Snow, C. E., 1974. Early Hawaiians: An Initial Study of Skeletal Remains from Mōkapu, O'ahu. Lexington: University of Kentucky Press.

Thomas, D. H., 1986. *Refiguring Anthropology: First Principles of Probability and Statistics.* Prospect Heights, Illinois: Waveland Press.

Underwood, J. H., 1969. *Human Skeletal Remains from Sand Dune Site (H1), South Point (Ka Lae), Hawai'i.* Pacific Anthropolgoical Records No. 9. Honolulu: Department of Anthropology, Bishop Museum.

HAWAIIAN STANDING *KĀHILI* IN THE BISHOP MUSEUM: AN ETHNOLOGICAL AND BIOLOGICAL ANALYSIS

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In October 1990, the authors began a project to identify the biological components of *kāhili* preserved in the Bishop Museum, to determine techniques of construction, and to reassess their ethnohistorical significance.[1] This paper presents the results of that study. We begin by reviewing the ethnohistorical context of these distinctive ensignia of rank in 18th- and 19th-century Hawai'i, then examine the process of *kāhili* construction, focusing particularly on the raw materials used and the techniques used to assemble the standing *kāhili* surviving from the 19th century. Finally, we examine the particular bird species used in the manufacture of *kāhili*, and conclude with some speculations on the possible impact of the collection of feathers for *kāhili* on the bird species involved.

The Sample. Bishop Museum Standing Kāhili

This paper is based on a detailed examination of the entire collection of 75 tall, or standing, *kāhili* (*kāhili kū*) preserved in the Bishop Museum (Rose MS 1991). Over half of the collection (46 *kāhili* or 61% of the total) originate from heirs of the Kamehameha dynasty: Queen Emma (29 *kāhili*), Bernice Pauahi Bishop (10), Ruth Ke'elikōlani (4), and Victoria Kamāmalu (3), heir to the throne during the reign of Kamehameha V. These *kāhili* survive from among those assembled for the funerals of Victoria Kamāmalu in 1866, Kekelaokalani (mother of Queen Emma) in 1880, and the funerals of Ke'elikōlani, Bernice Pauahi Bishop, and Queen Emma between 1883 and 1885. They were among the first items placed in the Bishop Museum in 1891 and comprise the initial 46 entries in the catalogue — an incidental footnote of their contemporary esteem.[2] Of the remaining 29 standing *kāhili*, 17 were received between 1910 and 1924 from the heirs and estates of Kalākaua (5), Lili'uokalani (7), Kapi'olani (1), and Ka'iulani and Likelike (4). All but two or three of the remaining 12 were probably associated with Lili'uokalani, but this is not fully verified in the museum records. The last two *kāhili*, received in 1946 from the Edgar Henriques estate, descend through Lucy K. Peabody, former lady-in-waiting to Queen Emma. A collection of some 175 small *kāhili* and raw materials used in featherworking — as well as historic photographs, prepared bird skins and mounted specimens in the ornithology collections at the Bishop Museum and Brigham Young University, Hawai'i Campus — were also used for reference and comparison.

ETHNOHISTORICAL CONTEXT OF HAWAIIAN *KĀHILI*[3]

William Ellis, surgeon on Cook's third voyage, grasped something of the variability and complexity of Hawaiian *kāhili* when he observed in 1778-9:

> They have also a kind of fly-flap, made of a bunch of feathers fixed to the end of a thin piece of smooth and polished wood: they are generally made of the tail feathers of the cock, but the better sort of people have them of the tropick birds feathers, or those belonging to a black and yellow bird called mo-ho. The handle is very frequently made of one of the bones of the arm or leg of those whom they have killed in battle, curiously inlaid with tortoise-shell: these they deem very valuable, and will not part with them under a great price. This ornament is common to the superiors of both sexes (Ellis 1782:II:156).

