rectangular this group is meant to include those without definite internal divisions. The average size of 12 heiaus of this type is 101 by 162 feet with a range of from 24 by 60 feet to 273 by 324 feet. Site 107 is an enclosure that has a notch taken from one corner of the rectangle (fig. 39).

2. Divisioned enclosures.—The divisions are marked in two ways; by walls, and by low terraces. The enclosure walls are unbroken even though the divisions are marked by terraces. Site 81 and probably Site 66 have three divisions marked by slight terraces. Site 105 shows three distinct divisions marked by walls. The enclosures at Site 105 and at the heiau of Kihawahine on Niihau (See p. 153) are exceptionally long and narrow.

3. Compound enclosures.—An enclosure within an enclosure seems to be the type represented by Site 108, where a rectangular walled enclosure fills about half of a large enclosure. (See fig. 40.)

C. Terraced heiaus.—The terraced heiau is a series of platforms or enclosures on a slope that requires terracing to keep the platforms level. But though they combine features of the platform, the terrace, and the enclosure, the terraced heiaus stand out as a recognizable class. The chief mark is the definite division into terraces with facings 4 to 10 feet high. (See fig. 4*c*.)

1. Two-terrace types.—Of the two heiaus representing this class, that at Site 16 presents a lower open platform and an upper platform walled on three sides, and that at Site 123 has the lower section completely walled and the upper section walled on three sides.

2. Three-terrace types.—The heiau at Site 65 and one described by Thrum on Kalalea peak are square structures with three terraces, walls, and paving. At Site 199 the lower section is an open platform, the middle section is walled at each end, and the upper section walled on both ends and the back.

3. Four-terrace types.—The heiau at Site 1 was the only one found with four distinct terraces. The sides of these terraces have low, wide walls. The first terrace has a low wall across the front, and the top terrace is faced across the back.

D. Round heiaus.—Thrum (53) lists five round heiaus on Kauai. None of these could be relocated, due principally to destruction. Two of these are described as "small," one as "large," one as "50 feet in diameter," and one as "100 feet in diameter." Four are classed as walled and three as paved. (See Site 114 and Site 126.)

E. Unclassified heiaus.—Two structures of unusual form appear at Site 93 and Site 160. They are long, narrow, raised platforms paved solidly along the front. At Site 93 an upright stone is embedded in the ground. It has been suggested that these are the sites of large community houses. Of the heiaus that Thrum (53) describes as "large," 13 have been destroyed. Thrum describes the structure at Site 99 as covering four acres and that at Site 119 as an "L-shaped structure" (probably a heiau of the two terrace type). Of the 13 destroyed heiaus, 7 are listed as walled and 4 as paved.

#### LOCATION

The large heiaus are located at fairly regular intervals around the coast of Kauai as is shown by the following list.

Location	Site	Location	Site
Polihale	1	Kealia	112
Hoea	16	Anahola	113
Waimea	23	Kihe	123
Hanapepe	48;55	Pilaa	128
Wahiawa	62	Waiakalua	129
Kukuioolono	66	Kilauea	133
Koloa	80,81,83	Hanalei	139
Mahaulepu	87	Haena	154
Nawiliwili	99	Kalalau	170
Hanamaulu	102	Nualolo flats	199
Wailua	104;105;106;107;108		

Because only the high chiefs had religious sanction, or could command the labor to build the largest heiaus, these structures should be concentrated at the principal resident places of the chiefs. Thus five heiaus are located around the mouth of the Wailua river, the banks of which were the grounds of the royalty and the birth place of the kings for many years. But the distribution throughout the rest of the island suggests that the chiefly power was evenly divided, an assumption somewhat substantiated by the historic accounts.

The small heiaus found in the villages, in the mountains as shrines, far up in the valleys, along the coast and in other locations that would serve the people, are distributed according to the population.

The sites of the large heiaus are along the shore, on prominent points, knolls, and ridges, at the bottom or sides of talus slopes, and occasionally in the valleys. In general the site is a commanding one overlooking a village in a position where it could be seen at all times.

True orientation to the points of the compass was seldom, if ever, considered, and was of little importance. The topography usually determined the orientation, the heiaus commonly facing the sea or valley.

Traditionally the sites chosen for heiaus are said to be those of old heiaus, especially successful ones. Accordingly stratification ought to be evident,



but unfortunately none was found. The difficulty of excavation and the objection to destroying the existing heiaus, together with the uncertainty of obtaining results, has discouraged work of this kind.

## MATERIALS AND METHODS OF CONSTRUCTION

### GENERAL FEATURES

No native literature gives accurately or specifically the methods of building heiaus. The observations made on the structures still remaining show many minor variations in the kind of work done, but few that illustrate new principles. It is obvious from examination of the walls and platforms of the heiaus that most of the construction work was done with the accuracy of the eye alone, though stakes and cord might have been used to mark out the foundations. When accurately measured, corresponding walls are not of the same length, their width varies, and the slopes and levels are not always true. Consequently accurate recording is hardly necessary and a comparison of form must make allowance for the variations introduced by different architects.

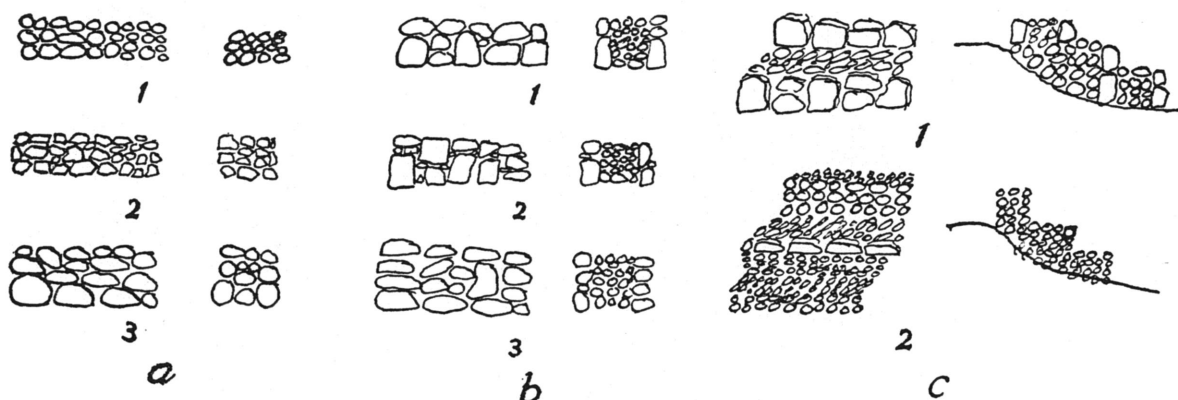


FIGURE 5.—Side views and cross sections of heiau walls. *a*, faced and filled at the same time (type I): 1, with waterworn stones of about the same size and small; 2, with field stone of about the same size and small; 3, with large stones; *b*, parallel rows of slabs on edge filled in between with small stones (type II): 1, large flat slabs; 2, slabs chinked with small stones for greater solidity; 3, large stones (not slabs) used in similar fashion; *c*, stepped walls (type III): 1, with slab facing for sides of steps; 2, with small stones.

The terminology used in the following descriptions distinguishes walls as enclosing structures from facings used for sides of a platform and for the stonework on a terrace.

### WALLS

The walls of heiaus on Kauai are of three types.

1. Regularly piled up walls, faced and filled at the same time. (See fig. 5.) This is the commonest type found and the simplest. Both waterworn

and rough stone is used, though seldom in conjunction. By using the unworn rock fragments a more perpendicular wall can be built. Some walls are made principally of stones 8 to 10 inches in diameter; in others most of the stones are 20 inches or more in diameter; in others the combination of large and small stone is common. A variation is the mixture of stones 2 to 3 inches in diameter with larger ones, not as chinks to make the wall more solid, but merely as part of the fill. (See Site 107.)

2. Parallel rows of large stone facings filled with rubble. In many structures large slabs are set on edge in two parallel rows 6 to 9 feet apart and the intervening space is filled with rubble and smaller stones, jumbled. Some of these slabs are 3 to 5 feet high, though the average is less than 3 feet. The interstices between the slabs are filled with smaller stones, and the facing is built higher with smaller stones, usually on edge, while the center of the wall is still filled with rubble. (See Sites 105 and 108.) Between some slabs are chinks of smaller stones to insure greater firmness. Chinking is distinguished from merely filling in spaces. The chink must be put in at the time the stone is laid for otherwise the slabs would not set solidly. (See Site 87 and Pl. IV, B.)

3. Stepped walls. Two heiaus have three steps or terraces on one outside wall. The sea wall at Site 108 is built with large lava slabs on edge from which a horizontal step extends to another row of slabs on edge. Another horizontal step and a wide, low wall complete the cross section. (See fig. 40.) This triple stepping is probably for protection against the waves, but it also gives a formidable appearance from the sea side. Site 123 also illustrates stepped walls. This stepping is quite distinct from the double facing shown in the walls at Site 32 and Site 72.

#### FACINGS

In facing the walls and terraces of heiaus six methods were employed.

1. Regular facing made with stones of about uniform size, or mixed large and small. The facings are either perpendicular or on a slight slant. The platform facings tend to be perpendicular, while the terrace surfacing is on the slant of the terrace. River stones are used but rough stone is more common.

2. Platform facing of long stones. In the well-built wall at Site 170 worn stones over 2 feet long and 8 to 10 inches wide and thick are laid lengthwise with their long sides forming the facing. Other stones were also used.

3. Facing of angular, fractured, broken stones chinked with small stones. The stone is not artificially broken, though the effect is much the same as in a modern wall. The flat surfaces are carefully selected for the outside, giving a smooth, perpendicular facing. (See Pl. IV, A.)

4. Platform facing of rectangular lava blocks on edge and carefully laid.

The blocks are unmodified in shape, and common to the region, but the platform thus faced is very durable, as well as perpendicular. (See Site 16.)

5. Double facing. Two sites (32 and 72) have one facing over which another facing was laid, two feet thick, and there is some indication of a third. Angular stone was used, and carefully laid, though fallen in parts. The facings were on the side of a slope, even though also forming the sides of a platform.

6. Terrace without stone reenforcement or veneer.

#### PAVING

The paving of heiaus is of four types.

1. Dirt or sand paved. Whether this work is artificial or natural is hard to determine. In some places the stone paving may have been removed. Site 129 illustrates dirt paving and Kihawahine on Niihau (p. 153) sand paving.

2. Large flat stones carefully laid is a common way of paving. In places the spaces between these stones are filled with small pebbles giving a fine paving (Pl. IV, D). Most of the paving stones are about 2 feet in surface diameter.

3. Some pavements consist of stones 4 to 5 inches in diameter, making a rough surface. The picture made by Webber of the heiau in Waimea (Pl. I) shows loose stones lying on the surface without any special arrangement.

4. Natural outcrops of smooth lava are utilized as pavements with little alteration. (See Site 87.)

#### CORNERS

In the heiaus on Kauai four methods of making corners were recorded.

1. The most common corner is that formed by two facings of river stone meeting with one stone or two stones as the corner. Obviously little attention was paid to the forming of such corners.

2. The single block type of corner consists of a rectangular block on end.

3. The overlapping corner is found in heiaus which have slab facings. The slab of the front facing overlaps the side slab to form a square corner.

4. In Malae heiau (Site 104) the walls extend, instead of meeting at a square corner, giving the effect of special buttressing.

#### PLATFORMS

The process of building a platform seems to have consisted chiefly of facing and filling, though whether the facing was made first or last is difficult to determine. It is probable that in the wide platforms the filling was done first and the facing came as a finishing touch, whereas in the high platforms the facing was done first, or at the same time. At Site 183 the large

facing stones were obviously put in position before the fill was supplied (Pl. IV, C).

The engineers who were in charge of heiau construction had several methods of increasing the effect and decreasing the labor. Figure 6 illustrates how slopes are used to the greatest efficiency. First the platform is built up on one side and backed by the slope on the other (fig. 6, *a*). The

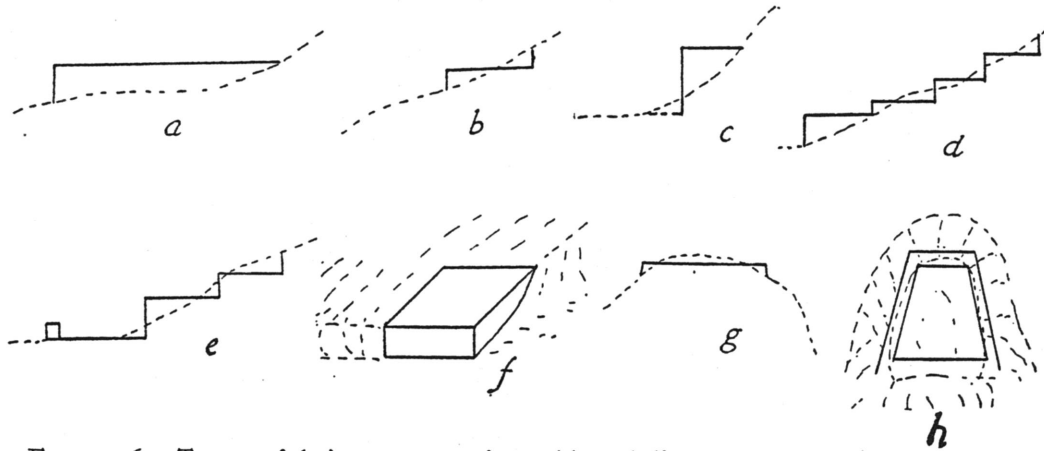


FIGURE 6.—Types of heiau constructions (dotted lines represent slopes, solid lines platforms or facings): *a*, slope used for back side of platform; *b*, slope cut into to increase size of platform; *c*, slope cut out at base to increase height of platform; *d*, three or four terraces running up a slope; *e*, level base of the slope paved together with terraces; *f*, natural terrace used for platform by paving sides; *g*, top of a knoll leveled and paved; *h*, end of a pali leveled and paved on top and sides.

amount of labor and the stone required is half that of a platform of the same size and height on level ground. However, the site was not always chosen just for the conservation of labor. For example, at Site 55 a depression had to be filled before the platform was constructed. This labor could easily have been avoided by locating the platform a short distance to either side.

A further method of conserving labor is to cut into the slope as well as to use it as a back support, thus increasing the size of the platform without any more additional labor than paving and facing the back cut. (See fig. 6, *b*.) In building some platforms the slope is cut out at the base of the front facing thus gaining a few feet in height with little added labor. (See fig. 6, *c*.) These same principles are utilized for three and four-terraced structures. (See fig. 6, *d*.) In one heiau (Site 199) the pavement is laid on the level ground at the base of the talus slope, thus easily adding size to the structure. (See fig. 6, *e*.) A natural river or sea terrace is easily faced and paved into a platform. (See fig. 6, *f* and Site 120.)

Following the method of leveling off the top of a knoll and paving and facing its sides (fig. 6 *g*, *h*) a low, narrow pali may be converted into a structure with high side facing, and several small platform terraces. (See Site 32.) Stokes (51) reports that a destroyed heiau in Wahiawa gulch is said to have

had an artificial chamber in its foundations, which might possibly have been an advanced principle of construction economy.

#### RELATION OF CONSTRUCTION TYPES TO HEIAU TYPES

There is considerable mythological and some traditional evidence that the stones for building heiaus were carried great distances. Rice (46, p. 35.) records the legends that the heiaus of Elekuna, Polihale, Kapa-ula, Malae and Poliahu were all built by the Menehunes with stones brought from Makaweli. The archaeological evidence, however, does not substantiate these beliefs. Although some of the stones of a famous temple might have been taken to be built into a new temple, a practice recorded for other parts of Polynesia, especially Tahiti, most of the heiaus were constructed from the stones in their immediate vicinity. In fact no heiau examined was constructed of stones foreign to its locality. This means that the type of construction is limited to the materials at hand. Thus walls with two parallel facings of slabs filled with rubble can hardly be constructed with spherical river stones, and the overlapping corner requires a slab constructed wall. In regard to the relation between corners and walls it is interesting to note that in Site 170 the lower part of one corner overlapped, but that above, at the same corner, the junction was formed by a single block. Thus two different types of corners appear in the same wall. As for the relation between walls, facing, and paving, little would be expected except possibly a similarity in materials, and even that is refuted in Site 107 where the walls are chiefly waterworn stones, and the paving is of angular, flat, broken pieces of lava. So far as has been observed there is little correlation of the different types of construction features. There is little relation between the structural types and the forms of the heiaus. The limitation of the materials is a controlling influence. Five heiaus have walls made of parallel rows of slabs on edge, filled with jumbled stone (Sites 105; 108; 81; 87; and Kihawahine, Niihau); all five are walled enclosures. Kihawahine and Site 105 are long narrow enclosures. Site 108 is a double construction type the outer enclosure of which is long and relatively narrow, and differs from the inner enclosure in the type of wall. Site 87 is just a rectangular enclosure and Site 81 is not long and narrow. Other rectangular enclosures do not have this type of wall. Whether there is enough similarity between these five to classify them as one type depends on whether any other features are similar, but the others have unfortunately been destroyed. Site 81 followed the technique of slab construction even though no slab material was at hand. Site 80, but a short distance from it and also rectangular, shows evidence of the parallel slab construction in places where the walls have not been rebuilt. The similarity in form and in structure of three heiaus (Kihawahine (p. 153), Site 105, and possibly Site 108) might warrant a closer placing of those sites into a special



group. (See p. 49.) Aside from this it has been observed that the paving on the platform type of heiau is usually with rough, small stone rather than with the large flat rock and pebble filling (*ilili*). Structure and type form alone are not sufficient for creating new groups or drawing conclusions. However, similarity in structure taken in conjunction with other features would certainly be significant.

#### HEIAU AT WAIMEA

As the description of the heiau at Waimea as given by Cook (14, pp. 200-3; Pl. I and II, A) is the only account of a Kauai heiau contemporaneous with its active use, it is worth quoting in full.

As we ranged down the coast from the East, in the ships, we had observed at every village one or more elevated white objects, like pyramids or rather obelisks; and one of these, which I guessed to be at least fifty feet high, was very conspicuous from the ships anchoring station, and seemed to be at no great distance up this valley. To have a nearer inspection of it, was the principal object of my walk. Our guide perfectly understood that we wished to be conducted to it. But it happened to be so placed, that we could not get at it, being separated from us by the pool of water. However, there being another of the same kind within our reach, about half a mile off, upon our side of the valley, we set out to visit that. The moment we got to it we saw that it stood in a burying-ground, or *morai* (heiau); the resemblance of which, in many respects, to those we were so well acquainted with at other islands in this ocean, and particularly Otaheite (Tahiti), could not but strike us; and we also soon found, that the several parts that compose it, were called by the same names.

It was an oblong space, of considerable extent, surrounded by a wall of stone, about four feet high. The space inclosed was loosely paved with smaller stones; and at one end of it, stood what I call the pyramid, but in the language of the island, is named *henananoo* (*amuu*, place of the oracle); which appeared evidently to be an exact model of the larger one, observed by us from the ships. It was about four feet square at the base, and about twenty feet high. The four sides were composed of small poles interwoven with twigs and branches, thus forming an indifferent wicker-work, hollow or open within from bottom to top. It seemed to be rather in a ruinous state; but there were sufficient remaining marks, to shew, that it had originally been covered with a thin, light, grey cloth; which these people, it should seem, consecrate to religious purposes; as we could see a good deal of it hanging in different parts of the *morai*; and some of it had been forced upon me when I first landed. On each side of the pyramid were long pieces of wicker-work, called *hereanee* (translation uncertain), in the same ruinous condition; with two slender poles, inclining to each other, at one corner, where some plantains were laid upon a board, fixed at the height of five or six feet. This they called *herairemy* (probably *he lele*, the altar); and informed us, that the fruit was an offer to their God, which makes it agree exactly with the *whatta* of Otaheite. Before the *henananoo* were a few pieces of wood, carved into something like human figures, which, with a stone near two feet high, covered with pieces of cloth, called *hoho* (*hoho* in Tahitian is given as, "the place just above the temple."), and consecrated to *Tongarooa* (Kanaloa), who is the God of these people, still more and more reminded us of what we used to meet with in the *morais* of the islands we had lately left. Adjoining to these, on the outside of the *morai*, was a small shed, no bigger than a dog kennel, which they called *hareepahoo* (*halepahu*, drum house); and before it was a grave, where, as we were told, the remains of a woman lay.

On the farther side of the area of the *morai*, stood a house or shed, about forty feet long, ten broad in the middle, each end being narrower, and about ten feet high. This,



which, though much longer was lower than their common dwelling-places, we were informed, was called *hemanaa* (*ka mana*, a sacred house). The entrance into it was at the middle of the side, which was in the *morai*. On the further side of this house, opposite the entrance, stood two wooden images, cut out of one piece, with pedestals, in all about three feet high; neither very indifferently designed nor executed. These were said to be *Eatooa no Veheina* (*akua no wahine*, gods for women), or representations of goddesses. On the head of one of them was a carved helmet, not unlike those worn by the ancient warriors; and on that of the other, a cylindrical cap, resembling the head-dress at Otaheite, called *tomou*; and both of them had pieces of cloth, tied about the loins, and hanging a considerable way down. At the side of each, was also a piece of carved wood, with bits of the cloth hung on them, in the same manner; and between, or before, the pedestals, lay a quantity of fern in a heap. It was obvious that this had been deposited there, piece by piece, and at different times; for there was of it, in all states, from what was quite decayed, to what was still fresh and green.

In the middle of this house, and before the two images, was an oblong space enclosed by a low edging of stone and covered with shreds of cloth so often mentioned. This on inquiry, we found, was the grave of seven chiefs, whose names were enumerated, and the place was called *Heneene* (probably *he ilina*, a grave). We had met already with so many striking instance of resemblance, between the burying-places we were now visiting, and those of islands we had lately come from in the South Pacific, that we had little doubts in our minds, that the resemblances existed also, in the ceremonies practiced here, and particularly in the horrid one of offering human sacrifices. Our suspicions were too soon confirmed, by direct evidence. For, on coming out of the house, just on one side of the entrance, we saw a small, square place, and another still less, near it, and on asking, what these were? Our guide immediately informed us, that in one was buried a man who had been sacrificed; a *Taata*—(*Tanata* or *Tangata*, in this country)—*taboo*—(*tafoo*, as here pronounced)—(*kanaka tabu*, man forbidden, probably referring to the commoners as contrasted with the priests); and in the other, a hog, which had also been made on offering to the divinity. At a little distance from these, near the middle of the *morai*, were three more of these square, inclosed places, with two pieces of carved wood at each, and upon them a heap of fern. These, we were told were the graves of three chiefs; and before them, was an oblong, inclosed space to which our conductor also gave the name of *Tangata taboo*; telling us, so explicitly, that we could not mistake his meaning, that three human sacrifices had been buried there; that is, one at the funeral of each chief . . . . The island seemed to abound with such places of sacrifice as this which we were now visiting, and which appeared to be one of the most inconsiderable of them; being far less conspicuous than several others, which we had seen, as we sailed along the coast, and particularly that on the opposite side of the water in this valley; the white *henananoo*, or pyramid, of which, we were now almost sure, derived its color from pieces of the consecrated cloth laid over it. In several parts, within the inclosure of this burying-ground, were planted trees of the *cordia Sebestina* (*Kou* tree); some of the *morinda citrifolia* (*Noni*); and several plants of *etee*, or *jijie*, (*ti*-plant) of *Tongataboo*, with the leaves of which the *hemanaa* was thatched; and as I observed, that this plant was not made use of in thatching their dwelling-houses, probably it is reserved entirely for religious purposes.

The exact location of this heiau described by Cook is unknown. The lake or pond referred to was probably that made by the backing up of the Waimea river. Of the large heiau that Cook mentioned as being across the pond, nothing remains. From a notebook of Frances Gay the Nanaikalani heiau was located inland from the Russian fort which stands on the southern side of the mouth of the Waimea river. This alone would meet the requirement, and no descriptive matter is given about it. On the northern side of

the river, the supposed site of the described heiau would be in the position of Kēaali heiau (Site 23), though this is mostly destroyed. The background given by the artist Webber (Pl. I) is far different than that seen at Site 23, but it is quite possible that the background was a later addition to the picture, and not one made on the site. It is strange that no mention is made by Cook of the heiau and city of refuge (*puuhonua*), named Hikinaakala which is said to have been located in Waimea village very near the sea. As late as 1906 Thrum was able to measure it and to find a trace of its walls. In size and location this heiau is entirely unlike the one described.

#### FEATURES OF HEIAUS

The remains of the heiaus today are little more than the stone foundations on which the perishable structures were built. They retain, however, some markings and internal divisions that indicate the location of special features described in contemporary accounts and in later native literature. No one structure shows all the features and many heiaus have all traces of internal divisions and features erased. The features that are found include the following: house sites, terraces, altars, oracle towers, pits, entrances, steps, paths, uprights, sacrificial stones, chambers, graves, springs, ponds, and pens.

House sites are the most common markings to be found on the heiaus. They indicate houses that range in size from 8 by 10 feet to 20 by 75 feet though the average is about 10 by 15 feet. The markings of house foundations are distinguished by paved and raised platforms; by lines of stone, both waterworn and rough, on edge; by special arrangement of the heiau paving or by extra fine paving with small beach pebbles; by faced depressions from 1 to 2 feet deep; by low walls; and by terraces. The house markings are not in definite places; they are found both inside and outside the heiau limits. There were sacred houses for idols and for prayer, and dwelling houses for priests. Probably the priest's houses were placed immediately outside or near the heiau, and the houses for idols took the positions in the center, and along the sides of the heiau. According to the literature there were as many as four houses located on some heiaus. The largest of these was called *kamana* (a sacred house containing the idols). (See Pl. II, A.) The second house of major importance was the *halepahu* (drum house) where the sacred drums were kept and where the chiefs and priests prayed. The two smaller houses mentioned are *umu* (an oven house) and a small shed (*waiea*, a term applied to the sacred salt water used in ceremonies) which was used for special prayer.

In several of the heiaus there is a terrace, raised 1 to 2 feet, running across one end or along one side. (At Site 107 a terrace runs along the end and the side.) The sides of these terraces are faced with stones, some of them on edge. The size of the terrace ranges from 6 feet width to 42 feet.

These terraces are distinct from the built-up platforms for house sites. As drawn by Webber (Pl. I) these terraces were used as a base for the arrangement of other temple features, such as uprights, oracle towers, and idols, though Thrum (53, p. 66.) suggests that the people sat on this ledge during the temple ceremonies.

Raised, stone-paved platforms, square, or slightly oblong, found on some of the sites, are interpreted as altars. In size they average about 8 by 10 feet or 8 feet square, and stand from 1 to 2 feet above the floor. In some heiaus the natural outcropping of lava, or slightly arranged blocks, level with the floor, have been considered as altars. They occupy no definite position, but in general are near the front central portion of the main division. In the native accounts the word *lele* refers to this type of altar. In Captain Cook's description, the altar proper consisted of two poles supporting a board 5 to 6 feet above the ground. (See Pl. I.)

The tower (*anuu*) of wickerwork frame and tapa covering, is described by Cook as a structure 20 to 50 feet high with a base 4 feet or more square. It is difficult to determine the site of this tower, as little remains to mark it. The area 18 by 20 feet, marked by a line of stones on edge on the end terrace of Site 107 suggests, through its position, the site of the oracle tower. In the heiau at Kee, Haena (Site 154) a small platform near a pit again suggests the position of the oracle tower.

Associated with many of the heiaus are pits, located either on the inside, or just outside, the heiau structure. In the native terminology the *luakini* referred to the refuse pit where remains of sacrifices, both human and otherwise, were thrown. The pits as found are usually round and from 5 to 15 feet in diameter. Some are surrounded by low walls. If just outside the heiau, the wall of the heiau may serve as one side of the pit, thus giving a D-shaped depression. In the heiau at Waiawa (Site 16) the pit is a long, narrow, rectangular depression surrounded with heavy walls built up about five feet above the ground level. All the pits are carefully made and most of them are lined with stones.

It would seem that all walled enclosures should have entrances, but most of the Kauai heiaus have no definitely marked points of entrance. In those that do, the opening is a passage way about four feet wide through the wall. Probably at one time all the heiaus had definite places for entering and leaving which could be easily marked with idols, sticks, or tapa cloth. Captain Cook mentions an entry way into the Waimea heiau.

Steps leading from one terrace to the next are found in Site 1. They are well made and the edges finished off so that they do not appear to be modern additions (Pl. V, C).

Indications of a path which was said to have once led from the beach to the heiau, was noted at Site 199. Emory (21, p. 91.) speaks of an indistinct

path leading up to the high platform at Site 154. Definite trails and paths to the other heiau, if they existed, have been effaced like the entrances. However, in Site 108 a passage way about 4 feet wide, between the outer wall of the one enclosure and the inner wall of the other, apparently led from the outer to the inner section, though the outer end has been completely destroyed. This feature is unique for Hawaii so far as now known.

In the account by Cook two types of uprights are described, another suggested, and a fourth shown in Webber's drawing (Pl. I). The first type is a narrow wooden slab a little over 2 feet high. Its front side is carved with headdress designs and a semblance of features below, and each side had short pieces of tapa cloth attached. The second type is a stone, 2 feet high, with strips of tapa around it. From the engraving it appears to be a dike prism. The suggested type of uprights are the bundles of wicker work tied together, five of which are shown along the terrace. Also in the engraving right below the altar is a stone shaped like a cone with slightly bulging sides. It is possible that this is the stone referred to with the wooden slabs as consecrated to "Tongarooa" (Kanalooa) though it does not appear to be covered with tapa. On any assumption the number of uprights is the same. A few sticks with a bit of tapa tied to their tops are stuck in the ground in different places. A wooden idol (B. M. 8049) found on Kauai while excavating a ditch line, is very similar to the wooden slabs described and pictured by Cook. (See p. 88 and Pl. IX, C.) Poliahu heiau (Site 107) has an upright slab on a terrace which is against but not part of the side wall. It is the only true upright found (Pl. V, B).

A sacrificial stone found a short distance from Site 66 is reported by Thrum (53), and the name is given by Mr. Alexander McBryde as *Napohakuakiola*.

Several heiaus of different types of construction have divisions walled off. Fornander (24, p. 59.) writes that the late Hawaiian period was marked by an increased exclusiveness in the heiaus. Only the priests and chiefs were admitted to the inner sections. This may account for the function of these separate walled divisions within the heiau. In three sites there are small room divisions. In two of these, Sites 55 and 123, the rooms are small and the walls are flimsy suggesting that they were made at a later time than the heiau. In Site 81, however, three distinct rooms are incorporated as part of a wide back wall and it hardly seems possible that they were excavated at a later date even though the whole wall is badly tumbled. No passage was discovered joining these enclosures to each other or to the main division of the heiau.

The only artificial chamber reported on Kauai is that in the foundation of a heiau in Wahiawa gulch. This feature has, however, been found on other Hawaiian heiaus.



Graves on heiaus are fairly common. (See p. 28.)

In Waiopili heiau (Site 87) a tower of stone stands in one corner. It is solid enough to climb upon and an excellent view is afforded from the top. It is a unique feature for Kauai heiaus, and if modern, defies conjecture as to the reason of its construction.

The stone-faced pond at Site 199 is a unique feature for Kauai heiaus. A walled-off spring in one corner of the pond furnishes the only drinking water on Nualolo flats. Near Site 55 is a well 15 feet deep which may be modern.

On the outside of many heiaus are small additional enclosures some of them modern, but some that might be old. Such enclosures were used for keeping sacrificial pigs. Most of the pens are too small and the heiaus too unsuitably placed to encourage the view that they are of recent construction.

Rocks and caves were used as places of deposit for umbilical cords and were not necessarily associated with the heiaus. However, there is a stone named "Kilioe" used for this purpose near the heiau at Site 154, and a similar one back of Site 19.

Because so many of the heiaus have had all traces of the features destroyed, little is to be gained by an attempt to correlate those features remaining. The most probable correlations fail when applied to the few heiaus the features of which are not wholly distinct. For example, those heiaus that have altars for sacrifice would be expected to have refuse pits for the disposal of remains, but this combination occurs only at Site 170, and here interpretation is questionable. The frequency of occurrence of the heiau features is shown in the following table:

#### OCCURRENCE OF FEATURES IN KAUAI HEIAUS

FEATURE	FREQUENCY	SITES
1. House sites	16	6; 16; 23; 19; 32; 55; 66; 107; 108; 120; 123; 151; 160; 170; 199; 154.
2. Special terraces	5	23; 80; 104; 107; 160.
3. Altars	6	23; 80; 81; 104; 129; 170.
4. Oracle towers	3	23; 107; 154.
5. Pits	5	16; 87; 107; 170; 154.
6. Entrances	6	23; 80; 87; 107; 120; 16.
7. Steps and paths	4	1; 108; 199; 154.
8. Uprights	5	23; 93; 107; 140; 170.
9. Sacrificial stones	1	66.
10. Rooms	3	55; 81; 123.
11. Chambers	1	Wahiawa heiau (Site unknown)
12. Graves	4	23; 105; 129; 137.
13. Tower	1	87.
14. Springs and ponds	3	55; 87; 199.
15. Pens	1	129.
16. Umbilical stones	2	19; 154.
17. Ovens	2	66; 123.

## FUNCTIONAL CLASSIFICATION

The great variety of heiaus described by Malo, Kamakau, Kepelino, and other writers, falls into five general classes of functions. (1) The sacrificial heiau, called by various names, chiefly *luakini* and *pookanaka*. It was the great heiau of the high chiefs to the god of war, Ku. (2) The agricultural heiau, designated by a multitude of names, *heiau hoouluulu* being one of the commonest. The purpose of this heiau was to induce rain, increase the crops or to fulfil any other purpose helpful to agriculture. (3) Fishing shrines called *koa*. These are located along the shore and used in sacrificing to the fish god, in order to increase the catch or for other purposes related to fishing. (4) The *pohaku o Kane* or the family heiau for private prayer and worship. (5) Miscellaneous heiaus. This class included a great variety of heiaus built by the lesser chiefs and priests for such purposes as circumcision, aid in childbirth, impelling love, paying debts, surf riding, hula dancing, and tapa making.

To-day the function of the heiau is little known and the information to be gathered is apt to be faulty. In the list of Kauai heiaus published by Thrum (53, pp. 36-43), 15 heiaus are classed as *pookanaka* or *luakini*, 5 as agricultural heiaus, 3 as places of circumcision, 3 as heiaus dedicated to Laka, goddess of the hula, and one as dedicated to tapa makers.

There seems to be no definable relation between functional classification and descriptive classification of types as given on p. 30. The fifteen sacrificial heiaus mentioned by Thrum for Kauai fall into the following types:

NUMBER	FOUNDATION TYPE	SITE
1	II B: small walled	136
1	III A 1: open platform	55
1	III A 2: crown of hill	139
2	III A 3: two terrace platform	129
1	III B 2: divisioned enclosure	66
1	III C 1: two terraced	16
6	III E 3: large enclosures	48; 83; 102; 106; 112; 134.
1	III D: round	S19.
1	Unclassified	S23.

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15

The only point in common is large size, which is to be expected from the native accounts. It is in the features more than in the foundations where the distinction of functional type should be found. It is reasonable that the offering of human sacrifice, the one distinguishing function of the *pookanaka* or *luakini* heiaus, should be accompanied by a certain similarity of apparatus, such as places of sacrifice, places to lay the bodies, and places to throw the rotted sacrifices. Unfortunately the features of most of the



sites classified by Thrum are now destroyed so that such a theory can be tested only after more Hawaiian heiaus have been studied. However, on the theoretical basis that certain features accompany certain functions, 6 heiaus might well be added to the 15 listed by Thrum. The result is shown in the following table:

#### ARRANGEMENT OF TEMPLE FEATURES IN SACRIFICIAL HEIAUS

SITE	16	55	66	129	154	23	80	87	104	107	170	Total
House sites	×	×	×		×	×	×			×	×	8
Special terraces						×	×		×	×		4
Altars				×		×	×	(×)	×		×	6
Oracle towers					×	×				×		3
Pits	×				×			×		×	×	5
Entrances						×	×	×		×		4
Steps and paths					×							1
Uprights						×				×	×	3
Sacrificial stones			×									1
Rooms		×										1
Chambers												0
Graves				×		×						2
Towers								×				1
Springs and ponds		×										1
Pens				×								1
Umbilical stones					×							1
Ovens			×									1

#### HEIAUS WITH CONNECTED WORKINGS

Thrum (53, p. 41) mentions heiaus which were said to have been connected in their workings. Those mentioned as connected were Poliahu (Site 107) and Malae (Site 104); Kapaka (Site 140) and Kapinao (Site 129); Kuhiau (Site 99) and Paukini (a heiau or priest's house now under water in Nawiliwili harbor). What is meant by connected workings is not certain. Malae is the second largest heiau on Kauai, but Poliahu is also of large size, so that it is not merely a connection of a large and a small heiau. Nor is proximity the chief item as Kapaka and Kapinao are separated by a straight line distance of more than 6 miles and the overland route is longer. It is possibly a reference to two heiaus with the same priests, but such separation and the similarity in size, makes even that explanation seem faulty. Similar references to heiaus connected in their workings are found on most of the islands with equally strange relationships between the connected heiaus.

#### FISHING SHRINES

The fishing shrines (*koa*) of Kauai are not notable. They are relatively scarce for the places where they probably once stood are now occupied by plantations and settlements. The principal and simplest shrine is the flat rock on which fish are laid. There is some evidence that this practice still continues. A rock (Kupelekai) at Wanini, and similar rocks in Kalalau

valley, are of this type. A platform fishing shrine is located at Pohakuao on the trail to Kalalau (Site 159). A similar platform at Site 188 seems likely to have been a shrine. Some fishing shrines were probably small houses. A square enclosure at Site 202 in Kauhao valley is probably a shrine. The chief distinction of a fishing shrine is its position: a rocky point at the end of a ridge, or the terminus of a sand beach.

#### PLACES OF REFUGE

The following sites, all associated with heiaus, are described as "places of refuge" (*puuhonua*): (1) Hikinaakala in Waimea (p. 152), regarding which Thrum (53, p. 39) says, "Some report it as a place of refuge, while others assert that the crossing of the river to Makaweli was the only *puuhonua* of this section of ancient Kauai." (It is interesting to note that a *puuhonua* could possibly be a river crossing.). (2) Keonekapu in Waimea (p. 152) referred to by Kamakau as a place of refuge. (3) Hikinaakala (Site 105) referred to by Dickey (16, pp. 91-2.) as a place of refuge called Hauola. (4) Puwouwou (Site 125) considered by native informants as a place of refuge. (5) Hauola (Site 16) Hoea, referred to indirectly by Rice (46, p. 46.): "Later, Ola sent the Menehune to build a heiau at the mouth of the Wailua River, which was to be called Hauola, after the famous city of refuge of his father at Kekaha." (6) Kihawahine hiau and *puuhonua* on Niihau (p. 153). (7) Alexander (1, p. 45) refers to Waimea and Wailua as sites of *puuhonua*.

The information about the workings of a place of refuge is very slight. The ever present heiau suggests that the enforcement of the protection was one of the functions of the priests.

Hikinaakala (Site 105) and Kihawahine on Niihau (p. 153) are *puuhonuas* similar in plan: long, narrow, walled enclosures. Hikinaakala at Waimea (p. 152) is also of this type but the method of construction of its walls is not known as the whole building is now destroyed.

Hauola (Site 16) is a different type of structure, and may not be a city of refuge. Two of the six structures classed as *puuhonuas* are destroyed without record. It is not possible to draw conclusions from the remaining four, but it is interesting that three—one at Wailua on the east, one at Waimea on the southwest, and one on Niihau—are all exceptionally long and narrow walled enclosures, and that at least two have walls that consist of parallel rows of slabs on edge, the intervening space being filled with rubble. Furthermore two have the same name, Hikinaakala, and the three are located on the beach parallel to the shore line. It is the nearest to a type that Kauai and Niihau offer.

## SHRINES AND ALTARS OUTSIDE OF HEIAUS

The most notable shrine not associated with heiaus is Kaawako on the summit of Waialeale (See p. 152.) A stone fish god now in the yard of Mr. Walter McBryde at Kukuilono, but formerly located on the beach, is shown in Plate IX, A. (See p. 87.)

## COMPARISONS

## HAWAIIAN HEIAUS

The many publications on Hawaiian heiaus, especially those by Thrum (53) and Emory (19, 20) supplemented by numerous manuscript notes in the library of Bernice P. Bishop Museum, make it possible to preliminarily compare the structures on Kauai with those on the other Hawaiian islands.

In general it seems that the heiaus of Kauai are typical of Hawaii. If anything they are simpler in plan than those on the other islands. The large heiaus on Kauai are mostly the enclosures, and the terraced and platform types are relatively small. They all lack the massiveness characteristic of the heiaus elsewhere in Hawaii. There is an absence of the impressive, high, stone platform, walled on three sides and stepped in front, such as the heiau of Puu Kohola at Kohala, Hawaii. The combination of platforms, terraces, enclosures, and other such architectural features, while not entirely lacking, is less common on Kauai than on the other islands. That this difference may be due to the tremendous amount of destruction that has occurred in Kauai, is possible. Stokes (51) writes: "It may be of interest to note that most of the sites to be found on Hawaii were platforms or enclosures, while the majority on Molokai were terraces. Hawaii is cultivated to a greater extent than Molokai and it may be and is probable that the terraces were on the slopes suitable for agriculture."

Though knowledge of the forms of Hawaiian heiaus is insufficient to justify a close comparison of types, it is evident that most of the types of heiau foundations found on Kauai reoccur on the other islands. The combination of the open platform with an enclosure on it, and the enclosure with a wall on one side 15 to 20 feet wide that serves as the setting for the heiau features, is not found on Kauai. Likewise the true platform built up on all sides and located on level ground is missing on Kauai, where all the platforms noted were built on sloping ground which gives the form of a single terrace. On the other hand, the long, narrow heiaus (p. 34) are not reported from other places in Hawaii and may be called a Kauai type.

Although the features of heiaus are better preserved in the temples of some of the other islands those on Kauai are fairly representative. The greatest difference is that on Kauai, few features are preserved in any one structure, thus making restoration or comparison on the basis of features, difficult. Some of the outstanding features that seem limited to Kauai

heiaus are the passageway between the walls of the inner and outer division of Site 108, the buttressed corners of Site 104, and the unconnected rooms within the rear wall of Site 81.

Comparison of some of the other features yields minor differences. The extra terrace is a common feature of all Hawaiian heiaus. However, on Kauai heiaus the terrace is single. Only in Site 107 are there two terraces and there one is across one end and the other along the side. The series of terraces, such as found at one end of Puu o Mahuka heiau on Oahu where five terraces run about 8 to 18 inches above each other in a step formation, is not found on Kauai heiaus, though similar forms are found on Hawaii and Molokai. The features which have been called altars, oracle towers, and pits are found on the other islands, many of them in better preservation than on Kauai. Long, narrow, rectangular pits, such as in Site 16, have not been noted elsewhere. More entrances, and paths leading to them, are found on the heiaus of the other islands than on Kauai.

An artificial chamber like that reported for the destroyed heiau in Wahiawa gulch appears in Hikiau heiau on Hawaii. The practice of burying in heiaus seems to have been followed throughout Hawaii, and on many of the heiaus graves are found, both old and modern. Sacrificial stones are found both in and near many heiaus. One large boulder with a natural hole through it is listed as a strangling stone by Emory (20, p. 65.) for Kahea heiau, Lanai. Stones of a similar nature have been mentioned by Stokes, Thrum, and others. The association of sacred pools and springs with heiaus is fairly common, though none has been described that compare with the large, artificially constructed pool at Site 199. Pens are found as parts of many temple foundations, though many of them are probably modern. One other tower such as that described in Site 87 has been reported from the island of Hawaii and said to have been used as an observation platform, a function for which it would be excellently suited. On some of the heiaus of the other islands the holes in which the idols were placed are still preserved. There is no doubt that such idols existed on the Kauai heiaus as well, and that the lack of any evidence is due to poor preservation.

The upright at Site 107 is an important special feature not found on the other islands. A similar feature is reported at the heiau of Haleaama at Holualoa, Kona, Hawaii; but there the uprights consist of three slabs set on edge in a row across the middle of a platform. So as Emory (19, p. 108.) states, in referring to the heiau described by Cook as a type, "The possibility is thus apparent that the use of slabs was not only restricted to Kauai, but to certain of the Kauai heiaus." Aside from that pictured by Webber in the heiau at Waimea, only the heiau called Poliahu (Site 107) has a true upright. This is a single stone slab on end on the side terrace, against the wall (Pl. V, B).

The same methods of construction seem to have been used throughout Hawaii. The only one not definitely mentioned for the other islands is the wall constructed of parallel rows of slabs on edge with the intervening area filled with small stone. However this technique is probably followed elsewhere as is suggested in the pictures of the City of Refuge at Honaunau on Hawaii. Earth foundations prepared by cutting into a steep slope or by making a shallow excavation in level ground, are reported from Hawaii, and meet a close parallel in the natural sites of Kauai. The general method of stonework throughout Hawaii was to face and fill as the work proceeded. Another method is recorded whereby high platforms, terraces, and heavy walled enclosures would be composed of a series of parallel walls, 2 to 3 feet wide, one leaning against the other, and forming a wall different from the definitely stepped terraces. Somewhat similar construction is used in the double facing types of the Kauai structures. However the method was little used with waterworn stones where its utilitarian aspects are to the greatest advantage. The "honey comb" structure reported by Stokes (51) from Honaunau is not found on Kauai, nor so far as now known, on any other island but Hawaii. Likewise the use of dressed stone in the Kukii heiau at Puna, Hawaii, is a unique feature.

#### MARAES ON NIHOA AND NECKER ISLANDS

Emory regards the culture and temple form on Nihoa and Necker islands as a remnant of the early Hawaiian. He writes (19, pp. 60-1) :

The type form is a low, narrow, rectangular platform which faces on a paved rectangular terrace. Along the full length of the rear of the platform an odd number of upright slabs which average  $2\frac{1}{2}$  feet in height,  $1\frac{1}{2}$  feet in width, and 8 inches in thickness, are set at equal intervals. On the front of the platform a smaller upright stands opposite the central upright. Directly in line with these two, a pair of small uprights are planted on the pavement of the terrace and against the platform, at their base a flat slab. Opposite this pair of uprights another pair, or a single upright, stands on the front of the pavement. All these uprights face parallel to the platform.

Viewed from the front, one, two or three small uprights stand near the right corner of the pavement. Near the left edge of the terrace, about one-third of the way from the platform to the front edge of the pavement, stand one or two small uprights. The right and left terrace uprights face parallel to the platform or at right angles to it.

The platform and terrace is constructed of the unshaped, small and large volcanic stones which lie on the slopes of the island in abundance. No coral or beach stones were used. The front and side retaining walls of most of the maraes are faced with a single course of rough blocks of stone set on edge. The fill of terrace and platform consists of medium size stones on the bottom, small stones towards the top, and a top dressing or rough pavement of smaller stones.

This description is thus quoted extensively to show the extreme standardization of types of maraes and to impress the difference in form from the heiaus of Kauai. Unfortunately no heiau of the form found on Necker island has been found elsewhere in Hawaii. The nearest approach to it is



that heiau at Waimea pictured and described by Cook. (See pp. 41-42 and Pl. I.) This, as mentioned by Emory, has a terrace across one end with wooden slab uprights and one dike prism. If the wooden slabs were used, their disappearance or absence to-day is easier to account for. However, it seems strange that somewhere in Hawaii a heiau with several uprights has not been found, for surely stone slabs were plentiful enough, and dike stones are common.

The heiaus on Kauai show the following similarities to the Nihoa and Necker type. (1.) The number of small heiaus is large—a fact of little significance as the topography of Necker and Nihoa distinctly favors a small ground plan. (2.) Several heiaus on Kauai have a terrace across one end, in some marked by stones set on edge in a single row. (3) Poliahu heiau (Site 107) has a single, upright stone against the side wall, on a terrace marked in front by a single row of stones on edge. The other features of this heiau are quite different from the typical marae, but this upright (Pl. V, B) is possibly a remnant of the older idea.

Thus the comparison of temple structures on Kauai with those on Necker and Nihoa shows little in common. But improbable as it may seem that such a standard form as that represented on the Nihoa and Necker islands, if once established on the Hawaiian islands could have completely disappeared, it is not impossible. At a later time the Hawaiians so completely destroyed their thousands of idols that to-day scarcely a dozen are to be found. It is conceivable that the old temple form may have been destroyed under some similar stimulus.



## FORTIFICATIONS AND SLIDES

On Kahili peak, on the ridge between Koloa and Lihue at an elevation of 3000 feet is a structure that may have served as a fort (fig. 3). It has been visited and described a few times. Jarves (30, p. 119.) writes:

After groping our way in this fashion for an hour or more, we reached the summit. It consisted of a small plot of earth about a rod square, bare in the centre, but overgrown with stout trees upon its sides. Upon it were several large timbers, of a foot in diameter, standing perpendicular, and about twelve feet high, with notches for foot-hold cut in them. These, as runs the legend, have stood from time immemorial, that is to say, some half century or more, and are the remains of a fortification which a chief erected, who lived on bad terms with his less elevated neighbors. As the approaches to its site are a succession of narrow ridges, a few warriors were able to set a host of enemies at defiance, and make the place impregnable. During the night his followers sallied down and levied black mail in the shape of pigs, fowls, taro, and potatoes, for their lord's table. What was his end, the legend tells not; but if his enemies did not eventually take him off, then influenza must, for no mortal could have lived there long . . . .