Insignia of Rank and Status

Kāhili were observed and occasionally collected by members of Cook's expedition and by subsequent visitors, but their cultural contexts were rarely described in useful detail. From the early contact period to the 1820s, individuals of high chiefly rank, males and females of all ages, were observed on many occasions accompanied by servants and retainers, one or two of whom usually carried a *kāhili*. Favoured attendants held *kāhili* over the sacred heads of their masters or waved them gently to and fro as fly brushes to stir the air and keep troublesome insects at bay. Although *kāhili* provided practical benefits of personal cooling, especially inside the close and stifling grass houses, they served primarily to mark the presence and spiritually protect an important individual of *ali'i* or chiefly rank. *Kāhili* bearers were of either sex, but early accounts suggest that females tended to be bearers for female *ali'i* and males for male *ali'i*.

Kāhili bearers, along with other members of a chief's retinue such as the ubiquitous spittoon bearer, occupied honoured positions; called *pa'a kāhili* or *lawe kāhili*, they functioned essentially as personal servants. Jules Remy noted in the mid-19th century: "The duties of this officer were continual and most fatiguing, for he must constantly remain near the person of his master, armed with his *kāhili*, whether the king was seated or reclining, eating or sleeping." (Nordhoff 1974:229-30). Historian David Malo wrote: "Where the king went, there went his *kāhili* bearer . . . and where he stopped, there stopped also the *kāhili* bearer. When the king slept the *kāhili* was waved over him as a fly-brush . . . " (Malo 1951:77). Malo added that servants who handled *kāhili* about the king's sleeping place were called *ha'a e* or *kua-lana-puhi* (pp.59, 61); yet another name for them was *olu-eke-loa-ho'o-ka'a-moena* — a poetic allusion to the rustling of the chief's tapa robe or blanket as he turned from side to side while lounging on his mat.

Pageants and Ceremonies of State

Apart from the times when chiefs ceremonially greeted visiting ships, outsiders had few opportunities before 1820 to witness — or record — purely indigenous formal events in which *kāhili* may have played a conspicuous role. When New England missionaries arrived in 1820, their headquarters at Kawaiaha'o Church soon became the venue of pageants and colourful spectacles mixing the old and the new. During the 1820s, school examinations, the occasional dedication of a new church structure, or annual celebrations commemorating the death of Kamehameha I and accession of Kamehameha II provided suitable opportunity for ceremonial display. *Kāhili* of all sizes and hues, feather capes and helmets, elegant tapa and imported silks and satins, *mele* and *hula* were conspicuous components of the display on these occasions.

The missionary C. S. Stewart witnessed one such procession in May 1823 that concluded a two-week commemoration of Kamehameha II's accession. In full view of thousands of spectators, his ranking wife Kamāmalu, "seated as a Cleopatra" (Bingham 1847:184-5), was carried on the backs of men in a large whaleboat shaded by an immense Chinese scarlet silk umbrella. Two *kāhili* bearers, high chiefs Nahi and Kalanimoku, proclaimed her rank by each carrying

> a feathered staff of state, nearly thirty feet in height. The upper parts of these kahilies were of scarlet feathers, so ingeniously and beautifully arranged on artificial branches attached to the staff, as to form cylinders fifteen or eighteen inches in diameter, and twelve or fourteen long; the lower parts or handles were covered with alternate rings of tortoise shell and ivory, of the neatest workmanship and highest polish (Stewart 1830:117-8).

Except for height of the pole, this description closely matches the appearance of *kāhili* in the Bishop Museum collection.

As a highly conspicuous form of status-rivalry, pageantry such as this waned through the coming decades of change confronting Hawaiian society. As a consequence, *kāhili* assumed new functions in increasingly Westernised contexts. Whether borne as fly-flaps by personal retainers as in the past or set up as symbols of authority of the evolving state, *kāhili* added colour to formal audiences and receptions whenever the royal court and chiefs received visiting foreign dignitaries. When Kamehameha III convened the newly created Hawaiian Legislature for the first time in Honolulu on May 20, 1845, he was accompanied by two *kāhili*, "their feathers . . . worn and rumpled by age . . .":

> They were, however, about twenty feet high, with massive and rich staffs — the one surmounted by black feathers on a white ground — the other by orange and crimson. These were placed so as to tower over the throne, over which was

> thrown the only really rich remnant of royalty left. This was a feather cloak, made of very minute yellow feathers . . . (Judd 1928:119-20).

Thereafter, State *kāhili* appeared at annual openings of the Legislature until it was reorganised in 1850, and subsequently throughout the 19th century on special occasions. Until the overthrow of the monarchy in 1893, *kāhili* highlighted numerous state events, such as the accession of Lunalilo in 1873, the coronation of Kalākaua and Kapi'olani in 1883, and the 50th birthday jubilee of Kalākaua in 1886.

Throughout the 19th century and into the 20th, *kāhili* graced formal social functions such as receptions, banquets, dinner parties, *lū'au*, *poi* suppers, church services, and quasi-official events wherever ranking members of the Hawaiian *ali'i* were present or memorialised. One event relevant to note is the grand birthday *lū'au*, banquet, and ball that Ke'elikōlani hosted from April 9 to 11, 1882, to celebrate the housewarming of Keōua Hale; some of the *kāhili* made for her stately new mansion are preserved in the Bishop Museum (see figure 1). By the turn of the century and the demise of the old *ali'i*, *kāhili* became relegated more and more to stage and costume props for historical pageants and tableaux, such as the 1920 centennial of the arrival of the first missionaries, the 1928 sesquicentennial of Cook's discovery, various Hawaiian civic society functions and, of course, the annual Kamehameha Day parades still held each June.

State Funerals

Kāhili are perhaps most commonly associated with the imposing state funerals staged throughout the second half of the 19th century for members of the Kamehameha and Kalākaua families. Although a newspaper account in 1921[4] purports to describe the funeral procession by canoe of Kalani'ōpu'u in 1782—in which the *kāhili* named 'Ele-ele-ua-lani, Kaua-ka'a-honua, and Hawai'i-loa were erected — there are no eyewitness accounts yet found of pre-Christian Hawaiian mourning practices involving *kāhili*. On the death in 1823 of Keōpūōlani, mother of Kamehameha II and Kamehameha III, she was accorded the first native Christian funeral in Hawai'i. Her remains were borne in procession to a newly constructed mausoleum at Moku'ula, Lahaina, on a bier surrounded by six pallbearers — the five wives of Kamehameha II and the wife of Boki — "each carrying a beautiful black *kāhili* . . ." (Stewart 1830:348; see also Bingham 1847:197).

As Christian burial practices supplanted traditional rites, *ali'i* funeral processions became increasingly elaborate, and public. In May 1825, Lord Byron of *HMS Blonde* brought home to Honolulu the bodies of Kamehameha II and Kamāmalu, who had died on a state visit to London the year before; their remains,in magnificent coffins furnished by the British Government, were

Figure 1. Some of the Kamehameha family *kāhili* assembled in front of Keōua Hale, the house of Ke'elikōlani and Bernice P. Bishop, c.1890. All these *kāhili* are preserved in the Bishop Museum. Photo: W. T. Brigham, Bishop Museum Archives.

interred with military honours. The procession from the *Blonde* to Kawaiaha'o Church, then to temporary shelter in a grass house belonging to Kalanimoku, was preceded by male bearers carrying nine *kāhili*, "about thirty feet long, and from one to two feet in diameter, some of black, some of crimson, others of green, and others again of yellow feathers. . ." (Stewart 1830:348; see also Loomis MS).

Western military processions of honour, provided initially by visiting naval ships and which proved to be so pleasing to Hawaiians of the 1830s and 1840s, became a standard feature of state funeral ritual. Before 1850, contemporary eyewitnesses, and early newspaper accounts when they exist, do not always mention the number or appearance of *kāhili*, or even their presence, but there is clear evidence for increasing numbers of *kāhili* being displayed throughout the second half of the 19th century (see Table 1). Kamehameha III, laid to rest in the old Royal Tomb at Pohukaina in 1855 in the most imposing funeral cortege yet witnessed, was accompanied by at least four "large" *kāhili* (reportedly four black, or two yellow and two green — accounts are ambiguous) and 16 "small" *kāhili*.[5] Most of the individuals interred (or transferred there later) at the Royal Mausoleum at Mauna'ala were similarly honoured; their biers were accompanied in procession to their final resting place surrounded by *kāhili*. High-ranking female chiefs seem to have merited a greater number of *kāhili* than their male counterparts during the second half of the century. Notable are the funerals of Ke'elikōlani, Bernice Bishop, and Queen Emma (whose rituals marked the culmination of 19th-century royal funerals; see Fig. 2.)