In 1915 this structure was examined by Mr. John F. G. Stokes and Mr. Charles Dole in behalf of Bishop Museum. Mr. Dole reported that an area 12 feet by 27 feet has been leveled off the top of the peak at least to decomposed rock, but much cutting in solid rock is improbable. Instead of several long posts, 1 foot in diameter, reported by Jarves, Stokes and Dole found one post 13 feet 2 inches high, and 11 inches in diameter, and smaller ones 3.5, 1.75, 1.25, and 0.75 feet high, and 6 to 8 inches in diameter. The posts are of *kauila* wood which is said to have come from the mountains back of Waimea. If so, great labor must have been expended in dragging them up the steep ascent. The only artificial work mentioned are notches on the large post. Reports of carving were not substantiated. An adz and several waterworn stones (not sling stones) were found on this platform.

The function of this structure is uncertain as it is not mentioned in native traditions. As the position gives a commanding view in clear weather, Mr. Stokes suggests that it may have served as a lookout, but Mr. Dole reports that the peak is usually surrounded by clouds. The suggestion of Jarves that the site was the home of a robber chief seems improbable in view of the climatic conditions. By some it has been considered a funeral pyre on which the bodies of the chiefs were left to decompose. The difficulties attending the construction of such a site implies that it was built by some powerful chief who could command the labor.

Thrum (53, p. 64) mentions a fort on Hauola ridge, Waimea district: "Above the heiau of Hauola rises the abrupt and precipitous hill of the same name. This is a plateau of 20 acres, fully 800 feet high, and was fitted out

as a most perfect *puu-kaua* or fort. This was last used on the occasion of Kamehameha's threatened invasion in 1804."

The *holua* slide at Puuohewa, (Site 91), as it now exists, is free from stonework, and is marked by crossing depressions in the side of the hill (Pl. VII, C). Another slide on the side of Hoesa Valley is said by Mr. E. A. Knudsen to have been stone-paved. A hill named Puuholua in Makaweli was probably another slide.

## STONE ARTIFACTS

## KINDS OF MATERIALS

The artifacts from Kauai available for study in Bernice P. Bishop Museum and in privately owned collections include hammer stones, grind-stones, polishing stones, adzes, knives, mortars, pounders, lamps, dishes, oil presses, sinkers, mirrors, game stones, objects made of wood, shell and bone, mats, and calabashes. As elsewhere in Hawaii the material used for stone artifacts on Kauai is that widely distributed in river valleys, on ridges, and along the sea shore: chiefly varieties of basalt, eolian limestone and rock from the coral reefs. Rock for making adzes and other stone implements was quarried on Nounou ridge on Kauai. The much used quarry on Moki-hana ridge back of Waimea has been described by Brigham (5, pp. 76-78.) who found there many chips, and partly worked adzes.

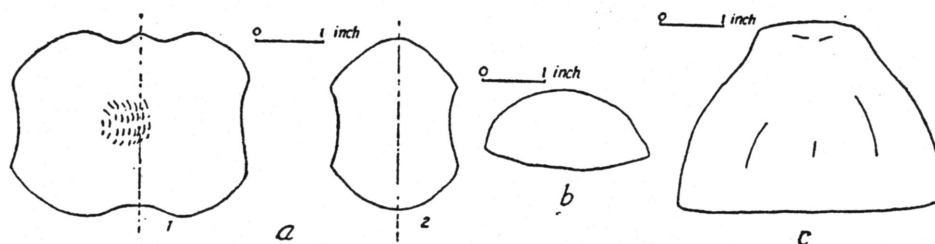


FIGURE 7.—Stone implements. *a*, shaped hammer stone; 1, side view showing pounding surface on each end and in middle and the finger grips on the edges; 2, cross section showing pounding surface on the middle of each side, length 3.6 inches, width 2.75 inches, thickness 1.9 inches (10714); *b*, cross section of polisher of fine-grained limestone highly finished, diameter 2.6 inches, thickness at center 1.3 inches, weight 6 ounces (10312); *c*, polisher made from a broken pestle or pounder, the polishing surface is at the base, the top part serves as a handle, diameter of base 4.0 inches, diameter at tip 1.6 inches, height 2.7 inches, weight 41.5 ounces. The material is a medium-grained, dark basalt (10709).

## HAMMERS, GRINDERS, AND POLISHERS

The most common hammer stone on Kauai is the river boulder with a pounding surface on one or more sides. These can be picked up around house or camp sites. Shaped hammer stones, characterized by finger grips and definitely localized pounding surfaces, are not as numerous as might be expected from the amount of hammering that must have been done. A stone ball, B. M. 9335, 3.6 inches in its longest diameter and 2.95 inches in its shortest diameter, has a pounding surface at each end of the shorter diameter. A barrel-shaped piece, B. M. 10716, 2 inches long and 1.5 inches in diameter, has a pounding surface at each end and a finger grip chipped on each side. The stone shown in figure 7 *a* is representative of the definitely shaped hammers. One in the McBryde collection is longer and narrower and has two finger grips on each side.

Many large boulders with scalloped surfaces were utilized as grinding stones for adzes. (See Pl. VIII, B.) Smaller rocks that could be transported were taken to the house sites. One of these in the McBryde collection measures 14 by 12 by 6 inches and shows signs of use on both sides. Both surfaces of some large, flat, thin stones were used. Many of the smaller grinding stones are broken pieces of larger ones, though many were originally small—4 to 5 inches in diameter. These smaller pieces are to be found around almost any camp site and village site.

Artifacts classed as polishers include a great variety of stones of different sizes and texture. The one feature in common is a rubbing surface on one or more sides. The distinction between a grindstone and a polisher is principally one of use. The grindstone is the base on which the tools to be sharpened are rubbed and scraped; the polisher is itself rubbed and scraped on the artifact. The abrasion surfaces of the grindstone are more regular than those of the polisher and are limited in extent. They are usually concave near the center, in contrast to somewhat convex surfaces on the polishing stones.

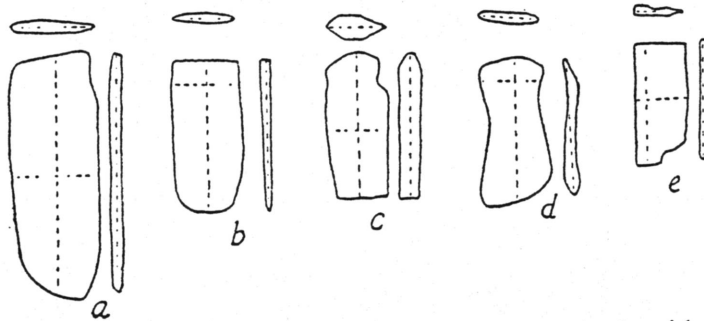


FIGURE 8.—Five stone knives from Kauai: *a*, flat on the back with the cutting edge on the lower side, length 6.6 inches, width 2.4 inches, thickness 0.35 inches (Collection of Francis Gay); *b*, completely polished with two cutting edges, length 4.1 inches, width 1.9 inches, thickness 0.25 inches (Wilcox collection); *c*, flaked knife with sharp edge, roughly finished, length 4.0 inches, width 1.7 inches, thickness 0.6 inch (10601); *d*, slightly shaped waterworn piece with dull edges, length 4.0 inches, width 2.0 inches, thickness 0.5 inch (B 4485); *e*, flake, with secondary chipping to form the lower cutting edge, back side rounded, length 3.3 inches, width 1.4 inches, thickness 0.2 inch (C 1660).

A rough classification of polishers includes several varieties. (1) Big pieces of pumice stone, roughly shaped, and worn on one or two surfaces—one greatly modified form (B.M. 10706) seems artificially shaped to include a polishing surface and a holding grip. (2) Roughly shaped balls of coral without a definite polishing surface—a typical specimen (L 492) measures 4.8 inches in the longest diameter and weighs 36 ounces. (3) Rough pieces of cellular lava, illustrated by a stone (B.M. 10708) that has a wellworn, circular polishing surface 4.4 inches in diameter—a much smaller piece of the same type is described by Brigham (5, p. 17) as a "bath-

rubber." (4) Many polishers are made of fine-grained material—chiefly limestone. They are disk-shaped about 2.5 inches in diameter, 1 inch thick and weigh about 8.5 ounces. These show slight differences in the degree of polish but are smoothed off all around, indicating considerable use in fine finishing work. A variation of this form is shown in figure 7, *b*. (5) Bisected river boulders with a concave polishing surface are illustrated by a specimen, (L 490) 4.4 inches in diameter and 3 inches high. (6) Mullers or small poi pounders are converted into polishers because of breaking or some other defect. (See fig. 7, *c*.) (7) Pieces of fine-grained basalt, polished all around, but smooth only on the bottom side. A representative stone, (B. M. 10713) is roughly rectangular, 3.7 by 5 inches and 1.1 inch thick.

#### ADZES

The typical adz of Kauai differs in no way from the typical Hawaiian adz. It is rectangular in cross section and has a tang at an angle to the blade for hafting. Most of the adzes are ground and polished on the bit and the front of the blade, though in a few grinding is continued along the back and sides. The remaining parts are left rough. The cutting edge is usually straight. The sides are parallel in most adzes, though in some they diverge towards the front cutting edge, and in a few converge. One adz (L 549) shows the most marked convergence towards the cutting edge. It measures 2 inches in width at the poll, 2 inches in width at the shoulder, and but 1.3 inches at the cutting edge. The total length is 12.5 inches, and the greatest thickness is 2.3 inches.

As shown by Emory (20, p. 78) tanged adzes fall into three main classes. (See fig. 9, *a, b, c*.) 1. Broad, heavy adzes, with the width of the cutting edge more than 25 per cent of the length and the tang at a marked angle to the blade. 2. Narrow, heavy adzes, with the width of the cutting edge less than 25 per cent of the length. 3. Thin bladed adzes with tang at a slight angle. In class 1 the sides diverge towards the cutting edge, in class 2 they are parallel, or converge, and in 3 they diverge markedly. In Kauai thick bladed adzes, classes 1 and 2, are far more numerous than the thin bladed, or class 3. Though adzes of class 1 are slightly more numerous than those of class 2, the difference is too small to be significant. Out of 100 adzes from Kauai in the Bishop Museum collection, 40 were of class 1, 38 of class 2 and 22 of class 3.

There are so many adzes less than five inches long that it seemed worthwhile to group them separately. These small adzes show many deviations from the norm, but the variation is more likely due to the kind of material used than to the intent of the maker. Many chips were used for making these small adzes and the cross section of the adz depends on the shape of the chip.

Group 1—Adzes from 3.5 inches to 5 inches long that still retain the features of the normal adzes, only in miniature. They have a tang at a slight angle to the blade. The polishing is chiefly confined to the front of the blade and the bit. The cross section is rectangular. The sides are parallel though the varieties with sides that diverge towards the cutting edge are common. They are mostly thin-bladed adzes, though the distinction between

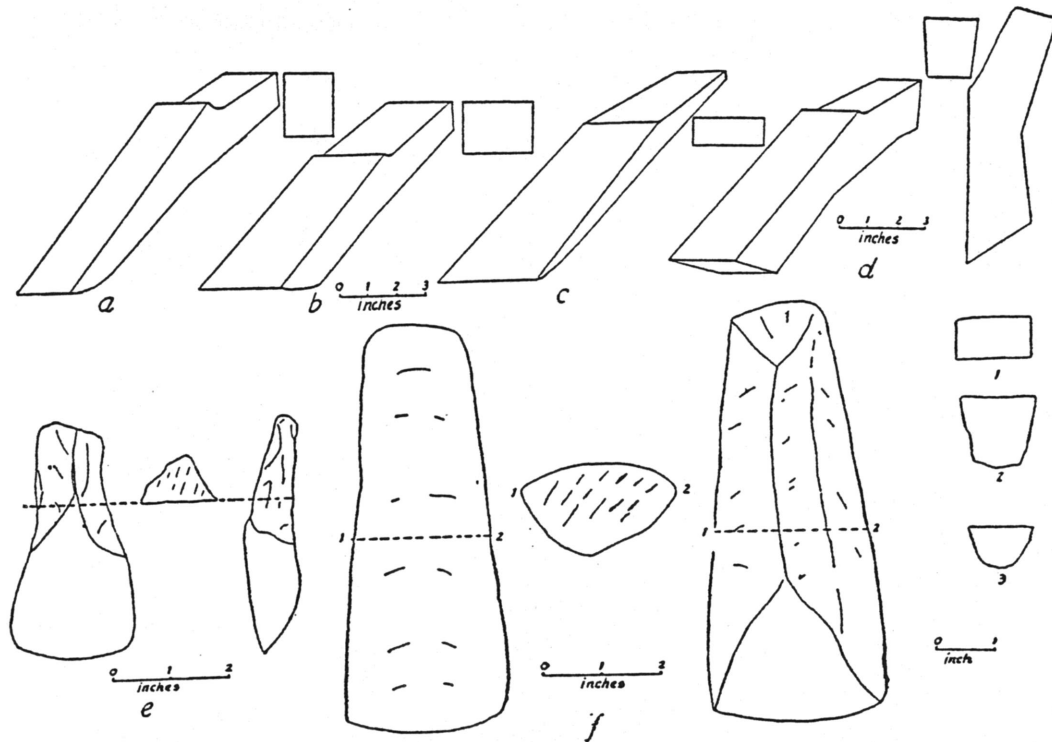


FIGURE 9.—Adzes from Kauai: *a*, type 2 adz, length 10.3 inches, width at cutting edge 1.8 inches, width at shoulder 1.8 inches, width at poll 1.8 inches, thickness at shoulder 2.2 inches, thickness at poll 1.12 inches, width at cutting edge is 17.5 per cent of the length or less than 25.0 per cent (10669); *b*, type 1 adz, length 8.8 inches, width at cutting edge 2.8 inches, width at shoulder 2.5 inches, width at poll 1.95 inches, width at cutting edge 31.8 per cent of the length or more than 25.0 per cent (10679); *c*, type 3 adz, length 9.4 inches, width at cutting edge 3.4 inches, width at shoulder 2.5 inches, width at poll 1.7 inches, thickness at shoulder 0.9 inches, thickness at poll 0.3 inches (10689); *d*, completely polished adz, length 8.9 inches, width at cutting edge 2.3 inches, width at shoulder 1.95 inches, width at poll 1.5 inches, thickness at shoulder 2.1 inches, thickness at poll 1.6 inches (10570); *e*, type of curved adz—1, top view—2, side view—3, cross section—the front blade is polished and the bit likewise, but the tang is roughly triangular with the apex at the front, the bit is flat, not concave, length 4.0 inches, width of cutting edge 2.1 inches, width of poll 1.1 inches, thickness at cross section 0.8 inch (B 1799); *f*, curved tangless adz of unique type, fairly well polished, with concave bit, the front face maintaining a lateral curve throughout from the cutting edge to the poll—1, top view—2, cross section—3, obverse, length 7.0 inches, width at cutting edge 3.0 inches, width at poll 1.7 inches, thickness 1.55 inches (L 546-cast); *g*, three cross sections of adzes showing variation—1, a regular adz with a rectangular cross section (4593)—2, cross section showing sides converging towards the back face (4586)—3, showing rough face at the back, as in (2) rounded off by polishing (10582).



thin and thick-bladed adzes when the length is less than 5 inches, is a nice one.

Group 2—Adzes less than 3.5 inches long that still imitate the normal classes. The blades are thin and the angle of the tang is obtuse. The cross section is rectangular in intent, though because of the limitation of the material used, this form may be only approached. The polishing extends over a greater surface than in Group 1. This group could possibly be incorporated with Group 1.

Group 3—Tangless adzes. The polishing on these adzes approaches completeness. Some of them are roughened on the poll to permit hafting. In all the cutting edge is formed by the flat, front side of the blade meeting the inner or back side at an angle. In other words, the front is straight and the back forms the angle. A part of this group is represented by adzes (B. M. 4594) in which the front side continues straight and flat from the cutting edge to the poll, whereas the back side bulges and slants from the middle to the cutting edge to form the angle.

Group 4—Wedge-shaped adzes. In these adzes the front and back of the blade are similar and both converge to form the angle at the cutting edge. Some adzes in this group appear to have been used as wedges. (See p. 62.)

Few conclusions regarding origin and source can be drawn from a study of these small adzes. They are fairly numerous and in a functional way must have been quite important to the Hawaiian workman. Each of the four groups has a good representation in the collections and in each group there is considerable variation. Any pieces that vary enough to appear as exceptions are treated as such.

Among the Kauai specimens there are a number of exceptional forms as regards polishing, shape and cross section. Most of the adzes are polished only on the bit and the front of the blade, but some display variation in the amount of polishing. A few large adzes approach complete polishing—a rare feature—and some of the small adzes are completely polished. One broken adz (B. M. 4573) 3.9 inches long, shows complete polishing and there is every indication that the whole piece might have been polished. The width of its cutting edge is 1.9 inches; the width at the shoulder, 1 inch. Two broken pieces of class 3 adzes (B. M. 6331 and B. M. 10591) represent the front 3.5 inches of the blade including the cutting edge. Both are highly polished on the front, back, and sides. One (B. M. 6331) is 0.5 inches thick and has a cutting edge 3 inches wide. It has been used for a polishing stone since it was broken, as the cutting edge and the edges of the break are rounded off. The other adz, 2.7 inches wide and 0.5 inches thick, is unmodified. Another adz (L 481) a typical class 2 adz, is well polished all around except for the back side at the poll end. The width of its cutting edge

is 2 inches; its total length, 9.4 inches; the thickness at the shoulder, 1.8 inches. The adz shown in figure 9, *d* is completely polished on all sides.

Three adzes from Kauai—one each in Bernice P. Bishop Museum, the McBryde collection, and the Wilcox collections—have curved blades. (See Pl. X, *B*; fig. 9, *e, f*.) The McBryde and Bishop Museum adzes have tangs and were meant to be hafted. The whole conception of these curved adzes is different from the regular adzes. The cross section is triangular, the bit is flat and polished, the cutting edge is curved back, and the front side of the blade is convex and highly polished. The third adz represented in figure 9, *f* is similar in style to the other two but considerably larger. It has no tang but could have been hafted as there is a rough surface at the poll for that purpose. The convexity of the front of the blade extends from the cutting edge clear to the poll, whereas in the others it just reached the middle, forming a shoulder. The bit of this adz is concave; in the others it is flat. The cross sections of all three adzes are triangular but in the first two the apex of the triangle is at the front side, and in this third adz the apex is at the back side. Thus it would seem that two styles of curved adzes are represented, the only feature in common being the curving of the cutting edge. Brigham (10) suggests that such a tool was used for hollowing out canoes and the insides of wooden bowls. It seems strange, however, that a tool with such important uses should be so rare.

Other variations from the Kauai adz with a rectangular cross section, are found among the specimens examined. The simplest variation is that in which the sides converge from front to back. For example, in one adz (B. M. 10672) the front side at the shoulder measures 2.5 inches and the back 2 inches. In another (B. M. 10688) the front side measures 2 inches at the shoulder and the back side, 1.4 inches. The variation is not great enough to be significant, however. Among the smaller adzes are several in which the inward slant of the sides is definite enough to look planned. The appearance of the convergence is increased by the roughened chipping on the back which makes the shape obscure. In some adzes this rough chipping on the back has been polished and a rounded back formed (fig. 9, *g*). No true adzes with triangular cross sections have been found in Kauai. The nearest approach is a gouge of triangular cross section, the apex being at the front, while the back face (the base of the triangle) curves up to form the cutting edge, or in this implement, the point (fig. 10, *d*). Two adzes (B. M. 10587 and B. M. 6333) are tangless with roughly triangular cross sections. They are 3 inches and 4 inches long respectively.

Among the Kauai stone implements are some classified as gouges. That shown in figure 10, *c* is typical. Of these gouges a general description would specify a flat back; a curved cutting edge; the cross section in the form of a bisected oval; a slight angle, a flattened space, or roughened surface for

hafting; the under side of the blade, the bit, flat and not concave. One gouge 4.4 inches long (B. M. 10602) is almost round in cross section.

Wedges may be appropriately considered as a group of specialized adzes. A wedge has the following features: no tang, front and back similar and both converging to form the cutting edge, a flattened poll, no facilities for hafting. Of the wedges studied one (B. M. 4563) is 2.2 inches long, another

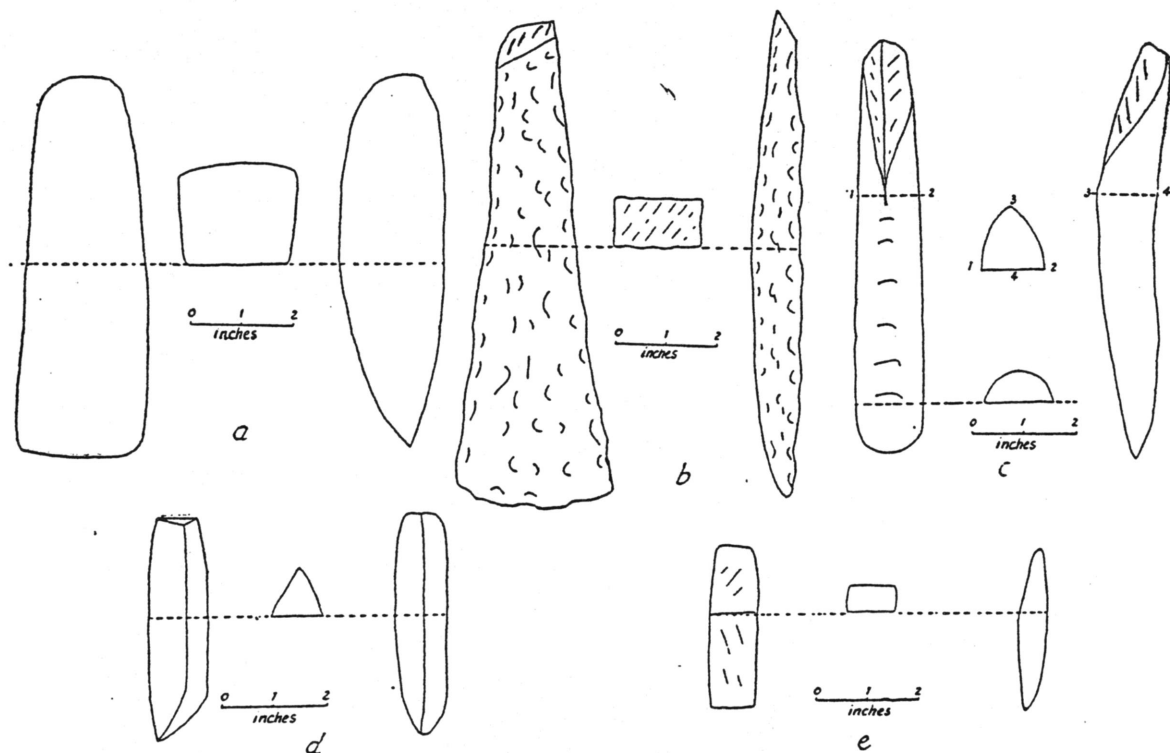


FIGURE 10.—Stone implements from Kauai: *a*, front, cross section, and side view of axe or wedge of black clinkstone highly polished, tangless and with a flat poll, the front and back face converging to form cutting edge; length 7.5 inches, width at cutting edge 2.5 inches, width at poll 1.6 inches, thickness 2.0 inches, weight 2 pounds 13 ounces (4603); *b*, top, cross section, and side views of stone axe still in the rough, unfinished in any part except the shaping, with no tang as in an adz but the front face running straight back to the poll and the back face curving up to meet the front to form the cutting edge. The smoothness of the bottom is due to the natural fracture of the stone used and not to polishing or grinding; length 9.2 inches, width at cutting edge 3.0 inches, width at poll 1.0 inches, thickness at cross section 0.9 inch (B 1671); *c*, front, cross sections, and side views of a typical gouge; the front face has a regular upward curve near the cutting edge which sharpens near the shoulder as shown in cross section, finally becoming triangular at the poll. The whole piece is polished though not very well on the tang and the back face is flat throughout, but there is a slight angle as shown by the side view; length 7.8 inches, width at cutting edge 1.3 inches, width at poll 0.8 inch, thickness at shoulder 1.2 inches (B 1669); *d*, side cross-section and front views of a triangular gouge in the rough; length 4.25 inches, width of back face 1.0 inch, width of sides 0.9 inch, the triangular cross section having the apex at the front face (Broadbent collection); *e*, small adz resembling the Nihoa and Necker type, length 3.0 inches, width at cutting edge 0.7 inch, width at shoulder 0.7 inch, width at poll 0.7 inch, thickness at shoulder 0.5 inch, thickness at poll 0.25 inch (6332).

(B.M. 10677) 3.4 inches long, and a third, (B 1700), 3.4 inches long. Two of these have roughened ends undoubtedly for hafting. Among the larger wedges three (B 1684, B 4501, and L 484) were once adzes that had been broken at the shoulder. The broken ends were squared off to fit them for use as wedges. The tool shown in figure 10, *a* is described by Brigham (5, p. 74). It hardly seems possible to haft such a piece, especially as it is completely polished. But, on the other hand, the butt end is rounded off and does not seem to have been pounded much. The piece is the only one of its kind in the collections.

The unfinished ax shown in figure 10, *b* illustrates a type. Whether the idea of this was conceived after seeing steel axes, is not known, as the antiquity of the piece is in question. Another axe (L 489) is 3 inches long with a 1.9 inch cutting edge that runs obliquely. It is tangless and completely polished. Still another axe is shown in Plate X, *c*.

Aside from the stone tools described, there are a few which remain unclassified. One is a tangless piece (C 303) 2.3 inches long, 0.8 inches thick and roughly triangular in cross section. The base of the triangle is at the front and 0.9 inches wide; the apex is at the back and slightly rounded off. The cutting edge is blunt. Another tangless tool (B.M. 10704), 2.2 inches long, is interesting because the sides in the cross section converge towards the front instead of the back. Still another, B 1670, is a thin, flat, rectangular chip 1.1 inches wide, 2.3 inches long and 0.15 inches thick. One end is square and the other sharpened to a cutting edge.

It is somewhat surprising to find on Kauai few adzes of the type described by Emory (19, p. 93) from near-lying Nihoa and Necker. Only three are included in the collections studied. Two of these are shown in figure 10, *e* and Plate X, *A*. The third is much smaller, measuring 2.2 inches in length; 0.8 inch in width; and 0.5 inch in thickness at the shoulder. It is polished, and its sides are parallel.

## KNIVES

Stone knives, probably for use in cutting up fish, have been found on Kauai, but on no other Hawaiian island. Most of them are small and, though varying in shape, have certain characteristics in common. These are a cutting edge, a back edge which is thicker and flat or rounded, and an absence of means of hafting. The simplest form of knife is a fragment with a rough edge and a slightly finished back side (fig. 8, *e*.) A more typical form is the one illustrated in figure 8, *b*. It is a smooth, polished piece, not thick, rounded at one end, and broken off at the other. Apparently there is a cutting edge on both sides. Two similar knives have a cutting edge on one side only. (See fig. 8, *a*.)

Another style of knife (fig. 8, *c*) is a chipped piece, not smoothly fin-



ished, but with a sharp cutting edge, and a possible roughened end for attaching a handle, though this is doubtful. Specimen B 4495 and the knife shown in figure 8, *d* are waterworn stones, not shaped very much, and with very dull edges. Though classified as knives, they are poorly adapted for cutting.

As reported by Frances Gay, an old Hawaiian when using the knife grasped the back of it in the palm of his hand, and extended the forefinger well over towards the point.

Stone flakes used as scrapers are found on all the islands, and the shell scrapers for *olona* fibre and other scraping purposes, are common.

#### MORTARS, MULLERS, AND PESTLES

The Kauai mortars fall roughly into two types. Type 1 is a short, wide bowl with the sides slightly convex and the diameter of the base greater than that of the top. There is no flare either at the base or at the rim. The bottom is flat or slightly rounded. The measurements of a typical mortar, (B.M. 1226) are: height 5.5 inches, diameter at base, 7.3 inches, diameter at top 5.7 inches, inside diameter 4 inches, inside depth 4 inches.

Type 2 is tall and narrow. The sides are straight and almost parallel, that is, do not converge towards the top. In many mortars there is a flare at the top and bottom rims. The typical mortar (B.M. 10777) measures: height, 7.4 inches; diameter of base, 7 inches; diameter of rim, 7 inches; inside diameter, 5 inches; inside depth, 5.5 inches. These two types are not distinctly defined. One mortar (L 510) has the shape of type 1 and the straight sides of type 2. In the collections the specimens of type 2 predominate. In one mortar of type 2 the top and the bottom flare so much that the sides are given a concave outline.

Most of the mortars are without designs. Of the exceptions, one (B.M. 10630) has a groove encircling it about two inches from the bottom. Another (B 1737) has a ridge running around the middle, and a third (B 1772) has a ridge about 2 inches from the base. The flare of the base and the rim, together with this ridge, give the appearance of three ridges.

One mortar (B 1741) has a hole through the bottom due to excessive wear. Another (B.M. 10629) also has a hole in the base, drilled from both sides, and probably with a steel drill. One type 2 mortar is exceptionally large. It measures: height, 11.7 inches; diameter of base, 8.2 inches; diameter of rim, 8.2 inches; inside diameter, 4.5 inches; inside depth, 6.5 inches. The base and the rim flare and the bottom is flat.

It was thought for a time, when the mortars were first found, that they were localized on Kauai. They have now been found on the other Hawaiian islands as well, but most of those in the Bishop Museum collection are from Kauai, where, it would seem, they were most frequently made.

In general Kauai mullers are cylindrical, though the diameter of the base is a little greater than that of the butt. (See Pl. XI, *C*.) In some there is a flaring at the base. They range in length from 3 inches to 8 inches, the average being about 6 inches. The diameter of the base averages about 3 inches. Some of these are ground fine and some are still rough. In the Horner collection there is a muller 5 inches long and 3.5 inches in diameter at the base end, which has a groove encircling it about 2 inches from the top. This may represent a conversion into a sinker, or a method of hanging the tool up when not in use.

The pestles are very similar to the mullers in shape but are longer. The average length is about 10 inches. There are few with any variation of the handle or base. It is probable that mullers and pestles are pounders of the conical type modified for special use, that later became a standardized form.

#### FOOD POUNDERS AND GRINDERS

The typical Hawaiian poi pounder is found on Kauai and is still in use to-day. It is a cone-shaped stone with a convex base and a small knob at the top. It is made of compact basalt, and pecked and ground into shape. Coral is also used for some pounders. It is essentially a one-handed implement used by the men to pound the taro into poi. The average weight and size of the conical poi pounder is given below. Nothing about the conical forms of the Kauai pounders is distinctive.

Aside from the conical forms Kauai has three other types of food pounders or grinders that are not found elsewhere in Hawaii. These are (1) a ring pounder; (2) "stirrup" or block pounders; (3) block grinders. The following summary shows the relative weights and sizes of ring pounders and stirrup pounders as compared with conical pounders. The features of block grinders are discussed on pp. 66-68.

Pounders	Weight in ounces			Height in inches			Base in inches		
	Av.	max.	min.	Av.	max.	min.	Av.	max.	min.
Conical Pounders.....	78.8	169.0	29.0	7.4	10.1	5.1	4.8	6.7	3.1
Ring Pounders.....	57.7	91.0	21.0	5.4	6.4	3.9	5.8x3.4	6.6x4.6	4.1x2.7
Stirrup Pounders.....	50.8	69.0	33.0	4.7	5.2	4.0	4.0	5.0	3.8

Ring pounders.—Typical ring pounders are shown in Plate XI, *E*. One side of a ring pounder is very much like the other, there being no front nor back. In fact this symmetry is consistent from sides, ends, top, or bottom. Throughout all the ring pounder group there is a remarkable consistency of form. The three forms shown in Plate XI, *E* represent the major variations, and it is obvious that these are but slightly different. The one characteristic in common to all of this group of pounders is the perforation, as the name implies. This ring is well finished and about 1 to 2 inches in diameter. The



ring handle—the consistent feature—is varied by a straight, high base, and a flaring base. The general appearance is, however, about the same.

Stirrup pounders or block rubbers.—Three block pounders are shown in Plate XIII, *A*. Though there is considerable variation in this group, the general characteristics are a straight face, slightly hollowed in the center; a convex back; a broad base, asymetrically convex. Leaving out many minor variations in form, there are two general types. One a semi-elliptical type in which the sides are bulged in a convex curve that continues over the top. The top may be modified with lugs or notches to aid in the grip. The second subtype is the block-like form in which the sides are straight; the top, though it may be varied with lugs and notches, essentially straight; the concavity of the front face delineated with regular, straight edges; and the back less bulging. The grips mentioned for both subtypes, are two or three notches along the top edge, two or three projecting lugs, which may be angular, rounded, or extended into horns, and combinations.

Block grinders.—The several types of stones classified together as oblong grinders are shown in Plates XIII, *B* and XIV. In general the bases of the larger specimens show so much wear that the indication is that they were rubbers or grinders. Most of the surfaces meet at fairly good right angles, a characteristic of the slab forms, but not a general Hawaiian characteristic. In most of the grinders the grips are not such that would permit of hand usage, but present the suggestion and the necessity of hafting. One of these stones has been classified in the Museum as a "canoe rubber," a possible use.

Because of their rarity and the interest attached to them, the ten known block grinders are here described in detail.

1. Specimen B 2408 (Pl. XIV, *A*; fig. 11, *a*). A two-handled grinder with the top of the projection handles notched as if for some means of hafting. The front face is flat and fairly rectangular in outline though one end has the corners slightly rounded. The back side bulges in a regular curve from the top edge to the flat bottom. The measurements of the body are: length, 7.7 inches; vertical width, 2.7 inches; thickness, 2.9 inches. The projections are about 1.6 inches wide, 1.9 inches thick, and 2 inches high. They are 2.5 inches apart and slant out a bit.

2. Specimen B 1316 (fig. 11, *c*). A broken grinder. Judging from the position of the one projection remaining, it was probably similar to B 2408, only thinner. The front side is flat and the corners but slightly rounded. The back side has no bulge but curves in towards the base. The original length was about 7 inches. The body is 2.2 inches high and the handle projection adds 2 inches more. The thickness is 1.6 inches.

3. Specimen B 8789 (Pl. XIV, *C*; fig. 11, *b*). A single-handle projection type, evidently hafted in some fashion at one time as use by hand seems impossible. The face which includes the front part of the handle projection, is flat and quite angular at the corners. The lines are straight except for the base which is slightly convex. The back side bulges from the base of the handle to the flat bottom. The base of the handle seems slightly notched as if for some hafting device. Length 6.3 inches, height of the body 2.9 inches, greatest thickness 2.3 inches. The handle is 1.6 inches high, 1.8 inches thick, 2.7 inches wide at the base, and slightly wider at the top.

4. Specimen in the collection of Mr. Walter Sandburn, Hanalei, Kauai (Pl. XIII,

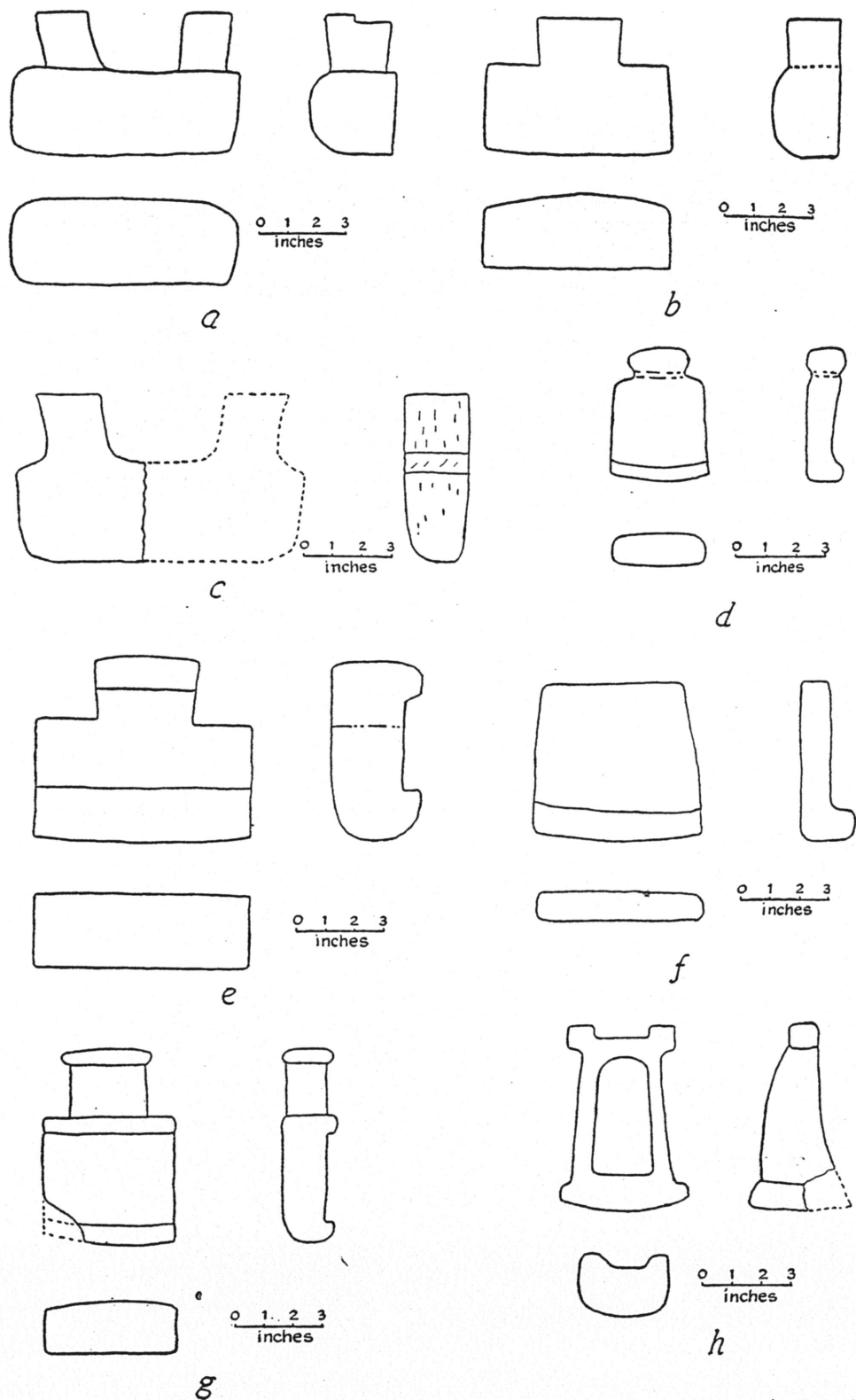


FIGURE 11.—Types of block grinders showing front profile, and vertical and horizontal cross sections, both taken through the center: *a*, specimen B 2408 (cast); *b*, specimen B 8789; *c*, specimen B 1316 (broken—dotted lines indicate theoretical restoration); *d*, specimen 4140; *e*, specimen 7660; *f*, specimen L 2373; *g*, specimen L 7276; *h*, specimen 6820 (cast).

B). This grinder is 7 inches long and 6 inches high including a short handle projection in the center. The face is flat and the back side curved with a slight bulge. The corners are worn quite round as though through considerable use. The handle has no notch at the base which would suggest means of hafting and the top edges of it are rounded instead of angular.

5. Specimen B.M.7660 (Pl. XIV, E; fig. 11, e). A single handle projection form, with the added new features of an extended ridge along the front side of the top of the handle and the base of the body. The face, excepting these two ridges, is remarkably flat and angular. The edges are quite square at the sides and shoulders, but the base and the top of the handle are slightly convex. The back side is also flat until near the bottom where a smooth curve includes the whole base of the specimen. The horizontal cross section is almost a perfect rectangle. Length of the body 7.3 inches, height 4 inches, and thickness 2.5 inches. The ridges at the base and top of the face project 0.5 inches, and are 1.7 inches wide at the base and 1.0 inches at the top of the handle. The handle is 2 inches high and the same thickness as the body. The width is 3.2 inches at the base and 3.5 inches at the top.

6. Specimen L 7276 (Pl. XIV, D; fig. 11, g). This grinder approaches the food-rubbing type though the method of handling is still problematical. The vertical cross section shows a projecting ridge at the base, top of the body, and the top of the handle. The front face is again flat, angular, the sides straight, and the base slightly convex. The back side is slightly convex horizontally, though vertically flat until it reaches the base which is a regular curve. The body is 4.4 inches wide, 1.5 inches thick, and 4 inches high. The rims project 0.3 inches and are about 0.5 inches wide. The handle is 1.5 inches thick at the base, 1.3 inches thick at the top with a rim that projects 0.3 inch. The width is 2.5 inches and the height 2.2 inches.

7. Specimen L 2373 (fig. 11, f). An angular grinder without any handle projection and with an extended rim along the base. The front face is flat as is the back side also. There is less of a curve to the base than in the other specimens. The width at the base is 5.6 inches and the top 4.7 inches. The height is 5.2 inches and the thickness fairly uniformly one inch. The basal rim projects 0.7 inch.

8. Specimen B.M. 4140 (Pl. XIV, B; fig. 11, d). Somewhat curved grinder with a single handle projection, grooved at the base. There is a short, projecting rim at the base on the front side. The front side is flat horizontally and slightly concave vertically. The edges are rounded. The back side is straighter than the front, and the base is almost flat. The width of the body is 3.3 inches at the bottom and 3 inches at the top. The height is 3 inches, and the thickness varies from 0.7 inch to 1.1 inches. The rim at the base projects 0.5 inch. The handle is 2.1 inches wide and has a notch out of its front face.

9. Specimen L 2277. A broken grinder apparently similar to L 2373 or B.M. 4140. The piece is roughly rectangular, though with the edges slightly curved and rounded. It measures 2.6 inches by 3.6 inches. The thickness ranges from 0.4 inch at one end to 1 inch at the broken end. The whole is curved vertically and there is a suggestion of a projecting rim at the thinner end.

10. Specimen B.M. 6820 (Pl. XIV, F; fig. 11, h). This specimen may not be Hawaiian. If it is Hawaiian it provides a fine connecting link between the grinders and stirrup pounders as it has the features of both. It has the straight face, the curved base, the slightly bulging back, and the projected basal rim of the block grinder, together with angularity and straight lines. It has the hollowed face and the two projecting lugs of the stirrup form.

In the food-rubbing stones of Kauai the distinctions between the conical pounders and the special pounders are related to cultural differences and also to distribution and antiquity.

The conical pounder is a one-handed implement which is used by the men

to give a sound blow in order to crush the taro on the poi trough. The ring and the stirrup pounders are two-handed implements. They are held with the thumbs resting on the top and the fingers extending around the handle into the concave face, or the ring. (See Pl. XI, D.) The process according to Brigham (6, p. 44) is "rather grinding than pounding." While on the other Hawaiian islands only the men prepared the poi, on Kauai and Niihau both the men and the women were engaged in this work. The women often used the ring pounders which are called by the natives, even to-day, *wahine* (woman) pounders.

Stone poi troughs, as well as wooden ones, are found on Kauai. One now in Bernice P. Bishop Museum (B.M. 5963) is a large, rough stone 28 inches high, 36 inches long, and 22 inches wide. A depression on top, highly polished from use, is 22 inches long, 16 inches wide, and 3 inches deep. Others more like the ordinary poi boards have been reported. The stone poi trough, while it may well be used in a rubbing process, is not adapted to a pounding process. This emphasizes the distinction that the conical form of pounder is essentially a crushing implement, while the ring form is a rubbing implement.

The conical pounders are found all over the Hawaiian islands, and, with variations, throughout Polynesia. The Kauai forms are limited to that island. The conical forms are in use to-day by Hawaiians and Chinese for pounding poi. The ring pounders, unused, are still to be found about the homes of the Hawaiians. The stirrup forms are found in the deserted archaeological sites. The block grinders are plowed up in the fields, or found as curiosities in collections.

In summary the essential differences between the conical and the stirrup forms are: (1) the stirrup forms only on Kauai and Niihau, the conical over all the islands; (2) the stirrup a woman's, the conical a man's, implement; (3) the stirrup forms held in two hands, the conical forms in one; (4) the stirrup motion a rubbing one, the conical a crushing-pounding one; (5) possibly the stirrup form was used on stone poi troughs, the conical on wooden ones. The lighter weight, the two-handed grip, and the rubbing motion of the stirrup form are all better suited for the woman than the contrasting qualities of the conical form.

The exact relations between the forms of food pounders and grinders is still undefined, especially in regard to the block grinders. But some of the relationships seem to be established.

The perforated ring form was evolved from the block rubber or true stirrup form. Brigham (6, p. 44) suggests this and Stokes (48, p. 22) writes: "The perforated stirrup form was evolved locally through many fine gradations, from imperforated stirrup types which in turn refer to a prototypic form, quadrangular in outline and in sections—an angularity unusual



for Hawaii." Plate XII, *A, B* show some of the series that seem to confirm this conclusion. Many of the ring forms have preserved the shape of the imperforated forms even to the lugs and notches of the grip. Some imperforated pounders appear to have been bored through. There are many of these transitional forms, giving a series with fine gradations from imperforate to ring. The generalized ring form eventually produced, being perfected for its use, became stabilized.

In the imperforated forms, which seem the fore-runners of the ring types, there are two sub-types: the semi-elliptical and the block forms. The semi-elliptical forms are probably slightly modified river stones. Indeed some of the more primitive forms found are little more than natural stones. Their use was made possible through the system of lugs and notches for holds. The block subtype is not a modification of waterworn stones, but, as Stokes (48) says, "are quadrangular in outline and in sections . . ." Of this type there are no truly crude, or primitive forms.

The features that appear in most of the grinders are angularity of corners and internal angles, flat faces, straight edges and sides, slightly curved bases horizontally, and flat to curved bases crosswise, curve of back sides and usually a bulge to the back side.

The relation of the block grinders and the block form of the rubbers seems a bit incongruous. Accepting the theory that the semi-elliptical prototype was evolved locally from natural waterworn stones, no connection between them and the block grinders would be expected. The comparison of the specimens confirms this theoretical distinction. The outstanding characteristic of the grinders is angularity which is the one thing that the semi-elliptical subtype lacks. The semi-elliptical prototypes are just waterworn stones slightly modified; the block grinders are considerably modified, well finished pieces. The block subtype however, is closer to the grinders. Any prototype to this form is still but an hypothesis as no actual specimen has been found. The form reconstructed from sections of several near prototypes shows angularity, a slightly curved base, a flat face, and a straight back that bulges and curves vertically to form the base. The manner of handling such a piece presents a decided problem. Without finger grips or a slightly curved face it seems almost impossible to hold it and hafting is highly improbable. It is quite possible that there was no such prototype but a direct transition from the hafted block grinders to the hand form of the block type which assimilated the grips developed for the elliptical type. In other words, the evolution of the block grinders was from a hafted to a hand piece. The actual block grinders tend to confirm this view as several of them seem to be transitional pieces between the hafted and the hand types. They retain many of their grinder characteristics, at the same time assuming the rubber features.



Quoting again from Stokes (48):

The technic of the prototypic form and of the grinders finds its nearest analogy in implements on the deserted islands of Nihoa and Necker. In structural work, it is present, though rare, in Hawaii, although better represented in southern Polynesia. So far as known, the grinders are without analogy elsewhere.

The problem then remains. The grinders are finished pieces of definite form. None of the Hawaiian foods now known requires grinding. There is nothing to show local development of the grinders on Kauai, either in theory or forms. The problem then, is where they came from and for what they were used.

#### LAMPS

The stone lamps from Kauai show an astounding multiplicity of form. (See fig. 12.) There are hardly two lamps alike. The crudest lamps are merely natural stones with a depression for oil on the top. Almost any stone object that had or could easily acquire a small hole to hold oil and the wick, could be converted into a lamp. The only means of identifying them as lamps is the black stain that is left from the burning oil. Two of the lamps seem to have been made from old mortars. Others are made from broken conical pounders, using either the pounding surface, or the flattened section of the broken off handle, for a base. Some of the lamps are decorated with rims at the bottom, or the top, or both. In one, there is a hole bored through the rim as if for a means of suspension. Two have short handles. (See Pl. XI, A; fig. 12.)

#### CUPS AND DISHES

Small, round-bottomed, cup-shaped stones, sometimes called *kapuahi kuni* are found on Kauai as elsewhere in Hawaii. Their form is so consistent that any variation might be classed as a different article. Some are more sharply curved at the bottom and some are shallower, but the form is the same. In some the edges flare to a considerable extent, and in some the outer edge of the rim is beveled. All of the specimens in Bernice P. Bishop Museum are ground and some are polished. Their rims and round bottoms make them unsuitable for drinking cups and it has been suggested that they were used for mixing bait or dyes. One of these cupped stones (B.M. 10635) is a thin, well-ground, disk-shaped piece 4.4 inches in diameter. The bottom is a shallow curve and the top is flattened and has a hole 1.4 inches in diameter and 1.1 inches deep, in the center. The thickness at the outer edge is 0.6 inch and 1.4 inches thick at the center. Another smaller cup (B.M. 10748) is pecked off at the bottom side near the center to make the piece sit solidly. Plate XI, B illustrates the only decorated stone cup found on Kauai.

Most of the Kauai stone dishes are thin, circular, or oval-shaped pieces, with a shallow depression on one side. The bases are flat or slightly curved

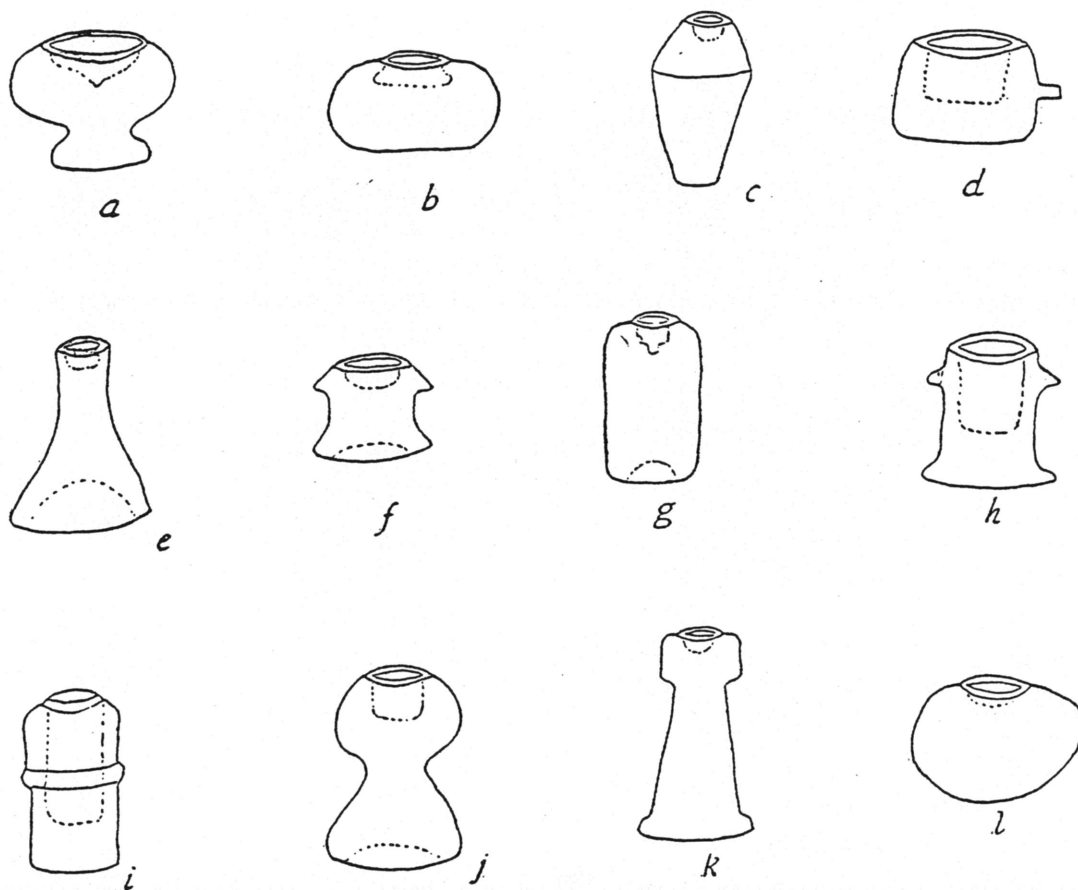


FIGURE 12.—Forms of stone lamps: *a*, specimen 10757, diameter of base 3.5 inches, diameter of bowl 7.2 inches, diameter of opening 3.5 inches, height of lamp 3.6 inches, depth of opening 1.8 inches (There is a hole in bottom of oil basin and a cavity in lamp base.); *b*, specimen 10763, diameter of bowl 8.4 inches, diameter of opening 4.2 inches, height of lamp 4.6 inches, depth of oil basin 2.2 inches; *c*, specimen 10760, an old poi pounder turned into a lamp using the pounding surface for the oil basin; *d*, specimen 10765, diameter of bowl 5.5 inches, diameter of opening 4.0 inches, height of lamp 4.5 inches, depth of basin 1.7 inches, length of handle 2.0 inches; *e*, specimen 10758, old poi pounder converted into a lamp using handle end for oil basin, though there is a larger cavity in the base as well, diameter of base 4.4 inches, diameter of top 3.0 inches, height 5.6 inches, the top cavity is the only one showing use; *f*, specimen 10764, diameter of rim 6.0 inches, diameter at center between rims 5.7 inches, height of lamp 5.0 inches, of a cavity in the top and bottom only the top one shows use; *g*, specimen 10766, diameter 5.1 inches, diameter of top cavity 3.15 inches, diameter of base cavity 2.95 inches, height 6.5 inches, depth of upper oil basin including extra cavity in center 3.0 inches; *h*, specimen 10767, diameter of basal rim 7.1 inches, diameter of upper rim 7.8 inches, diameter between rims 6.5 inches, diameter of opening 3.4 inches, height of lamp 6.3 inches, depth of basin 5.0 inches (There is a rope running through the upper rim on one side.); *i*, specimen 10768, diameter 5.4 inches, diameter of opening 3.6 inches, height of lamp 5.5 inches, depth of oil basin 4.5 inches (Decorated with a rim around the center.); *j*, specimen 10771, diameter of base 4.3 inches, diameter of bowl 4.9 inches, diameter of opening 2.9 inches, height of lamp 5.8 inches, depth of opening 2.2 inches (a common type.); *k*, specimen 10773, diameter of base 6.1 inches, diameter of top rim 4.5 inches, height of lamp 11.0 inches, width of upper rim 3.3 inches, depth of opening 1.5 inches; *l*, specimen B 4469, waterworn stone with a cavity in one side.

and most of them set quite firmly on the ground. On two of the dishes the bottom is projected into a rim which serves as a base. The degree of finish in the dishes varies greatly, some are round and others have a polish that is almost a glaze. Although most of the dishes are thin, some are 3 to 4 inches thick at the rim and slightly depressed at the center. In addition to the usual depression one dish (B.M. 10756) has a hole 1.25 inches in diameter and 0.5 inch deep in the center. In another dish (B 4468) a 0.5 inch projection on one side is grooved around its base as if for a handle or cord attachment. A tall bowl with a beak is in the Sandburn collection.

A bowl of unknown use, and of difficult classification is shown in Plate VIII, C. It was possibly used as a large grindstone. It was found at Kapahi in the Kapaa homesteads under a large tree, about 5 miles from the sea and near taro terraces and house sites. Such a heavy stone (3100 pounds) probably was not moved far from its place of manufacture. No lava like that composing the bowl was seen nearby, but is found a short distance up the valley.

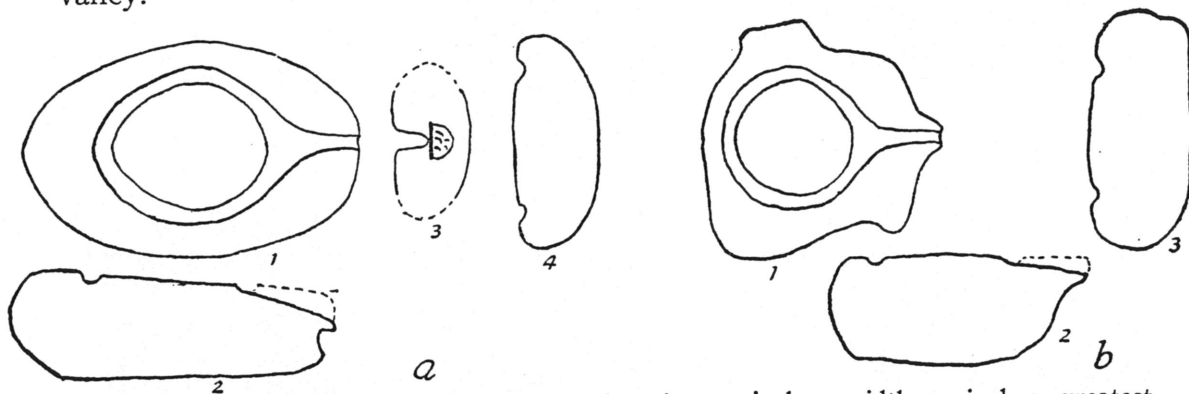


FIGURE 13.—Sketch of oil presses. *a*, length 19.5 inches, width 12 inches, greatest thickness 6.0 inches; 1, top showing groove; 2, lengthwise cross section showing slant of the whole stone and sudden decline of groove as it leads to the hollowed-out spout (dotted line shows edges of groove); 3, end view showing the relation of the hollowed portion to the end of the groove lead; 4, cross section (C 301); *b*, specimen in Kalalau valley, length 14.0 inches, width 14.0 inches, thickness 6.0 inches; 1, top plan showing rough outline and groove; 2, lengthwise cross section showing the projecting spout; 3, crosswise section.

#### OIL PRESSES

Two stone objects found in Kalalau valley are unique for Hawaii. (See fig. 13.) They have been called oil presses. In general they consist of a large, natural rock, on the upper flat surface of which a circular groove has been cut, leaving a raised portion in the center. The groove leads off at one end, in one press to a projecting spout, in the other, to a spout formed by cutting out a hollow from the end of the stone large enough to permit a cup, or other receptacle, to be placed where it could catch any drippings that might come through the groove. In one press the rock itself sits on a slant to facilitate the flow of a liquid towards the spout. Both presses are large,

solid, well-finished pieces of close-grained basalt. The juice of anything crushed on the central platform would run into the groove and thus out through the spout into a container placed beneath it. Kukui nuts were crushed to obtain oil for lamps, but if these stones were used for that purpose, their scarcity is puzzling.

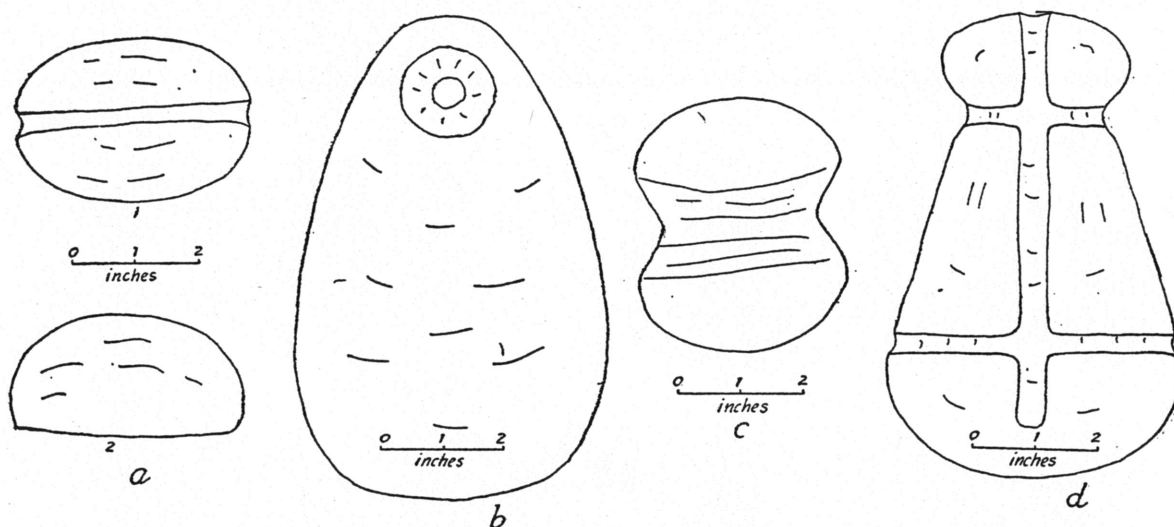


FIGURE 14.—Sinkers. *a*, typical squid lure sinker; 1, top view showing groove; 2, side view showing general shape of polished coral limestone sinker around which runs the groove—length 3.7 inches, width 2.8 inches, height 2.0 inches, weight 18.0 ounces (10802); *b*, sinker or *pohaku melomelo* of coarse-grained basalt, length 7.5 inches, width 5.0 inches, the hole at the top is counter sunk from both sides (McBryde collection); *c*, sinker or weapon of the bola type made of a fine-grained, red lava rock; length, 4.2 inches, width 3.4 inches, thickness 2.5 inches, depth of groove 0.9 inch, width of groove 1.5 inches, weight 36.0 ounces (L 2000); *d*, sinker or canoe breaker, length 7.5 inches, width at base 5.0 inches, width at top 3.0 inches, thickness 3.0 inches, the two grooves encircle the piece at each end, and the third runs laterally on the one side; heavily patinated with coral limestone deposit. (McBryde collection.)

### SINKERS

The squid lure sinkers are among the most common artifacts to be found on Kauai. From the typical one (fig. 14, *a*) the variations in form are few and of minor import. Almost all kinds of rock are used in making these sinkers. Varieties of basalt are the most common material but stone from the reefs and from ancient dunes is also used.

The bottom of most of the sinkers is flat but in some it is hollowed out considerably. The groove runs completely around or only across the top. In some sinkers it is shallow with rounded sides, in others deep with sharp edges. Most grooves across the flat bottom are shallow and smooth. Some of the sinkers are finished with a fair degree of polish while others are in the rough, and there are all stages in between. Out of 75 sinkers examined, 72 are flat on the bottom and 3 are hollowed; 39 are polished, and 36 are rough;



in 62 sinkers the grooves go only three-fourths of the way around (top side only), in 12 the longitudinal grooves are complete, and in one there is no groove.

In size these sinkers deviate little from the typical one shown in figure 14, *a*. One of the smallest (B.M. 9502) is a dark, polished piece of basalt with a sharp-edged, three-quarter groove. It measures 1.8 inches in length, 1.2 inches in width, 0.6 inch in height, and weighs 2.75 ounces. None of the Kauai sinkers is of sufficiently greater size to be set off from the others.

Many of the sinkers for ordinary use show careless workmanship. Quite a number consist of stones 5 to 6 inches in diameter with a groove around for binding. Some of these stones are waterworn and some are rough blocks of lava. The large stones were used for anchoring nets and for any purpose for which an easily attachable weight might be used. In addition to these roughly grooved stones, there are several types of better finished sinkers. One large sinker in the Sandburn collection has the shape of a ball 10 inches in diameter with a knob handle well shaped for attaching a cord. Another type of large sinker (fig. 14, *b*) is a heavy lozenge-shaped rock with a neatly drilled hole in the small end. Except that a hole replaces the knob it fits the description given by Emory (20, p. 81) of the *pohaku melomelo* found on Lanai: "a stone smeared with bait and let down to attract fish, is shaped like a swollen pendant bluntly pointed: the neck is short and slender, ending in a more or less well-formed knob."

There are some sinkers similar in form to the *pohaku melomelo*, but smaller. One (L 622) is a flat piece of eolian limestone 1.8 inches thick, in the shape of a circle 5.2 inches in diameter, with one side slightly elongated and pierced with a hole, the outer diameter 1.3 inches, the inner, 0.5 inch. Another sinker (B.M. 7975) is a roughly-worn ball with a hole through the top side, countersunk from one side only, the narrow part of the hole running for 1.7 inches before emerging. In diameter the hole starts at 0.4 inch and finishes at 0.2 inch, which, considering its length, is a remarkable piece of drilling through hard stone.

The smaller sinkers exhibit the same variety of workmanship and finish as do the larger ones. Two rough pieces of rock with single grooves were used for sinking nets and for other such purposes, and grooves run longitudinally or crosswise with almost equal frequency. One small sinker in the McBryde collection has a groove at each end. Another has a knob at each end of a piece 6 inches long and 3 inches wide at the center. In the Wilcox collection one piece 2 inches long has a bisected knob at one end. The sinker in figure 14, *c*, is deeply grooved at the center. It might have been hafted and used as a hammer stone but the ends show no signs of concussion. Brigham (5, p. 22) in describing objects (B.M. 4793 and B.M. 4794) similar to that shown in figure 14, *c*, classes them as weapons rather than sinkers.



"These were grasped in the hand as a reinforcement and gave the fist a dangerous solidity. They could, according to other native authorities, be used as bolas."

Strangely enough the sinkers of the "bread loaf" type described by Emory (20, p. 82), though present on Lanai and elsewhere in Hawaii are, with the exception of one in the Wilcox collection, lacking in the Kauai collections. The absence of such a distinct form is significant in defining local differentiation.

The sinker shown in figure 14, *d* has a groove around each end and a transverse groove on one side. It is heavily patinated with limestone as the result of lying on the ocean bed for some time. Such secure binding as these three grooves afford indicate that the sinker was used for something more strenuous than a mere weight for a net. It is not heavy enough for an anchor. Brigham (5, p. 9) mentions the use of weights for canoe breakers, but the transverse groove indicates hafting of some kind.

#### DISKS, MIRRORS, AND BALLS

The three perforated stone disks from Kauai in Bernice P. Bishop Museum represent three styles. One (B.M. 4681) is a flat disk 2.2 inches in diameter and 0.3 inch thick, made of semi-porous lava, fairly well polished. The hole runs through the center, countersunk from both sides, with an outside diameter of 0.5 inch and an inner diameter of 2.5 inches. The second (L 620) made of polished limestone is 2.05 inches in diameter. The thickness at its outer edge is 0.65 inch but it bulges towards the center to a thickness of 1.2 inches. The diameter of the hole that goes through the center at the thickest part, is 0.25 inch and it is not countersunk but maintains the same diameter throughout. The third (L 621) is a rough disk of red basalt with curved edges, 1.2 inches thick and 2.4 inches in diameter. The hole is through the center and deeply countersunk from both sides. The diameter of the hole at its outer side is 1.2 inches and at the narrowest part 0.25 inch.

The exact function of a perforated disk is unknown, though the possibilities are infinite.

Hawaiian mirrors are described by Malo (41, p. 162) as follows: "For mirrors the ancient Hawaiians used flat pieces of wood highly polished, then darkened with a vegetable stain and some earthy pigment. After that, on being thrust into the water, a dim reflection was seen by looking into it. Another mirror was made of stone. It was ground smooth and used after immersion in water." Mirrors made of wood may have been plentiful but are not easily preserved. Those of stone would be rarer because harder to make. All the mirrors found on Kauai are made of a fine-grained black or dark brown basanite. They are polished smoothly but not glossily. The

specimens vary in size and thickness and there seems to be no defined relation between the diameter and the thickness. A typical mirror of about average size (B.M. 10779) measures 3.4 inches in diameter and is 0.35 inch thick. A range in diameter of 2 inches to 5 inches would include most of the specimens. Two mirrors (B.M. 6260 and B.M. 10624) have a hole drilled through near one edge, probably for suspension when not in use. Most of the mirrors are flat on both sides, but some bulge a little towards the center. All of them are polished on both faces and on the edges. They are all circular. Brigham (5, p. 66) adds another use for mirrors and gives an explanation for the hole found in some of them. "In the native *kahuna lapaau* practice they are occasionally used as a cooling application to furunculi or other ulcerous sores, and for this use holes are often bored near the edge through which a cord for suspension could be passed."

The stone balls from Kauai range widely in size from more than 1 foot to less than 1 inch in diameter. Though they are all classified as balls, some of them are not round. Those that may be roughly called the large type range from 4 to 10 inches in diameter. Though many river stones can be found that are almost round, most of the stone balls show the effect of artificial shaping. In surface texture some are rough, and others have a fairly good polish. The exact use of these balls is not known. Some of the larger ones are said to have been used in a balancing stunt. Brigham (5, pp. 15-16.) says that a stone ball in Bernice P. Bishop Museum weighing 87 pounds "was used as a test of strength on Kauai." Those of more medium dimensions might have been used for grinding work. The smallest might have been game stones.

#### GAME STONES

The *ulumai* bowling game stones are found in great numbers on Kauai and elsewhere in Hawaii. They are all much alike. The typical *ulumai* is discoidal with slightly convex sides, and is made of some fine-grained, polished stone. The average size and weight of 50 *ulumai* stones is as follows:

Diameter in inches	
Average	2.47
Maximum	4.4
Minimum	1.7
Thickness in inches	
Average	1.44
Maximum	3.0
Minimum	0.9
Weight in ounces	
Average	10.48
Maximum	24.00
Minimum	2.5

The size of most of the stones is near the average. One *ulumaika*, (B 4470) has a diameter of 5.7 inches, a thickness of 3.4 inches, and weighs 7.25 pounds. This is in a class by itself and is probably a ceremonial or test stone. Practically all kinds of materials were used, though the fine-grained basalts and smooth limestone conglomerates predominate. Many of the stones are still in a rough state and probably were never finished. None of the stones has a slanting edge as needed for bowling trick curves. A few, however, have finger grips pecked on the sides. It has been said that stones with these finger grips had been converted into pounders, but one of them (B.M. 10783) shows a definite pecked-out hollow on both sides in the center, and a fairly good polish all around. This polish would soon disappear if the stone were used as a pounder.

There is said to have been an *ulumaika* court (*kahua*) on the flat ridge in Waimea valley where the Koaie river meets the Waihalulu—an area now heavily overgrown. There must have been other courts on Kauai, but the flat land suitable for such is also suitable for cane fields.

Besides the use in games as described by Brigham (5) and Malo (41), *ulumaika* stones came to be used ceremonially. Brigham (5, p. 71) mentions a curious custom:

In the sand burials at Koloa, Kauai, and near Leahi on Oahu, they were placed under the chin of the corpse, which was arranged in a sitting posture with the knees against the breast. Curiously enough two of the three instances noted were female skeletons; the other was not recorded; but as women did not play *maika* these were not cases of prized possessions buried with the dead,—rather a pillow for the tongue in the long sleep."

Aside from the game of *ulumaika* and the possible use of large balls for balancing, there are a few other games in which stones were used. One stone (B 4486), listed as a quoit, is a fairly well-finished round piece, 3 inches in diameter, flat on one side, and bulging in a regular curve to a maximum thickness of 0.8 inch at the center. It weighs 5.25 ounces. Another (B.M. 10717) is described as a top and is a piece of fine-grained, smooth, dark, basalt weighing 6 ounces. From the flat top, 1.3 inches in diameter, it tapers down quite symmetrically to a dull point with but a slight bulge at the sides. The length is 2.3 inches.

Stones used for the game of *noa*, as described by Malo (41), are natural pebbles with a fair polish. Though usually quite small, a famous one in the Wilcox collection is 6 inches long and 3.3 inches wide. As the object of the game is to hide a stone under one of five piles of *tapa* without it being observed by the onlookers, the difficulty is obviously increased with such a large stone.

The pitted slabs used in the game of *konane* were not found on Kauai, though doubtless the game was played there.

## CLUB HEADS

Two types of stone club heads are represented in the collections from Kauai. In the first type, represented by one specimen (fig. 15, *b*), the base end shows the effects of wear and indicates that this might have been a pestle as well as a club. It is not adapted for hafting and so is strictly speaking not a club head, but a cord handle might well have been run through the hole in the smaller end.

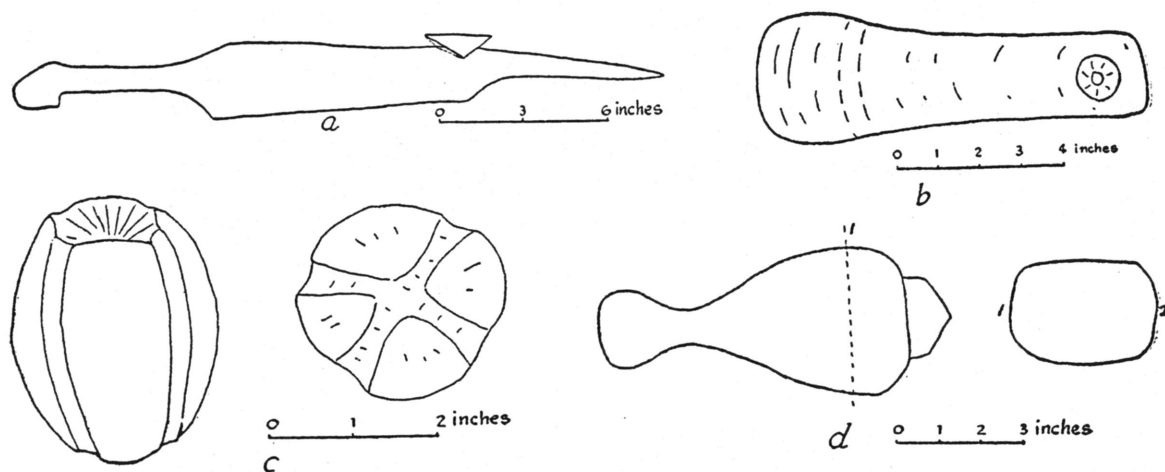


FIGURE 15.—Weapons: *a*, wooden dagger with notch projection from the base which serves as a barb (4804); *b*, club of fine-grained, dark basalt, well polished, length 9.4 inches, diameter of base 3.0 inches, diameter at handle end 2.1 inches, outer diameter of hole 1.0 inch, inner diameter of hole 0.3 inch, weight 4.5 pounds (10721); *c*, club head of coarse-grained, light basalt, length 3.1 inches, width 2.5 inches, width of grooves 0.45 inch, diameter of hafting cavity 1.3 inches, depth of hafting cavity 0.7 inch, weight 0.15 ounce (9262); *d*, top view and cross section of hand club, length 8.0 inches, diameter of handle 2.0 inches, width of head 3.5 inches, thickness of head 2.5 inches (4787).

Club heads of the second type are more common. (See fig. 15, *c*.) The ordinary features of this type are two grooves quartering the club head longitudinally, crossing at one end, and meeting in a cavity at the other. The end of the hafting shaft fits into this depression and the binding cord fits into the grooves. In this way a very solid club is formed. There are but slight variations in this form. A club head in the McBryde collection has the hollowed end protruding about one-half inch so that the grooves do not run directly into the cavity. One club head (L 1309) has the grooves crossing at one end but no cavity at the other end. However, it is still unfinished, and there is indication of pecking to show that the hollowing was just beginning to be done when the work was abandoned. A broken one (B.M. 10623) differs from the type only in its greater size. The diameter at the hafting end is 2.6 inches and the sides widen out up to the break. A club head of the second type is in the Sandburn collection, and two are in the Wilcox collection.

Brigham (5, p. 22.) speaks of a use for club heads of the first type as

follows: "Through the beveled hole thus formed a strong braided cord of *olona*-fibre is passed, showing that besides its use as a common club, the weapon could be hurled as a *bola* to entangle the legs of an adversary. This latter use was a favorite one among the Hawaiian warriors . . . ."

A hand club which could have had no haft or cord is shown in figure 15, *d*. The pointed projection at the end would have made a thrusting blow effective.

Although the true club heads, with the double groove, are not restricted to Kauai, most of the known specimens come from there, thus indicating some local specialization.

#### SLING STONES

Among the natural stones on Kauai there are a great many waterworn pebbles that might have been used as sling stones. In places these are found gathered in heaps as though they were intended for use. There are also the worked sling stones of spherical shape with a dull point at each pole. Some are not provided with definite points but only slightly modified to make them regular in shape for greater accuracy in throwing.

Sling stones known to have come from Kauai are few in number. Either they have not been found or shaped stones that can definitely be recognized as sling stones are rare.



## WOOD, SHELL, AND BONE ARTIFACTS

Most of the common Hawaiian wooden artifacts are found on Kauai, and few of them show local peculiarities.

Wooden bowls (*umeke*) are common in various shapes and sizes, including finger bowls and spittoons. Wooden pipes and spoons are also found. None of them is decorated with designs and none is carved in the round. Among the implements of war the common wooden spear and the fancy dagger (fig. 15a) are found.

The tapa-making tools are well represented on Kauai by tapa anvils, grooved boards, tapa beaters, tapa markers, and bamboo stamps. The tapa anvils are the ordinary hollowed and squared logs, though a special wide form was found only on Kauai. The grooved *malo* boards, used in the final process in the tapa finishing to give the tapa an extra softness, are 2 to 3 feet long, 6 to 8 inches wide and 0.5 to 1 inch thick. They are closely grooved on both sides, the grooves running parallel along the length of the board. Tapa beaters are quite ordinary. One design however is mentioned by Brigham (7, Pls. 2-4) as being a Kauai "favorite." It consists of grooves carved in a cross-hatched pattern with one or two small holes on the interspaces. The tapa markers and bamboo stamps are not distinguishable from the ordinary types.

Poi boards built for one and for two workers are found on Kauai and are still in use to-day. The wooden pestle (B.M. 10720) is rare but not unique. Boards on which the *olona* fiber was scraped with a pearl, stone, or shell scraper in the preparation of cord, are not uncommon. An average one measures 7.5 feet in length, 6 inches in width at the top and 8 inches at the base, and has a maximum thickness of 0.75 inch. It is concave in both the horizontal and vertical cross sections. A hole pierced near the top served to hold the strands while they were being scraped.

Perhaps the most common shell object from Kauai is the pierced cowrie shell used as a squid lure. Some of these have been pierced at one end, though most at two, and some are not pierced. The holes in most of them are small and carefully made, though some give the appearance of having been roughly broken. Shells of different kinds were used in making fish hooks, both barbed and plain. Shell was much used for the back of trolling hooks. The hook itself was usually of bone. (See fig. 16, *d, e*.)

Much of the shell work was for decoration. Numerous shell beads, combs and bracelets were made. Thin disks of polished shell were pierced and worn as pendants. Brigham (11, p. 81) states that "*kupees* and leis of shells were durable and beautiful, especially those made on Niihau of a small white *Columbella*." Trumpets made from the *Cassis* shell have been found.

Aside from serving as ornaments, shells were used in making implements. The shell adz, though uncommon, is found on Kauai. One adz in the Broadbent collection is 2.9 inches long, 1.5 inches wide at the cutting edge, and 1 inch at the poll. Though solid the shell is not thick and could be used only for fine, light work. A small piece classified as a file is shown in figure 16, *c*. Common among the shell implements are the widely distributed scrapers, of which two styles are found on Kauai: one is a rectangular piece of tortoise shell brought to an edge at one end; the other is a pearl shell scraper with the back edge pierced to permit a grass hand guard to be tied on it. (See fig. 16, *a, b*.) A large shell with one sharpened edge is said to have been used for peeling taro. A small, thin piece of tortoise shell about 2 inches long and 0.75 inch thick was used in measuring the mesh spaces in net making.

The minor uses for shell were many. Most of them have been described by Brigham in papers published by Bernice P. Bishop Museum.

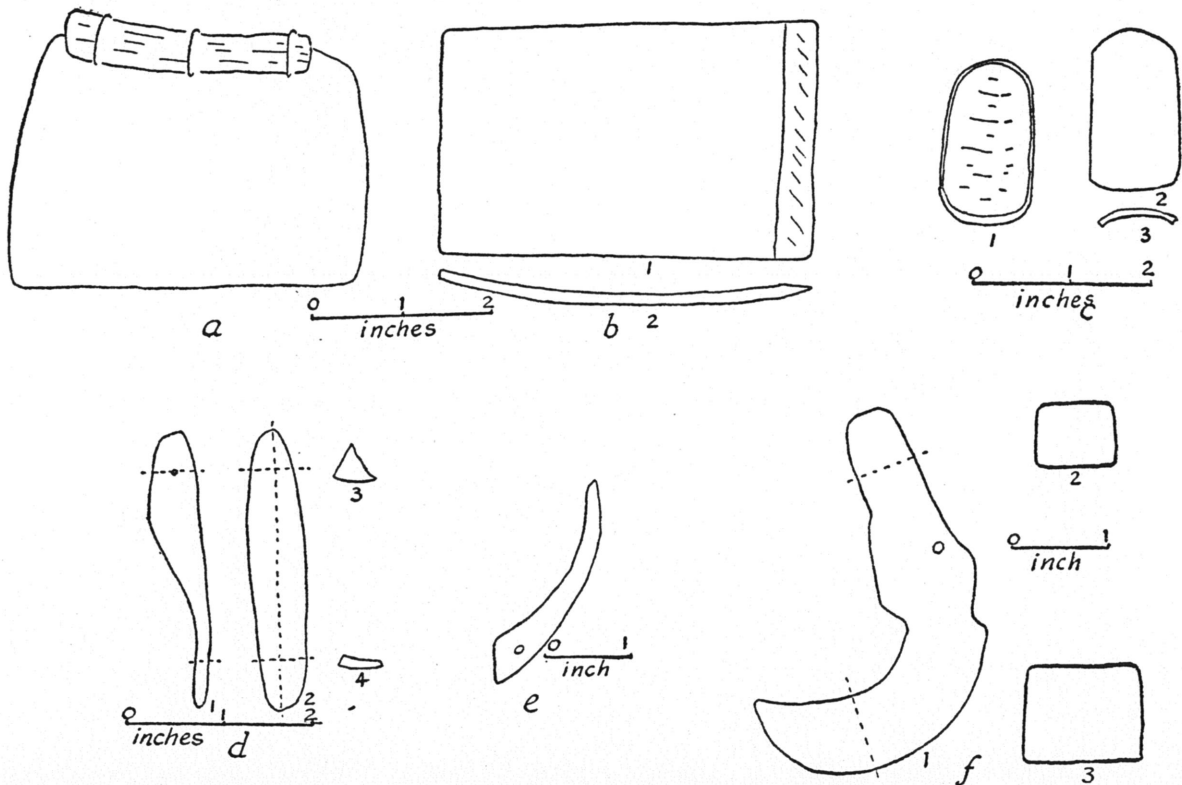


FIGURE 16.—Artifacts of shell and bone. *a*, shell scraper with cutting edge at base and grass handle on the top; *b*, tortoise shell *olona* scraper: 1, bottom view showing beveled cutting edge; 2, cross section showing curve; *c*, shell file: 1, bottom view showing beveled cutting edge; 2, back view; 3, cross section showing curve and bevel of edge; *d*, trolling hook of shiny shell: 1, cross section showing hole for attaching cord and thin end onto which the hook is tied; 2, outline of bottom; 3 and 4, horizontal cross sections; *e*, bone hook pointed and pierced for attachment; *f*, bone *palaoa*: 1, side profile showing hole through which the necklace of human hair passes; 2 and 3, cross sections.

Bone objects from Kauai are fairly numerous but have few local peculiarities. Bone fish hooks, barbed and plain, and hooks for shell trollers are found. Bone of the pig or the dog was most used, though human bone is common enough. Some slightly altered bones are used as scrapers. Netting needles with the open eyes at each end appear in the Kauai collections. Teeth are used in place of bone for hooks. (See fig. 16, *e*.)

Bone beads and pendants were used in necklaces. Teeth were used for wristlets and anklets. Most important was the *lei palaoa* which was made of human hair with a peculiar shaped pendant at the base. (See fig. 16, *f*.)

## NIIHAU MATS AND CALABASHES

Niihau has been distinguished for its art technique especially in the field of mat weaving. Brigham (9, p. 77; 11, p. 66) says:

It was chiefly on the little island of Niihau that the makaloa mats (*moena Niihau*) were made, although the sedge (*Cyperus laevigatus*) grows on Oahu and other islands of the group, and it is claimed that those with colored figures were not made elsewhere. . . . The fine mats can only be plaited while the sedge is young, hence the time of work is limited to a few months each year, and it is certain that the largest mats of this kind in this collection must have been in the makers' hands seven or eight years.

The patterns were made both by using different colored sedge and by varying the manner of plaiting. The size attained was quite large for Hawaii, one of the largest measuring 14.5 by 30.5 feet.

Niihau can hardly be said to be distinct from Kauai as most of its inhabitants came from Kauai. The intercommunication between the two islands was at all times frequent and political control was exercised by a Kauai chief. Thus the distinctions applied to Niihau apply equally to Kauai. The abundance of the sedge on Niihau may have localized the actual manufacture, though not the technique of mat making. The technique itself was better developed on Kauai and Niihau than on the other islands, where the sedge was also present. Therefore, the local differentiation is not merely a result of natural limitation.

A further illustration of the design specialization for Niihau is the spotted gourd calabashes. As with the mats the technique is better developed and more used than elsewhere rather than an exclusive localization. Several methods were employed in designing and decorating the calabashes. One method is described by Brigham (11, p. 8): "A water proof glaze was put all over the gourd and the portions that it was desired to stain black were scraped bare, and the gourd sunk in the mud of the kalo-patch." It is difficult to understand how such a crude method could produce some of the delicate designs. Another method which Mr. Alexander McBryde used in making decorated calabashes seems much more suitable. A light-brown dye is made by boiling down the *palaa* fern (*Microlepia tenuifolia*) and a dark brown dye from the *alahee* leaves (*Plectronia odorata*)—the same shrub from which the *oo* (a pointed tool used in cultivating) was made. Sometimes the tops of sweet potatoes were used as a dye. The top of the gourd was cut off with an adz or knife and the insides removed, except for a layer about one inch thick. The design was then scratched on the outside with a tooth, or other sharp instrument, the cut being just deep enough to go through the outer skin of the gourd. The dye was then poured into the gourd and left to

stand for days in the sun. Mr. McBryde says the odor resulting from the rotting plants "injured the comfort of my happy home." During this time the skin of the gourd must not be touched as it is very tender. The dye is replenished from time to time as evaporation depletes it. When this process is complete the remaining dye is poured out and the gourd is dried. The rest of the pulp is then removed and the inside scraped and polished. The outer skin is then peeled off and the design is left in light color on the dark background wherever the first cuts had been made. The air or the sun, or both, prevent the dye from taking effect on the parts exposed by cutting through the skin in making the design.



## CARVING

## STONE CARVING

Very little carved work is represented in the artifacts from Kauai. The collections, however, include some pieces of carved stone and carved wood. One of the most interesting is the unique stone bowl plowed up in the fields of the Kauai Fruit and Land Company in 1926. The bowl is of vesicular basalt and on it projecting arms, legs and a head have been carved (Pl. X, *D*, *E*). Except for the head which is slightly raised, the relief work is below or on a level with the flat upper rim of the bowl. The projecting head is oval in outline and concave vertically thus making the chin project markedly. The features consist of a forehead which runs into a nose, the end of which projects out farther than the rest. A U-shaped depression around the nose forms the eyes and mouth. A ridge below the mouth is possibly a chin. On each side of the bowl at the front, or head, half, are the arms. They are each U-shaped, one side being parallel to the rim. All parts of the arm project about the same distance, and the width is the same throughout. At the back are the legs. The upper portion of the leg to the knee, runs level with the rim of the bowl. From the bent knee, the lower part of the leg extends down almost to the base of the bowl, curving towards the back slightly. The leg narrows to the bent knee, then bulges out markedly for the calf, narrows slightly to leave a shallow groove for an ankle, and bulges again into a flat-bottomed knob for the foot. The carving of the whole is well-finished.

A carved stone lamp (B. M. 9338) somewhat similar to that shown in Plate X, *D*, *E* is briefly described by Stokes (50 p. 39). It is made of porous basalt. Human figures in the position of the handles are carved in high relief. The head of the figure is flat along the rim and the feet curve under almost to the base. The head is almost round with the forehead, eyebrows and nose projecting on the same plane. The mouth is represented by a slight depression. The neck is marked by a projection lower than either the head or the body. The shoulders are straight and the waist is narrow with straight sides. The chest projects a bit. The arms are short and straight and slant downward, without elbows or hands. The legs too, though showing knees bent, are not finished at the feet. No sex is indicated. The maximum projection of the relief is about 0.75 inch. The height of the lamp is 6.5 inches, the diameter from figure to figure is 7.5 inches, and the smaller diameter, 6.0 inches.

The lava image shown in Plate IX, *B* is 6 inches high and 2 inches wide across the shoulders. The head and right arm are missing. No sex is indicated. The carving is done in curved lines; the knees are bent and the arms,

though curved, extend down at the sides. The feet are blocks and the hand is an enlarged knob at the end of the arm, without finger markings. The legs are separated by a groove and the arm, though joined at the hip, is free from the body of the image in the upper part.

A small lava image in the Wilcox collection is of questionable antiquity. It has knobs for the head and arms; sides almost straight; two projections at the hips that are neither legs nor arms; and two straight, distinct legs without knees or feet.

Of a different type of work altogether is a stone fish god (B. M. 316) called *papa kahuli*. It is carved of compact basalt and stands on a stone altar similar to a grindstone. It is a fairly accurate representation of a fish. As described by Brigham (11, p. 77):

The stone altar on which the god No. 316 was placed and offerings of *ia ula*, *awa* and five leaves of the grass called *puaa lau* or *kukaipuaa* (*Panicum pruriens*) that the fish might be drawn towards shore. The grass is a substitute for a live pig.

Such carved fish are found elsewhere, but they are rare.

An unshaped bulging stone (B. M. 7664) 1.5 feet high, 1.5 feet wide and 1.25 feet thick, with a ring cut 2 inches in diameter through a projection at the top is described as a fish god. It has a slight anthropomorphic appearance. It is encircled in a net with grass around it. Use as an anchor or mooring seems like a good utilitarian reason for cutting such a ring in heavy stone. In later times it might have been changed into a fish god.

Another stone fish god is shown in Plate IX, *A*. The total height is 7 feet 3 inches. The front view shows a broad base 3 feet 4 inches wide. One foot 6 inches from the ground the base converges rapidly to a width of 1 foot 9 inches, and from this width it narrows but slightly, being 1 foot wide at the top. This front face has been artificially cut flat. It probably was not necessary to cut much to finish off a stone, naturally rather flat. The side view shows the greatest width, 1 foot 8 inches, in a bulge just above the middle from which it converges to a blunt edge at the top, and narrows slightly towards the base. Stones were said to have been piled up against and under this bulge to give the whole a firm support. On the front are two Japanese characters which are supposed to have been cut there later. The back is irregular and rounded, not artificially.

#### WOOD CARVING

Like the stone carvings, the wood carvings localized on Kauai are uncommon, though due, perhaps, more to destruction than to any scarcity of the work. From early accounts it appears that numerous wooden idols were located at each heiau, as fences, uprights, and as representations of the gods before which offerings were laid.

A carved wooden object in the Bernice P. Bishop Museum (B. M. 8049) seems to belong to the type of carved slab image pictured by Webber in his drawing of the Waimea heiau (Pl. IX, C). It consists of a base, broken off and evidently intended to be set in the ground; features carved from the round log; a flat headdress, which gives the slab appearance; and notches cut near its base for the insertion of the tapa strips. Another carved slab (B. M. 4068) though 10 feet high and carved more in the round, is of the same type. The comparison of these two slabs with the ones pictured by Webber shows the following relations. Cook refers to the slabs as 2 feet high, though the drawing shows them to be nearer 3 feet. One of the existing slabs (B. M. 8049) considering it to be sunk 1 or 1.5 feet in the ground, would stand 3 or 3.5 feet above the ground. The other (B. M. 4068) although sunk 3 feet in the ground as the base indicated, would still stand 7 feet above ground. The flat headdress is strikingly similar in all three slabs, even to the slight concavity of the top edge, and the notches for tapa strips at the base on both sides. The headdress designs also are the same—parallel zigzag rows of grooves running across horizontally. The features are difficult to compare, as the drawing by Webber shows them very roughly and the engraver has modified them still more. As shown on one of the Museum slabs (B. M. 8049) the forehead differentiated from the eyes, the shaped nose, and long oval mouth resemble those in the Webber drawing, but the circular eyes are different. On the other slab (B. M. 4068) the triangular gouges for eyes resemble those pictured by Webber, but the forehead is not differentiated from the eyes and nose and the mouth is round. In general the carving on the slab shown in Plate IX, C approaches closely that illustrated by Webber.

Of two wooden idols in the collection of Eric Knudsen, one stands on a pedestal 14 inches high and about 3 inches in diameter. The figure has arms extending behind like wings, and hands without fingers, though bent at the knuckles. The face is round with oval slant eyes deeply grooved. The nose projects, has two grooves running along it, and is surrounded by a deep indentation. The mouth is wide and but slightly opened. The lips project and the tongue also projects clear across the width of the mouth. A sharp angle marks the chest. The knees are carved in the round and bent. The other idol is also on a standard about 1 inch in diameter and notched all around. The image is small, and distinguished by a carved crest and a shell eye.

A large idol 11 feet high and 2 feet in diameter, carved in the round, is said to have been the corner post of a heiau.

Another small idol on a standard (B. M. 4044) has the title "Kealoewa" (goddess of rain). It is described by Brigham (11, p. 75) as: "Curiously

carved from *kawila* wood and carrying on its back a socket with two figures on the rim; dog teeth and human hair; *red puakui kapa malo.*"

Except for the slabs resembling those in the ancient heiau at Waimea, there is little similarity of style in any of the carved woodwork. Each piece seems to represent a different type. This probably is due more to the lack of material than any other factor, though considerable individual variation is to be expected.

In connection with this discussion of idols, mention may be made of two objects classified as phallic stones: One (B. M. 4076) is a polished cylindrical stone, 16 inches high, 7 inches in diameter at the base and 6 inches at the top. Three projecting ridges encircle it at fairly regular intervals, the ends are rounded, and a depression has been cut in the smaller end. Another (B. M. 10815) is a broken piece, but slightly shaped, 5.8 inches in diameter and 6 inches long.



## PETROGLYPHS

## LOCATION

Petroglyphs have not been reported for Kauai in the abundance which marks the other Hawaiian islands, though more may be discovered. At present stone glyphs have been found in four places and reported from a fifth. First is the pictured ledge at Keonelo (Site 84). The other sites in the order of their importance are Papalinahoa, Nawiliwili Bay; a large rock in Lawai valley (Site 71); Wahiawa gulch about one-half mile below the government road where one glyph has been reported by Judge Lyle A. Dickey; and Niu ridge where glyphs are reported to have been located. On Niihau petroglyphs have been mentioned by Stokes (49, p. 69) at a place called Kii.

The five figures from the rocks of Papalinahoa described by Stokes (49, p. 68), are linear with the possible exception of one outlined triangular body, not joined at the hips. Three have round, solid heads on short necks, and the other two are without heads. Two are armless; two have the arms slanting down; and one has the left arm up (fig. 17, *d*). One has a solid body that bulges out above the legs (fig. 17, *c*). All five are about 1 foot in height.

The petroglyphs on the large rock in Lawai valley (Site 71), are made chiefly with the abrading process of hammering and rubbing described by Emory (20, p. 94). A dozen figures were visible of which all but two were finished linear representations of human figures. The two unfinished figures represented the body and legs without head or arms; and the head and trunk without limbs. The others have round solid heads on short necks or on the shoulders themselves. The shoulders are straight and the arms slant downward. In all, quite regular, linear type petroglyphs. Their heights are all less than a foot.

The pictured ledge of Keonelo has been long famous. It was described by Farley (22, pp. 119-125) in 1898, and again by Judd (31, pp. 179-194) in 1904. The beach is about one-half mile in length and the ledge itself is about 110 by 25 feet. It is usually covered by sand except after heavy storms. From the accounts of Judd and Farley, and a brief examination of the pictures of Stokes (51) the following résumé is given.

There are in all 168 figures representing chiefly human forms. Applying the classification used by Emory for the Lanai petroglyphs (20, p. 106) it is apparent that most of the human figures are of the linear form, a few are triangular, and the columnar type is rare. Without showing individual drawings of each glyph, the varied combinations of head form, arm, and leg position, and special features, can not be given. In the following paragraphs the separate characters together with their variations; and the typical and most exceptional combinations are described. (See Pl. XV; fig. 17.)