Funeral obsequies for ranking *ali'i* throughout most of the 19th century lasted ideally a full month, during which period the deceased lay in state constantly attended by mourners. Watching over the body in pairs of three or four, they waved small, often black *kāhili* slowly and rhythmically over the coffin in solemn vigil day and night. From time to time chanters wailed in traditional manner and recited *mele* in honour of the deceased. Tall *kāhili* were assembled from components previously stored away and added to the scene, their numbers culminating

Table 1. *Kāhili* observed at selected state funeral processions (extracted primarily from newspaper accounts).

Individual	Date of Interment	Approximate Number Reported
Kamehameha II and Kamāmalu	May 11, 1825	9 large
Kamehameha III	January 10, 1855	74 large, 16 small
Kamehameha IV	February 3,1864	24 large, 24 small
V. Kamāmalu	June 30, 1866	"many" large and small
Kamehameha V	January 11, 1875	"many" large and small
Lunalilo	February 28, 1875	72-76 large and small
Lele'iohoku	April 18, 1877	?
Ke'elikōlani	June 17, 1883	80-90 large and small
Bernice Bishop	November 2, 1884	"not less than" 100 large and small
Queen Emma	May 17, 1885	65 large, 65 small
Kalākaua	February 15, 1891	95 large and small
Ka'iulani	March 12, 1899	27 large and ? small
Kapi'olani	July 2, 1899	70+ large and small
A. Kūnuiakea	March 15, 1903	30-60 large and small
D. Kawānanakoa	June 21, 1908	107 large and small
Lili'uokalani	November 9, 1917	"at least" 60 large and small
J. K. Kūhiō	January 15, 1922	"many" large and small

on the day of the funeral and procession to the mausoleum. At the conclusion of ceremonies at Mauna'ula, it was customary to place half a dozen or so *kāhili* around the coffin and apparently outside the mausoleum as well. They were left behind to weather slowly as the feathers drifted away in the breeze one by one, or until another royal funeral required that they be removed. The other large *kāhili* were carefully dismantled and their feathers stored until needed again, usually when the next *ali'i* death occurred.

Names and Naming

The word *kāhili*, defined in part by the Pukui-Elbert *Hawaiian Dictionary* (Pukui and Elbert 1971:105) as "Feather standard, symbolic of royalty . . . to brush, sweep, switch", has cognates in many Polynesian languages, including Tahitian, *tahiri* (Davies 1851:242); Marquesan, *tahi'i* (Phelps 1976:96); Aitutaki, *tahirihiri* (Buck 1907:207); and Maori, *tawhiri* (Buck 1927:207). Although the physical referents differ, ranging from finely plaited fans to fly-flaps of various sorts, most connote some sort of insignia of rank and/or authority.[6] In Hawai'i today, two kinds of *kāhili* are recognised. *Kāhili kū* are the "standing or tall *kāhili*, and *kāhili pa'a lima* or *kāhili lele* are small, much more common "hand-held" or "waving *kāhili*.