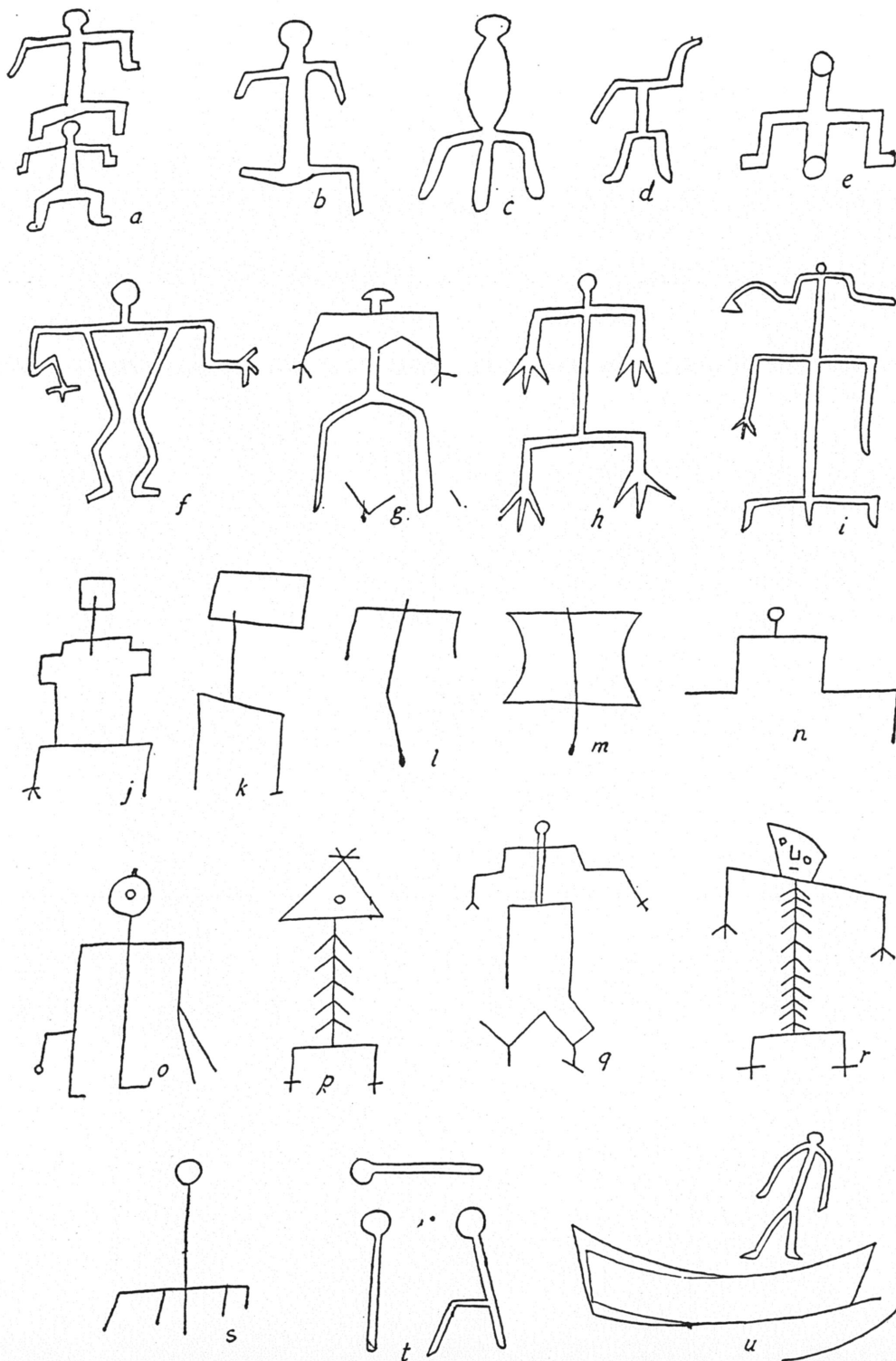


FIGURE 17.—Petroglyphs: *a* and *b*, linear, from Lawai valley (*b*, a running figure); *c* and *d*, linear, from Papalinaloa, Nawiliwili (*d*, with one arm up and *c* possibly representing an idol on a pole); *e* to *u*, from Keonelo (reproduced from drawings made in the field by Judd and by Stokes); *e*, a geometric figure; *f*, triangular figure unjoined at hips; *g*, linear, with possible arm muscles represented; *h*, linear, with three fingers and three toes; *i*, with triangular hand and extra arms; *j*, columnar, with square head; *k*, linear, with square head; *l*, linear, possibly representing an idol on a pole; *m*, geometric, possibly representing some object; *n*, linear; *o*, linear with several legs and a round outlined head; *p*, representing skeleton; *q*, semicolumnar; *r*, linear with facial features marked; *s*, linear, with several legs; *t*, linear, possibly representing unfinished figures; *u*, canoe and figure.

## HUMAN FIGURES

In the human figures the typical head representation is round and solidly cut out and has no indication of facial features (figure 17, *b*). Rarely the shape is oval. A few of the heads are round and outlined instead of solid. On one of these a dot in the center of the outline possibly represents some facial feature (fig. 17, *o*). In a few figures the head is represented by a vertical line, and on one by a horizontal line. Triangular and quadrangular outline heads are depicted. In one of these triangular heads a dot in the center again seems to represent a facial feature (fig. 17, *p*), and in one quadrangular head two dots are shown for eyes, a square U for a nose and a straight-line mouth (fig. 17, *r*).

Most of the heads are placed on short, straight necks, though some are on long necks, and some are placed directly on the shoulders. In a few figures the heads are completely detached from the body. Some figures are without heads.

Shoulders are represented by straight lines, most of them horizontal, though some are oblique. The only variation is a slight curving which is probably due somewhat to poor technique. In some figures it is hard to distinguish arms and shoulders.

Most of the arms are at right angles to the shoulders and extend downward. (See fig. 17, *a*.) It is common to have only one section of the arm represented with a short hand attached to it, though in some figures two sections of the arm are depicted as well as a hand. Arms that slant downward and those that extend outward on the line of the shoulders, are found in places and in some figures one or both arms are raised. Although the arms are most commonly straight, curved lines are used. Arms are distorted in some figures and extend to lengths far beyond their proportions. (See fig. 17, *f*.) Rarely the arms are missing. An extra pair of arms was noted for several figures, between the regular arms and the legs.

Hands when delineated are in most figures short, straight lines at an angle to the arms. A knob is used in a few places. In many hands three fingers are shown, and less commonly, two or four. More than four were not observed on one hand. One figure has a triangular hand.

A vertical, straight line represents the trunk in most figures. This is varied by the addition of six or more pairs of lines slanting downward from the vertical which possibly represent ribs or a skeleton (Pl. XV, *A*, *C*; fig. 17, *p*, *r*). Triangular trunks are found and a few of these do not meet at the hips but continue into the legs (Pl. XV, *E*; fig. 17, *f*). Some of these have the sides bulging out a little. One columnar trunk was noted and a few that were columnar from the waist down, including the thighs, the rest of the figure being linear.

The legs are mostly of straight (or slightly bowed) lines, though some

definite curves are found. The thigh is in most figures at right angles to the trunk, and the lower section of the leg slants down from this at varying angles. The position of some of the legs suggests running (fig. 17, *b*). In a few glyphs more than two legs are shown.

Feet, like hands, are straight lines at angles to the legs. Dots at the end of the legs represent feet in a few figures. Two, three, and four toes are found, with three as typical.

Sex when indicated is male. This is marked by the downward extension of the trunk line (fig. 17, *i*).

Muscle delineation is not common. Figure 17, *g* possibly indicates muscle in the additional lines beneath the arms. Triangular muscles were not noted.

#### MISCELLANEOUS FIGURES

Aside from the human figures other objects are shown. Animals are rare. In all the Kauai glyphs the cows and dogs found by Emory on Lanai were not seen. A canoe is shown in one place with a man above it (Pl. XV, *B*; fig. 17, *u*). No sail is indicated. Many of the miscellaneous lines may be incomplete figures and some are completely unrecognizable. Others are definitely geometric or the depiction of some material object.

#### DISCUSSION

From a sample of the Keonelo ledge in Bishop Museum (B. M. B1332) and Farley's note (22, p. 119) the technique is seen to be chiefly a pecking one. The grooves are from 0.25 to 0.75 inches deep and from 0.5 to 1.5 inches wide. The figures range in height from 1 to 7 feet, being exceptional in this respect. Those at Papalinaloa, Nawiliwili, are the closest in size and technique, while those at Lawai, are the usual type of abraded glyphs founded on all the Hawaiian islands.

The age of these petroglyphs is unknown, even the Hawaiians wonder who made them. Farley (22) makes the following observation which suggests that they are fairly old:

As the ledge on which the pictures are made is, when free of sand, only partly exposed at low tide, and then nearly covered with water by every good sized wave, a natural conclusion is that the beach has subsided at least 6 feet since the pictures were cut . . . . The upper half of the ledge was dark and well glazed over, and the gravings on it were worn to the same appearance.

Farley quotes the unverified statement of Kauila, an old Hawaiian woman, who said:

Another ledge from fifty to one hundred feet further inland, under the sand, has pictures of birds, fishes, canoe and strange animals cut on it. The animals are not like anything now seen; they have bodies like cattle, heads and ears like pigs, but no horns; the canoe has no outrigger or figures in it.

The Keoneloā glyphs are located on a sandstone ledge along the beach, and most of the figures have their heads towards the ocean. Most of the reported glyphs from elsewhere in the Hawaiian islands are on rocks and in caves. The beach where the glyphs are located is a fine landing place. That the glyphs were cut as a record of the start and completion of journeys is possible. The presence of the canoe glyph seems to confirm this idea. Stokes suggests that figures like the one shown in figure 17, *p* represent skeletons or dead. (A famous burial dune is near this beach.) The immense size of the glyphs is hard to explain except as a sign of power. Little can be added as yet to the interpretation of glyphs made by Emory (20, pp. 118-121).



## PLACE OF KAUAI IN HAWAIIAN CULTURE

The Kauai heiaus seem in general smaller and less elaborate than those in other parts of Hawaii due no doubt to the lack of the more powerful chiefs in the later historical times. A few temple features, or construction methods, of the Kauai heiaus are not found elsewhere, but this may not be significant because it was a principle in heiau construction to be distinctive. The presence of uprights in the Waimea heiau as pictured by Webber, and in Poliahu heiau is a point of some value, as it is a link to the Nihoa and Necker marae.

The presence of the dressed stone in the Menehune ditch is unique for Hawaii and for Polynesia. There is, to be sure, other dressed stonework, but none used for aqueducts, and none with the joints in the blocks. The extent of this one undertaking is unusual for the Hawaiian islands where dressed stonework is rare. In most other structures slabs are used instead of blocks.

A rather extensive list of artifacts are peculiar or predominant for Kauai. The most noteworthy are the unique pounders and food rubbers. Both the ring form and the block form of food-rubbing stone is found only on Kauai. Block grinders also are limited to this island. These are of great importance as representing a technique and an implement differing from those in the dominant Hawaiian culture. In this same class is a stone poi trough, as well as a wooden one. Kauai has a complete series of conical pounders, mullers, and pestles, as well as the unique forms of food-preparing stones.

The double-grooved stone club head for hafting on a handle is predominantly found on Kauai, and most of the cylindrical stone mortars have been found there. Polished and definitely shaped stone fish knives are exclusive Kauai forms. On the other Hawaiian islands, as on Kauai, stone flakes are used for cutting with little if any retouching, but the polished knife is a Kauai specialty.

Not enough is known of Hawaiian adzes to distinguish local types. On Kauai are found a few completely polished adzes; three curved adzes, triangular and curved gouges, a large wedge, and several other small forms of adzes that vary from the normal type.

The two carved stone bowls found on Kauai are unique. The two oil presses likewise are unknown elsewhere.

The long *olona* fibre boards and fibre scrapers of pearl shell are predominantly from Kauai. The broad anvil used in tapa making is localized on Kauai, and a grooved *malo* board for especially fine finishing of tapa is found chiefly there. One design on the tapa beaters was a Kauai favorite, namely, cross-hatched grooves with small holes on the interstices.



Among the specialized art products of Niihau and Kauai, the mats of *makaloa* sedge are famous, as well as many of the mat designs. The sedge grew elsewhere but the mats were seldom made except on these two islands. The decoration of gourds and calabashes was done most extensively on Kauai and Niihau. Leis of small shells were made particularly on Niihau.

The technique of using two hands for pounding poi with a ring or block pounder was closely associated with the special forms. Also the fact that both men and women prepared food is an interesting distinction, as on the other islands the women were seldom permitted to take part in the food preparation. Another cultural difference is that mentioned by Cook—the lack of distinction among the Kauai chiefs. The fact that Cook landed at Waimea and the greatest chiefs lived on the opposite side of the island, at Wailua, may have influenced this opinion.

A linguistic distinction is mentioned by Fornander (24, p. 59.):

The effect of the new migration was great on the people. It even effected the speech of the people and as late as fifty years ago it was easy to distinguish a native from the leeward islands from one of the windward by his manner of pronouncing the *k* and *l*, which Kauai and Oahu natives, adopting the Tahitian style, pronounced *t* and *r*.

A slight distinction in physical measurements was noted by Sullivan (52, p. 273.):

A resume of Table XLIV shows that the differences from island to island are small. In specific instances some slight tendencies to differentiate appear; for instance, in cephalic index, for both sexes, Oahu and Kauai are opposed to the other islands, the index being lower. In head length this same grouping is more noticeable than in head width. In other characteristics, no such grouping is indicated.

Many of these features must be considered purely local developments of no great significance. Some of them, however, seem to indicate traces of an older Hawaiian culture which was covered by the later influx. Since Kauai became clearly part of the dominant Hawaiian culture, these distinctions must be carefully sought out. The contrasts are not glaring. The block grinders and the slab prototype of the block rubbers together with the Menehune cut stone causeway have flat surfaces and sharp angularity that contrasts with the curves in most of the later Hawaiian work. In this angularity, straight lines, and surfaces, there is some analogy to the Nihoa and Necker culture. The place of women in preparing food, the speech difference, the slight skeletal difference, and to a greater or less extent the different artifacts all point to a culture not the same as the dominant later Hawaiian.

The following queries present themselves. If Kauai block rubbers and grinders are a feature of an earlier culture why are they not found on the other Hawaiian islands, at least in the primitive forms? why are they not found on Nihoa or Necker islands? why have they not been found elsewhere

in Polynesia? If, on the other hand, they are local developments for the island of Kauai, why are there not more primitive, experimental forms, especially among the grinders?

If Nihoa and Necker represent the early Hawaiian culture, why are there not more analogies found in Hawaii? The temple form on these islands is fairly well standardized—a non-Hawaiian characteristic. Wooden slabs may have been used as uprights on Kauai, but why are not some dike prisms found, like those on Nihoa? And why are there not more of the artifacts found? So far only two, possibly three, adzes resembling the Necker type have been found among the thousands of Hawaiian adzes. None of the Necker images have been found on the other Hawaiian islands.

The geographical and political isolation of Kauai favors the development of local cultures and the retention of traces of a previous culture. In many ways it has developed local peculiarities, but at the same time it is dominantly part of the great Hawaiian culture. Certain local peculiarities suggest a previous culture that probably existed before and contemporaneously with the later culture. Also Kauai shows the closest relation to the Nihoa and Necker non-Hawaiian culture.



## KAUAI SITES MAPPED

Site 1. Polihale heiau, a four-terraced structure on the seashore at the base of Polihale cliff (fig. 19).

The base is almost obscured by the sand which covers it. The three outer edges of the first platform have a wall 8 feet wide which ranges in height on the inside from 1 foot along the front to 3 feet at the junction with the second platform. The front facing is a perpendicular wall. The wall at each side of the second terrace has a width throughout of 8 feet. The third platform measures 13 by 89 feet, and the fourth measures 21 by 89 feet. The facing of the fourth terrace is slightly bowed out making a curved front; the back side is faced with a 5-foot wall and backed by boulders on the talus slope which continues upward. The steps of the platforms are quite definitely though roughly finished. (See Pl. V, C.) The heiau is paved throughout and is in good condition despite the heavy growth of lantana. The outside walls are perpendicular and vary in height to meet the slope of the talus. They are made chiefly of waterworn stone, though other rock from the talus has been used. On the front edges of the second and fourth platforms are piles of loose stones indicating religious observances at some time.

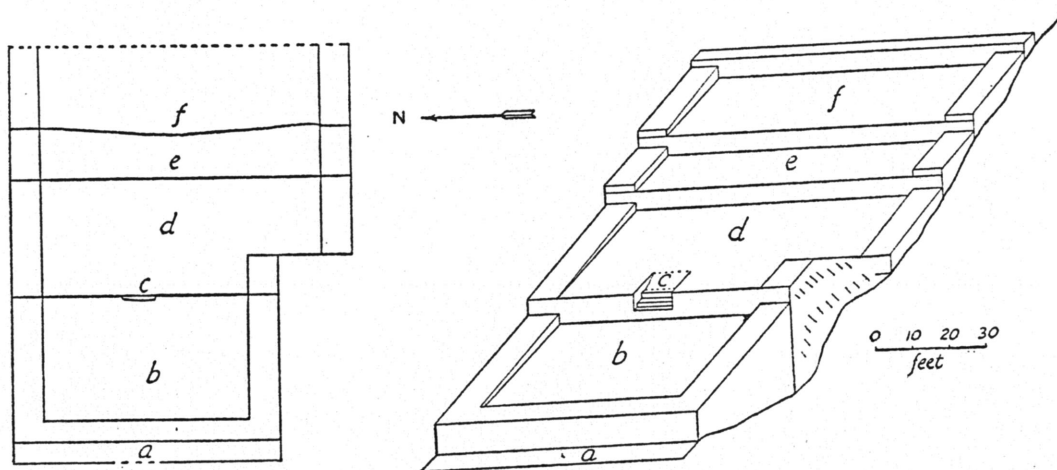


FIGURE 19.—Ground plan and perspective plan of Polihale heiau at Site 1 (slightly altered from the plan by Thrum). The walls which are 8 feet wide and from 1 to 3 feet high on the inside, varying on the outside to meet the slope, are usually higher at the back than at the front, on the inside: *a*, stone-paved base 6 feet by 70 feet; *b*, platform 37 feet by 70 feet standing 8 feet above the base; *c*, steps; *d*, platform 31 feet by 70 feet at the front, and 89 feet at the back; *e*, platform 13 feet by 89 feet; *f*, platform 21 feet by 89 feet and backed by a wall of natural boulders 5 feet high.

Site 2. House sites, in Haeleele valley not far from Polihale heiau.

A series of stone platformed house sites appear on the ridge between the two branches of an intermittent stream. Their size and arrangement are shown in figure 20. Starting at the seaward end and proceeding up the valley the houses are at different levels conforming to the rapid rise of the ridge. The sites are terraced on two or three sides and the height of the terrace ranges from 2 to 6 feet as the topography varies. The result of the terracing is to make a level platform. Although the lines are indicated in the figure as straight, slight curves and irregularities are found for the purpose of utilizing some natural boulder. The paving is carefully done with 5 to 6-inch stones. In



many places the ground behind the stonework indicated is smoothed off so that the stone facing and platform could serve more as a lanai. Several terraces may face one large flat area.

Site 3. House site, in a niche in the cliff back of Polihale heiau.

The lower ten feet of this niche has been carefully built up with a rough stone facing and a dirt fill to make a platform 15 feet wide and 12 feet deep. The site is about 20 feet above the talus slope on the cliff and commands an excellent view. Excavation in the loose dirt of the floor of this house site revealed numerous shells including several cowrie shells, grass, hala (*Pandanus*) leaf matting, pieces of grass cord, pointed sticks, charcoal, and kukui nuts.

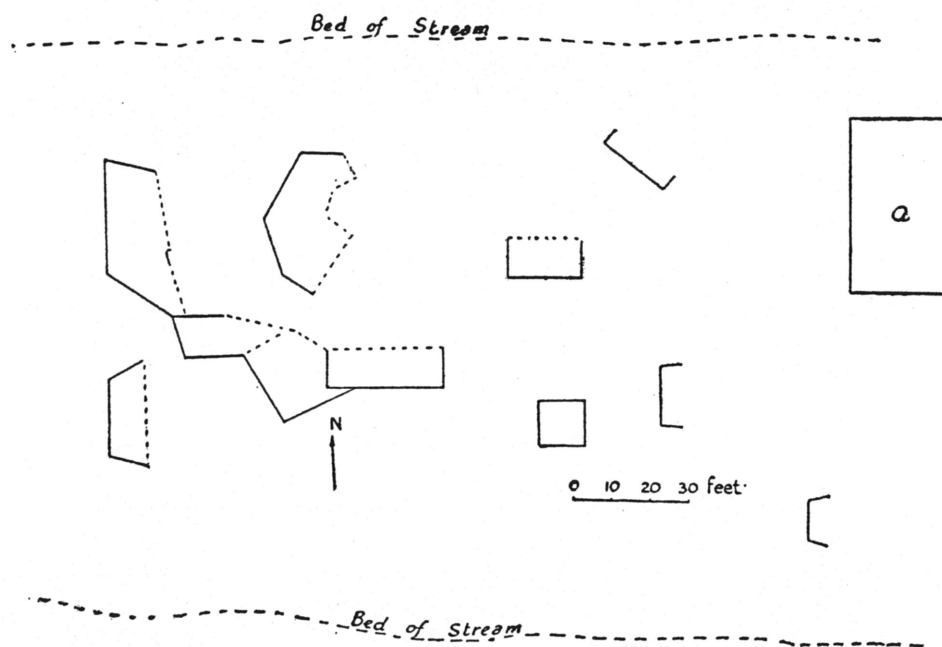


FIGURE 20.—Position of houses and platforms in Haeleele gulch at Site 2 (solid lines represent stone facings and dotted lines show extent of the stone paving); a, platform 25 feet by 45 feet, the largest of the house sites.

Site 3a. Burial cave, at the base and in one corner of Haeleele ridge.

A large burial cave at this place is said to have once contained a chief in a canoe.

Site 4. Kapaula heiau, on the north side of Kaulaula valley, about 100 feet above the base of the talus slope on Haeleele ridge. (See fig. 21.)

The structure consists of a platform paved with flat blocks of lava 14 by 16 inches in area on which is a second platform paved with stones 4 to 6 inches in diameter. The larger platform is built up 3 feet in front while the back side is level with the ground. The small platform is flush with the back of the large one and within 7 feet of the edge while on the other side of it a single row of stones faces a 1-foot terrace, extending from the back corner of the small platform to the corresponding back corner of the large platform. There is a flat space behind this line of stones that might be considered a third terrace.



Site 5. House sites, at the base of Lapa ridge and continuing up the valleys on both sides of this ridge.

A number of house sites are similar to those described in Site 2 though not as well made. One compound house site is shown in figure 22. The total area covered by this structure is 70 by 25 feet. It is paved with slabs of lava about 16 inches in diameter. The northern section of the structure consists of three platforms, of which only the middle one is still paved. The southern section consists of four platforms, the lowest two paved.

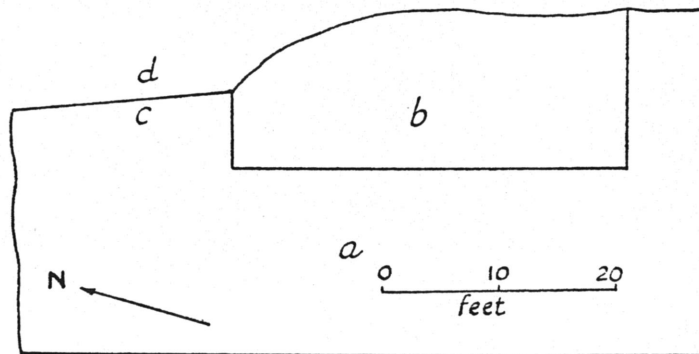


FIGURE 21.—Plan of Kapaula hiau at Site 4: *a*, platform 30 feet by 60 feet; *b*, platform 14 feet by 34 feet, 2 feet high; *c*, line of stones 1 foot high; *d*, flat area for house site.

Site 6. Kapaula heiau, at Kolo near Mana described by Thrum as, "A large heiau said to be still standing, about 4 feet high against the hill. Class unknown."

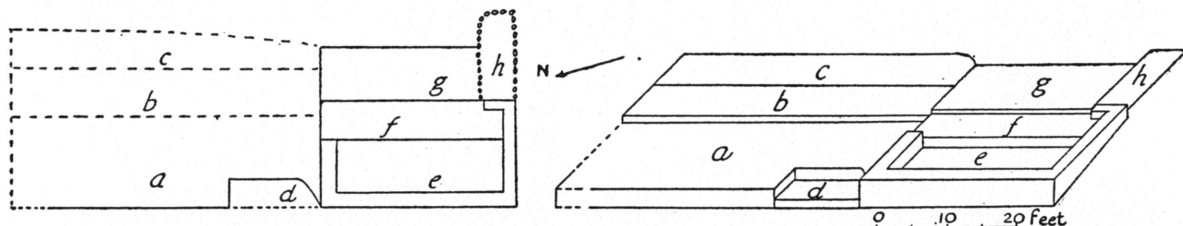


FIGURE 22.—Ground plan and perspective plan of a house site at Lapa, Site 5: *a*, platform 13 feet by 43 feet and 2.5 feet high; *b*, platform 6 feet by 43 feet, 1 foot high; *c*, platform 6 feet by 43 feet; *d*, steps; *e*, platform 10 feet by 27 feet surrounded on three sides by a wall 2 feet high on the inside; *f*, platform 5 feet by 27 feet and 1.5 feet high; *g*, platform 7.5 feet by 22 feet; *h*, area 5 feet by 12 feet outlined by stones.

Site 7. Dune burials and camp sites, between Polihale and Barking Sands.

There is some evidence of burials along these dunes but the bones are in bad condition. Many stones are found along the top which must have been brought there by human agency. Many camp sites are indicated by stones and shells. Grooved sinkers large and small, grindstones, polishers, hammers, pieces of adzes, files, and other implements were found in these sands.

Site 8. Elekuna heiau, near the Barking Sands at Mana, in a cove on the inland side of the dunes.

Thrum describes this sheltered site as follows: "This is termed a heiau by the natives of the district, and is without doubt a place of marked distinction as it was visited on various occasions by royalty; nothing of a structural character was found; simply a mound of outcropping sandstone at the base of which were placed the offerings of the devotees."

Site 9. House sites, along the inland side of the dunes from the Barking Sands northward.

These sites are marked by single rows of stones outlining the sites, or by low walls. At one time there was a swamp that extended from this place to the near vicinity of Waimea, which may have changed the nature of the climate a bit. The swamp is now drained and sugar cane covers the area.

Site 10. Kahelu heiau, at Kahelu near Mana and described by Thrum as, "A heiau of platform character at the base of the hill, about 6 feet high in front, not of large size."

Site 11. Makahoe heiau and village site on Niu ridge, Kaunalewa.

A small, platform village shrine. Thrum describes the village as "Four and one-half miles from the coast and at an altitude of 1200 feet. This village had about 0.5 acres of taro land besides the dry crops to depend on." On the inland side of Niu ridge small valleys are found with small streams and a few taro terraces. Petroglyphs were reported for this area.

Site 12. Hooneenuu heiau, along the ditch line inland from the government road near the center of Kaunalewa ridge.

This heiau now consists of two sections roughly paved, each 15 by 35 feet, the back one 2 feet above the front. The lower platform is built up 4 feet in front, but the ditch line has cut through it causing much disturbance. It is made of the lava so plentiful all around. Thrum describes it as consisting of two tiers 20 by 30 feet in size, one 6 feet above the other. He also mentions that it was a heiau for circumcision.

Site 13. Burial caves, on Kaunalewa ridge.

On Kaunalewa ridge there are a number of burial caves. In one there was a canoe containing a skeleton. The canoe was not large, was cut in half, and had the boards sewn together with grass cord. The burial was wrapped in tapa. A number of other bones were jumbled together in the back of the cave. In a cave nearby was a canoe burial wrapped in white, pink, and black tapa, as well as in some blue cotton cloth. There was a pillow of moss, and grass cords were tied clear around the canoe. The canoe was similar to the one mentioned above and seemed to be the other half of it. With this burial was found a feather kahili with a *kauila* wood handle. The feathers were from sea birds and dyed different colors. Another kahili was without a handle. Aside from these were two flat wooden plates about 10 inches in diameter. A small bundle of dog bones wrapped in stiff tapa was also found. There are on this ridge other caves with evidence of some use at one time. One cave contained a *palaoa* bone pendant but no other remains.

Site 14. Two small heiaus, near Waiawa, described by Thrum as a 12 by 20-foot shrine, and an 18 by 28-foot shrine.

Site 15. House sites and taro terraces, in Waiawa valley.

Some taro lines may still be seen in lower Waiawa valley. Many house sites are in evidence. They consist for the most part of leveled ground, faced in front with stone, or merely outlined with stone.

Site 16. Hauola heiau, in Hoesa valley at the base of Hauola ridge.

The site is on a talus slope that extends upward from a stream gulch to the base of a ridge. Upstream from the structure is a natural amphitheater. On a large, well-paved platform (fig. 23) is placed a smaller unpaved platform, its back side marked by a facing terrace 3 feet in height. Thrum describes this smaller platform as the location of house sites and says that the passage along its southern wall was the entrance to the heiau. There is nothing to distinguish it now. The third platform at a higher level is inclosed at the back by a wall 4 feet wide and 2 feet high, and on the side by a wall 6 feet wide and 3 feet high on the inside, and 5 feet on the outside. This upper platform is excellently paved with flat lava slopes 15 to 20 inches wide and filled with river pebbles. (See Pl. IV, D.) At the front of this platform is a long, narrow pit with an inner wall 7 feet thick and an outer wall 5 feet thick. Between the platform and the inner wall of the pit there is a definite break, 2 feet wide which has been loosely filled with small stones. The paving of the platform makes a definite edge along its side of this break. Also the paving of the lower platform seems to make an edge across the front in a line with this break, and in one place for 20 feet it is quite definite. This would all indicate that the pit and the extension of the lower platform were later additions.

The heiau is made of the local stone, a reddish lava, some of which has been slightly waterworn. Coral is found on the paving. The walls are well built of selected pieces carefully piled.

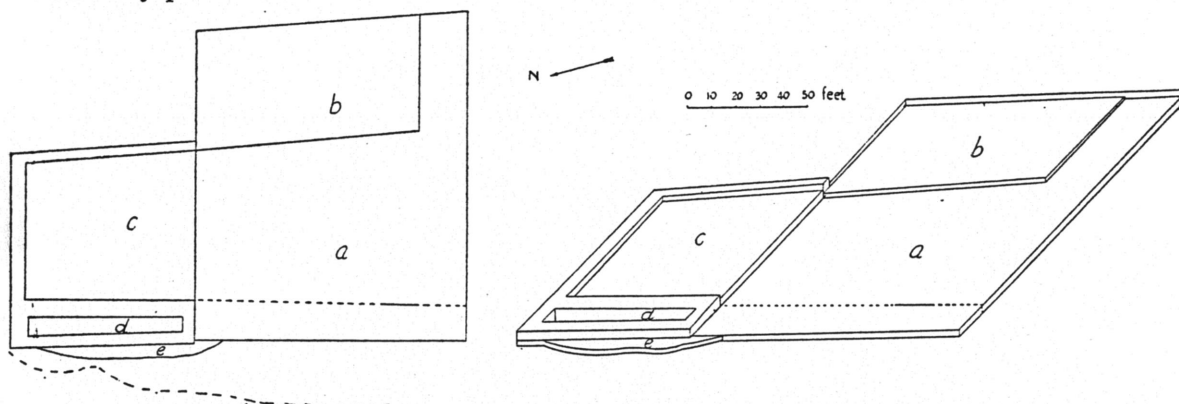


FIGURE 23.—Ground plan and perspective plan of Hauola heiau at Site 16. (The dotted line indicates a break in the pavement which is continued onto the upper section between the platform and the wall of the pit.): *a*, platform 112 feet by 138 feet, 2 feet high at the front and 3 feet on the sides; *b*, platform 50 feet by 93 feet, 2 feet high; *c*, platform 57 feet by 70 feet, 3 feet high; *d*, pit 63 feet long, 8 feet wide, 6 feet deep; *e*, supporting step 2 feet high.

Site 17. Burial caves, on Pokii ridge.

A number of caves that were used for burial have been rifled except for a few bones. In one there was a 3-inch matting of *pili* grass spread loosely on the floor.

Site 18. Heiau, on top of a small knoll with a commanding view of the country, five miles from the sea, at an elevation of 1700 feet, on the road to Kokee on Paehu ridge.

Thrum describes this site as follows: "The heiau is a simple platform on the top of a hill. It is built up on all sides with stonework, the whole space being then paved. The platform is a perfect parallelogram 40 by 60 feet; elevation above the sea about 1700 feet."

Site 19. Ahuloulu heiau, on the seaward side of the Puu Ka Pele crater cone at the edge of Waimea canyon.

This heiau consists of a walled enclosure the outside dimensions of which are 37 by 41 feet. The walls are 4 feet wide and badly broken. In front of this structure is a flat area about 50 by 50 feet without paving or boundaries. Back of the enclosure there is a paved platform 8 by 12 feet. This platform is backed by a large rock, the plugged-up holes in which indicate that it might have been used as a depository for umbilical cords.

Site 20. House sites, around the crater of Puu Ka Pele.

The remains of seven house sites are indicated by stones in line forming a terrace with a flat space behind. Some of these house sites measured 30 feet in width and 20 feet in depth. Some of the terracing stones were good-sized boulders. The dirt has washed down from above covering the original platform. On top of the crater cone there is a flat platform 30 feet by 30 feet, slightly terraced, in which river stones and coral are found.

Site 21. House sites, toward the sea from Puu Ka Pele on the north side of the road.

A series of house sites are located on top of a flat ridge, the edge of which is lined with stones for 50 feet or more. There are several cross divisions. Fireplaces consisting of four or more stones placed in a rectangle are in evidence on several of these divisions.

Site 22. Kaumuaiea (Kaumuaie) heiau, in the forest of Milolii on the ridge of Kaumuohua.

In the forest above Halemanu is a small clearing known as Kaumuaiea. Here there are a few stones in a rough line, but not forming a platform or definite outline. Thrum describes this heiau as a small shrine and says that no platform remains to indicate its location.

Site 23. Keaalii heiau, at Keaalii on the west side of the Waimea river, behind the first Japanese temple.

This structure is reported by some to be the heiau described by Captain Cook but, though the location seems about correct, so little remains that the rumor can not be substantiated. Imbedded in the ground are fragments of its foundations but the outline is no longer traceable. Thrum says "Fragments of foundation show it to have been about 60 feet square." There are other fragments, however, that would make it over 150 feet in length, and 100 feet in width.

Site 24. Burial caves, in the cliffs on the west side of the Waimea river.

Many caves show use for burial. Back of the second Japanese temple there is one group of seven caves all of which contain bones. Two caves are at the base of the cliff and quite small. In one of those higher up there are 5 coffins of wood and 1 completely covered with lead. Modern cloth, shoes, hair, nails, a coin dated 1878, glass beads, and other such finds, mark these burials as recent. In the back of this cave there



are a few canoe boards. In another cave there are also 5 coffins; one is hollowed out of a log. The association of modern materials date these burials as rather recent. In one large cave there are several fragments of old canoe boards and a bone or two. To the north of this cave is a smaller one containing many bones but no artifacts. One other cave with a small opening widens out and contains many bones and a canoe-shaped coffin. Most of the caves show evidence of being walled up with rocks and a mixture of clay and grass. Farther toward the sea is a large cave with the front still walled, but with windows and an open entrance, as though it had been used for a house site at one time.

Site 25. Taro terraces, in lower Waimea valley.

Many taro patches are reported by the early voyagers. Taro is still grown and much of the rice land has taken over the old terraces with little change. The divisions on the flat land are usually just dirt walls, though some are reinforced with stone.

Site 26. Menehune irrigation ditch, on the west side of the Waimea river where the pali first meets the river.

The ditch consists now of a wall of cut stone blocks standing 2 feet higher than the road and running from the pali about 200 feet up the edge of the road. How much still remains beneath the road cannot be determined but the suggestion is that it extends clear down to the river. The stones that can be seen to-day are shown in figure 24. The stones of this ditch are squared off on all sides but the inside. Some of the blocks are squared all around. The object was to have the stones fit closely together and present a smooth, flat surface on the river side. On the inside, where the fill was of dirt or stone or both, the roughness was perhaps beneficial. The size of the blocks shows great variation, some measuring 5 feet in length and over 3 feet in depth and width. There was no attempt to cut them all the same size. The masonry shows true coursing in some places, but it is by no means consistent, and many square joints, with the corners of four stones meeting at one place are found. (See Pl. III, *A*.) The jointing found in several places has caused great comment. The joints now to be seen are marked in figure 24. The jointing consists of a projection down from the lower corner of a stone fitting into a notch in the upper corner of a stone; the lower corner of a stone fitting into a notch in the upper corner of a stone below; a combination of the two and a projection forward on the lower corner of a stone; and a notch that distinguishes the rough inner end from the cut-bottom edge of the stone. (See Pl. III, *B*, and *D*.) The purpose of this jointing does not seem to be primarily for locking stones together, it is not consistent enough for that purpose. As Vancouver noted (55, vol. 1, pp. 376-377), the top of the wall served as a pathway as well as a causeway. The numerous joints between the first and second layer of stone seem to be for the purpose of keeping the top at a level. The general level of the top, even in the disturbed condition is easily seen (Pl. III, *C*; fig. 24). The difficulty to-day is that the lower part of the wall is covered by the road and the extent of the jointing cannot be determined. The joint from behind is chiefly to avoid cutting off the rough inner end. Also this joint would hold the wall steadier by overlapping the stone beneath and offsetting the outward pressure of the fill. Of course, some of the jointing was probably the easiest method of fitting the stones together. The theory of the level top is only questioned in one place where a stone, undoubtedly in the top row, instead of being cut at a level, is cut slanting obliquely inwards. (See Pl. III, *E*.) The quarry mentioned in the legend (p. 23) is 7 to 8 miles distant from the ditch and on top of a ridge. It is not near a permanent stream where the stones might be floated on rafts. The similarity of the stone at this place with that used in the wall has given rise to the legend. The stones could well have been secured at a much nearer place. The stones were probably roughly dressed at the point of quarrying, but the final fitting was done just before they were placed as the joints



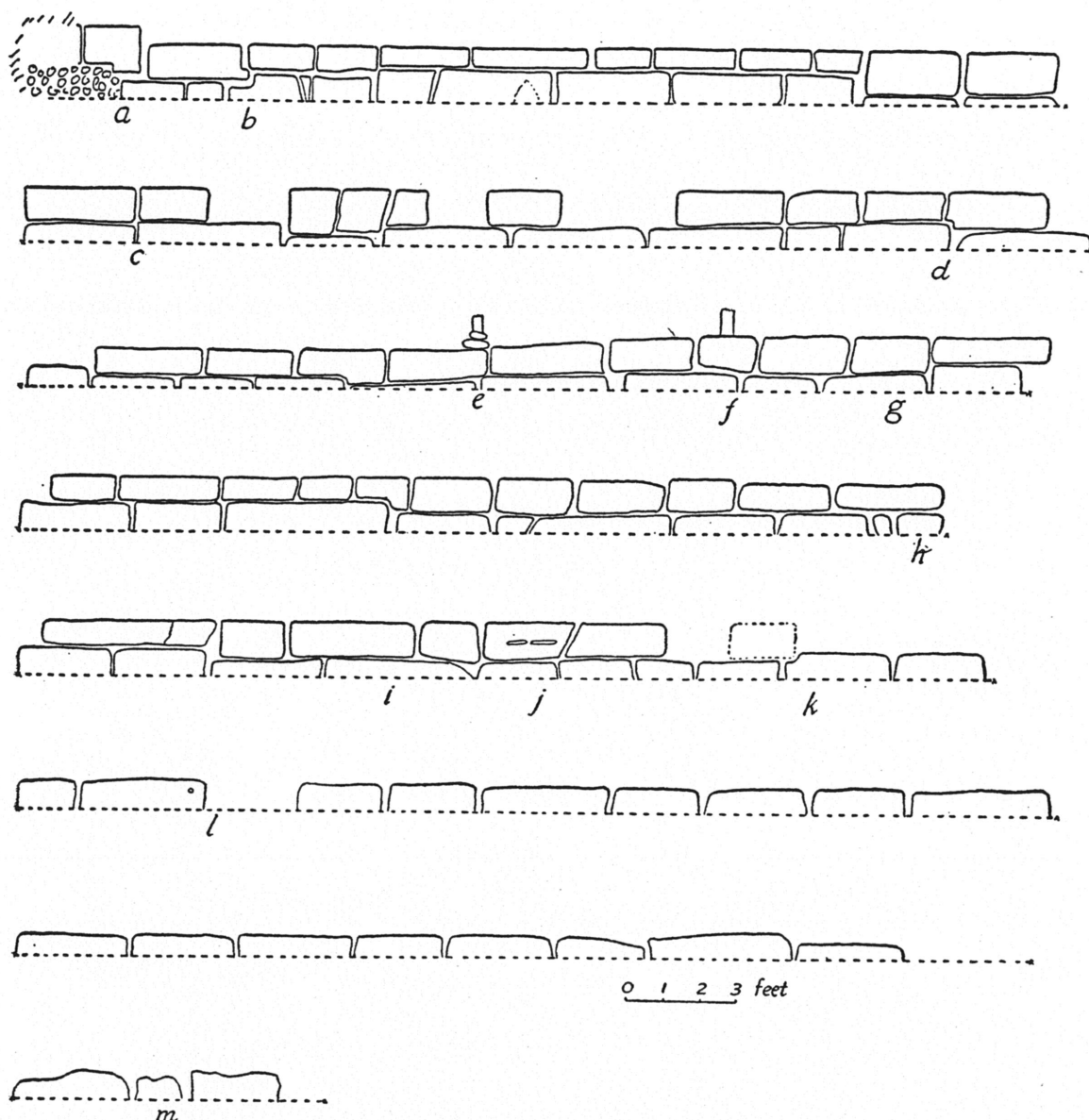


FIGURE 24.—Wall of the Menehune ditch, Site 26, starting at the lower end where road building and tunneling through the pali has destroyed the causeway, and continuing to the last stones in line from which point the dirt ditch, unfaced, continues: *a*, type of joint from above; *b*, double joint; *c*, four stones meeting in a square corner showing that regular coursing was not always followed; *d*, notch joint; *e* and *f*, post supports of swing bridge across Waimea River; *g*, stone off which the top surface angles sharply down unlike the others; *h*, single drill hole in top of stone; *i*, three drill holes in the top of the wall 1.0 inch in diameter, 0.5, 1.0, and 2.0 inches deep; *j*, groove in stone that suggests, a possible cut—stone joins the next one at an angle; *k*, badly weathered stone (represented by a notch jointed and dotted line); *l*, drill hole in side of wall 1.0 inch in diameter and 6.0 inches deep; *m*, rough, undressed stone that for a short distance faces the earth walls that line the remainder of the ditch.

could hardly have been planned. The method of cutting is not known, but a pecking and grinding process was probably employed. The fracture of the stones will not permit much splitting. In several places are drill holes (fig. 24 *i, l*) undoubtedly made with steel drills, though these are unquestionably recent additions.

Site 27. House sites.

Along the base of the bluffs on both sides of the river, after getting up past the branch of the Makaweli and Waimea rivers, there are built-up stone house sites. In some places these facings run for over 100 feet along the base of the bluff, with the paving extending back 15 feet or more. At other places the terrace is just sufficient to maintain one house. On the east side of the river, on the steep talus slopes, there are house sites with terraces as high as 8 feet to maintain a level platform for a house.

Site 28. Keakuamele heiau, on a high point on the west side of the Waimea river.

This heiau has an excellent view of the valley. Thrum describes it as, "An unenclosed small pile of rocks; a sacred place." There are a number of small piles of rocks, any one of which could be deemed sacred. The location is excellent.

Site 29. Makaakiaki heiau, near the Waimea ditch line on the west side of the Waimea river, a little above the Menehune ditch, on an open flat space of jutting rock.

The view of the valley is fine. There are a few large boulders, but the location is naturally smooth. It consists of a 50 by 30 foot platform roughly paved now, but with evidence of small pebbles being used as finishing. It is backed by a wall 1 stone high and 7 feet wide. In front of this platform is a large flat space dropping off at the front edge in a steep slope which runs to the road. Back of the heiau another flat space extends 50 feet to the irrigation ditch. It is said that the hula was taught here.

Site 30. Wailaau (Wilaau) heiau, on Mokihana ridge at the side of a sloping bluff on the east side of Waimea river.

The structure consists of three platforms. The lowest platform has a rough frontage, utilizing the natural rock that forms the talus slope. The rock used is all local lava. The pavement of the front platform is rough; in the others it is a little better, but all of it is badly torn up (fig. 25). All the stones in the walls and pavement are blocks of basalt from local sources.

Site 31. Pohakoelele heiau, indicated now by a house site and a long river wall on the east side of the Waimea river shortly above the branch. It is barely above the river level and on the flood plain—a poor site for a heiau.

Site 32. Kaunuokane heiau, on a pali, on the south side of Kunini gulch.

As the pali is steep and narrow and the heiau is correspondingly narrow and rises steeply on the slope, it can best be described by referring to figure 26, where the exact measurements are given. The heiau consists of a series of 8 small, terraced platforms of different sizes that rise one above the other till the steep rocks are reached at the back. Some of the side walls are 20 feet high, and where the facing is preserved the work seems well done. These walls are really no more than facings to the natural sides of the pali, though in some places quite a little work has been done to make the platforms

level. The facing is done in layers, each layer being about two feet thick and laid outside the first one. Three layers of thickness could be determined. The sides seem to run continuously from the lowest platform to the back of the structure, getting higher as the new platforms are higher than the preceding ones. The broken rock used gives a recent appearance to some of the work which is deceiving. The walls are unique for heiau on Kauai. (See Pl. IV, *A*.)

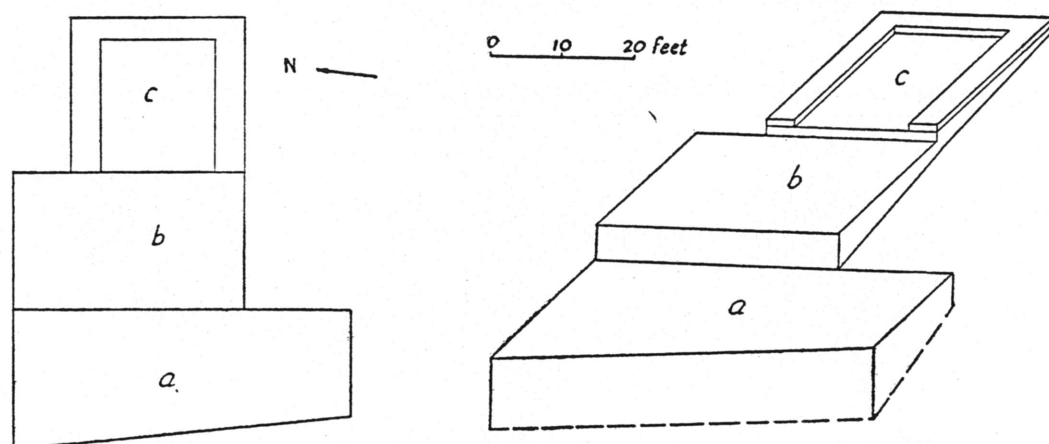


FIGURE 25.—Ground plan and perspective plan of Wailaau heiau, Site 30: *a*, platform 15 feet by 50 feet, about 20 feet high at the front; *b*, platform 19 feet by 34 feet, about 5 feet high; *c*, platform 16 feet by 19 feet, 1.5 feet high surrounded on three sides by a wall 4 feet wide and 1 foot high.

#### Site 33. Taro terraces and house sites, in upper Waimea Valley.

Many taro terraces are associated with house sites. On the river flats they are little more than rows of single stones separating patches. As one proceeds up the river and the land becomes steeper and narrower, the walls of the taro terraces become correspondingly thicker and higher. Very little irrigable land is not utilized. In some of the fields, even up to the power house, the taro is still grown. House sites are found all along the way most notable when built up 2 or 3 feet with stones in front, doubtless to protect the house in flood seasons.

#### Site 34. Peekoa heiau, in Waimea Valley.

Thrum describes this structure as, "an open platform heiau in good preservation." The road running up the Waimea valley leads to Camp 4. Across the river from this camp there is a broad flood plain used for sugar cane. The inland end of this plain is shut off by a low pali that juts out with a little peak on the end. A structure that may be this heiau is located on the side toward the sea from this pali. The site overlooks the portion of the valley including Camp 4 which still has taro patches around it. It is not more than 30 feet above the river level, and is the only stonework thereabouts. It is a simple stone platform 30 by 20 feet. The end toward the sea shows slight indication of having been walled. The front is well faced and is 4 feet high. It is made of large lava rock and paved with small stones. On the back corner there is a shallow pit, 4 feet in diameter, surrounded with a wall 3 feet wide and 1 foot high. The reported location of Peekoa heiau is on the other side of the river, on the first pali toward the sea from the camp. No structure was found there.

Site 35. Heiau or house site, at the junction of Waialae and Waimea rivers.

This is an unpaved, walled enclosure 82 feet long and 64 feet wide. The walls are roughly 3 feet wide and 3 to 4 feet high. They are made of large stones, some of them in their natural positions and some brought a short distance from the river, placed at intervals and filled in between and extended higher by smaller river stones. There is a trace of a division line through the center of this structure (fig. 27, f) but it is not distinct. West of the larger platform side a row of stones marks the edge of an area that may have been paved. Towards the back there is another line of single stones, among which was an unfinished poi pounder (C 1163). An inclosed circular pit 15 feet west of this main structure is partly excavated and partly built up. An irregular walled inclosure 30 by 50 feet (not shown in figure 27) lies 20 feet northwest. It is like the pig pens so common in Kalalau Valley.