Like other highly esteemed articles such as feather cloaks and helmets, *kāhili* also were given personal names. Such names are recorded for 29 (39%) of the standing *kāhili* in the Bishop Museum, mainly on old paper labels glued to Queen Emma's *kāhili* poles (Brigham 1892:10-5; see also Brigham 1899:21-4). *Kāhili* 9, for example, is Ka-'ula-ho'āno-lani The "Red Awe of Heaven", named by its makers "for the redness *('ula)* of the feathers and the heavenly sacredness *(ho'o-lani)* attached to the chief for whom the *kāhili* was made" (HEN 1:2751). The

Figure 2. *Kāhili* in the funeral procession of Queen Emma from Kawaiahao Church to the Royal Mausoleum, May 17, 1885. Photo: Bishop Museum Archives.

engraved inscription on its metal-sheathed pole proclaims that it was "Presented to the Prince of Hawai'i by his native subjects of Foreign Parentage" in 1859 to celebrate the birth of the only child of Emma and Kamehameha IV on May 20, 1858. It was refurbished, probably with albatross feathers, before being taken to the Bishop Museum in 1891. One of Bernice Bishop's *kāhili* (1), made of black *'ō'ō* feathers, is named 'Ele-'ele-ua-lani "Black Rain of Heaven"; it is a very old name descended from the chiefs — "rich and beautiful in color as the greenery of the forest" (Kamakau 1961:184). Besides physical characteristics, other *kāhili* are named for famous ancestors, such as several in Queen Emma's collection: La'ie-lohelohe (6), wife of Pi'ilani; Ka-neoneo (24), a chief of Kaua'i killed in the battle of Nu'uanu in 1795; and Ke-ku'i-apo-iwa (27), a wife of Kekaulike.

According to some writers (Brigham 1899:15; Chinen MS 1980; Scott 1930:16), the name of a *kāhili* was applied to its pole or shaft. When its feathers were removed and stored after the specific occasion for use had passed, or when the feathers became worn and were replaced by others (not always of the same kind), the name remained for the pole alone. Perhaps once the rule, particularly for poles incorporating human bones from known individuals, there are exceptions in the Bishop Museum *kāhili*. The feathers of 'Ele-'ele-ua-lani, for example, were removed at some unknown time and remounted on a turned and polished, imported ash pole, yet the name remains. Ka-'olohaka, a ruler's *kāhili* from the time of Kamehameha I to Kamehameha V, was one of those placed by Ke'elikōlani at the head of the coffin of Kamehameha III at the time she inherited the estate of the Kamehamehas. According to Lucy K. Peabody (HEN 1:2749), the *kāhili* was taken from the Royal Mausoleum by Kalākaua then acquired later by Lili'uokalani, who buried the bones of Ka-'olohaka at Mauna'ala and commanded her principal featherworker, Naheana, to divide the feathers for use in two *kāhili*. This pair (1922.08.02-.03) — with yellow *'ō'ō* axillary (shoulder) and red *'i'iwi* contour (body) feathers on similar walrus ivory and turtle-shell poles — were often displayed on either side of Lili'uokalani at royal receptions and other special events. They stood guard at her bedside until her death, and finally at the head and foot of the bier upon which she lay in state at Kawaiaha'o Church.

Paired Kāhili

Like the second incarnation of Ka-'olohaka, *kāhili* were frequently made in pairs — sometimes surprisingly matched duplicates, other times differing only in size, feathers, or type of pole. Of the seven closely matched pairs in Queen Emma's collection, both members of four pairs have the same name (8 and 33, Ka-lele-ho'ānoāno; 10 and 29, Ka-maka-alaneo; 12 and 31, Ka-leo-aloha; 16 and 25, Lele-'ō'ili). Individual *kāhili* in three other physically similar pairs bear different names (2, Noelani and 4, Ka-maka-ma'o) and (14, Ku'imaka, and 27,

Ke-ku'i-apo-iwa; for 20 and 22, see below). Four nearly identical *kāhili* (40-43) are named Pili-aloha; made of large, dyed red feathers on *kauila* poles, they were displayed at the four corners of the bier of Queen Emma's mother Kekelaokalani in 1880, and five years later over her own remains in Kawaiaha'o Church (Brigham 1899:24).