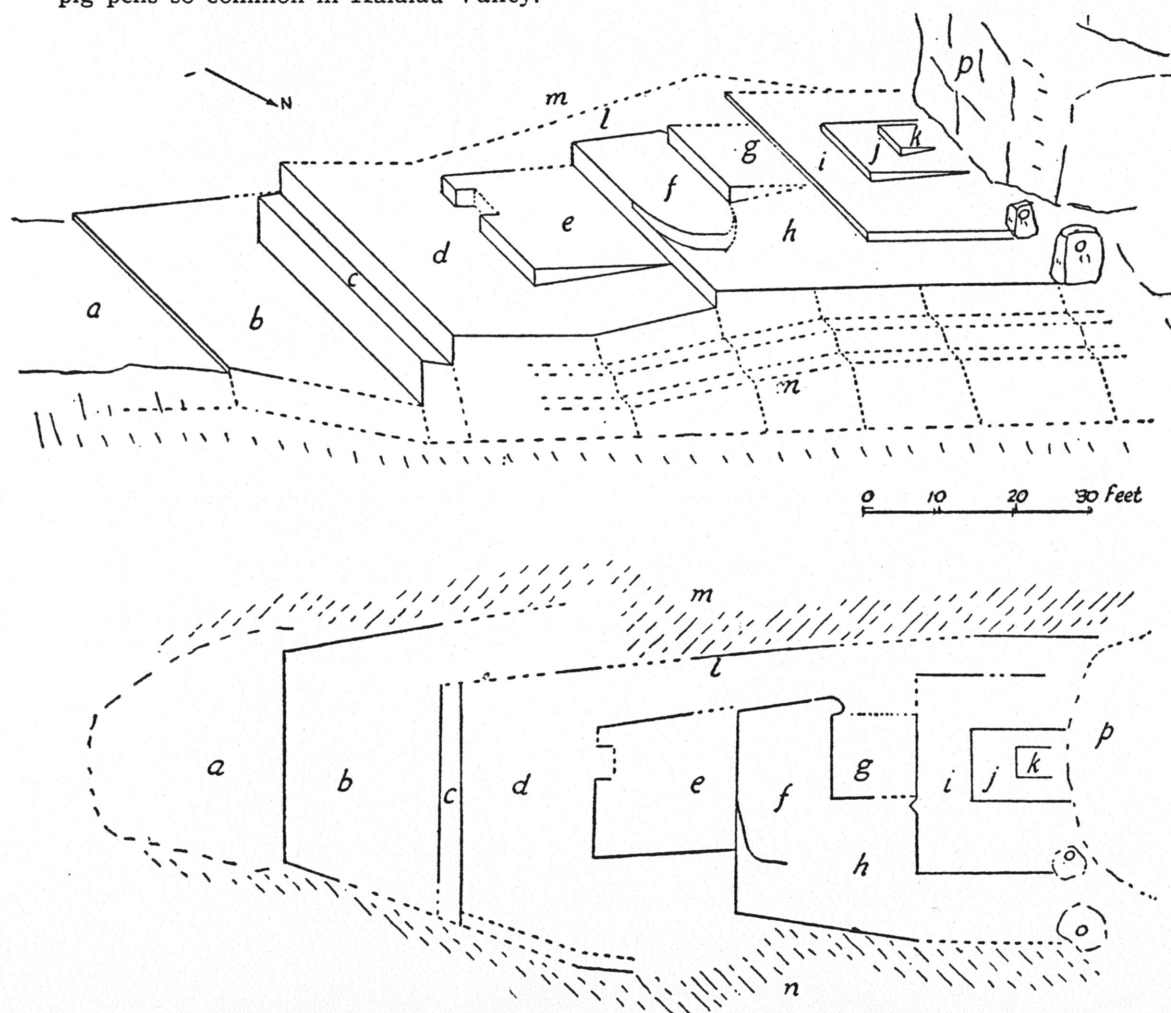


FIGURE 26.—Ground plan and perspective plan of Kaunuokane heiau, Site 32: a, area of the natural rock slope; b, paved platform 20 feet wide, 1 foot high; c, step 6 feet high; d, paved platform 12 feet wide, 4 feet high; e, paved platform 18 feet wide, 2 feet high; f, platform 12 feet wide, 2.5 to 3 feet high; g, platform 11 feet wide, 2 feet high; h, roughly level paved area; i, platform 7 feet wide at the center, 1 foot high; j, platform 7 feet wide at center; k, platform 7 feet wide; l, facing wall; m, steep slope faced with stones; n, steep slope double faced with stones; o, natural rocks; p, bare rock cliff.



Site 36. Stone cist burials, a short distance behind Site 35.

At this site are two stone cist burials, one of them shown in figure 28. There is no raised portion of ground to indicate the graves. In a space 6 by 13 feet there are five parallel rows of small river stones running lengthwise, connected by a row at each end. Under these there was a 5 inch layer of dirt covering the grave. The egrave itself measured on the inside 2 by 9 feet and was 2 feet deep. The sides and the ends were lined with a double row of stone. Four large flat stones covered the top, and the interstices were filled with smaller stone. The burial was extended under 6 inches of dirt at the bottom. There was no stone used for a flooring.

Site 37. Ulumaika court, between Waihalulu and the Koaie streams.

There is a flat place on which an old *ulumaika* field was said to have been. There is nothing to-day to distinguish it except the flatness of the land and the fact that the rocks are cleared off it. Many *ulumaika* stones were reported to have been found here.

Site 38. Irrigation ditch, on the north side of Koaie River.

Around the first pali that juts out so markedly and drops straight to the river plain is a built-up irrigation ditch. The problem—that of carrying water around a precipice—is the same as for the Menehune ditch (Site 26) except that here the river is not running against the base of the embankment. No cut stone is used in this ditch. However, the stonework is built up around the pali for about 400 feet. It consists of building a stone facing, well laid but not fitted, about 1.5 to 3 feet away from the cliff, filling up the inside with dirt and stone, and specially fixing the top stones. Sometimes this wall is 20 feet high, in others 3 feet high, depending on the nature of the talus slope below. At one spot it is reënforced until 4 feet thick. At the top are large flat stones set on an inward slant towards the cliff. Each flat stone overlaps the one in front of it on the downstream grade. Dirt is then placed over them.

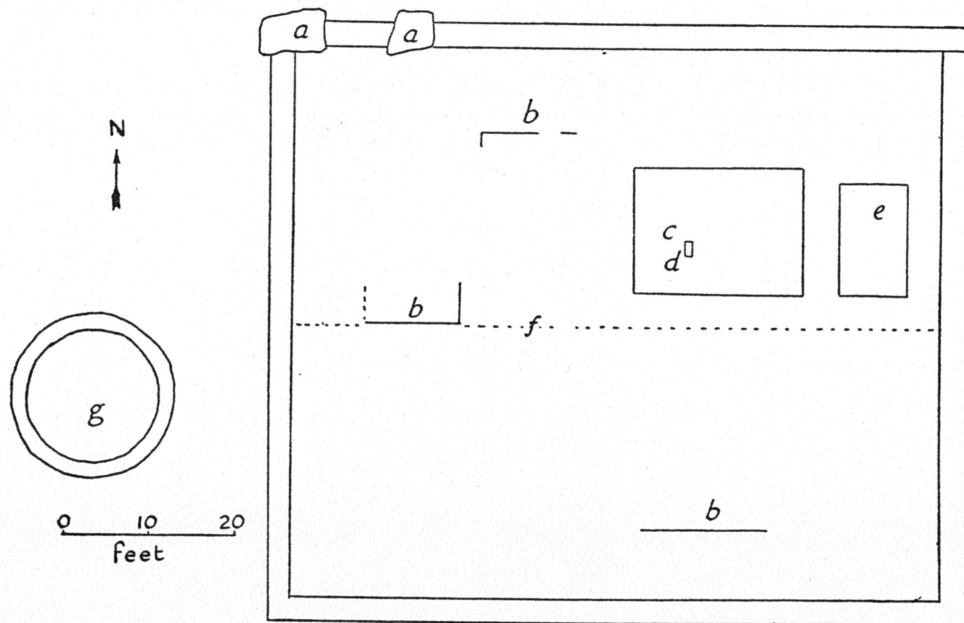


FIGURE 27.—House unit at Waialae and Waimea rivers, Site 35: *a*, natural rocks; *b*, line of stones; *c*, house site 15 feet by 20 feet outlined by row of stones; *d*, fire place of four stones; *e*, platform 8 feet by 13 feet, paved with river stones; *f* (dotted line), indications of a former division between terraces; *g*, pit four feet deep inside, 2 feet high outside.



Site 39. Quarry, on Mokihana ridge.

Extending for several miles there seems to have been considerable quarrying done as chips and unfinished adzes are found. Brigham (5, pp. 76-8) described this in some detail.

Site 40. Lewaula heiau, on Mokihana ridge on the main trail.

Thrum describes this structure as "An open heiau with stone foundations, made into a cattle pen some years ago by Aka." The cattle pen is still there though none of the original heiau structure can be determined.

Site 41. Kaunuenuhe heiau, on Mokihana ridge at the elevation of 1550 feet on the regular trail.

The top of the knoll is roughly round, 80 by 96 feet. There is evidence of stone paving still to be seen, though it is much disturbed. 20 feet straight in from the inland side are four stones that resemble a fire place. This paving covers the whole top of the knoll which has been flattened, probably naturally. It is like Site 18. The edges are washed out and no side delineation remains. Coral is found and a few river stones.

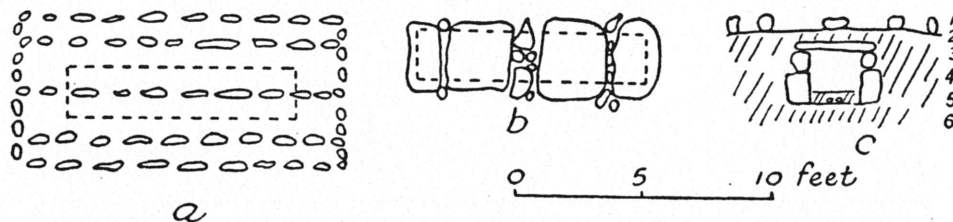


FIGURE 28.—Sketch of stone cist grave, Waialae, Site 36: *a*, top view showing design formed by arrangement of stones, length 13 feet, width 6 feet (dotted lines show position of cist.); *b*, top view after stones and earth have been removed showing arrangement of slabs across the opening, length 9 feet, width 2 feet, depth 2 feet (dotted lines show size of grave.); *c*, cross section of cist showing layers of material used in construction; 1, design of stones; 2, layer of earth; 3, slab covering cist; 4, double layer of side walls; 5, earth and skeleton; 6, earth bottom.

Site 42. Taro fields and house sites, in Makaweli and Olokele valleys.

The taro terraces and house sites, utilizing as much of the flat lands as possible, and terracing a bit on the sides, are much the same as in Waimea valley.

Site 43. Mahaihai heiau, now completely destroyed. The location was taken from an old map made by Frances Gay.

Site 44. Aakukui heiau, located in Makaweli at east branch of Kekupua valley near junction. Described by Thrum as, "A paved and walled heiau in good preservation."

Site 45. Kaunumelemele heiau, located in Makaweli on the ridge near the junction of Hikilei and Kunalele valleys. Described by Thrum as, "An open platform heiau in good condition."

Site 46. Taro fields and house sites in Kawaipapa Valley.

The valley is well terraced where convenient, though no great labor has been expended in irrigating the higher, though fertile land. The terraces and the house sites on the edge of the valley are interesting as they show a fairly large population quite a ways inland.

Site 47. Taro fields and house sites in Honuaula Valley.

This valley shows considerable taro terracing, as well as walled inclosures that look like pigpens. The part toward the sea of this valley is utilized for sugar cane and so all that is left is the outer rim. As such it would indicate fairly extensive work lower down in the valley.

Site 48. Kuwiliwili heiau.

Said to have been located just below Makaweli Camp 3, which site is now in the cane fields. Thrum describes this heiau as, "A large, high walled enclosure of *pookanaka* class now destroyed." At the location mentioned there is nothing to indicate a structure but a pile of rocks gathered from a cane field.

Site 49. Salt pan, near Puolo Point, Hanapepe.

The extent of this salt pan is shown on the government map. It is notable among the salt pans of Kauai in having no artificial divisions. It is merely a natural flat area on which the sea water could be let in to evaporate.

Site 50. House sites, at Puolo Point, Hanapepe.

The remains of many house sites appear on the great flat lands near the salt pan (Site 49). Most of the house sites are surrounded by walls 2 to 3 feet high, many of which have been built up recently. Walls run everywhere. East of here the field has been cleared for an airport. Along the shore the tumbled remains of wind shelters used by fishermen can be seen.

Site 51. Kauakahiu heiau, at Puolo Point, Hanapepe.

Thrum describes this structure as "A walled heiau of medium size at the shore, part of walls still standing. Kane and Kanaloa its deities." The site is now but slightly marked by crumbled stones. It measures at the outside about 80 by 60 feet. The walls were said to have been about 4 feet high.

Site 52. House site or fishing shrine, at Puolo Point, Hanapepe, just east of Site 51 at the shore.

The front part of this structure rests on the beach stones above which it has been built up 5 to 8 feet. In rough weather the sea spray must have washed over it. The exact measurements and plan are given in figure 29. It is composed of three sections with steps leading up to one. The paving on two of the sections (fig. 29, *a*, *b*) is with very small beach pebbles. The other section is more torn down, and is paved with larger stones. A wall one foot high runs around the south side and across the front (sea side).

Site 53. Sand burials. In the sand on the northwest side of Hanapepe bay, burials are found.

Site 54. Makole heiau, on Makole bluff, Hanapepe.

Makole bluff is said to be the one on the inland side of the government road west of the river, halfway between the road and Kapahili valley. Thrum describes it as, "A small heiau of platform character on side of bluff destroyed in the sixties; portions of its walls said to be still seen." None of the walls could be found.

Site 55. Pualu heiau, on the east side of Kapahili gulch about one quarter mile from the road, and at the base of the second pali.

This structure consists of a single platform 142 by 50 feet built up in front 6 feet, and backed by a wall 3 to 4 feet high and 3 feet wide. (See fig. 30.) The whole structure seems to have been paved with 3 to 4 inch stones but it is very much disturbed, and much of the rock has been hauled away. At the back near the center are two well-defined rooms and one poorly delineated. The room farthest north (fig. 30, *a*) shows a depression of two feet below the main platform level on the inside. The floor is well paved and the walls are carefully built. The walls of rooms *a*, and *b*, are of a single thickness of stones, and their tops are at the same level as the top of the back wall, except at the southern outside corner of the larger room, where the room wall is one foot higher than the back wall. The third room is just a depression surrounded by a poorly constructed wall. As Thrum does not mention these rooms it is possible that they were built at a later time. Thrum describes the front wall as curving in a D-shape, and in its fallen condition it does appear to curve. Examination, however, shows traces of wall edges which suggest that originally the heiau had more the shape of a rectangle with a square taken out of one corner.

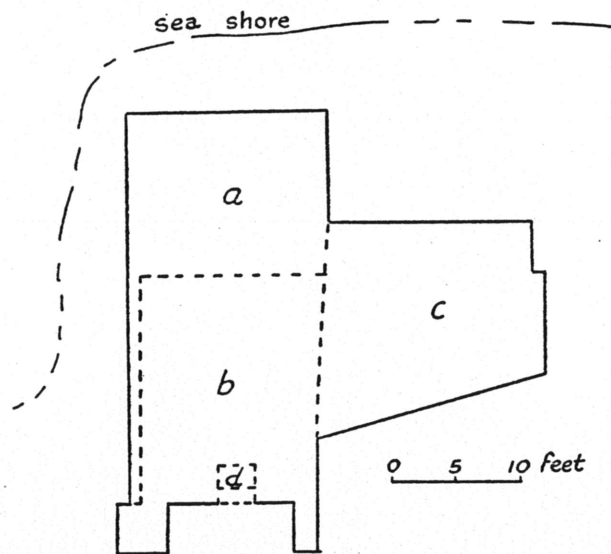


FIGURE 29.—Ground plan of a three division house platform with steps at Site 52 (for a perspective plan see figure 1, *a*): *a*, platform 12 feet by 15 feet, end wall 1 foot high; *b*, platform 12 feet by 20 feet, side wall 1 foot high; *c*, platform 16 to 17 feet by 12 to 15 feet, 2 feet high (platform *a*, is 1 foot higher than *b*, and *c*); *d*, two steps.

Site 56. Akowai heiau, at a place called Akowai on the steeply sloping side of a bluff.

This structure is described by Thrum as, "A small paved heiau of about 50 feet square, in bad condition . . . . Destroyed about 1865." The site to-day includes a number of well-built house sites (Site 57) and a jumbled mass of walls said to have been the heiau (fig. 31).

Site 57. House sites, at Akowai, Hanapepe near Site 56. (See fig. 31.)

Of three well-paved house sites (fig. 31), the first is 65 feet long, irregular, 20 feet deep with a 2 foot wall at one end, and built up 5 to 8 feet in front. It is paved with large stones. The second is on a line with the first only 6 feet higher, and measures 40 feet in width and 20 feet in depth. It is terraced against the back 5 feet and built up in front 5 feet. Directly behind this site, higher up on the talus slope is the third platform, roughly, 23 by 15 feet, with walls at each side, and built up 5 feet in front.

Site 58. Taro terraces, in Manuahi Valley. Like Site 60 this site is completely terraced for taro and contains similar house sites.

Site 59. Moloku heiau, in Hanapepe near the peak of Kuopoo ridge at its junction with Kahalau. Described by Thrum as, "An open platform heiau, in fair condition."

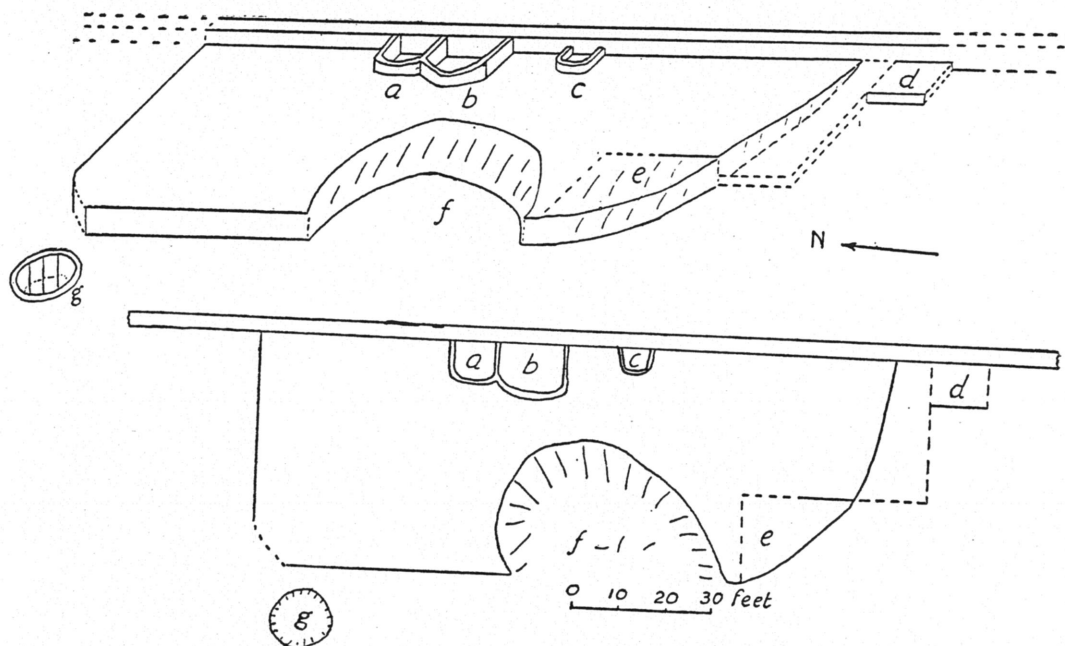


FIGURE 30.—Ground plan and perspective plan of Pualu heiau, Site 55: *a*, room 8 feet by 10 feet with walls 4 feet high on the inside and 2 feet on the outside; *b*, room 10 by 15 feet with walls 5 feet high on the inside; *c*, depression inclosed by a wall 1 foot high; *d*, terrace 10 by 12 feet, perhaps a house site; *e*, area of fallen stones; *f*, area from which stones have been removed; *g*, well 15 feet deep. (The dotted lines indicate the probable shape of the heiau before it had been damaged by the removal of stones.)

Site 60. Taro terraces and house sites, Hanapepe Valley.

In Hanapepe Valley the taro terraces are everywhere that the land is irrigable. On some the walls are 3 feet high. House sites are of the usual types. Low caves are utilized by building up in front. There is evidence of people having lived in every turn of the valley. The valley is narrow in most places. Farther on toward the sea the valley broadens and along the sides there are still house sites built up. One house site of stone was 20 by 30 feet and well built. It was walled 4 to 8 feet in front to make the platform level on a steep, rock slide. It was walled in back 3 feet against this slide. On the sides are walls 2 to 3 feet high in back, and the same in width, though in the front they are much lower.



Site 61. Taro terraces, in Wahiawa Valley.

The remains of terraces remarkable in places for their number on a small area of land. Walls that extend quite a way along the sides of the valley seem to have no purpose though they may be the result of clearing the fields for agriculture. There are platform house sites in the valley; burial caves and petroglyphs are also reported.

Site 62. Waiopili heiau, in Wahiawa Valley on the bluff on the east side, a short distance on the seaward side of the government road.

This structure is described by Thrum as "An oblong heiau of good size, walls still standing." The cane fields have now been run close to the edge of the bluff, and in clearing the fields of stone the heiau has been obscured so far as any plan is concerned.

Site 63. Huhuakai heiau, on Wahulua bay, Wahiawa.

Thrum says "A medium sized heiau; portion of its walls may yet be seen. Class unknown." It is mostly destroyed. A platform of irregular shape is left, the front part of which is paved with small stones and the rest roughly paved. Nothing that would identify it as a heiau now remains.

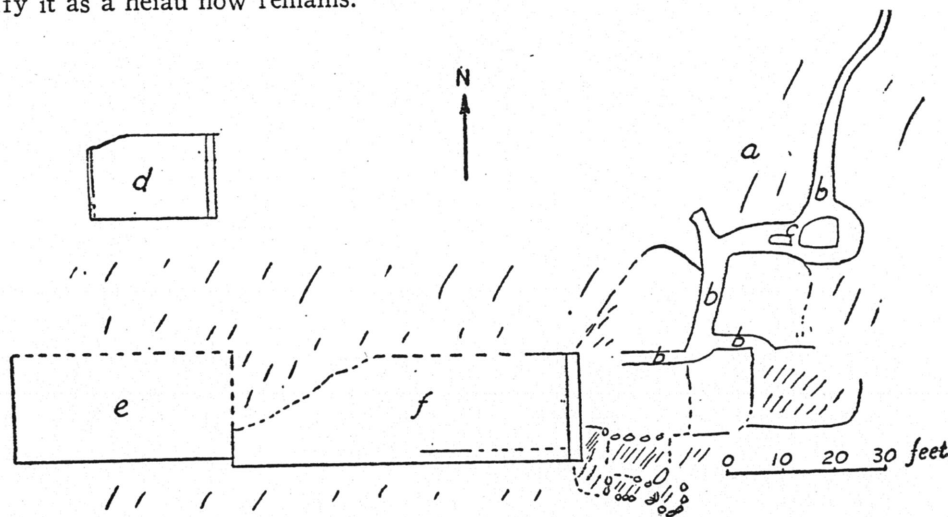


FIGURE 31.—Plan of Akowai heiau (a, b, c) Site 56, and house sites (d, e, f) Site 57: a, jumble of walls, paved sections, and lines of stones which are said to have been a heiau; b, wall 2 to 3 feet high; c, depressions 1 to 2 feet deep in the wall; d, house site 15 by 22 feet; e, paved terrace 20 by 40 feet, 5 feet high in front; f, paved terrace 18 by 65 feet, 5 to 8 feet high in front and 6 feet below terrace (e).

Site 64. House sites, in Kalaheo gulch at the sea.

Most of the many house sites are stone platforms 15 feet square. Some have low walls on three sides. There are fire places on some house platforms. Farther inland of Kalaheo gulch there are taro terraces, but not toward the sea. Along the shore, hollows under large rocks, with slight modification if any, are used by fishermen.

Site 65. Kahalekii heiau, on the western slope of Kukuiolono hill.

This heiau is now completely destroyed, but Thrum describes it as, "A square three-terraced heiau of large size, with several divisions: was high walled and paved: class unknown."



Site 66. Kukuilono heiau, once located on Kukuilono hill but now destroyed.

Thrum's description is as follows: "A large three terraced heiau, east section being 95 by 112 feet, mid-section 105 by 83 feet and west division 105 by 51 feet, giving a total length of 246 feet straight on the seaward side. Near east end is a large oven; near the division wall is the kahua of the oracle 22 by 30 feet, and on north side of mid-section are foundations of two houses which measure 15 by 42 feet. The sacrifices for this heiau were executed at some distance from it and the bodies then brought and placed on the altar that the temple be not polluted with blood." The name of the place of sacrificing was, "Na pohakuakiola."

Site 67. Fish pond, salt pans, and taro terraces, at Nomilu.

The fish pond is a large, natural, salt water pond with no artificial work done to it. It is famous in Kauai history and every great chief who visited the island made a journey to it. On the sea side of the pond are salt pans partitioned off with stones, and at slightly different levels. The salt from these pans was famous. The inland part of the pond is overgrown with cactus and lantana. There are numerous walls here and several lines of stones that run into the water. A burial cave is reported for the cliffs above. Back of the modern gardens, running up the slope, are taro terraces faced with stone, though whether they were irrigated or not is still a question, since no fresh water can be seen.

Site 68. Kapoho heiau, inland from the fish pond at Nomilu, Kalaheo.

Thrum speaks of this structure as "A large heiau *mauka* of the fish-pond; destroyed some years ago. Portions of its division walls yet to be seen." So much changing has gone on in this region that it is hard to say which of the rough stone walls remaining are the ones mentioned by Thrum. On the northwest corner of the pond a wall extends 80 feet along the edge of the pond, and in a rough fashion extends inland at each end, though the work is not very distinct. The front part of this wall is about 3 feet in height from which height it slopes back and downward to the ground, giving a triangular cross section. The wall is of very loose construction.

Site 69. Kalohiokapua heiau, in Lawai valley, inland on the west side on a hill. Described by Thrum as, ". . . . a stone platform heiau about 20 by 20 feet, walled some 4 feet high; a place of circumcision."

Site 70. Mamalu heiau, against a cliff about the center of the mouth of Lawai valley.

Although this site is now completely destroyed it was described by Thrum as, "A small paved platform heiau about 20 feet in size, located on the beach; portion still to be seen."

Site 71. Petroglyphs in Lawai Valley on the east side of a large rock a short distance toward the sea from the cannery.

They are the regular type of scratched or pecked petroglyphs. All are of the stick figure type made with single lines for body and limbs. None of the triangular bodies and limbs are found. In one figure three toes and three fingers are shown. (See p. 90.)

Site 72. Niukapukapu heiau, on the top of Niukapukapu hill, on the east bluff of Lawai valley.

The outside measurements of this heiau (fig. 32) are 46 by 95 feet. At the front, and for 60 feet on the east side, a section of the wall remains which is 3 to 4 feet wide, 3 feet high on the outside, and 1 to 3 feet high on the inside. Both east and west the steep sides of the hill are faced with stone. On the east side the cross section shows the wall 2 feet high on the inside, 3 feet high on the outside and 4 feet wide. At the base of the wall is a flat space 5 feet wide, then a 1 foot drop and another space 2.5 feet wide, and then a 2-foot drop from whence the facing continues at an angle for 15 feet or more down the side of the hill. This double step feature is on both sides. In front of the seaward side of the wall the paving continues out for 15 feet.

Site 73. Stone work, on the hill just inland from Site 72.

On this hill is considerable mass stonework. The top of the hill has an irregular, rectangular structure of stone walls on the four sides, but not on the center of the top. These walls are 15 to 20 feet thick, or wide, built up 3 to 5 feet on the outside and flush with the ground on the inside. They are not everywhere continuous, but the impression given is that they were continuous at one time. Portions of the walls are so roughly laid that it appears to be cleared stone from the plantation, but other portions seem well made.

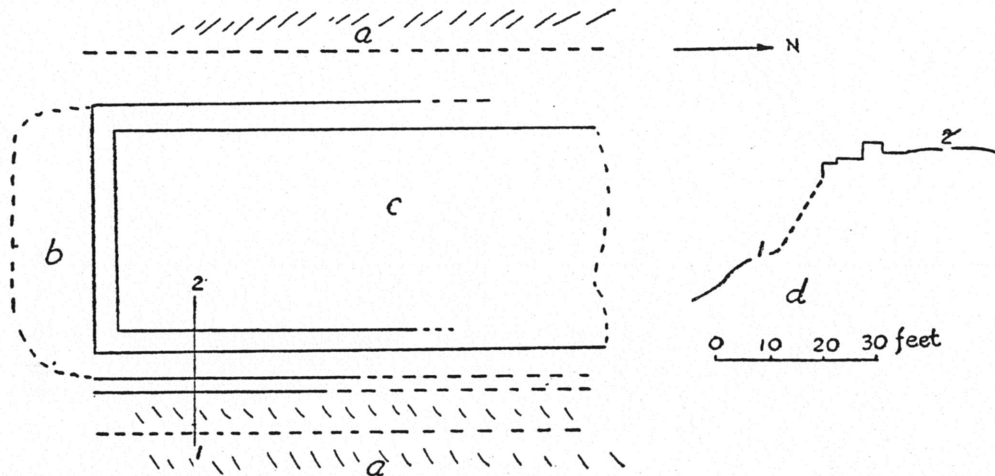


FIGURE 32.—Niukapukapu heiau, Site 72: *a*, side of hill; *b*, paved area 15 feet wide; *c*, unpaved inclosures 41 by 95 feet crowning the hill; *d*, profile.

Site 74. Fishing shelter. On the shore near the mouth of Kukuiula valley there is a fishing shelter (Pl. VI, C). It is 5 feet high, and 6 feet wide at the base. It is arched up of stone and used principally for a wind break.

Site 75. Kuhio Park, on the shore west of Waikomo stream, Koloa. Taro patches, a small heiau, an oven, paved house platform, fish pond, game ground with seats around, and a fishing shrine are the principal features shown.

Site 76. Salt pans, east of Waikomo stream along the shore.

In these numerous salt pans, some divisions are made by a single row of flat stones on edge, others by round stones in line, still others by a double row of stones with dirt or sand filled in between for a sort of a walk. (See Pl. VII, A, B.)

Site 77. Ponds, just inland from the shore road at the east side of the Weliweli, Koloa.

One of these ponds is of an oval shape 185 yards in circumference. It is encircled with a raised wall of dirt the edges faced with large stones. This raised portion is about 12 feet wide and built up 2 feet high most of the way around. Within this pond is a small circular wall of stones 2 feet wide, 2 feet high, and about 15 feet in diameter. A built-up path leads out to this circle. This pond is one of a series of four all similar in size and construction. There are no internal divisions, nor any great depth to these ponds.

Site 78. Taro terraces and house sites, just east of Site 77 and adjoining it.

These structures consist of a walled enclosure with three terraces and an unmistakable ditch line at the back, which would indicate that the whole was used for taro. The south wall is 5 feet wide and 2 feet high while the north wall is 5 feet wide and 4 feet high. The area covered by the three terraces is roughly 75 by 90 feet. The south wall continues back of these terraces broadening out along the edge of one of the large ponds to give a paved area 15 by 30 feet, and then continues eastward. The north wall also continues. A few feet back of the ditch line on a solid lava outcropping is a circular wall of stone, 3 feet high and 2 feet thick, covering an area 8 by 5 feet. A short distance north of this is a 15 by 15 foot stone-paved platform house site on the edge of Site 79.

Site 79. Walled inclosure and house sites, just northeast of Site 78, Koloa.

This inclosure is an irregular circle 300 to 400 feet in diameter containing good soil and surrounded by a wall 6 to 8 feet high. The land inside is now used for grazing but there is an irrigation ditch leading to it from the west side, which would indicate that it was once used for agricultural purposes. It is slightly marshy to-day. The wall is highest on the north side and presents two cross sections, one taken near the west end shows a rise of 3 feet, then a 10 foot width on a slight incline, then a 5-foot perpendicular wall 3 feet wide and only 2 feet high at the back because of the higher level of the outer ground; another section taken near the east end, still on the north wall, shows a wall 5 feet high and 2 feet wide, then a drop of 2 feet and a 6-foot horizontal width from which a 3-foot wall, 2 feet wide, rises and again is but 2 feet high on the back side. The first type is the most extensive. At the east end there are two places where the wall extends inward and the terrace at the base of the wall broadens. On one of these extensions there is a 12 by 15-foot house site. In front of the other extension there is a spring walled around. An altar, apparently of recent construction, is a bit on the seaward side of the spring. North and east of this enclosure are many house sites on the lava rock. The house sites are all of stone, some terraced up, some walled on one, two, three, or four sides. The walls are mostly 2 feet high and single stones on edge. There are also pits and small enclosures.

Site 80. Kihouna heiau, at Kihouna point, Poipu, Koloa.

This walled heiau measures 130 feet in length and 89 feet in width on the inside. The whole structure has been greatly disturbed and some of the walls restored. The wall toward the sea is in good condition and measures 7 feet in width, 3 feet in height on the outside, and 5 feet on the inside, and is well made. Along the inside of this wall is a terrace 3 feet wide and 2 feet high that runs the complete length of the wall. The west wall is only marked by stones embedded in the ground. The north wall is missing at the west end but the east half has been restored, which makes it 5 feet wide and 4 feet high. The east wall has been restored on the old wall as a base. Large lava



blocks set on edge and filled in with small stone is the method of construction shown in this wall. The whole heiau is strewn with large and small pieces of coral. Thrum's description adds some features not now discernible: "A single walled heiau . . . 100 by 125 feet, enclosed on all sides by walls 4 to 6 feet high, with entry way near middle of mauka wall; seaward or *makai* wall 8 feet thick. A section of stones as of pavement shows nearly the whole length near *makai* wall, and in N. E. corner is a section said to have been its altar stones." In front of this heiau, towards the point are some rooms roughly built. One is 17 by 10 feet, with walls 4 feet high. Another is 14 by 10 feet. On the seaward side of these divisions is a wall 11 feet wide in front, 30 feet wide to the west, and built up 3 feet on the sea side.

Site 81. Kaneiolouma heiau, on the shore a short distance east of Site 80.

This structure consists of three large sections and four rooms in the back wall (fig. 33). The front wall is now missing but stones embedded in the ground indicate its original position. The outer or front section is unpaved and it is divided from the midsection by a line of stones on edge as well as by a dirt terrace. The middle section still shows a few slabs of the limestone with which it was once paved. It is distinguished from the inner section by a slight dirt terrace. The inner section has no paving stones left. The wall towards the sea is 9 feet wide and 5 feet high. It is built with a facing on each side and a fill between, though the facing is not of large slabs but rather of unshaped blocks. The wall facing inland is 5 feet wide, 3 to 5 feet high, and has been somewhat restored. Room divisions within the back wall are badly fallen in. They are apparently without connection either between themselves or to the heiau proper. Thrum's measurements have been followed in drawing the room divisions.

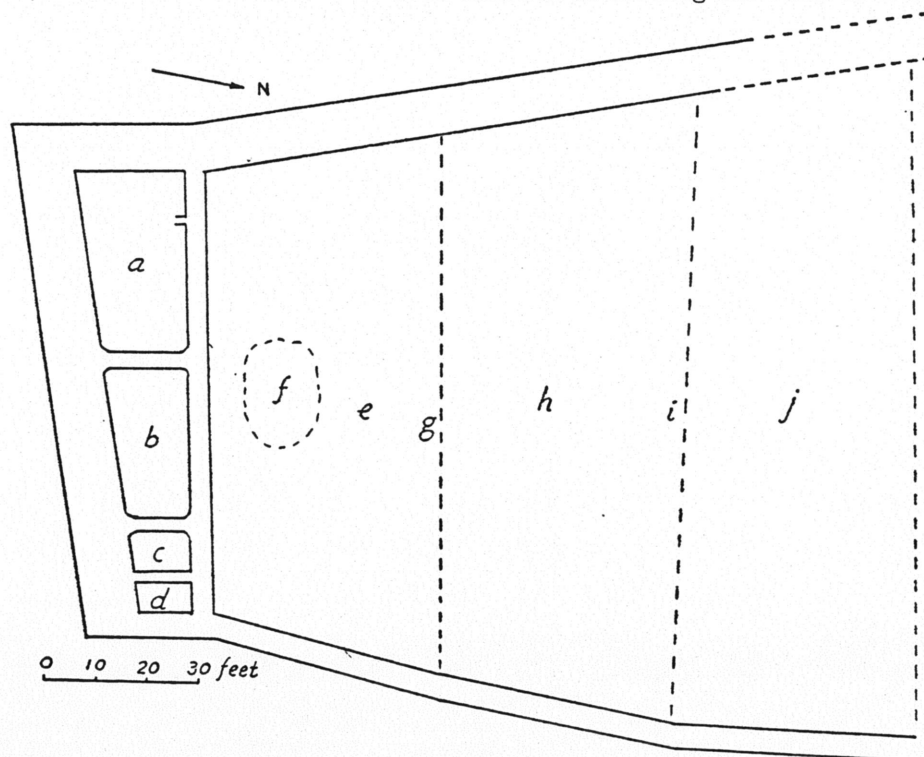


FIGURE 33.—Ground plan of Kaneiolouma heiau, Site 81 (based partly on a plan by Thrum): *a*, room 22 by 36 feet; *b*, room 15 by 30 feet; *c*, room 10 by 12 feet; *d*, room 8 by 10 feet; *e*, inner section 48 by 107 feet, 1 to 2 feet higher than middle section (*h*); *f*, outcrop of lava perhaps an altar; *g*, row of stones on edge; *h*, section 48 by 107 to 125 feet, 1 to 2 feet higher than outer section; *i*, line of stones on edge also a dirt terrace; *j*, outer section 50 feet by 125 to 149 feet on ground level.

Site 82. Dune burials, in sand dunes along the shore at Paa, Koloa, east of Makahuena point.

In these numerous burials the shifting of the sands exposes many bones in excellent preservation. Many skulls have been taken from this locality which has been reported as an old battlefield, but the number of children's and women's skulls would indicate that it was just a common burial ground.

Site 83. Weliweli heiau, on the shore in Weliweli section, Koloa.

Described by Thrum as, "A paved heiau of large size, pookanaka class; walls 4 feet high; portions of same said to be still standing." The cane field has been cleared and the stones piled over this heiau.

Site 84. Petroglyphs at Keonelo beach, now covered with sand. (See p. 90.)

Site 85. Walls, inclosures, house sites, in the cactus-covered country around the Koloa reservoir and extending to the sea.

Innumerable walls, some of them inclosures and some merely division walls and fences. In one large, walled inclosure were three piles of stone near one end. The center one, and the largest, was 10 by 7 feet and 2 feet high. It was built up around the edge with large stones and filled with 2-inch pebbles. On each side of this structure was a 3 by 3 by 2-foot pile of rocks. There are some fine house sites on flat places on the lava flows, slightly leveled with small stones. House sites about 10 by 15 feet are found everywhere on the lava. The walls are of different types of construction and some have been restored for modern use; double rows of large stones on edge filled in with small stones; walls built up of same size stones; walls built of blocks of lava set upright. Some walls are 6 feet and others 2 feet high.

Site 86. House site, in the area described in Site 85.

This special house site is rectangular, 25 feet wide, and 45.5 feet long, inclosed by walls 2 feet wide and about 2 feet high (fig. 34). It is divided into two sections. The south section is paved with small stone and has a terrace across the southern end. East of this section, outside the wall, is a roughly paved irregular area. The roughly paved north section is one foot lower than the south section, the walls being correspondingly higher. Outside the west wall of this house near the center is a paved platform in which is a square depression. The walls of this house site are made of double rows of stones on edge with a small stone fill between them. Coral is found in the walls. Southwest of this house site is another, with walls on three sides only, which measures 15 by 15 feet.

Site 87. Waiopili heiau, in Mahulepu section, Koloa, just northeast of Kapunakea pond.

This heiau, a rectangular, walled enclosure, is built on an old lava flow and made of the lava blocks (fig. 35). There is a semblance of a paving, but most of the floor is the fairly smooth lava in natural position. The function, and the age of the pile of stones forming the tower in the southwest corner of the structure are questionable. It is a unique feature for Kauai heiaus. The walls are made of great slabs of lava 3 to 4 feet wide on edge in double row and filled in between with smaller stone. The blocks of lava are chinked together. Coral is found.



## Site 88. House sites, at Mahaulepu, Koloa.

At Mahaulepu are many old walls and house sites. Most of the walls seem to have been built for corrals and fences. There are indications of comparatively recent occupation, such as cement foundations, metal objects, kettles, spoons, boards, shoes and many bottles. Some of the house foundations have walls 2 feet wide and 2 feet high. There are some quite large inclosures. The house sites represented here are not of very old origin. The cliff house site is an exception, with a platform built up 7 feet in front with coral sandstone rock, and a 15 by 12-foot area on top; though a bit washed away. Along the edge of the Kapunakea pond there is a 15 by 15 foot area of rocks built projecting out into the water. Along the bluff there are house sites built up of stone slabs on edge, outlining the site. Also there are natural caves formed by large rocks that have been utilized by the fishermen as shelters. In the dunes at the base of this cliff there are shell heaps which indicate camp sites. In the cliff are several caves one of which was found to contain two coffins. In the sand dunes beyond there are many burials. Running parallel to the dunes on their inland side is a wall made up of big and little stones on edge most of it just one row high.

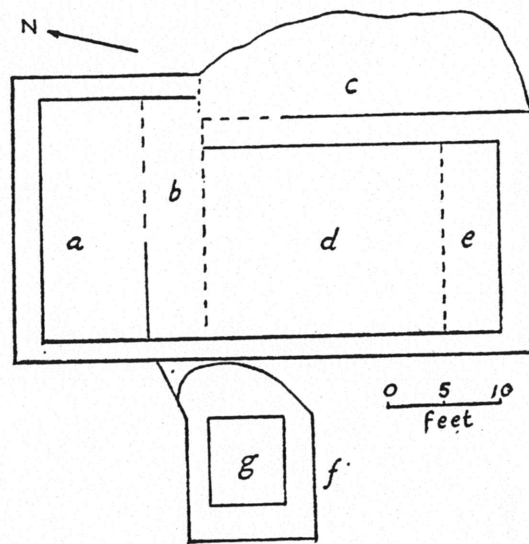


FIGURE 34.—Plan of Koloa house site, Site 86 (For perspective plan see figure 1-c.): *a*, walled area 9 by 25 feet; *b*, terrace 5 by 25 feet, 1 foot high; *c*, roughly paved area; *d*, section 21 by 30 feet; *e*, terrace 5 by 21 feet, 6 inches high; *f*, platform 11 by 11 feet; *g*, depressions 7 by 7.5 feet, 1 foot deep.

## Site 89. House sites, at Mahaulepu.

The Mahaulepu sand dunes contain some very interesting house sites built on top of the dunes. Most of them are 15 by 15 feet or larger. Some of them have been buried by the sand and are just now being exposed again. One had walls 2 to 3 feet high. Most of the walls only extend on three sides. In two house sites platforms had been made. The slabs used measure 18 to 20 inches. One house site is 20 by 30 feet, another 15 by 10 feet, and another 15 by 15 feet. Many other stones on the dunes must have been brought there by man.

Site 90. Keolewa heiau, on the peak of Haupu. Described by Thrum as "A small heiau dedicated to Laka."

Site 91. Holua slide, on the hill named Puu o Hewa just above Koloa off the main road.

Even from a distance a cross can be seen on this hill. This is said to be an old *holua* slide. It is a round high knoll in the cane field. Quite visible from the Koloa side are two lines crossing just below the middle of the hill and extending clear to the top. (See Pl. VII, C.) These lines on examination are seen to be depressions about 5 feet across and at the most 8 inches deep; nevertheless, they are distinctly discernible. The only thing artificial about this is the regularity of the lines. It hardly is possible to account for them by natural erosion. The lines are about 80 feet apart at the top. On one side there is a flat space at the top as if for a starting point. The bottom part where the artificial work would have been, if any, is unfortunately cut off by the railroad and cane field. No sign of a stone paving remains.

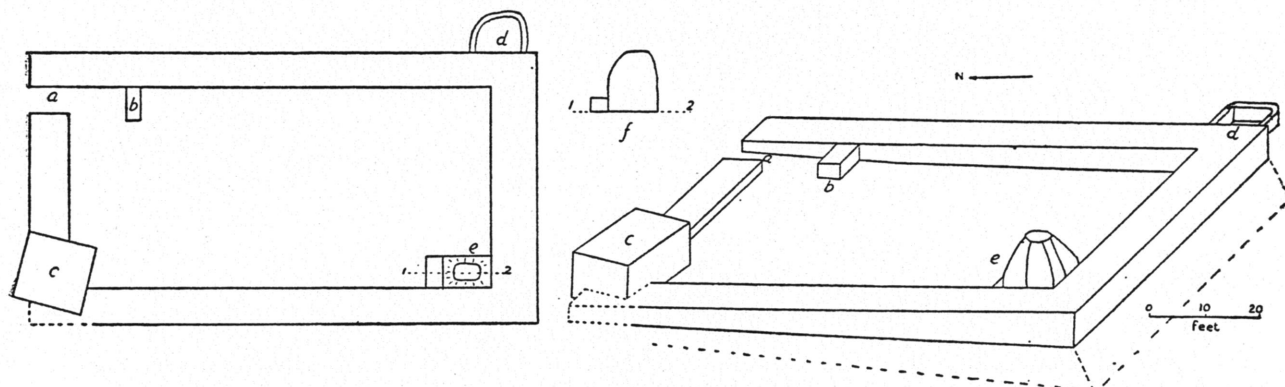


FIGURE 35.—Ground plan and perspective plan of Waipili heiau, Site 87: area 48.5 feet by 90 feet inclosed by walls 7 feet to 8 feet wide, 3 to 4 feet high on the inside, and 4 to 6 feet high on the outside: *a*, entrance, 4 feet wide; *b*, a modern wall; *c*, pile of stones supporting a water tank; *d*, enclosure 6 by 8 feet wide, walls 3 feet high; *e*, stone tower 6 by 9 feet at the base and 11 feet high resting on a platform 3 feet high; *f*, cross section of tower.

Site 92. Kanehaule heiau, at Kaunuieie, Koloa.

The site of Kaunuieie was said to be a small east branch of the Omao stream inland. Thrum describes this heiau as, "A paved, walled enclosure of large size but destroyed. Rites of circumcision were performed here."

Site 93. House sites or heiaus, in the Lihue district.

On the side of the trail that leads to Kipu Kai a short distance up the ridge there is a large two-terraced structure. At the front there is a stone facing 165 feet long and 15 feet wide that is built up 5 feet at the east end, but increases to 10 feet on the west end, due to a little gulch that cuts in there. The platform continues back of this facing 30 feet farther but is loosely paved. At the back edge of the facing near the east end is an upright stone embedded in the ground and standing about 2.5 feet high. The second terrace is 100 feet long, 50 feet deep, and raised 3 feet higher than the first. There is a facing of stone one layer thick but the platform is unpaved. At the back of this is a dirt terrace rising 4 feet and a flat area behind that might be considered as a third terrace.

Site 94. House sites, around Site 93.

Near Site 93 are numerous house sites marked by rows of stones and a 15 by 12 foot flat area on the side of the hill. One structure is composed of a platform 65 feet

long and 45 feet wide. It is built up in front 3 feet and has a solidly paved area for 10 feet back and then loose paving for the rest of the platform. At the west end there is a wall 5 feet wide and 1 foot high. There is a secondary platform on the big one which is unpaved. It measures 45 by 20 feet. It is clearly marked off from the larger one by a loose row of stones which face the 1 to 2 foot rise. At the back of it is a 1-foot rise unfaced.

Site 95. House (*unu*), at the east end of Kipu Kai valley.

A walled inclosure 30 feet wide and 38 feet deep. The east wall is a mass of lava rock but with a definite edge which gives an inside height of 2 feet. The front, or seaward wall is 6 feet wide, 4 feet high on the outside and 2 feet on the inside. The west wall is 3 feet wide. The back wall is 3 feet wide, 3 feet high on the inside, and flush with the ground on the outside. This flat space behind extends back 16 feet and the full width of 30 feet, though it is without definite delineation. There is a low wall running parallel to the shore a short distance in front of this structure, and several regular house sites near it.

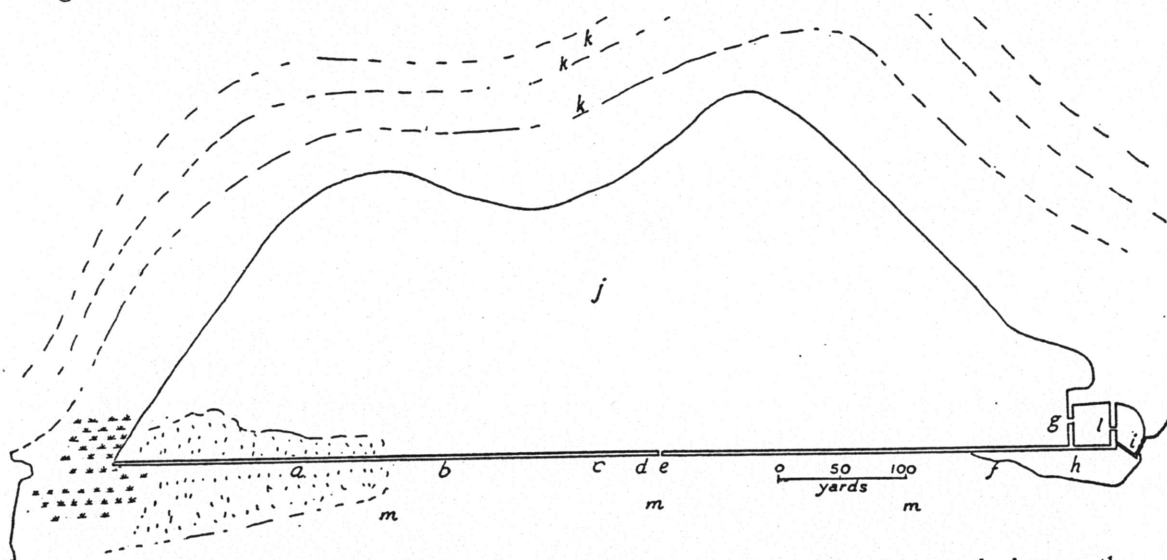


FIGURE 36.—Plan of Niamalu fish pond, Site 98: *a*, beginning of stone facing on the river side; *b*, facing of perpendicular wall two stones thick, 5 feet high; *c*, facing 8 to 9 feet high, though only 3 feet above the river; *d*, facing 3 feet thick; *e*, cemented entrance, probably in the position of the original entrance; *f*, end of stone facing; *g*, modern division wall; *h*, dirt wall, with modern cemented section on inside; *i*, small wall; *j*, fish pond; *k*, contours approximately 50 feet; *l*, modern control gates and walls; *m*, river.

Site 96. House sites and walls, in Kipu Kai on the lower part of the ridges east of the trail.

Innumerable walls. Almost all of the house sites are of the built up terrace type, though some are walled. Some of the walls are 60 feet long in front and quite thick. Much of the stone terracing gives the appearance of taro terraces, but the water problem makes it improbable. Most of this concentrated stonework seems to be functionless.

Site 97. Burials and camp sites at Kipu Kai.

In the dunes along the shore line of Kipu Kai are many burials, camp sites, and many shell heaps. Among the shell heaps were found two cowrie shells with nicely drilled holes in each end for squid lure (C 1591 and C 1592) also a ring poi pounder (C 1589).



Site 98. Fish pond, near the mouth of the Huleia River, Lihue district.

The Niamalu fish pond consists principally of a stone-faced, dirt wall that runs for over 900 yards and cuts off a large bend in the river for use as a fish pond. (See fig. 36.) It is to-day used both for fish and ducks. Cement walls and iron gates have obscured any old method of controlling the water or the fish. Between the west end of the wall and the shore there is 50 yards of shallow and reedy swamp land. The dirt wall runs, unfaced with stones, for 145 yards, whereupon the stone facing starts on the outside. The dirt wall is 5 feet above the water level, 4 feet wide on top, and the dirt slants up on the sides. The facing wall starts with a single row of stones but soon becomes of double thickness as it gets farther out into the river and the current starts to be effective. The stones also become larger until the double layer is 2 feet thick. The stone facing only on the outside, is 5 feet high in most places, and quite perpendicular. The stones are not uniform in size but are fitted together quite well. The stone facing runs only for 588 yards though the dirt wall continues beyond.

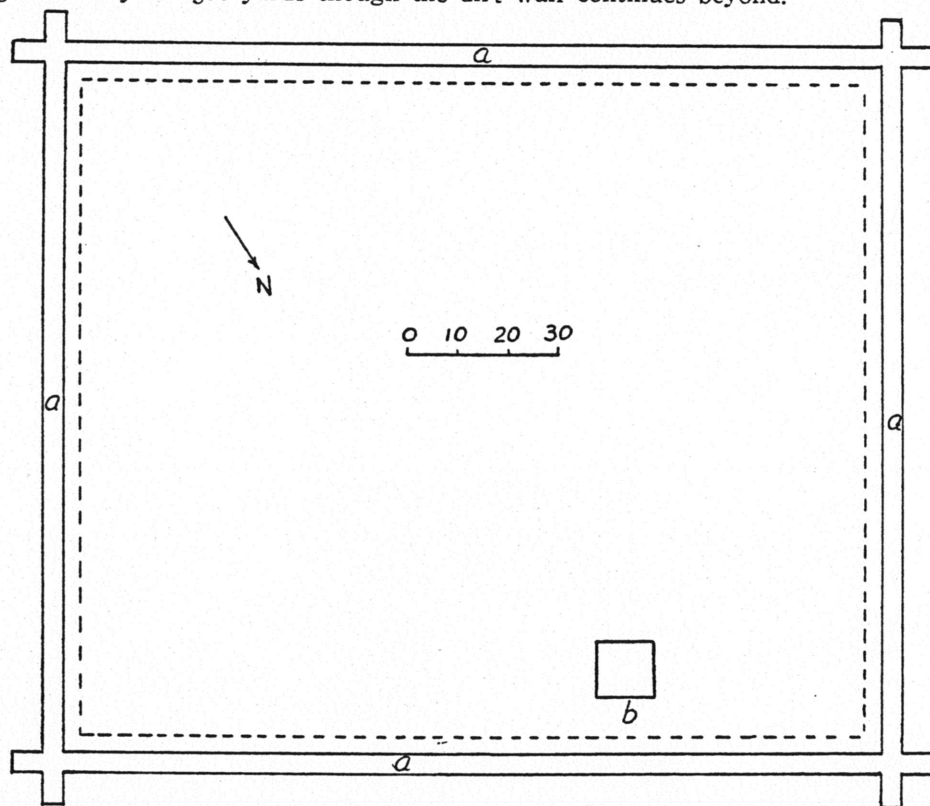


FIGURE 37.—Plan of Malae heiau, Site 104 (after Thrum): *a*, walls 8 feet wide and 7 to 10 feet high; *b*, altar. (The dotted line shows the position of ledge 6 feet wide and 2 feet high.) Note over-lapping or buttressed corners.

Site 99. Kuhiau heiau, at Nawiliwili near the site of the courthouse.

Thrum describes this structure as follows: "A large paved heiau, whose enclosure covered an area of about four acres; long since destroyed. The rock Paukini, now separate from but formerly connected with the shore, was where the kahuna lived. This is said to have been the largest and most famous on Kauai in its day."

Site 100. Ninini heiau, in Kalapaki near the site of the Nawiliwili light house. It is now all destroyed.

Site 101. Ahuhini heiau, in Kalapaki near Ahukini Point on the bluff overlooking the sea. This is now entirely destroyed. Thrum says, "A heiau of medium size; foundations only now remain."

Site 102. Kalauokamanu heiau, in Hanamaulu above the present mill. Described by Thrum as "A large walled heiau that stood above the present mill; destroyed about 1855. Of pookanaka class."

Site 103. Dune burials. In the sand dunes that run along the shore half way between Hanamaulu and Wailua River are many burials.

Site 104. Malae heiau, 40 feet north of the government road a short distance south of the Wailua River.

The site is on a raised area that has a good view of the country. As the walls, greatly modified, are all that remain, Thrum's description is quoted in full and his drawing shown in figure 37. "A walled and paved heiau 273 by 324 feet in size of traditional Menehune construction. The place of its altar is pointed out near the center toward the west wall and around on all sides ran a ledge about six feet wide whereon the people is said to have sat during its ceremonies. The outer walls are yet standing in good order. The corners buttressed with 13-foot walls. [a unique feature] Kapule (Queen Deborah) changed this heiau about 1830, and erected division walls for cattle and calf pens with its inner structures and stone pavements. A portion is now planted to cane." A ledge is said to have extended all around its four walls (similar to the feature noted in Oahu's largest temple) . . . . The companion heiau of Malae was Poliahu situated some little distance from it, further inland, but the two were in plain sight of each other."

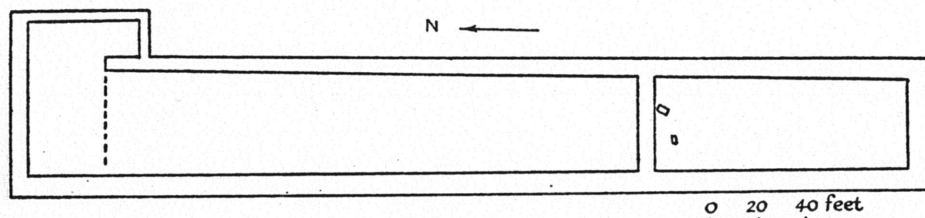


FIGURE 38.—Plan of Hikinaakala heiau, Site 105 (after Thrum): total length 395 feet, width at north end 80 feet, at south end 56 feet, side walls 8 to 9 feet thick and 6 feet high, south end wall 11 feet thick. Two natural stones are in the inner section.

Site 105. Hikinaakala heiau, on the south bank of the Wailua River at the shore.

Thrum describes this structure as follows: "The ruins of this heiau stand along the shore near the south side of the stream (See fig. 38). It shows three distinct divisions, paved; the inner section still in fair condition 120 feet in depth. End and S. E. corner walls are 6 feet high and 11 feet thick, of heavy stones. Two large boulders stand near the middle near the division wall of this section. The outer or front section of 80 feet includes a width that runs back beyond the division wall." "A number of graves mark the middle and outer sections, said to be the remains of an entire family in consequence of their desecrating the temple by living and cultivating within its walls." To-day much of the stone has been removed, reducing the walls to bare outlines, and obliterating the paving entirely. The outer section is also destroyed. The stones remaining show the construction of the walls to have been that of placing large stone slabs on edge in a double row, 8 feet wide, and filling in between with smaller stones. The division between the front and the middle sections is now marked by a rough row of stone that extends 50 feet or more west of the line of the old wall. This is probably later work, an



assumption substantiated by the finding of a stone, the surface of which was used for adz grinding, as part of this wall though in a position impossible for use (Pl. VIII, B). The Kauai Historical Society has called this a place of refuge "Hauola" as well as a heiau.

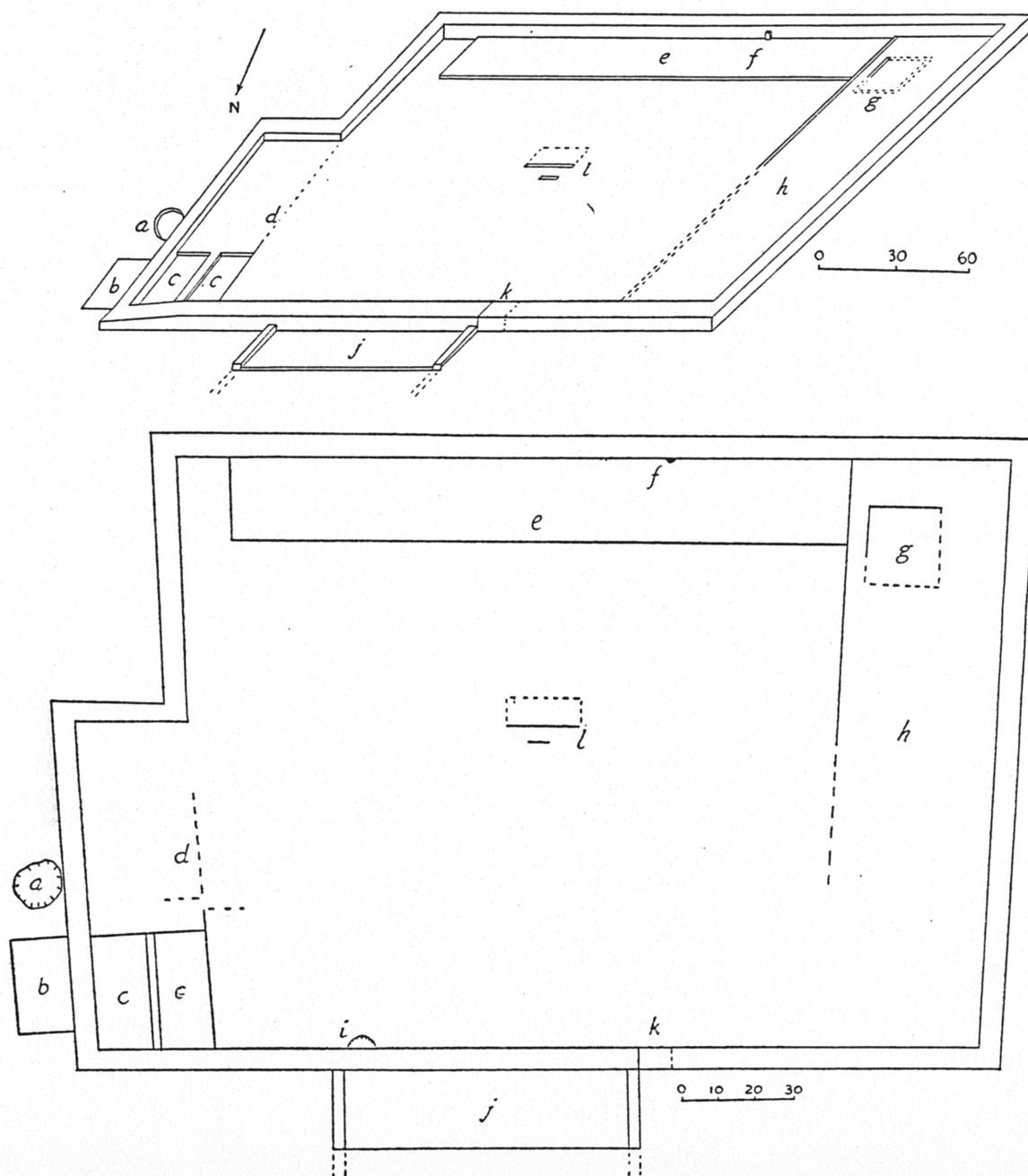


FIGURE 39.—Ground plan and perspective plan of Poliahu heiau, Site 107: *a*, depression 1 to 2 feet deep; *b*, platform 15 by 25 feet; *c*, two depressions each 14 by 30 feet, 1 foot below the level; *d*, lines of stones; *e*, terrace 20 by 162 feet, 1 foot high; *f*, stone slab 2 feet wide, 5 inches thick, and 3 feet high above ground (See Pl. V, B); *g*, rectangle 18 by 20 feet marked by lines of stones, possibly the site of an oracle tower; *h*, platform 42 feet wide and 2 feet high; *i*, depression; *j*, division 20 feet by 78 feet; *k*, old entrance; *l*, outline of house site.

Site 106. Heiau and sacred coconut grove, on the north bank of the Wailua River.

This is a famous coconut grove and birthplace of kings. It was the residence of royalty for many years. The heiau Holoholoku was located inland from this grove. Tradition says that the first drum (*kaeke*) introduced into Hawaii was left here.

Site 107. Poliahu heiau, on the pali between Opaikaa and Wailua rivers just to the seaward side of Opaikaa Falls.

The site commands an excellent view of the valleys below. A detailed drawing of this heiau is shown in figure 39. The heiau is a paved and walled enclosure roughly rectangular with a 30 by 70-foot notch taken out of the southeast corner. The rough measurements are 242 feet in length and 165 feet in width. The walls, though tumbled in many places, still show an original height of 5 to 6 feet and a width of 5 feet. Across the west end is a terrace delineated by a row of stones placed on edge. At the south end of this terrace platform is an indefinitely marked square that was possibly the site of the oracle tower. The site is marked by a row of stones. Along the south side, another terrace, and similarly marked by a row of flat lava stone on edge, runs from the west terrace to within 13 feet of the east wall. At the back of this terrace, is an upright stone. (See Pl. V, B.) firmly set in the ground and leaning against the wall, though not a part of it. Near the center of the heiau two rows of stones running parallel to the long axis of the structure appear to be the markings of a house site. In the northeast corner there are two house divisions separated by division wall of double construction and that might have been much higher than its present one foot. At the east end, outside the wall, there is a platform adjoining the heiau, and just south of it a slightly depressed area. Near the center of the north wall, on the outside, is a large division with a one-foot terrace 1 foot high on the outer edge and walls 3 feet wide and 1 foot high at each end. There is some indication that these two walls continued out farther at one time. Where the west wall of this division joins the main wall, the stones of the main wall seem to be finished off to an end as though for an entry way. The rocks are tumbled so that the other side of such an entrance can not be determined. The paving is well done with large flat lava stones with small pebbles over most of it, except on the west terrace. The outside walls are constructed with large stones and small stones intermixed.

Site 108. Kukui heiau, on the shore north of Wailua River on a point named Lae Alakukui.

This structure is a walled heiau of two divisions apparently an inclosure within an inclosure (fig. 40). The walls are much reduced in size by the removal of rocks. The entire east end can only be determined by traces of the old walls on the inside. Remains of the walls of the eastern division indicate them to have had an original width of about 5 feet on all sides. The west end wall of this section is missing, though a stone or two indicates that it was there at one time. The house site and small wall built out to the west are probably later additions. The outer walls of this section are very thick, and apparently continue so as to include the east division, thus leaving a passageway 4 feet wide between the outside of the east section wall and the inside of the thick wall. The thick north wall measures 11 feet across and is apparently in two steps of 6 feet and 5 feet respectively. The sea wall is 16 feet to 22 feet across, and is built up in tiers (fig. 40, e) of great slabs of lava set on edge and filled around with smaller stone. Some tremendous stones are used. On the north side of the north passageway the wall is made of 3 to 5-foot flat stones on edge, and the same was true of the south passageway. Where these passages led to, or whether the east section was entirely encompassed within the larger one, cannot be determined now. To-day there is no paving, but Thrum says that there was one.

Site 109. Heiau, on the north bluff of the Wailua River in the cane field a mile from the sea.

The site is near the bank of a small stream and completely covered by the cane field. Stones have been added to the walls. The structure is irregular in shape, though one wall is 165 feet long and another is 66 feet long. There are some room divisions at one end but they look modern. The walls are 4 feet high and the width cannot be determined.

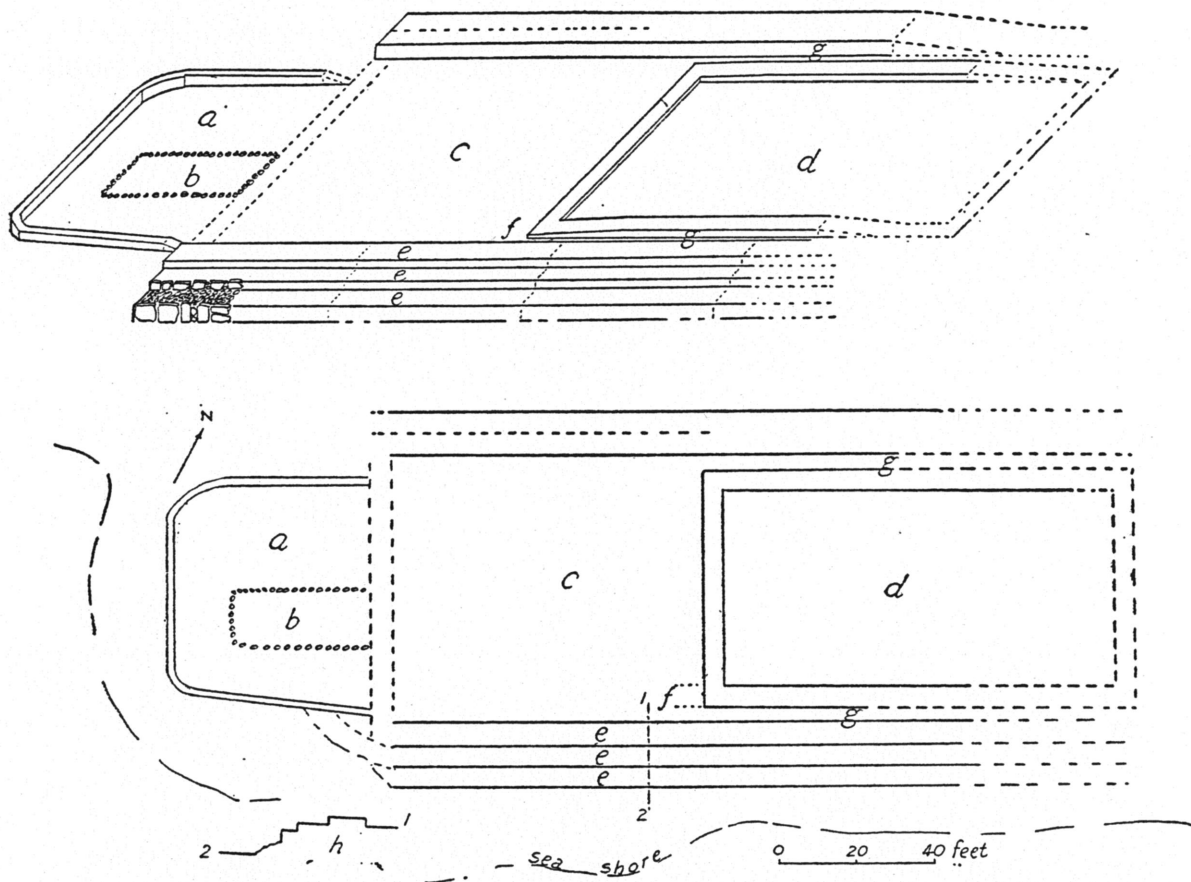


FIGURE 40.—Ground plan and perspective plan of Kukui heiau, Site 108, showing in the cross section the step construction of the sea wall and sides of the passageway faced with large slabs on edge: *a*, division 50 feet wide; *b*, house site; *c*, western division 68 by 80 feet; *d*, eastern division, 50 by 100 feet; *e*, steps, 3 feet, 2 feet, and 2 feet high, and 10 feet, 8 feet, and 4 feet wide as measured from the bottom up; *f*, possible continuation of side wall of inner inclosure; *g*, passage ways; *h*, cross section.

Site 110. Taro terraces and bowl, back of the Kapa homesteads.

In the foothills of the mountains are many little valleys which contain taro terraces. Single rows of stone mark the divisions with some 2-foot terraces. Under a large mango tree was found a bowl (p. 73).

Site 111. Ditch, south of the Kealia Valley, inland.

A large, simple dirt ditch, about 6 feet in width and of varying depths which is traditionally referred to as a Hawaiian ditch. The interesting part is a deep cut about 100



feet long made through a low ridge alongside of which the ditch ran. The lands to be irrigated were on the other side of this ridge and so the cut was made to a depth of 10 or 15 feet through loose rock and subsoil.

Site 112. Kawelomamaia heiau, said to have been located where the Kawelomamaia stream runs into the sea north of Kealia. Described by Thrum as "Kawalo's heiau dedicated to his shark god; of pookanaka class. Foundations traceable."

Site 113. Aikanaka heiau, at Anahola Point near the end of the bluff on the south side of the bay. Described by Thrum as "A small heiau, about 40 feet in size. All destroyed." One large rock marks the spot of this heiau in the cane field.

Site 114. Paeaea heiau, back of Anahola bay inland from the government road on the north side of the valley, a low site that gives a poor view of the country. Described by Thrum as "A small round heiau, walls 8 feet high not thick; class not known."

Site 115. Kuhua heiau, on the edge of the north bluff of Anahola Valley, about half way between the government road and the sea bluff. It has an excellent view of the valley. The site is now marked by a few tumbled walls in a pineapple field.

Site 116. Dune burials, in the dunes around Anahola bay many bones that have been found as burials have been uncovered by the shifting sand.

Site 117. Taro terraces, the inland part of Anahola Valley has the usual taro lines, though the edges of the valley are too steep for much cultivation. On the flats near the mouth of the valley, taro is still grown.

Site 118. Walled enclosure, in Aliomanu, directly back of the field 10 pineapple road, just within the forest line.

This structure extends between two "shower trees," and a square walled inclosure 119 by 119 feet, unpaved, with an entrance 7 feet wide on the sea side, right in the center of the seaward walls. The crumbly walls are 4 feet high and wide and made of river and mountain stones. It was probably a cattle corral. The country both ways from this walled enclosure has occasional stone walls and terraced house sites.

Site 119. Kaluakehulu heiau, at the base of Kahahei pali, (the first pali south of the south branch of Papaa stream, (inland marked with red dirt on top).

Thrum describes this heiau as, "A large L-shaped heiau with thick high walls at the base of Kahahei pali; still standing." There are in the pineapple fields some walls said to be very old. One is 40 feet long, and the other runs about 80 feet perpendicular to it.

Site 120. Pohakuokalani heiau, probably on the talus slopes back of the pineapple fields, just north of Kahahei pali (Site 119).

The site is fairly well raised so as to have an extensive view. It is a single-terrace platform heiau with partly crumbled walls (fig. 41). The north edge is built up 8 feet

near the front, but only 4 feet at the back, due to the rising slope of the ground. The platform is level. To the south the ground is on a level with the platform for quite a ways. At the south edge there is a side wall 3 feet wide that begins a short way back from the front edge, and increases in height from 1 to 2 feet. Across the back there is a terrace 2 feet high faced with stones, that extends beyond the heiau to the south for 18 feet, and serves as a front for house sites. The south side wall does not quite meet this terrace but leaves a passage; 15 feet south of the side-wall are two house sites, with stone faced terraces, 5 feet wide on their front and north sides. They are located one behind the other and the north terrace wall meets the extension of the back terrace of the heiau.

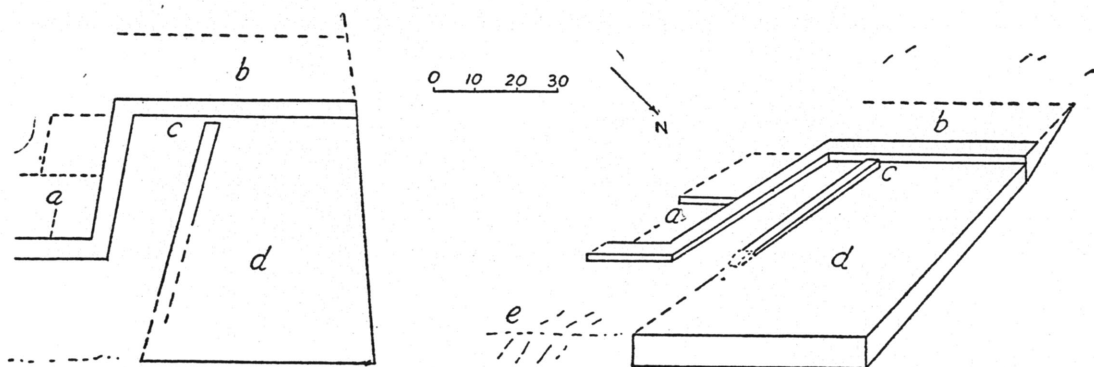


FIGURE 41.—Ground plan and perspective plan of Pohakuokalani heiau, Site 120: *a*, house sites on stone faced terraces 2 feet high; *b*, terrace for house sites; *c*, passage 2 feet wide; *d*, platform 37 to 57 feet wide, 60 feet deep, 8 feet high at the front, 4 feet at the back; *e*, natural bluff.

Site 121. Walled enclosure, in the pineapple fields half way between the forest line and the government road, on the first main branch of Papaa stream to the south.

This enclosure measures 132 by 236 feet with walls 3 feet wide and 2 to 3 feet high. The pineapples grow in and around it and many of the stones have been recently uncovered.

Site 122. Taro terraces, oven, and house sites, around the heiau described in Site 123.

The general plan of this little valley includes the heiau, an oven, stone walls, some house sites, taro terraces, and ditches. One ditch seems to have come from a small reservoir, 25 by 15 feet, blocked with stones. It is not large enough to hold any great supply of water. The ditch is unlined and shallow and about 3 feet across. The other ditch line comes from the end of an L-shaped wall and is lined with stones, not regularly now, but apparently so at one time. The L-shaped wall cuts across the stream and seems to have been used to direct the course of the water into the ditch. It is built of modern split stone. The taro terraces are single lines of fairly good-sized stones. The oven stands over 6 feet high, built of large, roughly hewn stone. The stones overlap and are chinked to make the top part arch over, but are of one thickness only. There is an opening on the stream side. The oven probably is not very old.

Site 123. Heiau, within the forest line on one of the north branches of Papaa stream.



In a valley called Kihe (back of pineapple field number 3) is the heiau shown in figure 42. It consists of two divisions: the lower division is a dirt-paved structure with walls adjusted to the slope of the ground. The north or seaward wall is 5 feet wide and 3 feet high on the inside, and 10 feet high on the outside. The south wall, extending for 20 feet with a height of 5 feet on the inside, continues westward and in from the east side for 20 feet, and from there on a foot stone-faced terrace 4 feet high marks the front edge of the upper division. The west wall of the lower division, 5 feet wide and 3 feet high, is built up on the outside as three steps. The lowest step continues around the corner and extends along the front side of the heiau without change in height; the two lower steps extend along the western side of the structure to an indefinite termination. The second division of the heiau, 4 feet above the first division, is surrounded by walls 2 feet wide, 4 feet high on the inside, and heights on the outside determined by the slope of the ground; like the lower division it has no stone paving. Three poorly paved rooms inside the lower section are divided by walls 2 to 3 feet high and about 1.5 feet wide. Facing the sea in front of the northwest corner of the heiau is a paved house platform and a house site, outlined with a single row of stones, both of which are connected by a rocky slope to the lowest step of the heiau walls. Off the northwest corner of the heiau is the oven described under Site 122.

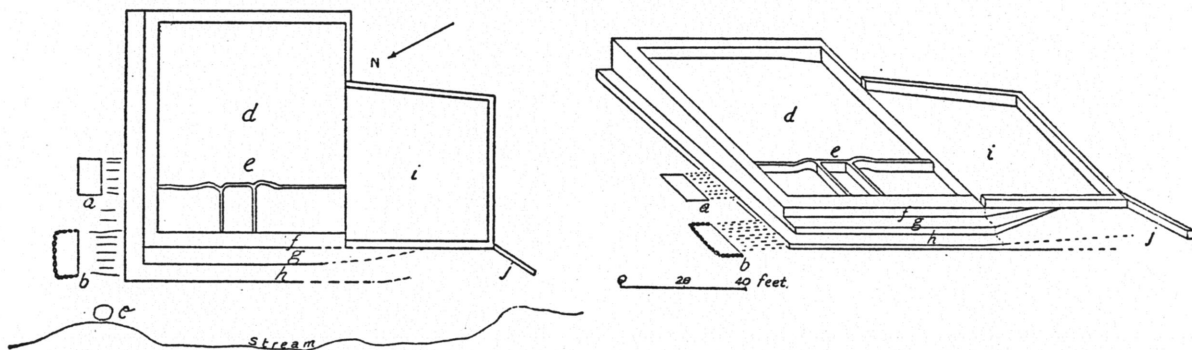


FIGURE 42.—Ground plan and perspective plan of Kihe heiau, Site 123: *a*, paved house platform 8 by 10 feet; *b*, house site 8 by 15 feet outlined by a line of stones; *c*, oven; *d*, division 60 by 68 feet inside; *e*, three rooms 14 feet wide and 9 to 28 feet long; *f*, wall 3 feet high, 5 feet wide; *g*, step 2 feet high, 5 feet wide; *h*, step 1 foot high, 5 feet wide; *i*, division 46 by 46 feet; *j*, modern wall.

Site 124. Papaa heiau, at Kawaipapa, Papaa at the junction of a side road and the government highway.

Thrum describes this as, "A walled heiau 60 by 80 feet in size; Kamohoalii its deity." It had been converted into a cattle pen and the internal divisions destroyed. It is of irregular shape with an entryway cut in the wall facing inland. The walls have been restored as shown by the split stone found all through them. The corners are square. The regular walls are 5 feet wide and about 4 feet high.

Site 125. Puwouwou heiau, on top of the hill mapped as "Puu Auau." The heiau has been completely removed and the hill planted to pineapples. Some say this was a place of refuge.

Site 126. Kapuaa heiau, behind the present Japanese school in Lepeuli section.

This heiau is described by Thrum as: "A round heiau 50 feet in diameter, paved, walls 4 feet high; still to be seen. Class unknown." The site is said to have been on

a small knoll a few hundred feet behind the school. There is nothing left here now, but had the heiau followed the contour of the knoll it would have to have been round.

Site 127. Hauluolono heiau, at Waipake, Pilaa, and that Waipake a stream that ran along its eastern end. The heiau is said to have been somewhere along the main highway, in a large kukui grove. Thrum describes it as "A walled and paved heiau of about 40 feet square; all destroyed. Foundations traceable."

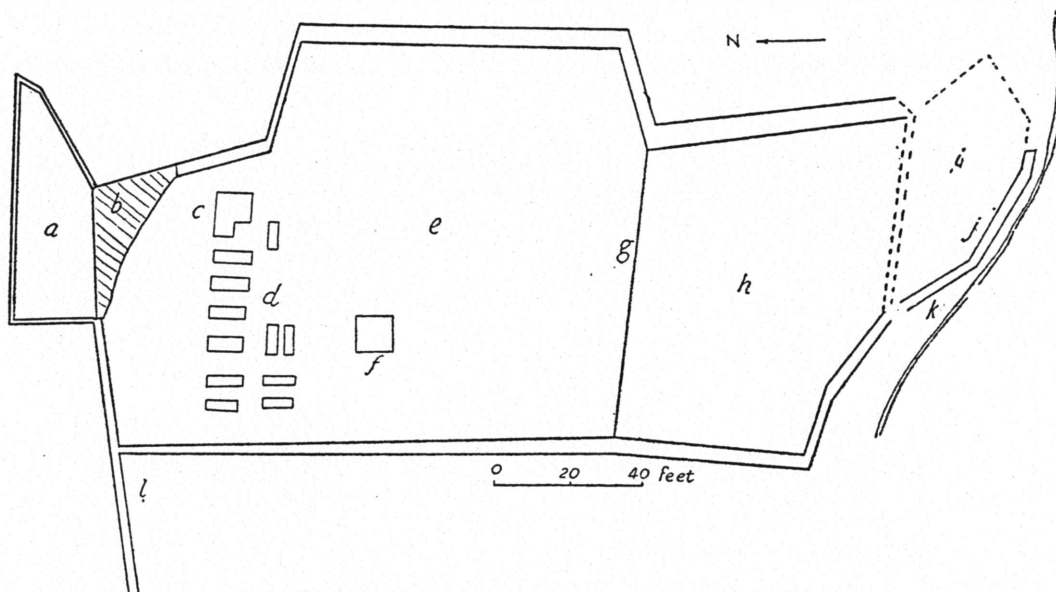


FIGURE 43.—Plan of Kapinao heiau, Site 129: *a*, enclosure about 30 feet by 65 feet; *b*, paved area; *c*, grave 9 by 9 feet; *d*, 11 graves, each 4 by 9 feet; *e*, lower section approximating 100 by 132 feet; *f*, paved platform 10 by 10 feet, 1.5 feet high; *g*, edge of terrace 2 feet high forming division wall; *h*, upper section originally about 66 by 75 feet; *i*, flat unpaved area; *j*, wall facing a modern ditch; *k*, old plantation ditch; *l*, poorly built extension of front wall. The double dotted line marks the probable position of the old wall.

Site 128. Kapuna heiau, in Pilaa section, a road to the west of a road running up to Kamoku and a bit toward the shore from the railroad track is the location given for this heiau.

Thrum describes it as, "About 100 by 200 feet in size, paved, walls breast high, still to be seen." In a bamboo grove there are many stones in little order, that probably represent the heiau.

Site 129. Kapinao heiau, in Waiakalua Valley.

Thrum describes this as "A large heiau of about 200 by 400 feet, high walled and stone paved. Still in existence. Of pookanaka class." It is probably the same as that described in detail by Meyers (42 *a*, pp. 41-2). The location of two such large heiaus in East Waiakalua Valley is improbable, and the valley has had no recent use that would destroy any large structure. The heiau shown in figure 43 is located at the head of East Waiakulua Valley just above the waterfall and is situated on a knoll of irregular shape, and is, of consequence, also irregular in outline. It consists principally of two sections running almost directly north and south; the lower, or north section is a

seven-sided structure unpaved except for a small triangular area on the north side which is solidly set with stones. The western wall of this section is flush with the ground on the inside, 5 to 8 feet high on the outside and 3 to 5 feet wide. The eastern wall is 3 feet high on the inside, 5 feet on the outside and 3 feet wide. The upper or south division 2 feet higher than the north division is not clearly marked because the back part of it has been disturbed in constructing an irrigation ditch. Meyers gives the measurements of this section as 66 by 75 feet. The east wall can now be traced back for about 60 feet and the west wall for about 50 feet, but the position and length of the back wall is now undeterminable. The south section is paved with large flat stones. Across the front side of the north section run two rows of stone-covered plots that appear to be graves. Their height is that of one layer of stone. Two of these have upright stones at their north ends. The northeast end of the heiau is an area bounded by a 3-foot wall that appears to have been recently built.

Site 130. Taro terraces, in East Waiakalua and West Waiakalua valleys.

These terraces are still well preserved and taro is still growing along the edges of the streams. Some of the highest terraces may have been used as house sites though nothing distinguishes the work from the lower stone facing. The terracing walls are of loose construction; on low places merely a single line of stone, while in the steeper places the walls rise to the height of 3 to 4 feet, usually just a single facing of stone with the dirt flush at the top. Some of the terraces are not faced with stone. Some of the patches on the beach seem merely depressions with dirt walls between.

Site 131. House sites, in East Waiakalua and West Waiakalua valleys and on the ridge between.

In the east valley one house site measures 20 by 15 feet with 2-foot walls on all four sides. The house sites on the ridge are made of large stones in line with flat areas behind. Two connected sites measure 40 and 30 feet and are 15 feet deep. One single site below measures 38 by 15 feet.

Site 132. Kipapa heiau, on the end of the first bluff east of Kilauea River in Kahili section. Described by Thrum as "A large heiau of some 300 by over 100 feet in size, paved, walls five feet high, standing in cane field in partial ruins." Since that time the stones have been removed.

Site 133. Pailio heiau, in the cane fields shoreward of Kilauea. The site does not have a view of the river valley. Thrum says that it was, "A round heiau of about 100 feet diameter: class unknown. Site covered in cane field." Nothing remains of the heiau to-day.

Site 134. Kalahihi heiau, on the east side of Kalihiwai valley on the bluff shoreward of the government road just before it turns down into the valley.

Thrum states: "Of pookanaka class. Foundations only remain, indicating it as of large size." Nothing but a few stones in the cane fields marked the site pointed out for this heiau, and as the situation was a poor one, it is possible that the location is not correct.

Site 135. Kauonoli heiau, on the east bluff of Kalihiwai valley on a little mound, near a bend in the Puukumu stream. Thrum says, "Destroyed years ago after used as a cattle pen." No rocks now remain.



Site 136. Kaihalulu heiau, said to have been located on the hill just inland from the government road where it turns to go down into Kalihiwai valley on the eastern side. Thrum describes it as "A small, high-walled heiau of pookanaka class dedicated to Kane and Kanaloa. Destroyed years ago to help build a mill." The site as pointed out has a fine view of the valley.

Site 137. Kihei heiau, on the east side of Kalihiwai valley just below a waterfall.

This heiau measures 50 by 20 feet and is built up 5.5 feet at the front while the back is against the base of a bluff and faced for 4 feet on the inland end. At the back is an 8-foot extension built up 8 feet high, but only 3 feet wide. No paving remains and the walls are of broken stones that look recent. Thrum describes it as, "A small heiau built by a chief of same name. Its walls were 8 feet high, and at his death its paving was removed and he was buried in his canoe in the enclosure."

Site 138. Maheu heiau, on Puu Maheu, Kalihikai, is a paved platform 18 by 21 feet on top of Maheu peak. There is a fine view of the valley and country all around. River stone as well as local rock is used in its paving.

Site 139. Pooku heiau, on the east bluff of Hanalei valley a short distance from the government road on a knoll marked on the map as "Pooku."

Only a few stones remain to mark the location of this heiau which Thrum describes as "An unenclosed heiau of about two acres in area. Of luakini class, terraced down on all sides from the central platform."

Site 140. Kapaka heiau, on top of Kapaka hill on the east bluff of Hanalei valley just within the forest line.

Thrum describes this structure as "A paved open platform heiau without walls; stones set edgewise traversing through. Kane its deity. Said to have had connection with Kapinao at Waiakalua in its workings." This site has had many stones removed, or covered over with vegetation. The river stones seem to cover the top of the hill for a diameter of about 75 feet. The extent of the heiau could not be accurately determined. The stones set edgewise traversing through could not be found.

Site 141. Heiau and house sites, at Kalama-iki, an old village on the river flats, four miles up Hanalei Valley.

There is a stone structure 18 by 20 feet with walls all around 2.5 feet wide and 2 feet high. In front is a paved section extending 5 feet, like a lanai, to a drop of 4 feet of the river terrace. The river is 50 feet out in front. Both river stones and rough rocks were used, but no coral was seen. The wall was chinked with smaller stones in front. Taro terraces and house sites are on the plains along the river.

Site 142. Kaapoku heiau, inland from Site 141 in Hanalei Valley. This small shrine consists of a paved platform 18 by 20 feet made of rough stones. A village was across the stream.

Site 143. Ditch and house sites, across the river from Site 142 in Hanalei Valley.

Site also includes taro terraces and a ditch that runs from 0.5 mile or so up the stream to water this plain. The water comes through a big rock which is conveniently

cracked. The legend runs, that Pele sent lightning to split the rock so that the people could get the water down to the fields. Upstream from here a large, overhanging rock forms a natural shelter. It has been built up along the front a bit. The house sites of the solidly paved type, as well as those merely outlined with stones, are found.

Site 144. Kupakoili heiau, on the west side of the pali west of Waioli stream, not far from the sea. Thrum says, "Reported as a small heiau, probably simply a place of offering."

Site 145. Nakikoniawalaau heiau, in Waioli Uka. Thrum describes it as "An open, paved space, not large, dedicated to Laka, to which offerings at the annual festival were brought."

Site 146. Halaloa heiau, at the end of a little road running up on the east side of Waipa stream, at the site of an old rice mill. Thrum describes it as "A square heiau of about 80 feet in size, with low walls. Kane its deity. Destroyed years ago for mill site." Nothing remains now but a few stones scattered about.

Site 147. Kailiopaia heiau, shoreward of the government road, to the east of the Lumahae stream on a raised coral point. Nothing remains.

Site 148. Heiau on Popoki knoll. Popoki knoll is located next to the road (inland side) in front of Site 149 near the Wainiha river. It is said to have been a heiau site, but nothing remains to mark it.

Site 149. Kaunupepeiao heiau, back of the first house on the first pali east of the mouth of the Wainiha river. A flat place about 30 feet wide and 20 feet deep with stones along the front edge meet the description given by Thrum: "A 12-foot open-paved heiau of husbandry class; probably simply a place of offering."

Site 150. Laumaki heiau, on a knoll west of the "Power House" road, about one mile from the government road, in Wainiha valley. Thrum describes this heiau as "A small, open platform, paved heiau, 2 feet high, of husbandry class." The platform measures 20 feet wide and 10 feet deep and faces the sea. It is paved with river stone.

Site 151. Apaukalea heiau, adjoining the "Power House" road on the east side, inland from Site 150 in Wainiha valley.

The remains of recent occupation together with modern stone platforms, walks, graves with tombstones, and other such work, make the distinction of this heiau difficult. The heiau consists of a small, square, paved area about 35 feet on a side. The east wall is 15 feet wide, and badly tumbled on the outside, though 3 feet high on the inside. The north wall is irregular, about 15 feet wide, and 2 feet high. A projection inwards forms a platform 10 by 15 feet. The west wall is just a trace of stone, but seems to have been 15 feet wide. The south wall is of varying width and runs from the road to the bluff, a distance of 130 feet. It is about 3 feet high. To the west of this enclosure is a flat space with two lines of stone traversing it, while on the east are two paved house sites about 10 feet square.



Site 152. Taro terraces, about one mile above the Wainiha power house on the intake trail.

This interesting taro section is high on the side of the valley utilizing a little stream and a small flat area. The hill is on one side and the stream and a bluff on the other, leaving a fairly steep section in between. At one place above the terraces stones are built across the stream as an intake, which could, with the addition of a few more stones, shunt the water into a ditch which runs between large rocks and dirt walls. All along the edge of the stream is a wall built to keep the water from running back. The terraces are from 6 inches to 3 feet high.

Site 153. House sites, on Mauna Hina ridge in Wainiha Valley. Remains of many old house sites and much irrigated land. The house sites are mostly of the terraced type and 10 to 15 feet wide.

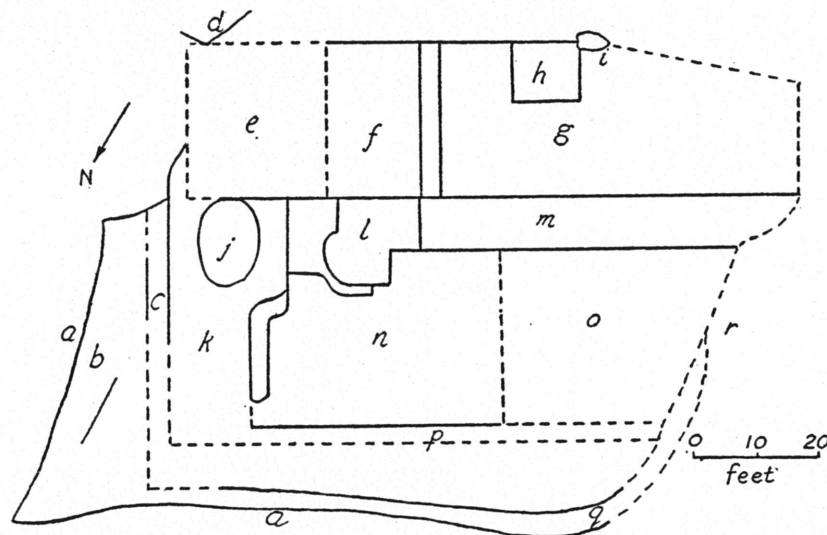


FIGURE 44.—Plan of Kaulaupaoa heiau, Kee, Haena, Site 154 (after Emory): *a*, original facing; *b*, path (?); *c*, step; *d*, terrace; *e*, *f*, and *g*, sections of the upper terrace; *h*, platform 1.5 feet high; *i*, rock in place; *j*, pit 5 feet deep; *k*, sloping ground; *l* and *m*, sections of a paved terrace; *n* and *o*, sections of main terrace paved with large stones; *p*, slope; *q*, slope of terrace facing; *r*, bluff.

Site 154. Kauluapaoa heiau at Kee, Haena, at the end of the government road.

This heiau was thoroughly studied by Emory (21) whose description and plan are here reproduced (fig. 44). "The plan of this heiau structure is an unenclosed stone terrace, approximately one hundred feet long and sixty feet wide. It appears to have been built up twenty feet at the highest corner. The end of the ridge has been little more than faced (on the front and on the most conspicuous side) with large, unworked, field and beach stones. The other side is bounded by a bluff. The retaining wall towards the sea is almost vertical, but that towards Haena village to the east slopes so gradually as to almost allow one to walk up it. Although much of the retaining wall has been dislodged, a great part of the lower facing of the seaward wall is intact, and a portion of the east wall. It is quite possible that the east retaining wall rose originally in two or three narrow terraces. Or possibly a pathway led up to the heiau platform from this side. The stones of the facing are of rather uniform size. The average a foot in diameter, and are laid up with care. The top of the heiau ruin is divided off by different

levels, different pavements, and by two disconnected short walls. The first section to be considered is the front part of the terrace, bounded on the east by a rough wall not more than three feet thick and three feet high, and bounded on the west by a bluff, and at the back by a terrace a foot higher. The area is paved with large stones. The eastern half is much more evenly paved than the western, and is rather sharply marked off from the latter by being a foot higher. Flat stones as large as 2 by 3 by 1 feet are conspicuous in the pavement of the eastern division. There, also, are indications of holes in which house posts or the bases of images were probably set. The low wall may not be of ancient origin; at least the several uppermost courses have been added or replaced very lately, as evidenced by the fresh, unweathered surfaces exposed in them. This corner is now used by native fishermen as an observation station. On the outer side of the wall is a large pit, 12 by 15 feet and 2 to 5 feet deep, a rough, unlined depression, undoubtedly the refuse pit for the decomposed remains of offerings. The low stone terrace extending across the rear of the front terrace is itself divided into three parts. The eastern end is a step six inches above the main floor and six inches below the rest of the terrace. The middle pavement is the most even and the finest of the heiau. It is natural to suppose the temple tower of scaffolding, the *lana-nuu-mamao*, stood here. This tower in most heiaus stood at one end, near if not over the refuse pit, and occupied a square about the size of this pavement. The western division of the terrace is more roughly paved than the middle section. A third terrace rises back of the second and extends from one end to the other of the structure. It is nowhere more than a foot higher than the second; in fact, the middle section of the last is flush with it. This upper terrace is divided about equally by a wall which is three feet high in front and a foot high at the rear end. The wall appears to have been built on the terrace at the time of its erection, as the terrace fill overlaps the wall. The western half of the upper terrace is unpaved. About midway between the ends against the back of it is a solid stone platform 10 by 12 feet and 18 inches high. The stones with which the top is dressed average a foot in diameter. The eastern half of the upper terrace is also divided by being a foot lower. A loose, low, shapeless wall at present lies partly along this division, but it looks as if it had been heaped up with stones taken from the original pavement, which hereabouts is much disrupted.