The pair with two different names, a famed and still handsome pair, combines trimmed black *'ō'ō* contours and yellow axillary feathers with red *'i'iwi* contours and central tail feathers of red-tailed and white-tailed tropicbirds. La'i-kū "Extreme Calm" (20, see Fig. 3) is mounted on a turned and polished, reddish-stained *kauila* pole, while Malu-lani "Heavenly Shade" (22) is on a walrus ivory and turtle-shell pole. According to Lucy K. Peabody (HEN 1:2753-4), these *kāhili* were made and given to Queen Emma during her childhood at Lanikeha in Lahaina, Maui, but their names, bestowed by the chiefs, were not ancestral. Both *kāhili* were erected at the heads of the coffins of Kamehameha IV and the Prince of Hawai'i at Mauna'ala, in 1864, then placed at the head of Queen Emma's bier during her funeral obsequies in 1885. It is interesting to note that Malulani Beckley Kahea, a celebrated featherworker of this century, was named for one of these *kāhili*, as was a daughter of Nalaniwahine.[7] Lili'uokalani herself is said to have quoted often the expressions "La'i-kū" and "Malu-lani" (Webb n.d.).

RAW MATERIALS AND CONSTRUCTION

Determination of Construction Techniques

Because of the fragile and irreplaceable nature of the *kāhili* in the Bishop Museum collection, it was not possible or desirable to disassemble any *kāhili* or their component parts in order to discover the construction techniques and materials used in their manufacture. As such, construction techniques had to be inferred through close visual inspection of the assembled components, and especially of areas where deterioration had revealed important details of the assembly process. Much information on construction and materials was also derived from examination of 40 of the standing *kāhili* disassembled (the branches taken off the pole) for safer storage between 1967 and 1974. The ability to examine the individual components of these *kāhili* allowed us to infer the construction techniques with much greater accuracy than otherwise would have been possible. The construction processes detailed in this paper represent the most plausible techniques that we can infer from both visual inspection and the few ethnographic sources that exist on *kāhili* construction.

Components

Hawaiian *kāhili* are constructed from three basic components: the *'au* or branches which make up the *hulumanu* or feathered cylinder; the *kumu* or pole

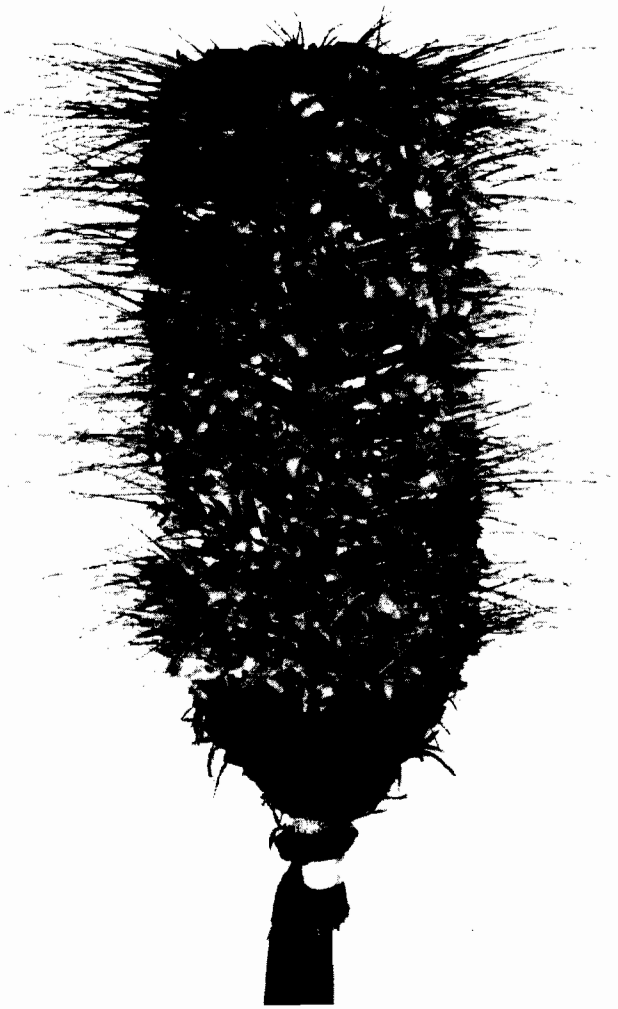

Figure 3. The *kāhili* called La'i-kū (20, "Extreme Calm"), one of a pair of *kāhili*, the other being Malulani ("Heavenly Shade"), made and given to Queen Emma during her childhood at Lanikeha in Lahaina, Maui. The feathers in this *kāhili* are the central tail feathers of *koa'e-ula* (red-tailed tropicbird), *'ē'ē* (axillary feathers) of the Hawai'i *'ō'ō* and body feathers of *'i'iwi*. Photo: C. Meyer.