Site 155. Lohiau's dancing pavilion and shrine, Kee, Haena (fig. 45).

Emory (21, p. 93) describes these structures as follows: "At the upper end of the slope above the heiau [Site 154] and against the base of the cliff are two successive, wide and low terraces [fig. 45]. The first is almost entirely natural, the front being a line of boulders and the top the natural, rocky slope, except for some stone filling along the front. The upper terrace, however, is entirely artificial. It is faced with a single course of large stones (averaging 1 by 2.5 by 3 feet), leveled with earth. On this, presumably, stood the *halau* or long building, open at least at both ends, in which dances were performed before the *kuahu* or altar to Laka, a simple frame decorated with leaves. . . . The eastern end of the earth-filled terrace is a little lower and slopes down as if forming a separated division. This end is faced with a wall four feet high which curves outward toward the back, forming the face of a short wing constructed entirely of stone. A few feet back of the level terrace rises the bluff. A small, rough platform stands against it, possibly a grave. On the lower ledges of the bluff lie numerous stones placed on bits of grass skirts, and anklets, and on remains of fern and hala wreaths; offerings to Laka. Wedged in a crevice with a small stone, I discovered a lock of human hair five inches long and loosely braided. There can be no doubt that this practice of placing offerings here has kept up until recent years, and probably to the present, as natives have been known to make a pilgrimage to this site after a hula performance to offer some trinket."

Site 156. House site or heiau of Lohiau, Haena, Kauai, at end of government road.

The following description is quoted from Emory (21, p. 94) (See Pl. VI, B.) "The house site or heiau of Lohiau is a stone faced, earth and stone filled, unpaved terrace 80 feet long and 8.5 feet high at its highest part. It is built across a swale at the base of the bluff, just where the road ends. From the front of the terrace to the bluff, a distance of 54 feet, is level ground. The facing wall is unusually even for a Hawaiian wall. It is almost perpendicular, in addition to being quite straight. In 8.5 feet the wall slopes in one foot from the perpendicular. The construction is characterized by the selection of large stones, with a flat smooth face, which are exposed in the wall and supported in some instances by the comparatively small stones placed in the interstices. None of the stones show indication of having been artificially shaped."

Site 157. Hanakapiai Valley has the usual taro and house markings together with some paving near the sea shore of indefinite nature and extent.

Site 158. Hanakoa Valley had a coffee plantation in it at one time and most of the stone work seems to have been in connection with it. Farther down in the valley there are places that indicate house sites and taro patches.

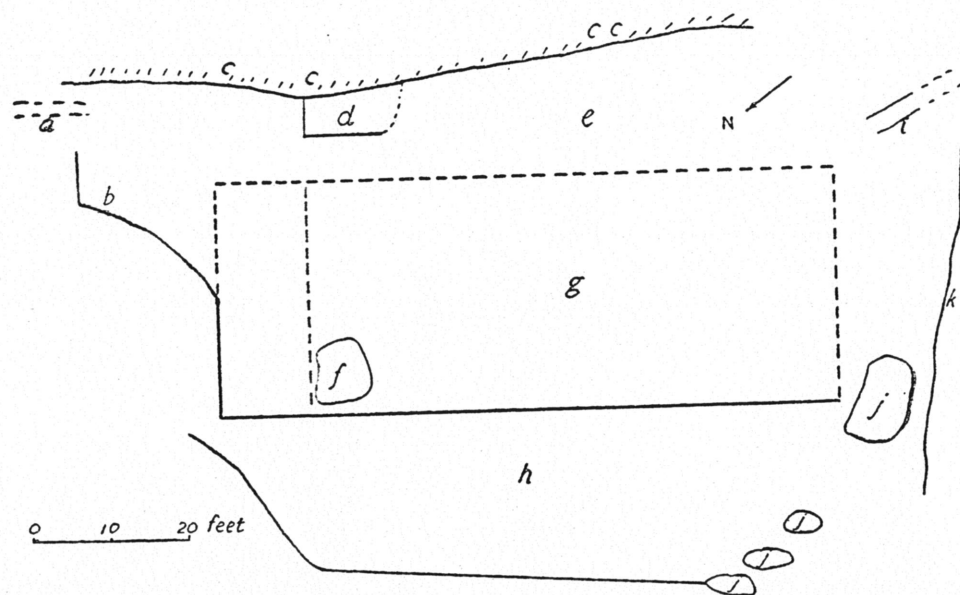


FIGURE 45.—Plan of Lohiau's dancing pavilion and shrine, Site 155 (after Emory-21): *a*, pathway; *b*, stone terrace with wall 4 feet high; *c*, places along line of cliff where offerings to Lake were found; *d*, platform 3 feet high; *e*, rocky, steep slope; *f*, recently built cairn; *g*, earth-filled platform 30 by 90 feet; *h*, gentle, uneven slope, roughly paved; *i*, trail to water; *j*, rock; *k*, bluff.

Site 159. Pohakuao flats has terraces and walls that seem to be house sites or pig pens. Other little valleys with permanent streams have a few taro lines when possible.



Site 160. Heiau, on the east bluff of the Kalalau stream at the sea.

This large stone structure looks like a heiau (fig. 46). It is a narrow, rectangular structure 186 feet along the sea side and 75 feet wide. The wide front wall is flush with the ground on the inside. It is built of large stones, at the edge, with little stones for a fill and paved on the top with big, flat stones and small pebbles. The east end wall, 3 feet wide, is constructed with a double row of stones filled in between with smaller stones. The outside facing is consistently one row higher than the inside, which may be due to the way it has fallen in. Along the inside of this wall is a stone-paved terrace marked by a row of stone on edge at the front. Its back wall is 3 to 4 feet high, is badly fallen, and the west end wall is missing except for a stone or two. The paving does not seem to extend over the whole structure. Back of the heiau are taro terraces; some of large size with 4-foot walls. To the east is a shallow depression containing taro lines. Along the river bluff to the west is a large rock naturally hollowed on top as if for a sacrificial basin.

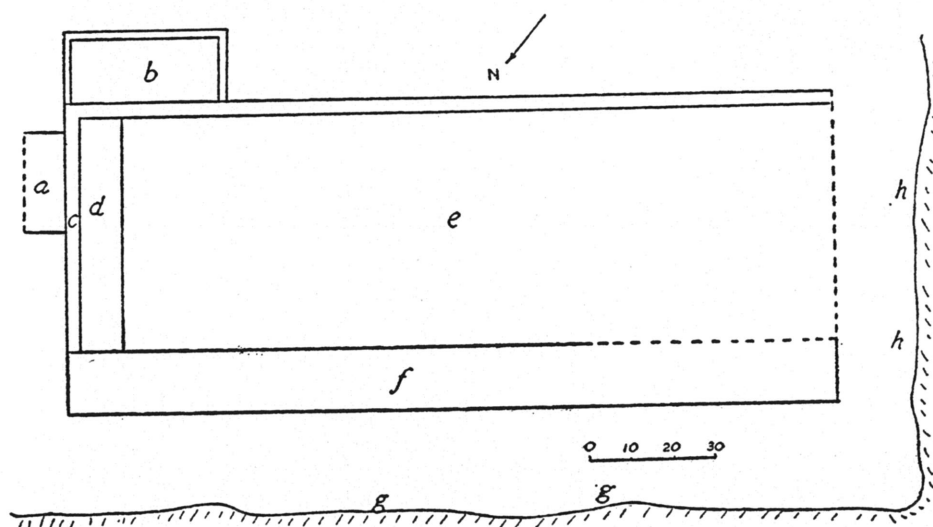


FIGURE 46.—Ground plan of Kalalau heiau or house, Site 160: *a*, house site on terrace 10 by 25 feet, 1 foot high; *b*, enclosure 18 by 35 feet with walls 2 feet thick and 3 feet high; *c*, wall 3 to 4 feet high; *d*, terrace 10 feet wide, 2 feet high; *e*, unpaved level area approximately 60 feet by 164 feet; *f*, front wall 15 feet wide, 34 feet high on outside, level with ground on inside; *g*, bluff facing the sea; *h*, bluff facing Kalalau stream.

Site 161. House site, Kalalau Valley, on the first rise east of Site 160, still on the sea bluff, and just west of Kala Triangulation Station.

This specialized house site (fig. 47) is 49 by 25 feet and walled on three sides, the seaward side excepted. The back wall is 4 feet wide and 3 feet high. The side walls are 3 feet wide and 3 feet high, except the front part of the west wall which drops to 1 foot in height. Large boulders are utilized in the walls. The front edge is built up 2 feet in height. Towards the center a division is marked by a 1-foot rise. At the back of the inner section is a platform, raised 1 foot and paved with stones about 6 inches in diameter except for about 3 feet on each side. In front of this house site there are two or three lines of terraces extending to the ocean bluff.



Site 162. Pens, house sites, and taro terraces, Kalalau Valley, inland from Site 160.

A short distance seaward of a frame house located on the government map is a 30-foot circle enclosed by a wall 3 feet high and mostly just one stone thick. In the little depression to the west of this house are taro terraces, some 3 feet high. On the rocky rise west of this depression there is a double pen made by connecting 6 large boulders with narrow walls 3 feet high. The boulders are from 10 to 25 feet apart. A division wall makes this a double pen. 50 feet seaward is a large enclosure, irregular in shape, about 80 feet at one end, 30 at the other, and 80 feet long. Within it are remains of old taro lines which would indicate that it was a later structure for the purpose of a cattle corral, though the walls are not very thick. A zigzag wall runs from the shore corner of this enclosure to the sea bluff.

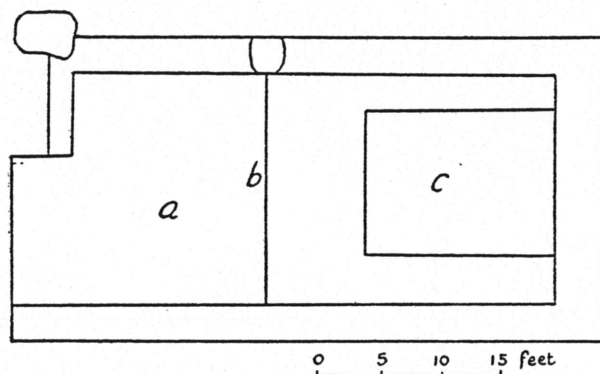


FIGURE 47.—Ground plan of specialized house in Kalalau Valley, Site 161, with walls three feet high (for a perspective plan see figure 1-d): *a*, paved area 19 by 20 feet 2 feet high, open at the front; *b*, terrace edge 1 foot high; *c*, platform 12 by 18 feet.

Site 163. Taro terraces, in the depression just east of Kala Triangulation Station, at the sea bluff.

A group of terraces start at the edge of the bluff and run back in 1 and 2-foot terraces. The terraces run up the edges of the rise on both sides as well. East of this depression there is a rocky rise and then a long stretch of good soil, heavily terraced with big patches. For the most part these terraces are parallel to the shore and run back a considerable distance. A single stone facing wall two to three feet high is general, but as the ground is more level the walls become single rows of large stones. Most of the stone is just an outer support, or facing for a dirt terrace. The terraces continue to the east side of the valley where there are some patches measuring 250 feet in length and 75 feet in width with 4-foot terrace walls.

Site 164. Stone graves and house sites on the west bank of the Kalalau stream.

On top of the knoll about 1.25 miles from the sea is an oval-shaped stone grave, outlined by large stones on edge filled in between with small pebbles (fig. 48, *c*). West of this knoll on a natural, level terrace is an unpaved house site outlined with stone, one end set off separately as if for a lanai (fig. 48, *b*). Twelve feet seaward of the house site are three graves, two of them outlined with stone and covered with smaller stone, the other outlined. Excavation of one grave revealed a skeleton with the head to the west, but unaccompanied by any artifacts.

Site 165. Stone structure, on the west bank of the Kalalau River at the sea shore just in front of the knoll and Site 164.

This ill-defined quadrilateral structure is shown in figure 49. Along the west side of the structure a wall one-stone thick separates two irregularly sloped stone-paved sections, 3 feet high on the west and level with the ground on the east. The rest of the enclosure is unpaved. The division line along the north, or seaside, is merely a line of boulders, and the same is true on the east, where the line is a row of boulders southward as a terrace 3 feet high. The south side is a terrace back of which and connected, to the west wall is another wall made of piling stones between natural rocks. This wall extends clear to the edge of the river bluff, where there is some indication that it follows seaward for a ways. At the rocky point where the river meets the sea is a rough shelter, and a trace of a wall that might have been connected with the southern outer wall.

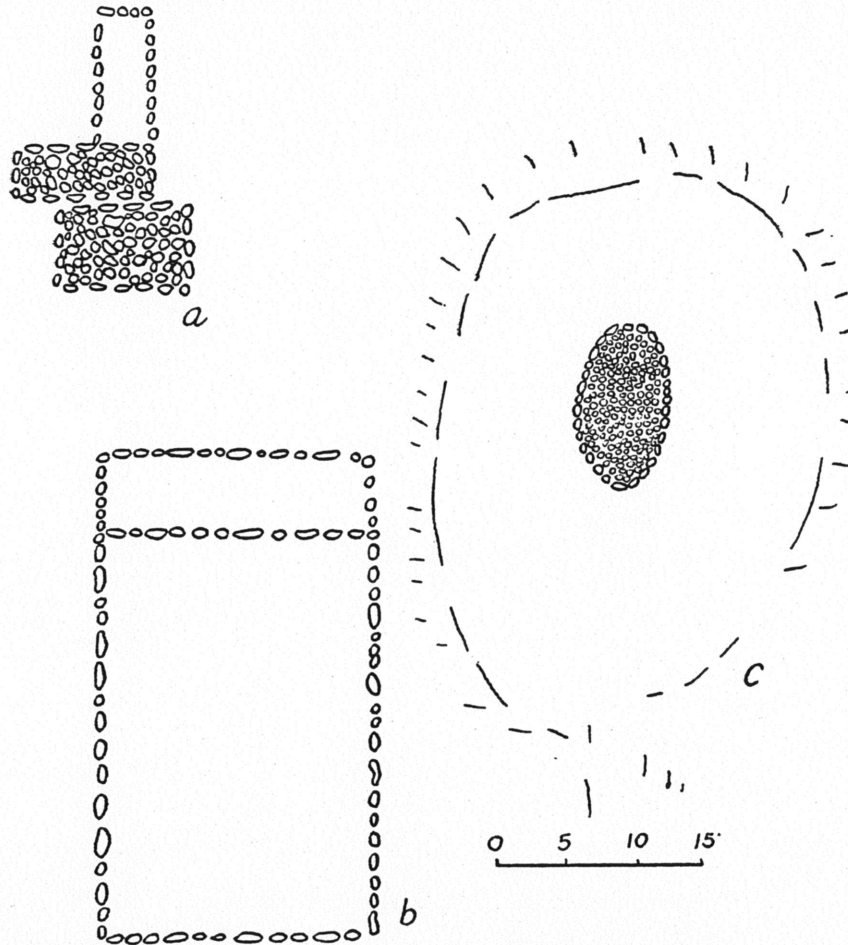


FIGURE 48.—Plan of structures in Kalalau Valley, Site 164: *a*, three graves each about 4 by 9 feet; *b*, unpaved house site 20 by 30 feet with a subdivision 6 feet wide at one end; *c*, grave 6.5 feet wide, 12 feet long and 6 inches high on top of a mound.

#### Site 166. Taro terraces, Kalalau Valley.

Running down the west side of the knoll below Site 164 are taro terraces, one with a facing 8 feet high. The next valley west is filled with taro terraces. Then all along the sea shore, running west, is a big embankment with a heavy sea wall on the shore side, back of which is flat land with big taro beds which continue, terraced, part way up the ridge. A cross-section taken of this area shows the 4-foot sea wall, then a series of

three taro beds on the level, 15 feet, 39 feet, and 45 feet wide respectively. They are divided by built-up divisions of stone about 2 feet wide and 1.5 feet high. At this point the terraces start to run up the talus slopes. There are 9 terraces varying from 2 to 7 feet in height and totaling a 37-foot rise. The width of the beds varies from 5 to 57 feet and totals 252 feet. At the top there are traces of an old ditch line that watered this terraced area. The ditch line is quite clear farther to the east.

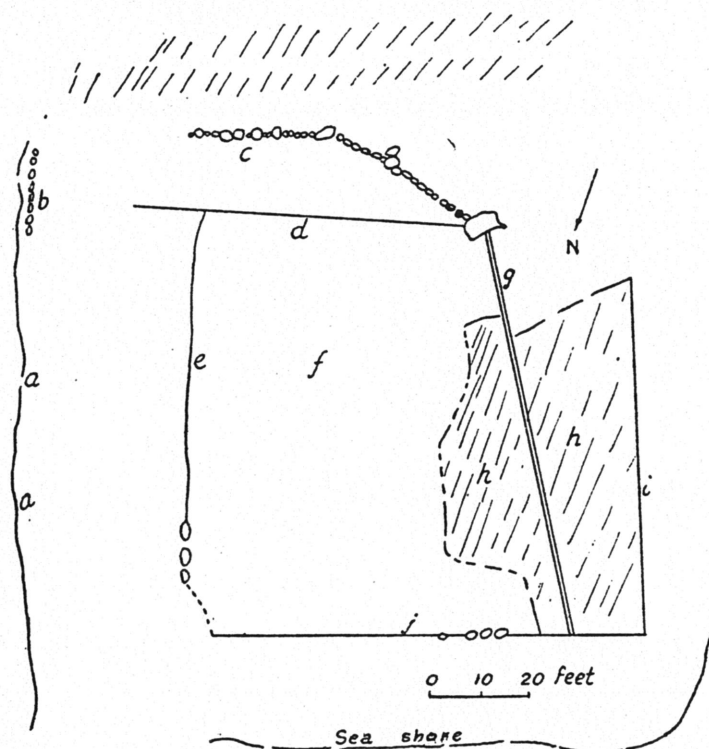


FIGURE 49.—An ill-defined Kalalau structure at river point, Site 165, partly paved and partly leveled, with walls and terraces as indicated: *a*, river bluff; *b*, broken line of stones; *c*, loosely constructed wall; *d*, terrace 2 by 3 feet high; *e*, terrace 3 feet high; *f*, unpaved level area approximately 72 by 84 feet; *g*, wall 2 by 3 feet high, one stone thick; *h*, two sections of a paved area 20 to 40 feet wide; *i*, terrace 3 feet high; *j*, single line of stones.

Site 167. Taro bed, along the sea shore on the west side of Kalalau River.

The farthestmost taro bed along the shore measures 225 feet along the front and is 150 feet deep. It is exceptionally well walled. The sea wall (fig. 50, *g*) is constructed, on top, of large stones laid across it in a double row, though in places there are more than two stones in a row. (See fig. 50, *m* and Pl. V. *D*.) Back of the wall is a stone terrace. The east wall is constructed in the same fashion as the front wall. The back, north side, of the taro bed, also the east side is faced with a terrace only 2 feet high. The west wall does not meet the back terrace but leaves a 2-foot entrance for water. Outside the taro bed and on the terrace, is a circular wall within which, and tangent to its back side, is another walled circle. In the almost vertical cliff behind the taro bed is a cave that has been used for a camp site. To the east of the cave and running down to the southeast corner of the taro bed is a roughly built wall, probably of rather recent construction.



Site 168. Grass shelter and house sites, against the cliff a little east of the taro beds (Site 167).

The grass shelter is built on the lean-to style and measures 12 by 30 feet. It is roughly made with nails, and modern wood has been used for posts and beams. Near the shore in front of this grass shelter is a stone-walled house site. It is open on the sea front while the sides and the back have a wall 3 feet wide and 2 feet high.

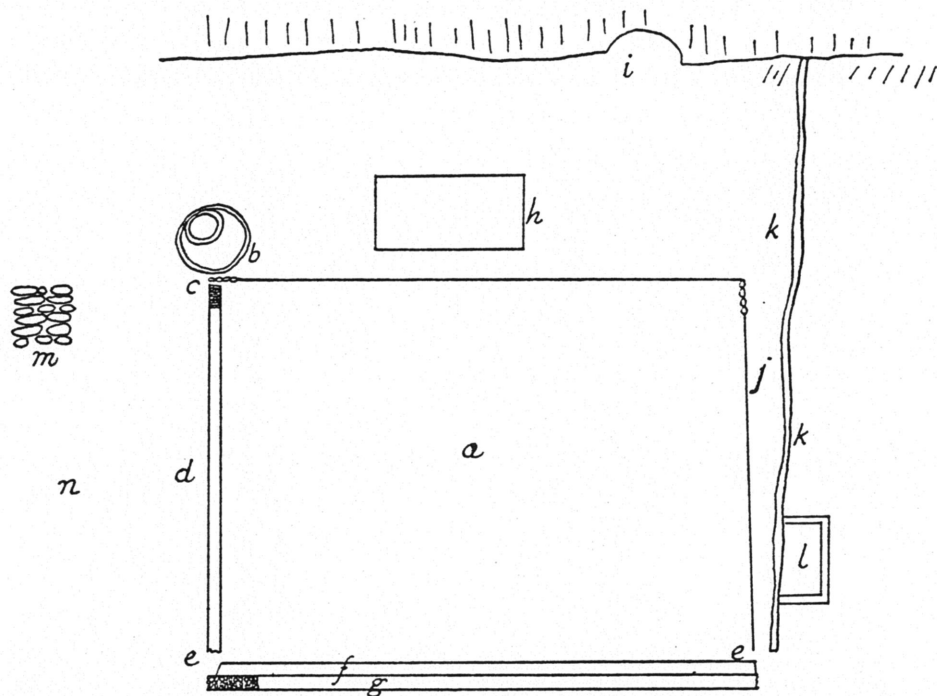


FIGURE 50.—Large taro bed and surrounding structures in Kalalau, Site 167: *a*, large taro bed 160 by 225 feet; *b*, circular wall 30 feet in diameter with smaller circle within it; *c*, entrance for water; *d*, wall 5 feet wide, 2 feet high; *e*, modern path; *f*, stone terrace 5 feet wide, 2 feet high; *g*, sea wall 5 feet wide, 4 feet high on outside; *h*, paved platform 30 by 60 feet; *i*, cave; *j*, terrace, 2 feet high; *k*, modern stone wall; *l*, modern enclosure 20 feet by 35 feet; *m*, enlargement showing arrangement of stones on top of wall; *n*, other taro beds.

Site 169. House sites, back of a frame house on a ridge on the west side of the Kalalau River.

On the ridge up to the cliff are many house sites, regarding which the following observations were made: some sites have only the lanai of stone with a flat dirt plot for house; some have the whole house platform of stone; some have no stone, but only a leveled space on the slope; some sites have no stone for lanai (porch or platform) but only for facing the terrace that makes the site level (terraces are 4 feet and less); most sites have no walls; some have stones set on edge to mark the extent; many seem crowded together; the platforms are made of local rock, though river stone and coral are found on some; natural boulders are utilized where possible; some sites have extra paving of small stone, though none of the paving was done with very large slabs. One house site of this group measured 20 by 30 feet and had walls on four sides, 2 feet wide and 3 feet high, without any opening. Another site had two sections: the first was a paved platform 42 feet wide and 36 feet deep, built up 2 to 4 feet at the front; the second section, 30 feet wide and 42 feet deep, opened onto this. It was walled on the sides and at the back with a 3-foot wall 1 foot high.



Site 170. Kahuanui heiau, on the ridge west of the first west branch valley of Kalalau stream.

This heiau occupies a fine site a short distance up hill from Site 169, with a view of the lower valley which especially commands the numerous house sites on the ridge below (fig. 51). The main platform, 110 feet wide and 60 feet deep, has no inclosing walls, is built up 6 feet on the east and north sides. The east side, on the edge of a steep gully, might have been faced even higher at one time. The walls are well built of selected stones about 12 inches square, carefully laid. On the west side the platform is level with the ground, which is sloping up to the ridge above. The east end of this platform is well paved for 15 feet or more—the remainder is loosely paved—the different pavements possibly outlining former divisions of the heiau platform. The platform near the southwest corner of the main platform (fig. 51, *g*), with its back edge against the dirt terrace, is roughly paved and in it has been sunk a pit walled by a circle of stone. The three sections adjoining the main platform on the north are all stone-paved. They probably are house sites. In back of the main platform, and separated from it by a dirt terrace 3 feet high, is an unpaved platform outlined by a single row of stone except on the back (south), where a 2-foot, stone-faced terrace forms its border. Immediately adjoining this platform are five house sites: the eastern two form steps each 2 feet high, bordered on the east by a facing wall 5 feet high; the western three likewise form steps each about 1 foot high; these three are stone-paved.

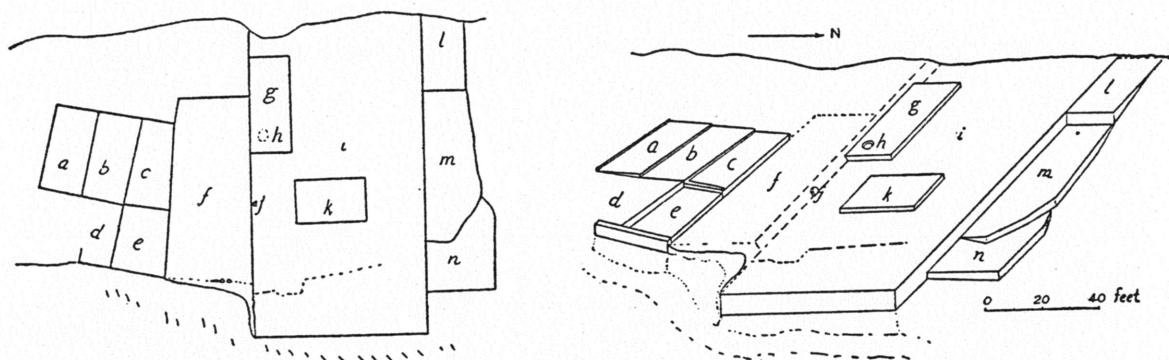


FIGURE 51.—Ground plan and perspective plan of open platform of Kahuanui heiau, Site 170, built up 6 feet at the front and east side, and on a level with the ground on the back and west side: *a*, house site 15 by 30 feet, 6 inches high; *b*, house site 15 by 30 feet, 1 foot high; *c*, house site 12 to 15 feet by 30 feet, 1 foot high; *d*, house site 10 by 25 feet, 2 feet high; *e*, house site 15 to 20 feet by 25 feet, 2 feet high; *f*, dirt platform 20 to 30 feet by 65 feet; *g*, paved platform, 15 by 34 feet, 2 feet high; *h*, pit 4 feet in diameter, 1 foot deep; *i*, main platform 60 by 110 feet, 6 feet high on the east and north sides, flush with ground on the west side; *j*, triangular upright stone against the 3-foot dirt terrace; *k*, paved platform 17 by 25 feet, 1.5 feet high; *l*, platform 16 by 25 feet level with main platform; *m*, platform 20 by 53 feet, 5 feet lower than platform (*l*); *n*, platform about 17 by 24 feet, 2 feet lower than platform (*m*). Dotted lines shows extent of close paving.

Site 171. House sites and taro terraces, on the flats above Kalalau River on the west side.

The large taro beds are remarkable in that no stone is used for facing the terraces of heavy dirt walls. On the ridges along the west side of the river house sites are unmarked, except for a few fireplaces, composed of four or more stones in a square and some low walls.

## Site 172. Ditch lines and taro terraces, Kalalau Valley.

Along the west bank of the Kalalau stream the ditch line that waters the taro patches on the ridge can be traced for 600 yards or more. For most of its length the ditch is lined with a single row of large stones, though in some places these are missing, and in other places the row is double. Below this ditch were two others. The top ditch ran above the taro beds and there were openings at intervals for the water to run through. The other ditch ran downgrade with beds on each side of it. The lowest ditch ran for more than 900 yards. The intake of both ditches has been washed out. In the ditches to the west (Site 166) the outside was faced on the curves just like the facing on the terraces. Both of those ditches ran to streams that are intermittent.

## Site 173. House sites, pens, taro terraces, on the east bank of Kalalau stream, between the two frame houses shown on the government survey map.

A depression at this place is filled with taro terraces. On the shoreward part of this dip near the river bluff several boulders are connected with low walls. The taro work is remarkable because every 10 foot square of land is utilized, even that between great masses of lava. The irrigating ingenuity is astounding. To the east of this depression is a large lava flow on which are 3 house sites on leveled parts of the lava, built up in front 4 feet. They measure 30 by 30 feet, 20 by 20 feet, and 15 by 20 feet. Nearby is a pen roughly 45 feet by 25 feet. Back of these sites is another ditch lined with big stones, and winding in and out between the rocks. Other house sites on the lava flow are merely places leveled off by filling in between the big stones with smaller ones.

## Site 174. House site, near the lava flow at Site 173, on the east side of Kalalau stream.

Another lava flow, 30 to 40 feet wide lies 6 to 10 feet above the adjoining land. On this is a house site 30 feet wide and 36 feet long (fig. 52). The principal structure is a house site consisting of 3 platforms at different levels: the lowest platform is at the surface of the lava flow; the second, 2 feet higher, is roughly paved; the third, 1 foot higher, is well paved with large, flat stones filled in with smaller ones. In front of this house site is a pit and an area in which the stones have been rearranged to make them level. East of the house, but still on the lava flow, is a site made by arranging lava blocks. A shelter south of the main platform is formed by 3 large rocks leaning together.

## Site 175. House site, taro terraces and grave, in Kalalau Valley.

At the back edge of the lava flow at Site 174 are 3 house sites. The first, 18 by 18 feet, is just a flat place on the lava flow. The second, 18 by 25 feet and 2 feet above it is stone-paved, and outlined with river stones along the back edge. The third site, 18 by 24 feet, adjoins this one to the west. The front half is stone-paved while the back half is dirt, outlined with river stone. West of this the taro terraces continue. Just southwest, near the branch of the stream is a stone grave 5 feet by 10 feet, outlined with stones on edge and filled with smaller stone. There is a large stone at the south end. The remains of a wooden fence enclose this, and nearby are boards, kettles, bottles, and other remains from a frame house.

## Site 176. House sites, taro terraces, pens, in Kalalau Valley.

On the land between the two branches of the Kalalau stream the taro terraces are everywhere. There are some big lava flows on the east side, on which are located house sites. Two house sites measure 20 by 20 feet and 15 by 15 feet, and are just flat spaces on the lava flow. A 20 by 30-foot circle of stones forms a pen.

## Site 177. Pen, walk, and house site, in Kalalau Valley.

On the west side of the east branch of the river in a kukui grove, is a pen 20 feet in diameter. From this a walk 2 feet wide runs across the lava flow. It is made by leveling the blocks in the flow. It leads to a house site, 15 by 20 feet, made of leveled blocks of lava. The outer edge is marked by stones on edge, and 2 stone graves are just beyond it. (See Site 178.) Taro terraces run west of it. To the south is a 30 by 45 foot walled inclosure having a stone runway 1 foot wide, built along the edge of a large boulder and leading from the interior of the inclosure to the ground level 3 feet above.

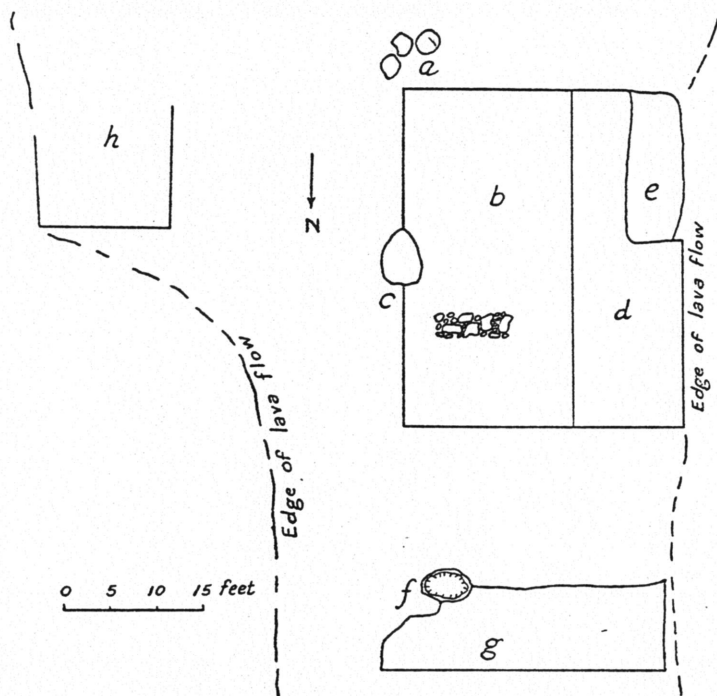


FIGURE 52.—Ground plan of house on lava flow in Kalalau, Site 174 (for a perspective plan see figure 2-b): *a*, cave 5 feet square under boulders; *b*, well-paved platform 18 by 36 feet, 3 feet high; *c*, rock; *d*, poorly paved platform 12 feet by 36 feet; *e*, section 6 by 16 feet; *f*, pit 5 feet in diameter, 3 feet deep with a wall 1 foot high on the outside; *g*, leveled area 10 by 30 feet; *h*, house site 15 by 15 feet.

## Site 178. Stone cist graves, in Kalalau Valley.

Next to Site 177 are two graves the same in size and shape, and closely similar in construction (fig. 53). Their sides are built mostly of a double layer of stone, though some stones reach the whole depth. After the sides and the ends had been built up, large, flat stones were placed over the top and fitted in between with smaller stones. The whole top surface, level with the ground, was then covered with dirt and stone. Nothing but the caving in of the graves revealed their presence. The graves are roughly oriented east and west. One of the graves is a bit wider than the other and in it the stones of the second layer are projected in order that the flat stones for the top would reach across.

Site 179. House sites and terraces, further up the central ridge, between the two branches of Kalalau stream. Some of the terraces are without facing.



Site 180. Taro terraces and house sites, along the west branch of Kalalau stream. There are taro terraces whenever possible, and house sites on the ridges. One terrace has a wall 50 feet long and 6 feet high.

Site 181. Taro terraces, pens, and house sites, on the east branch of Kalalau stream where there are terraces everywhere possible, together with pens and house sites. Terraces have been constructed wherever possible, and farther inland they continue at every wide spot of the valley. A stone oil press (fig. 13, *b*) was found near one of the pens.

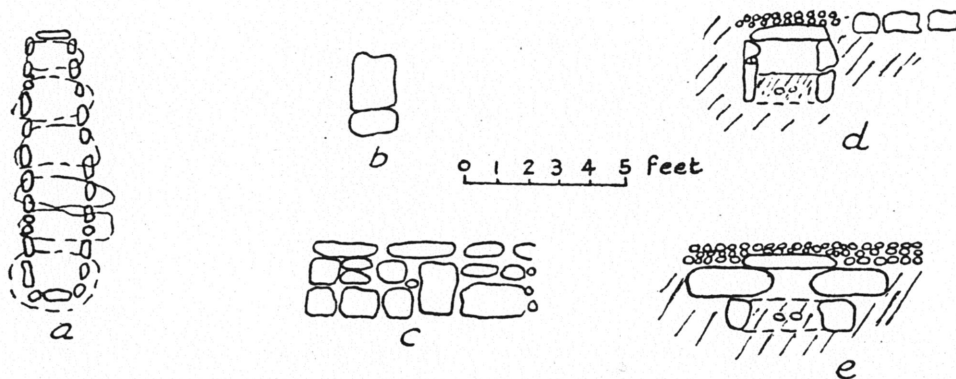


FIGURE 53.—Sketch of stone cist graves in Kalalau Valley, Site 178: *a*, top plan of grave, 1.5 feet to 2 feet wide, 8.5 feet long, 2 feet deep, showing the relation of the flat covering stones to the side walls; *b*, end wall showing arrangement of stones; *c*, side wall showing arrangement of stones; *d*, cross section of grave showing pebbles above, the flat top stone, side walls, the dirt and bones in the bottom, and the three stones (shown at the upper right) which are part of a house platform; *e*, cross section of another grave showing a special method of covering a wide-bottomed grave with flat slabs.

Site 182. Taro terraces and house sites in Honopu Valley. This valley is said to contain the usual extensive terracing for taro, as well as the usual house sites. The extent of the irrigating is a tribute to Hawaiian engineering.

Site 183. Heiau, on the east side of Awaawapuhi Valley near the sea bluff. Here is a large, terraced platform measuring 90 feet long and 20 feet wide. Although the talus from the cliffs above has covered it in part, and knocked down the wall, there remain sections of the front built up 15 feet with well-laid stone (Pl. IV, *C*).

Site 184. Taro terraces. Below site 183 and continuing on up the valley of Awaawapuhi stream are stone-faced taro terraces 2 to 4 feet high. Some are much higher. The valley soon becomes too narrow for cultivation.

Site 185. Burial caves, in the cliffs on the west side of Awaawapuhi Valley are burial caves. One, still sealed with stone, contained a single skeleton and a 6-foot pointed stick, but nothing else. Nearby were some large caves high on the cliff, with pointed sticks on their floors.

Site 186. House and taro terraces, on the west side of Awaawapuhi stream, just before it starts its sharp decline to the sea. Terraces are built



on very steep slopes, 3 to 5 feet high to make beds 8 feet wide. Above them are some stone paved platform house sites, built up 5 feet in front.

Site 187. Ditch line, on the west side of Awaawapuhi stream.

From the sea bluff back is a ditch line along the steep sides of the valley. It is built up along parts of the pali to a height of 15 feet. The top part is badly covered over with talus from above, but there is some evidence that there were stones slanting inward. The ditch can be traced for several hundred feet and leads to a series of seven taro beds along the sea bluff.

Site 188. House site, along the sea bluff on the west side of Awaawapuhi stream.

At the west end of narrow flats that run for a short distance along the sea is a dirt-paved house site 15 by 18 feet, built up 5 feet in front, with large, 20-inch stones. Below this are flat spaces for house sites, and a wall 15 feet long. Just below the house sites is a terrace wall 5 feet high running for 90 feet towards the stream. Two pounding stones and a polisher were on the house site. The name of this point is Puanaiea and is probably the structure referred to by Thrum as Puanaie.

Site 189. Stone platform, on the shoreward side of the first east valley of Nualolo stream.

The front wall of a rough platform is built up 4 feet and is 90 feet long. It is made of large stones. At the south (*mauka*) end a wall runs back and up the talus slope to the cliff behind for 40 feet. It is a double row of stone filled with small stone. There is no wall on the other end. For a short distance back of the front wall extends a paving of small stone.

Site 190. House sites, on the ridge on the east side of Nualolo Valley.

At this site is a platform 18 by 24 feet built up 1.5 feet, the edge of which is faced with large stones. There is a paving of small stone except in the center which is dirt-paved. Pounding stones, polishers, cowrie shells, some pieces of copper, and some old logs were found on this site. Seaward of this site were other clearly marked house sites, built up in front but unpaved. They measured 15 by 20 feet.

Site 191. House site, at the base of an overhanging cliff on the east side of Nualolo Valley.

Just inland from the place where the Nualolo stream starts its rapid descent to the sea, is a house site built up 8 feet in front. It has a platform 15 by 15 feet. One end is against the cliff, while a 2-foot wall flanks the other end. At the back is a 1-foot terrace.

Site 192. House site and taro terraces, in Nualolo Valley.

On the east side of Nualolo Valley is a platform 20 by 20 feet built up 8 feet in the front and at the south end. The outside wall is made of large stones. The platform is paved with small stones. The north end is marked by a single row of large stones and at the back is a 1-foot terrace. Across the valley from this site is one mass of taro terraces.

Site 193. House sites and taro terraces, in Nualolo Valley. In a large kukui grove are numerous house sites and terraces, though the country is badly washed over with rubble from the talus slopes.

## Site 194. Taro terraces, in Nualolo Valley.

Toward the shore in Nualolo Valley is extensive work in terracing. The height of the terraces is from 6 inches to 4 feet (Pl. VI, A). At the back side of the terraces, up on the slopes, are the house sites, most of them just stone-faced, dirt, or stone-paved platforms. The terraces run to the edge of the sea bluff.

## Site 195. Trail, at Nualolo flats.

The trail that leads from the Nualolo flats to Nualolo Valley is an ancient one. It starts around the base of the bluff on the east side of the flats and runs for 30 feet or more on a narrow ledge, sharply overhung by the cliff about 20 feet above the ocean. At the end of this ledge a rope ladder leads to a ledge 25 feet above it. The bulge in the cliff makes the ladder hang out over the sea. The ladder is fastened into four rings cut through the solid rock for that purpose. A protruding stone near the top of the ladder is grooved, probably for the purpose of lowering bundles to the ledge below. From the top of the ladder a series of notched steps and finger grips have been cut that lead to a narrow trail that runs up to the top of the cliff. The notches and finger grips have been worn smooth by ancient usage. (See p. 6.)

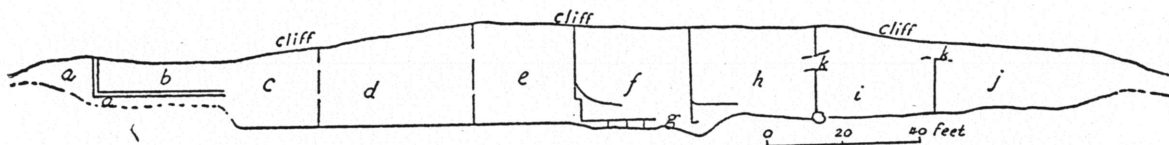


FIGURE 54.—Plan of house site on Nualolo flats, Site 196: *a*, path to the sea; *b*, enclosure 10 by 42 feet; *c*, *d*, and *e*, dirt-paved platforms respectively 20 by 24 feet, 20 by 42 feet, and 25 by 27 feet; *f*, platform 24 feet by 30 feet and 7 feet high; *g*, pathway and steps; *h*, platform 24 by 32 feet and 5 feet high; *i*, platform 24 by 28 feet and 4 feet high; *j*, platform continued at the back as a narrow, rising slope.

## Site 196. House sites, extending along the base of a high cliff on the east side of Nualolo flats.

There are eight terraced house sites (Pl. V, A; fig. 54). The first of these sites, about 200 feet from the sea, consists of an L-shaped wall 3 feet high, and open at the upper end. It is more like a pen than a house. Then follows a series of 3 sites on a gentle, upward slope, divided by single rows of stones. The fifth site is a dirt-paved platform with one edge built against the cliff; the other faced by a wall 9 feet high. In the path that leads up to it on the outside is a series of three steps. The sixth platform is separated from the fifth by a front terrace 8 feet high, and is faced on the side by a wall 3 feet high. A terrace 4 feet high crossed by a path separates the sixth platform from the seventh platform and a terrace 5 feet high, with a path at its edge divides the seventh from the eighth. For all the platforms the facing, where present, is only one stone thick. Excavation on the second terraced platform revealed grass cord fiber, pointed sticks, pieces of calabashes, china dishes, an *ulumaika* stone, pounders, polishers, bunches of *pili* grass, many cowrie and other shells, and a small fishhook. At one place the following stratification was revealed: 1, (top) 6-inch layer of *pili* grass, sticks, stones, and talus fragments from above; 2, deposit of gravel, small shells, and stones 2 to 3 inches thick; 3, a layer of hard-packed *pili* grass 1.5 inches thick; 4, dirt, grass, and rocks mixed and interspersed with ash beds and burnt soil 2 feet thick; 5 a layer of claylike soil, well packed 3 inches thick; 6 disturbed soil.

Site 197. House site and walls, along the shore of Nualolo flats.

From the east cliff running westward, is a wall made of large slabs of coral on edge. It runs in an irregular line for 80 to 100 feet where the structure suddenly changes to one of built-up beach stones. The continuity of the wall is unbroken. A house site back of this wall measures 20 by 30 feet and has walls 2 feet wide and high on all four sides. Other house sites are around here. A burial was found in the sand before the wall above mentioned. The reason for the change in the wall construction may possibly be the handiness of materials.

Site 198. Burial caves, in the cliff east and south of Nualolo flats. In many burial caves were found numerous skeletons wrapped in tapa. The seepage of water through the cliff has largely destroyed the tapa and rotted most of the bones. Two pointed sticks with the tapa burials and some blue glass beads were the only objects found.

Site 199. Heiau, at the base of the talus slope in the southeast corner of Nualolo flats.

This is a large, complicated structure the exact measurements and arrangement of which are shown in figure 55. In the center are 3 platforms. The lowest one is very irregular in shape and is paved with small stones. Its front (north) side is flush with the sandy ground. Its west side is a wall that runs northward, out beyond the front edge of the platform, and curves around to the east. Its back (south) side platform is marked by a well-made, perpendicular wall 8 feet high, its top level with the floor of a second platform well-paved with large flat stones. Behind this is a third paved platform, 3 feet higher with end walls 2 feet high, 4 feet wide, and a back terrace 2 feet high, built against the talus slope. To the east of the second platform is an unpaved enclosure with a back wall and a front wall. Sunk into the main platform is a depressed area measuring 5 feet deep, stone-faced all around, and divided into two unequal sections by a wall. The entire eastern section of this depression is filled with about 6 inches of water in which ferns are growing. The western section is dry, stone-paved, and at its southwest corner is a spring containing fresh water. To the east of it is an indefinite paved area with miscellaneous walls. Under a large rock is a small cave with animal bones in it. West of the main platform is another paved section crossed by a low wall within which hala trees are now growing. The back of this section is a wall 8 feet high and 2 feet wide, that acts as a facing terrace for a section which includes two walled house sites.

Site 200. House sites, on the ridges all through the Nualolo flats. These stone-terraced house sites averaging about 15 feet square are not unusual.

Site 201. Structures in Milolii Valley. Milolii Valley is said to be narrow with steep talus slopes. Terracing with some 8-foot facings is said to be fairly extensive. The stone platform heiau near the mouth of the river is estimated at 30 by 30 feet. Francis Gay named the following heiau or *unu* sites in Milolii: Pohakuokane, in Kaahole; Manienie, on top of Anaki; Kahe, Kamoalii, Kapuaapilau, and Kaunuakamalii.



## Site 202. House sites in Kauhao Valley.

Near the sea bluff in Kauhao Valley is a platform 30 by 30 feet with 5-foot walls 2 feet high. Across a deep gulch from this platform is a small platform. To the east is a paved house site 10 by 10 feet. Farther back is a 3-foot wall, 10 feet long and a trace of a wall 10 feet long, 10 feet in front of it. Between these is a fireplace of 4 stones. A cave in the cliff not high above had a wall along its front side. The dryness of this valley suggests that these sites are temporary fishing shelters, or possibly shrines.

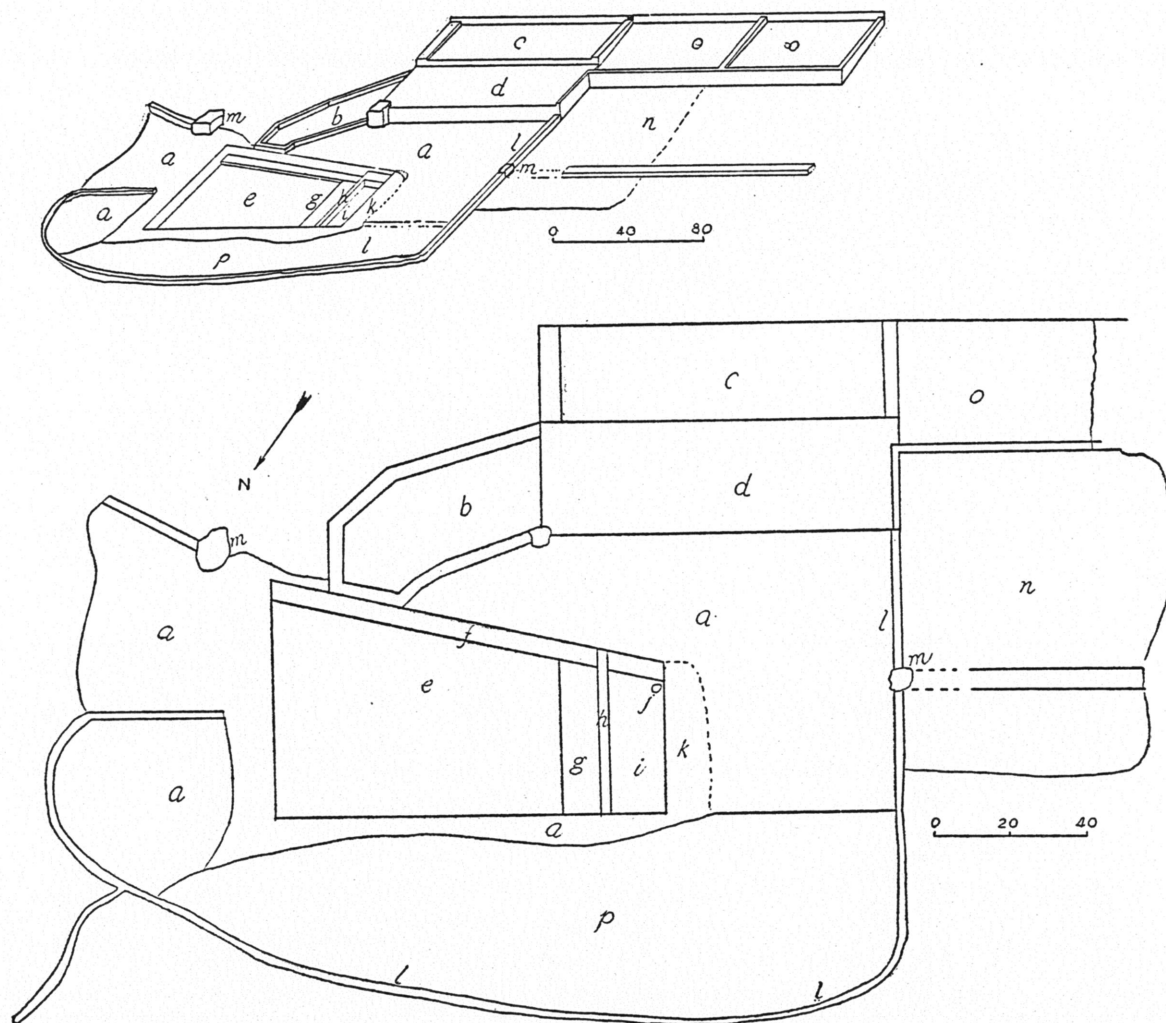


FIGURE 55.—Ground plan and perspective plan of a heiau on Nualolo Flats, Site 199: *a*, paved platform level with surrounding ground; *b*, unpaved inclosure with walls 2 to 3 feet high and 4 feet wide; *c*, paved platform 25 by 93 feet; *d*, paved platform 29 to 93 feet; *e*, eastern section of depressed area 40 to 60 feet by 74 feet; *f*, bench terrace 1 foot high, 5 feet wide; *g*, bench terrace 2 feet high, 10 feet wide; *h*, division wall 2 feet high, 3 feet wide; *i*, western section of depressed area 12 feet by 38 feet; *j*, walled spring 2.5 feet in diameter, 2 feet deep; *k*, paved area with indefinite boundaries; *l*, wall 3 feet wide, 3 feet high; *m*, cave under rock containing bones of animals; *n*, paved area crossed by a wall 5 feet wide and 2 feet high; *o*, unpaved house sites inclosed by walls 2 feet high on the inside; *p*, sand.



## KAUAI SITES NOT LOCATED

Sites 1 to 11, are in the Waimea district; Sites 12 to 17, in the Koloa district; 18 in the Lihue district; 19 to 20, in the Kawaihau district; 21 to 24, in the Hanalei district; 25 to 26, in the Napali region.

Site 1. A *holua* slide which was built up with stones; reported for Waiawa by Mr. Eric Knudsen.

Site 2. Hikinaakala heiau, in Waimea village. Described by Thrum: "Its foundations still to be seen run 272 feet along the road by 75 feet at east and 81 feet at its west end. Some report it as a place of refuge . . . ." Hofgaard (27, p. 12) writes: "Before the road was raised and all the flat lands were filled in opposite to Puuhonua, the place must have been nearly 3 feet higher than the surrounding country."

Site 3. Kaahu heiau. Described by Thrum as "An unwallled sacred place; flat ground."

Site 4. Puaola heiau. Said by Thrum to be "An open platform heiau in good preservation."

Site 5. Kopahu and Kaleinakauhane, located by Thrum at Pokii, Waimea, and described by him as "A flat sacred place, whence the souls took their plunge to Po,—the nether world."

Site 6. Keonekapu, mentioned by Thrum as an unidentified site "Referred to by Kamakau as a place of refuge in time of Kahamaluihi."

Site 7. Kaneheenalua heiau, on Mokihana ridge. Described by Thrum as "A paved heiau in good preservation."

Site 8. Peeamoa heiau, in Makaweli. Described by Thrum as "An unwallled heiau."

Site 9. Kapakaniau heiau, in Makaweli. Described by Thrum as "A paved, open platform heiau; in good condition."

Site 10. Naulili heiau, in Makaweli. Described by Thrum as, "An unwallled sacred place; flat ground."

Site 11. Kaawako shrine. Thrum says: "Kaawako is a small rectangular structure about five by seven feet and two feet high, made of smooth lava slabs, on the summit of Waialeale, between two knolls, in the open country near the pond. This is very sacred; to this day you must throw on it the most valuable thing you have with you—money, food, tools, or whatnot,—to propitiate the gods of the mist lest they envelop you and you lose your way in that tangle of woods and gulches and level plateaus of the interior of Kauai."

Site 12. Nihoana heiau, at Eleele. Described by Thrum as "A small heiau, about 20 by 30 feet, low walled. Destroyed."

Site 13. Kaunuolono heiau, in Wahiawa. Thrum describes it as "A large heiau of square shape; part of its walls still standing. Class unknown."

Site 14. Kahilina heiau, in Wahiawa-uka. Described by Thrum as "A walled heiau of large size, long since destroyed."

Site 15. Kakainahoa heiau, in Kalaheo. Thrum says: "A paved oblong heiau of large size. All destroyed."

Site 16. Hanakalauae heiau, in Mahaulepu, Koloa. Described by Thrum as "Of large size, destroyed years ago by Fredenberg, to erect cattle pens with its stones."

Site 17. Kalihi lookout on top of the mountain peak, Kalihi. (See p. 2.)

Site 18. Pohakoelele heiau, in Kalapaki section. Described by Thrum as "A medium sized heiau; all destroyed."

Site 19. Mahewalu heiau, on Olohena ridge. Described by Thrum as "A round walled heiau paved with large stone."

Site 20. Hakualele heiau, on Kalalea peak, Anahola. Described by Thrum as "A three terraced paved heiau about 100 feet square with low wall. Class unknown."

Site 21. Kapuohauae heiau, in Waiakaluauka. Described by Thrum as "A small round heiau, paved, with high walls, of husbandry class; still standing."

Site 22. Mamalahoa heiau, in Waioli. Described by Thrum as "A small heiau 24 by 60 feet in size, paved, with walls 3 to 5 feet high. Of husbandry class. Kanekekili its deity. Kapihi its priest."

Site 23. Puuohewa heiau, on Lumahae summit. Described by Thrum as "A paved heiau of *pookanaka* class, size not given; said to be still in existence. Ola was its priest."

Site 24. Puuomama heiau, in Lumahae. Described by Thrum as "An open heiau of about 50 feet in size for kapa makers. Hina-kuku-kapa its deity. Portions of foundation only remain."

Site 25. Makaoka heiau in Kalalau Valley.

Site 26. Thrum lists the following heiaus for Napali without description: "Kamakakiloia, and Kamakapu, in Awaawapuhi. Puanaie, on boundary of Nuololo and Awaawapuhi [Site 188], Kalilioku, Kaneakalau, Kaleleoluaka, and Kaiokia, in Napali and Kawaipapa, at Waianuenue, Napali." (See also list given by Francis Gay, Site 201.)

#### NIIHAU SITES

As the Niihau culture was essentially part of that on Kauai, it seems appropriate to incorporate here a brief description of the sites on Niihau as recorded by Stokes (51) during a visit to the island in 1912.

Site 1. Heiau and puuhonua of Kihawahine, at Pali Koea, at the edge of the beach; a long enclosure built of lime, sandstone slabs, with a low bench

encircling the walls exteriorly (fig. 56). The bench on the outside and the entrance inland are unusual features. In many places the base of the walls is faced with slabs set on edge to a height of about 2.5 feet, the upper slabs being laid longitudinally.

Site 2. Heiau of Kaunuokaha on the shore, about a mile to the northeast of Kihawahine. A small, low platform—probably a *koa*.

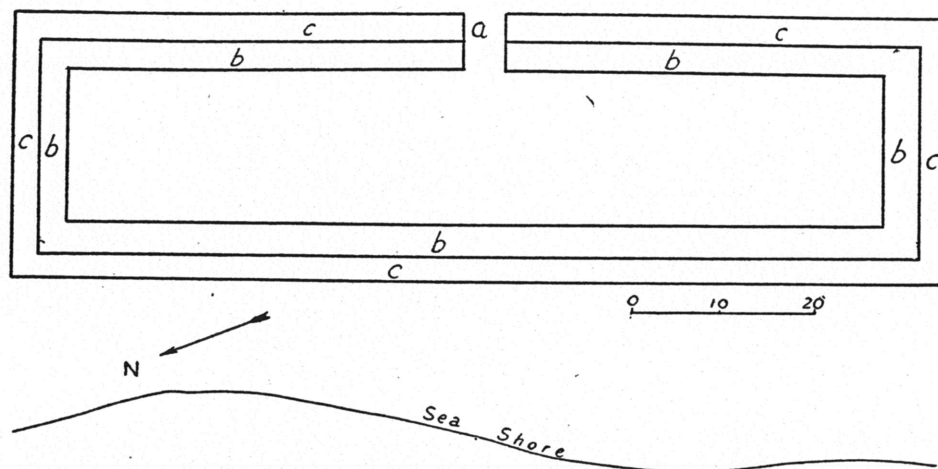


FIGURE 56.—Kihawahine heiau, and Puuhonua, Pali Koa, Lehua, Niihau (after Stokes): *a*, level floor of beach sand and grass about 16 by 90 feet; *b*, wall about 3 feet wide and 5 to 6 feet high; *c*, bench 1 foot high, wider on the east side; *d*, entrance 8 feet wide. The bench on the outside and the entrance to the inland are unusual features.

Site 3. Heiau of Halekuamano at Nanina bay, about 1000 feet east of Kalanilahale Point, near the shore. A low embankment 35 feet long and 5 feet wide.

Site 4. Fishing shrine (*koa*) of Kaunuopou, on the northeast point of Niihau. The shrine consists of a small platform of coral fragments with a group of basaltic stones on the northeast side.

Site 5. Heiau (?) of Puhiola, at Kamalino, southwest coast. "Reported but not seen."

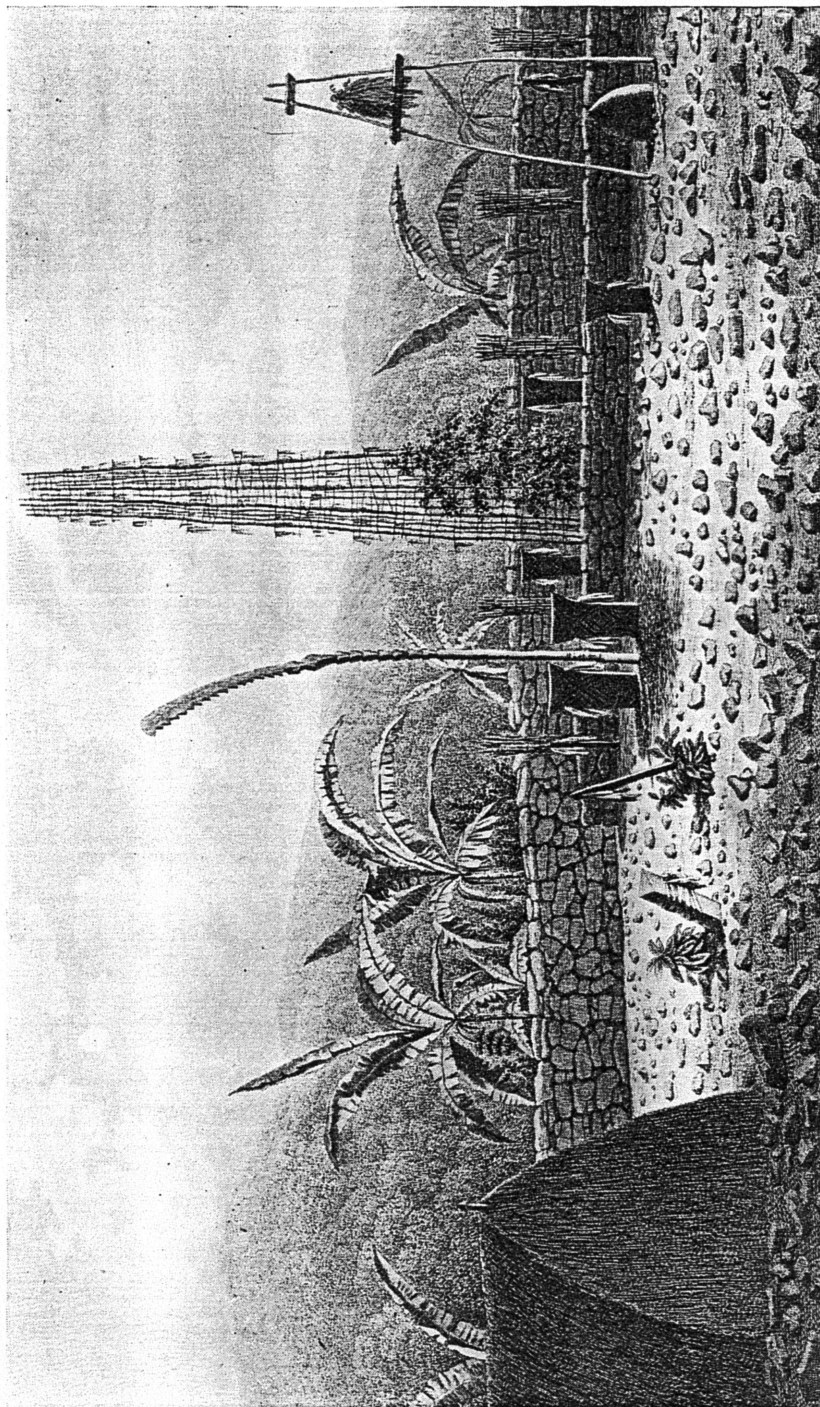


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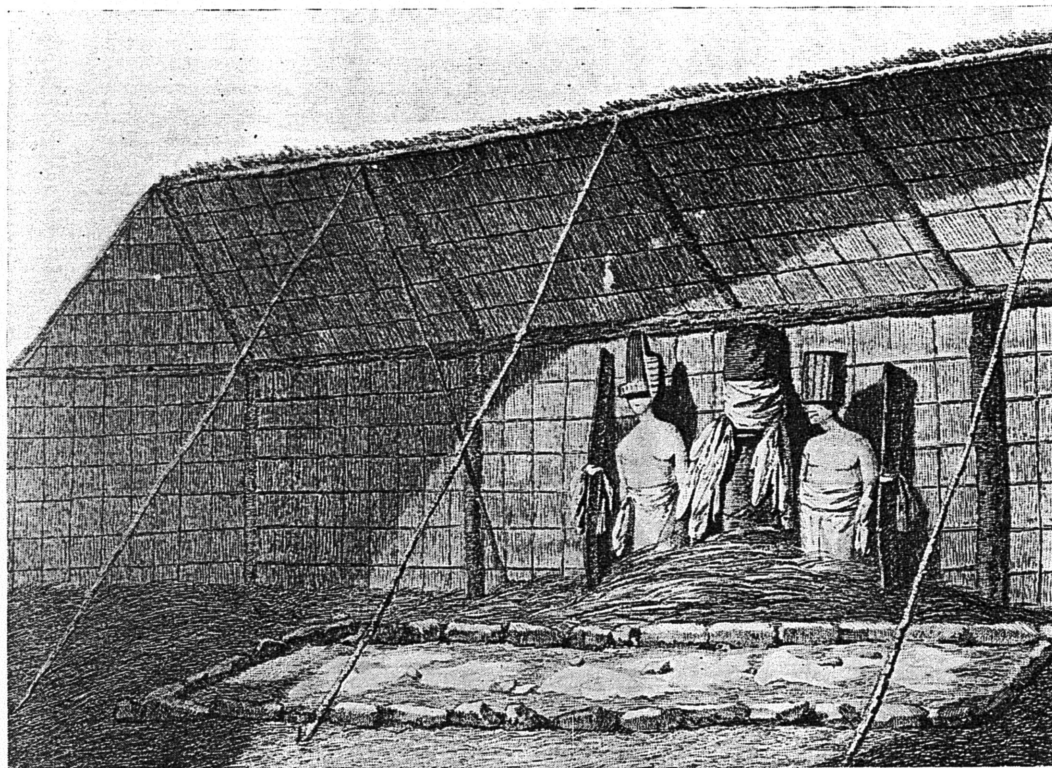


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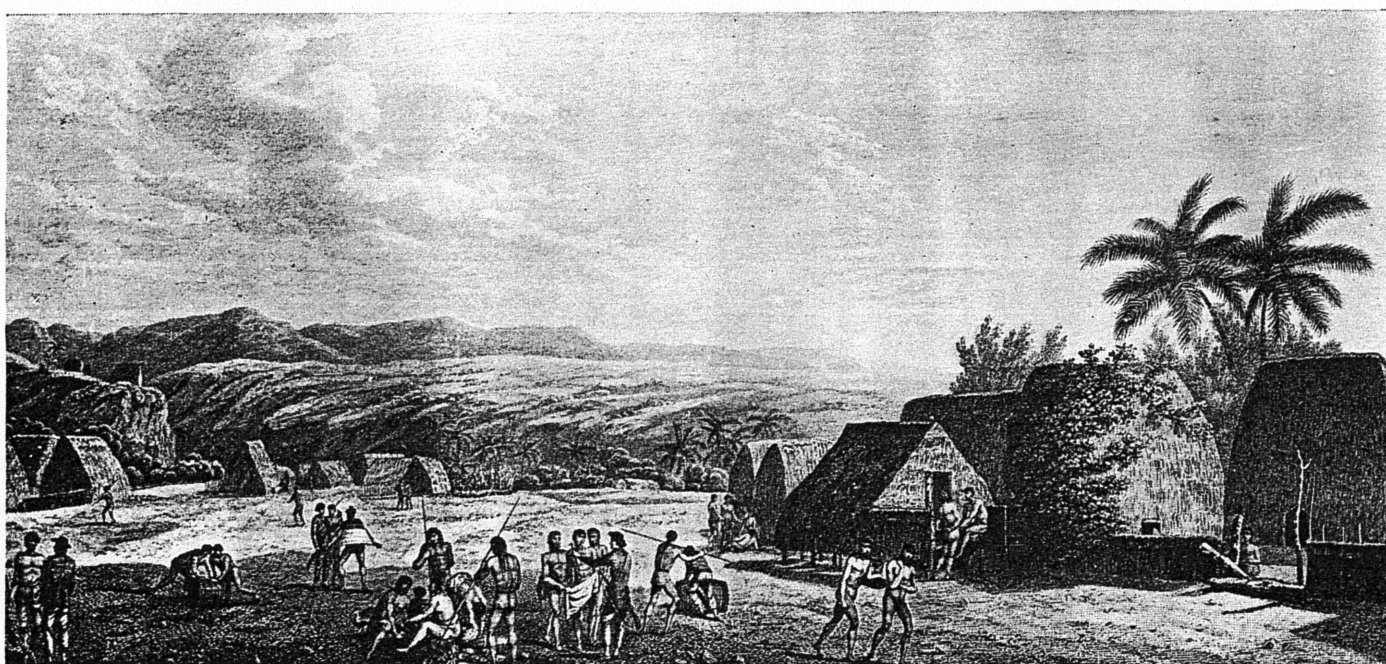


HEIAU IN WAIMEA VALLEY SHOWING UPRIGHT WOODEN SLABS. ACROSS ONE END IS A TERRACE AND  
NEAR THE CENTER A DIKE PRISM. (FROM A DRAWING BY J. WEBBER, 1778.)



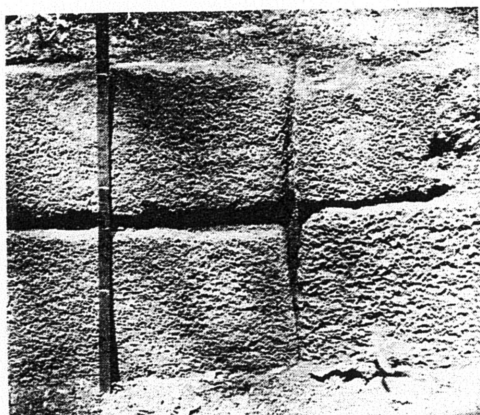
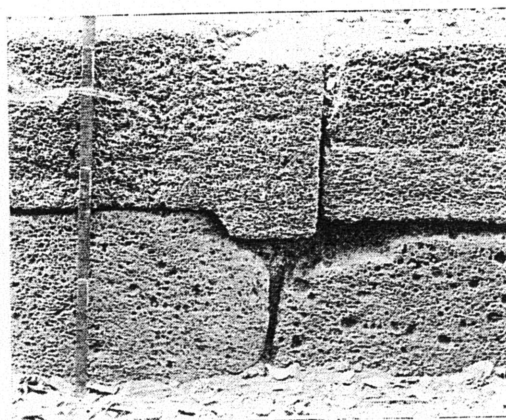
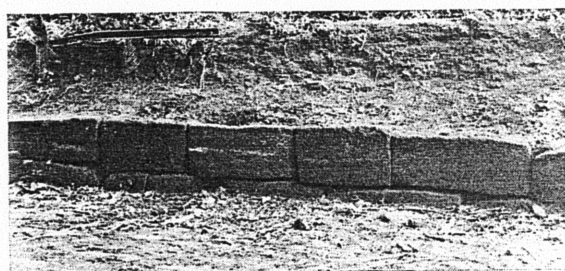
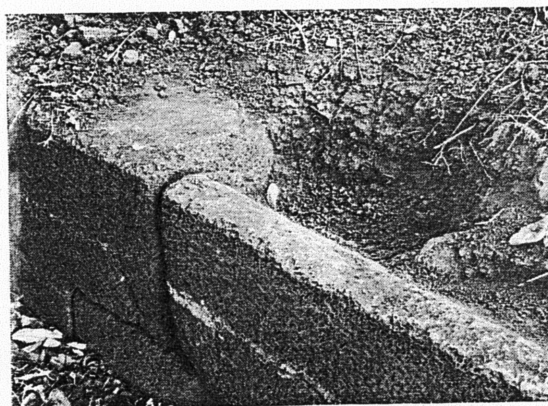


A



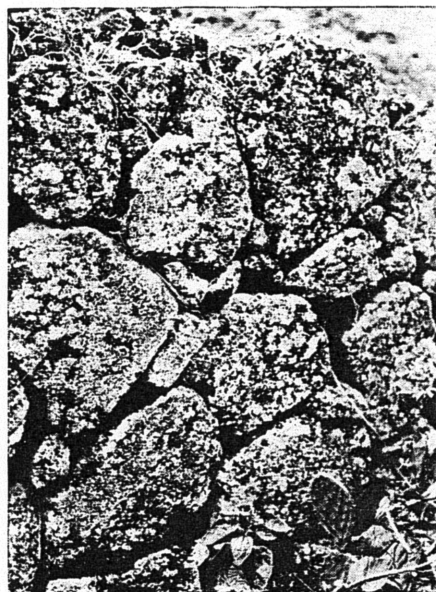
B

A, INTERIOR OF A HOUSE ON THE HEIAU AT WAIMEA, SHOWN IN PLATE I. (FROM A DRAWING BY J. WEBBER, 1778); B, VIEW NEAR WAIMEA SHOWING A ROUND HOUSE AND HOUSES RAISED ON POSTS IN ANTICIPATION OF THE ANNUAL WAIMEA RIVER FLOOD. (FROM A DRAWING BY J. WEBBER, 1778.)

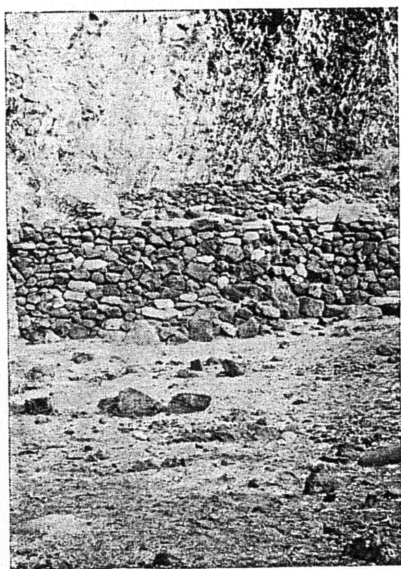
*A**B**C**D**E*

*A*, CUT AND DRESSED STONE FACING OF THE MENEHUNE DITCH WALL SHOWING A SQUARE JOINT, UNCOURSED; *B*, JOINT PROJECTING FROM STONE ABOVE INTO NOTCH IN STONE BELOW; *C*, GENERAL VIEW OF TOP TWO FEET OF DITCH WALL AS IT APPEARS TODAY; *D*, DOUBLE JOINT; *E*, TOP STONE SLANTING IN AND DOWN AFTER FIRST THREE INCHES. MOST OF THE TOP STONES ARE LEVEL.



*A**B**C**D*

TYPES OF STONE WORK: *A*, WALL MADE OF SHARPLY FRACTURED, WELL FITTED LAVA BLOCKS SHOWING FRONT FACING OF KAUNUOKANE HEIAU, SITE 32; *B*, FRONT WALL OF WAIOPILI HEIAU, SITE 87, SHOWING SLABS REINFORCED WITH CHINKS; *C*, SINGLE TERRACE PLATFORM HEIAU, SITE 183; *D*, PAVING OF LARGE FLAT SLABS AND *ILILI*, OR PEBBLE FILL, HAUOLA HEIAU, SITE 16.



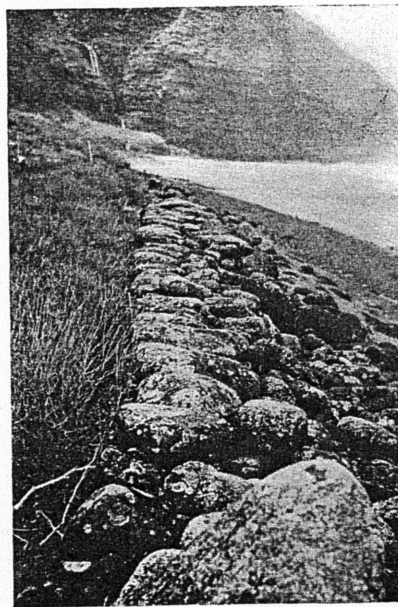
*A*



*B*



*C*



*D*

TYPES OF STONE WORK: *A*, SERIES OF TERRACED HOUSE PLATFORMS, SITE 196; *B*, UPRIGHT SLAB AGAINST SIDE WALL OF POLIAHU HEIAU, SITE 107; *C*, STEPS LEADING FROM FIRST TO SECOND TERRACE AT POLIHALE HEIAU, SITE 1; *D*, SEA WALL OF TARO BED SHOWING CAREFUL LAYING OF STONE ON TOP. A TERRACE COVERED BY LANTANA RUNS ALONG THE LEFT SIDE OF THE WALL, SITE 167.





A

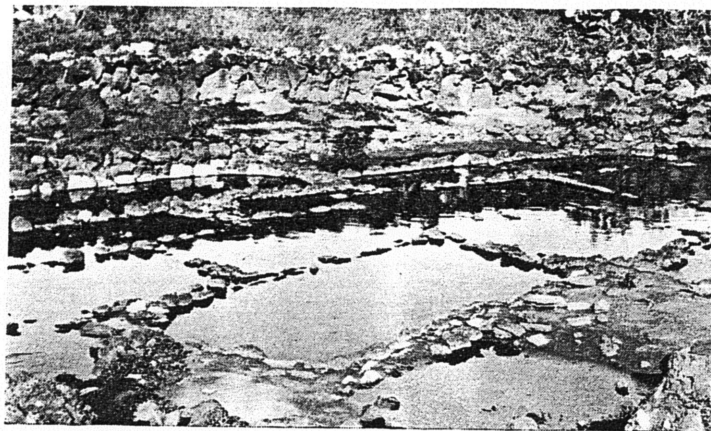


B



C

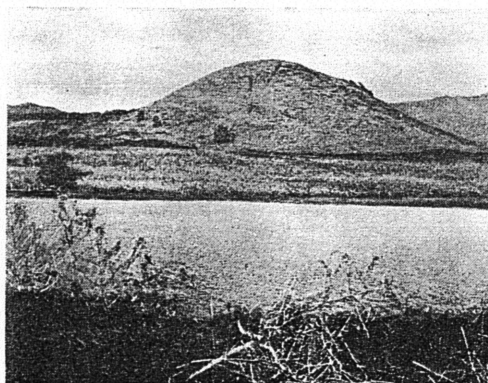
A, TARO TERRACES, SITE 194; B, PERPENDICULAR FRONT WALL OF LOHIAU'S HOUSE, SITE 156, THE FACING HAVING CHINKS IN THE INTERSTICES—NOT TYPICALLY HAWAIIAN; C, WINDBREAK OR FISHING SHELTER, SITE 74.



*A*



*B*



*C*

*A*, SALT PANS, SITE 76, KOLOA, SHOWING SINGLE STONE DIVISION; *B*, SALT PANS, SITE 76, KOLOA, SHOWING DOUBLE STONE DIVISIONS; *C*, CROSSING LINES ON HILL SHOWING POSITION OF PUU O HEWA HOLUA SLIDE, SITE 91.

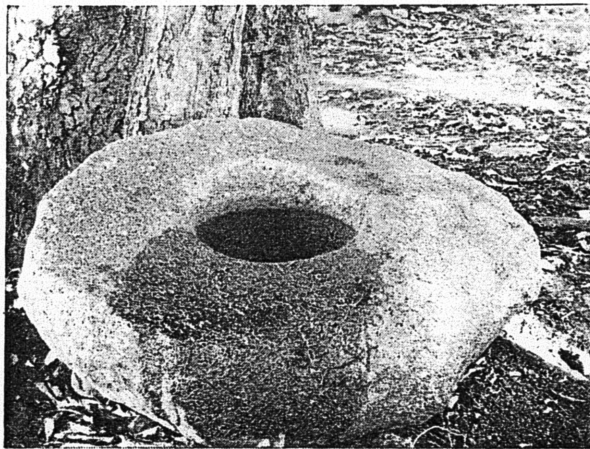




*A*



*B*

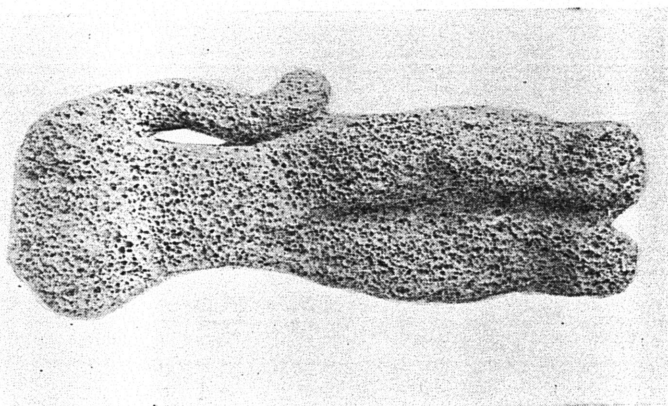


*C*

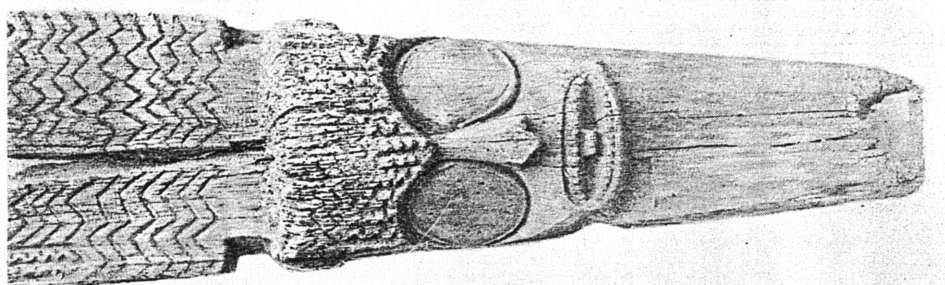
*A*, STONE CIST GRAVE AFTER FLAT COVER SLABS HAVE BEEN REMOVED, SITE 178; *B*, STONE ON WHICH ADZES WERE GROUND, WAILUA; *C*, STONE DISH WITH CIRCULAR DEPRESSION 1.7 FEET IN DIAMETER AND 9 INCHES DEEP, CUT OUT OF THE CENTER OF THE FLAT SURFACE, WEIGHING 3100 POUNDS AND HAVING A DIAMETER OF 4.4 FEET AND THICKNESS OF 2 FEET.



A

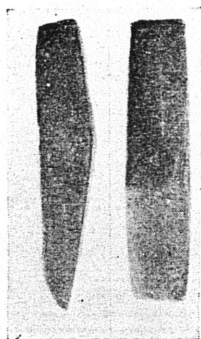
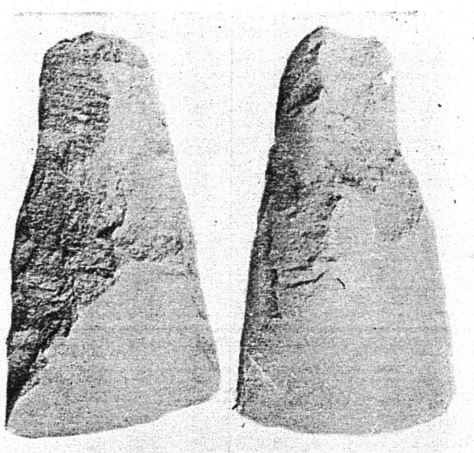
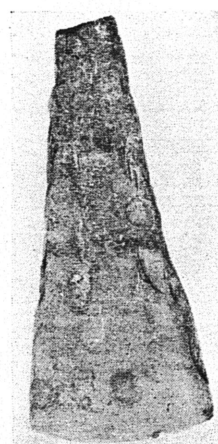
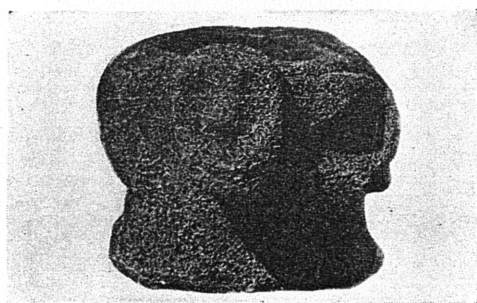
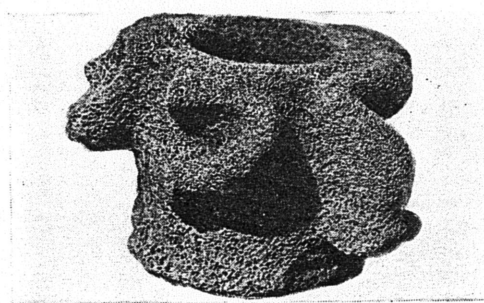


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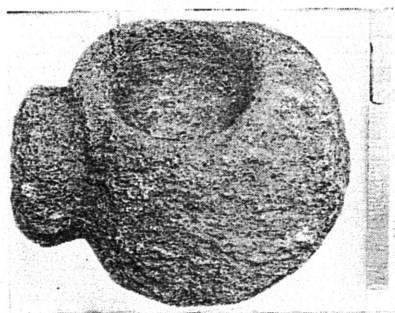
C

A, FISH GOD WITH DRESSED STONE FACE (IN THE YARD OF WALTER McBRYDE); B, LAVA IMAGE (McBRYDE COLLECTION); C, WOODEN SLAB IMAGE 4.5 FEET HIGH, 10 TO 18 INCHES WIDE, AND 3 TO 10 INCHES THICK. [COMPARE WITH SLAB UP-RIGHTS IN PLATE I.]

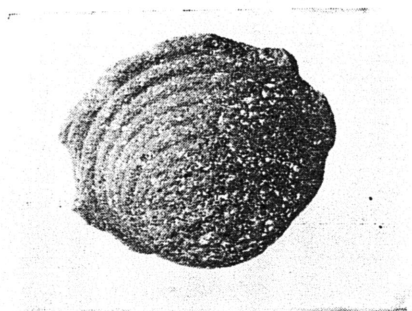
*A**B**C**D**E*

ADZES AND BOWLS: *A*, SIDE AND TOP VIEW OF COMPLETELY POLISHED NECKER TYPE ADZE WITH A LENGTH OF 4.7 INCHES, WIDTH AT SHOULDER 1.1 INCHES, THICKNESS AT SHOULDER 0.9 INCH, AT POLL 0.7 INCH, AT CUTTING EDGE 0.5 INCH (WILCOX COLLECTION); *B*, SIDE AND TOP VIEW OF CURVED ADZ (WILCOX COLLECTION); *C*, SLIGHTLY POLISHED STONE AX (WILCOX COLLECTION); *D*, AND *E*, FRONT AND SIDE VIEWS OF CARVED STONE BOWL 8 INCHES FROM HEAD TO STERN, 6 INCHES WIDE, AND 5 INCHES HIGH (McBRYDE COLLECTION).

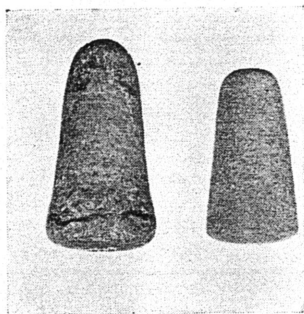




A



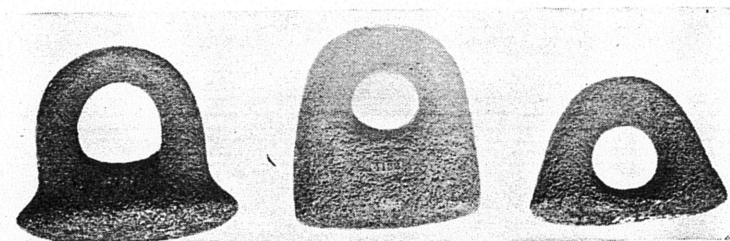
B



C



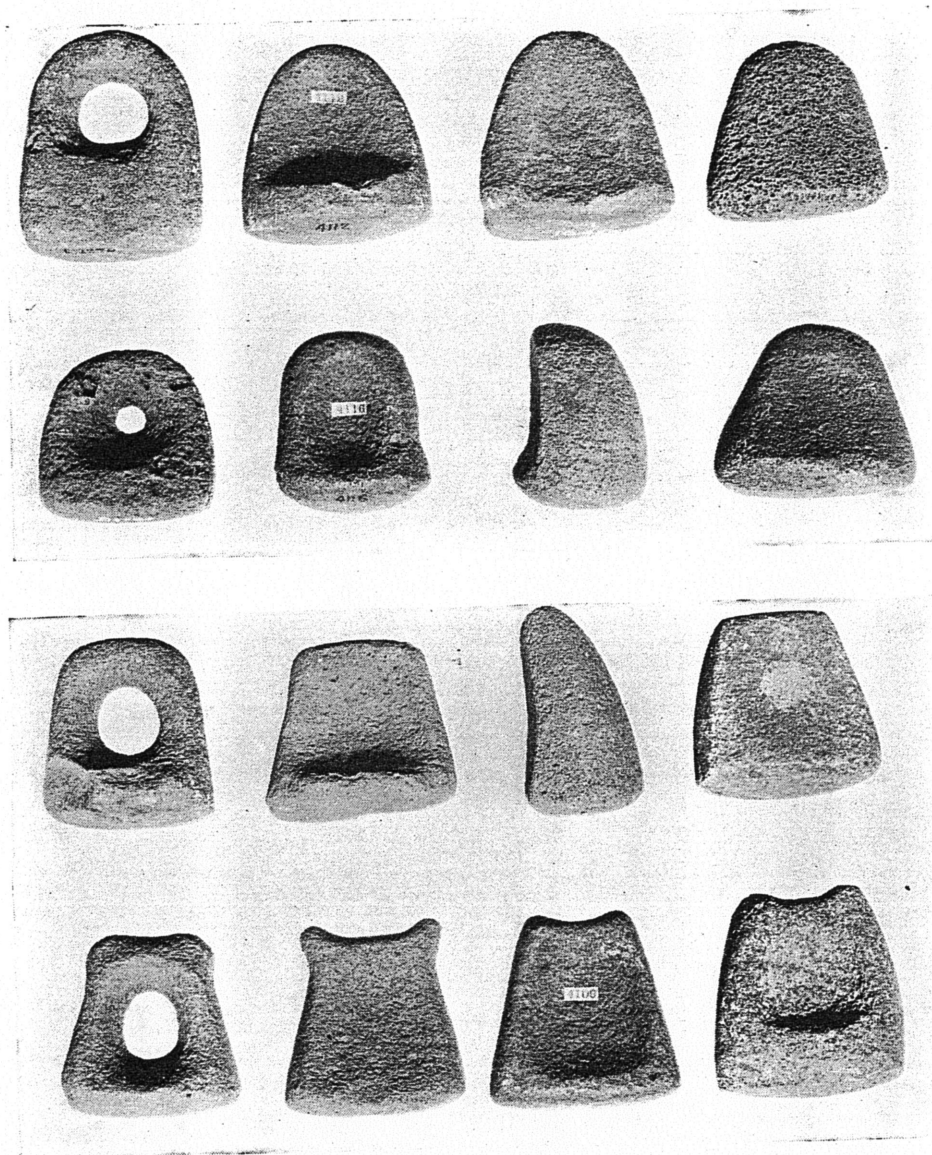
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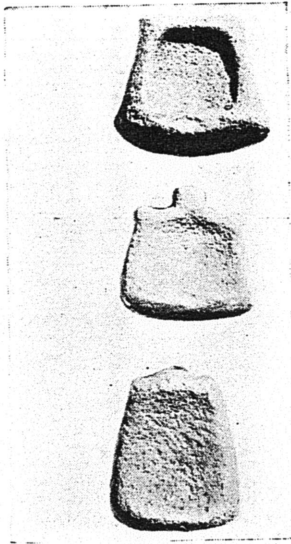
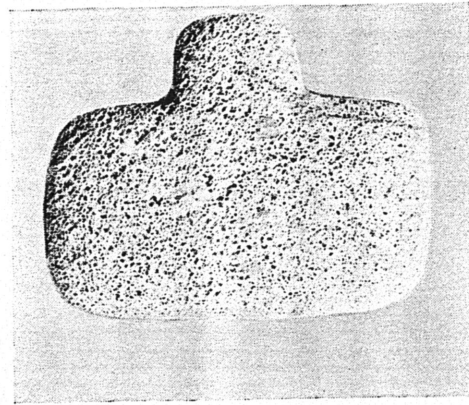
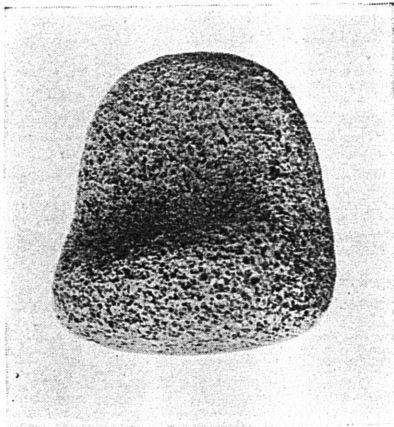
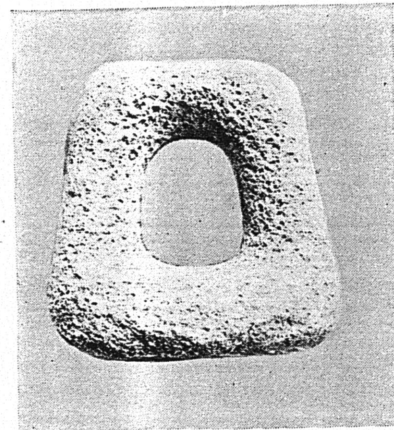
E

A, STONE LAMP WITH PROJECTING GROOVED HANDLE (GOODWIN COLLECTION);  
B, SMALL CUP MORTAR WITH GROOVED DESIGN ON OUTSIDE (WILCOX COLLECTION);  
C, TYPICAL MULLERS; D, VIEW SHOWING CORRECT METHOD OF HOLDING RING POUNDER;  
E, THREE TYPES OF RING POUNDER.

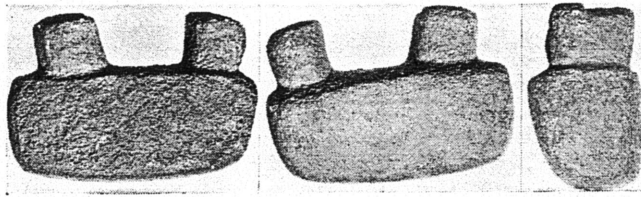
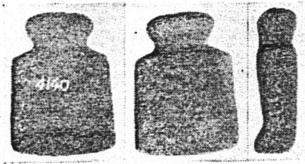
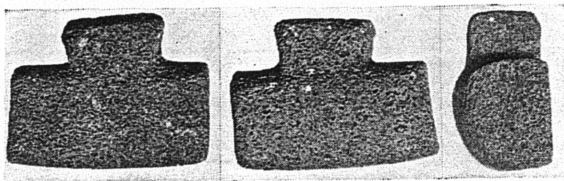
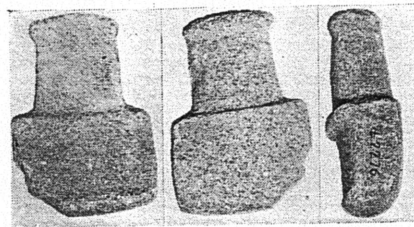
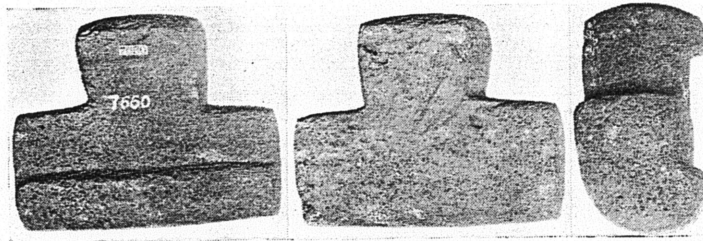
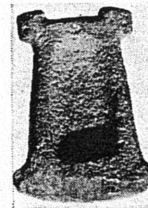




FOUR SERIES SHOWING RELATION OF BLOCK POUNDERS TO RING POUNDERS.

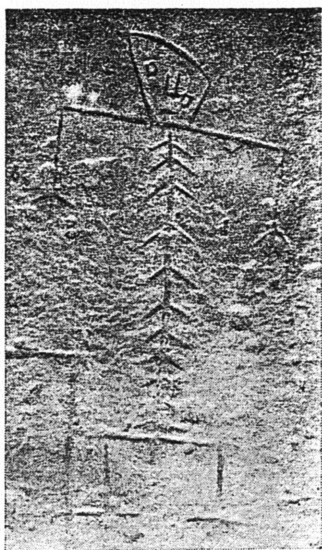
*A**B**C**D*

*A*, THREE BLOCK RUBBERS, THE TOP ONE SHOWING MARKED ANGULARITY IN THE DEPRESSION (GOODWIN COLLECTION); *B*, OLD FORM OF BLOCK GRINDER (SANBURN COLLECTION); *C*, IMPLEMENT INTERMEDIATE BETWEEN A BLOCK GRINDER AND A BLOCK RUBBER (WILCOX COLLECTION); *D*, UNUSUALLY SQUARED RING POUNDER, (SANBURN COLLECTION).

*A**B**C**D**E**F*

BLOCK GRINDERS. *A*, FRONT, BACK, AND SIDE VIEW OF CAST OF TWO-HANDLED FORM OF BLOCK GRINDER WITH NOTCH ON TOP OF HANDLE FOR HAFTING; *B*, A SMALL GRINDER THAT MIGHT HAVE BEEN HAFTED OR USED IN THE HANDS; *C*, BLOCK GRINDER WITH A SINGLE HANDLE FOR HAFTING; *D*, BLOCK GRINDER THAT MIGHT HAVE BEEN USED AS A HAND FORM WITHOUT HAFTING (THE ANGLES AND FLAT SURFACES STILL PRESENT); *E*, BLOCK GRINDER WITH EXCEPTIONAL ANGULARITY OF FORM WITH A SINGLE HANDLE FOR HAFTING; *F*, CAST OF GRINDER, SUPPOSED TO BE HAWAIIAN, COMBINING THE FEATURES OF THE BLOCK GRINDER AND THE BLOCK RUBBERS.





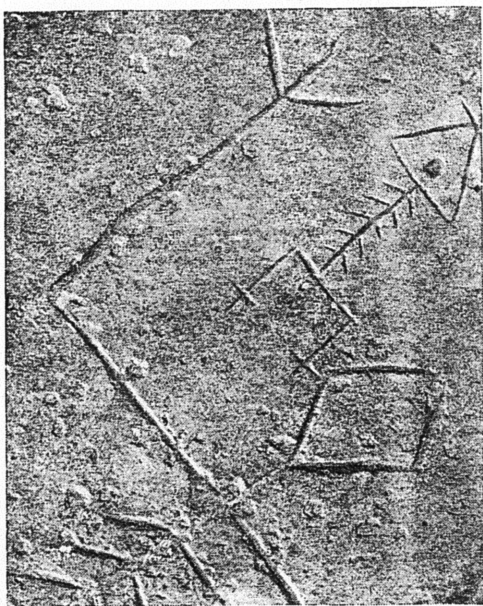
*A*



*B*



*D*



*C*



*E*

PETROGLYPHS FROM KEONELOA: *A*, SKELETAL-LIKE TRUNK AND QUADRANGULAR HEAD WITH FACIAL FEATURES; *B*, CANOE AND FOUR FIGURES; *C*, TRIANGULAR HEAD AND SKELETAL-LIKE BODY; *D*, GEOMETRIC DESIGN; *E*, TRIANGULAR BODY NOT JOINED AT THE HIPS. [PHOTOGRAPHS BY STOKES, 1916.]