to which the branches are tied; and the optional trim consisting of the *pāpale* or cap, the *pā'ū* or skirt and the streamers, originally of *kapa* or bark-cloth. Although construction techniques of each of these components differ only slightly among individual *kāhili*, the *kāhili* makers of old[8] were able to produce a tremendous variety of shapes, colours and styles by varying the form, materials and combinations of the three types of components. One factor which made this diversity possible was the availability of a large assortment of different raw materials, both native and imported, whose great diversity is only now beginning to become apparent. The following discussion of raw materials and construction is based on the 75 standing *kāhili kū* in the Bishop Museum. Small hand *kāhili (kāhili pa'a lima*, or *kāhili lele*) are more variable in form, materials and appearance and are not discussed in this paper.

'Au (Branches)

The most visually striking aspect of Hawaiian *kāhili* is the large *hulumanu* or feathered cylinder forming the crown. In most specimens, this cylinder is composed of several hundred separate *'au* or branches each tipped with several bunches of feathers. Traditional *kāhili* branches are all made of one or more bundles of stiff plant fibre, henceforth "core fibres", which are lashed together to form the finished branch. Analysis of these core fibres reveals that most of the branches are made from the split adventitious roots of the indigenous *'ie'ie* vine *(Freycinetia arborea)*, with coconut midrib *(Cocos nucifera)* and some other as yet unidentified plant fibres also present to a much lesser extent. Table 2 lists the botanical elements identified in *kāhili* branch cores and lashings. The predominant use of *'ie'ie* as a branch core fibre accords with the few surviving historical accounts that we have of *kāhili* construction (Anonymous MS n.d.). From the late 19th century on, there is also some use of stiff copper or steel wire as a branch core material, as seen in four of the later Bishop Museum standing *kāhili* .

Table 2. List of plant and animal materials found in *kāhili* branch cores and lashings.

Scientific Name	Hawaiian and Vernacular Names	Part Used
BRANCH CORE MATERIAL		
Cocos nucifera	*niu*, coconut	husk of fruit, midrib of leaf
Freycinetia arborea	*ie'ie*, screwpine	split adventitious root
LASHINGS		
Touchardia latifolia	*olonā*	bark
Gossypium spp.	cotton	fruit
Bombyx mori	silkworm	web

Construction of the branches was accomplished using two slightly different techniques, each of which produced a similar appearance in the finished branch. In the most common technique, the *'au* (branch) was made using a single bundle of core fibres evenly divided to form branch-like "forks" (i.e., it was bifurcated at set intervals) up to three times before ending in the twig-like tips, the *pe'a* or "tines", into which the feathers were incorporated. At each bifurcation, the bundle of fibres was divided approximately in half, usually by making a half-twist of the right half of the bundle over the left, and the shape of the fork secured either by bending back one or more of the core fibres to hold the two sides of the fork apart, or by tying it into shape during the lashing process — or both. Feathers were attached usually by first tying them into a small bundle (sometimes with a splint of core fibre to make them easier to attach) and then incorporating the bundle into the *pe'a* at the end of the *'au*. Once the feathers had been inserted, the entire *'au* was lashed together by wrapping the lashing material helically along the full length of the branch. Traditionally, the preferred lashing material was *olonā (Touchardia latifolia)* bast, but imported cotton thread was used in the construction of most surviving *kāhili*. In some specimens, the branches, once lashed, were given an overlashing of coloured yarn or ribbon to give the branch a specific colour. In a few specimens, the entire branch was dyed (usually red), again, perhaps for decorative effect.

In the second construction technique (which is much rarer than the first), the branches were first made in several individual subunits which were then assembled to form the finished branch. For example, to produce a double-forked branch, two single forked subunits would be made using the technique described above. These two subunits were then lashed together, along with some extra fibres that formed the stem (by which the branch was attached to the pole), to form a double-forked branch. Rather than being a separate technique for making new branches, this second technique probably was developed in order to reuse miscellaneous shorter branches from older *kāhili* in the construction of a new specimen — a practice well documented in historical records.

By varying the number of times a particular branch forked, as well as the number and colour of feathers used, *kāhili* makers were able to produce considerable variety. Most branches in large *kāhili* were of four basic types: unforked (in which the initial bundle of fibres was not divided, resulting in a straight branch with a single tine); single-forked (in which the bundle was divided once resulting in a branch with two tines); double-forked (in which the bundle was divided twice, resulting in a branch with four tines); and the rare triple-forked (in which the bundle was divided three times resulting in a branch with eight tines). Figure 4 shows examples of unforked, single- and double-forked branches. Most branches seen in large *kāhili* are of either the single- or double-forked variety, with triple-forked branches occurring in only two of the Bishop

Museum *kāhili;* these two specimens (26 and 32) are associated with Victoria Kamāmalu, heir to the throne who died in 1866, and are, thus, among the oldest in the Bishop Museum collection.

On completion, the branches could be stored for future need or used immediately. For assembly, the stems were bent to the appropriate length and then lashed to the pole beginning at the top and working downwards. Traditionally, either twisted *olonā* cordage or bast was used; however, ordinary cotton twine and commercial jute or hemp cordages are more common on surviving *kāhili*. In most *kāhili*, the *'au* are lashed on in a single continuous descending spiral, a technique that required both great skill and patience to perfect. In others, the *'au* are lashed on in a series of tiers, each consisting of a single ring of branches encircling the pole. Although overall shape of the *hulumanu* varies considerably, the most common form is a uniform cylinder of feathers which varies in compactness or density from one *kāhili* to the next. Rarer forms include squat or truncated cylinders, spheres, and spiky cylinders. *Kāhili* made of the two central tail feathers of the *koa'e-ula* or red-tailed tropicbird *(Phaethon rubricauda)* or *koa'e-kea* or white-tailed tropicbird *(Phaethon lepturus)* somewhat resemble pinecones. In some specimens, feathers of different colours are used to create a cap-like ring of branches on top of the *hulumanu* or a band of trim at its base.

Particularly notable are those *kāhili* with globular *hulumanu* which often resemble rosebuds or suggest the shape of ice cream cones. Such globular *kāhili* have an internal frame of bent wire or metal umbrella ribs to which the branches are tied to keep the *hulumanu* in its proper shape. A unique pair of *kāhili*, resembling English topiary and made not from feathers but from the curled shavings of an as-yet-unidentified plant, was presented to Queen Emma by a *hui* of women from Wailuku on her birthday in 1883. These two *kāhili* (only one of which survives) are the only examples in the Bishop Museum collection which do not use feathers. Other *kāhili*, made of *kapa*, flowers, or ferns are known from accounts of *ali'i* funerals but, as far as is known, none of these has survived.

Kumu (Poles)

Traditionally, the most important element in a *kāhili* was said to be the pole or *kumu* from which the *kāhili* derived its personal name (Brigham 1899:15; Chinen MS 1980:39). The length of the poles used in standing *kāhili* determined their final height and varies from about 2 to more than 5 metres. Although many different types of poles were produced from the late 19th century onwards, the earlier *kāhili* poles were of two kinds. The simplest of these were made by reusing an old spear to which the branches were tied. If a separate *pāpale* or cap (see below) was used, the tip of the spear was notched to allow it to be tied on more securely, but otherwise, little or no modification was needed. Several sources cite *kauila (Alphitonia ponderosa)* or *'ōhi'a lehua (Metrosideros polymorpha)* as the

Figure 4. *Kāhili* branch types (left to right) unforked (red-tailed tropicbird central tail feathers), forked (peacock eye feathers) and double-forked (Hawai'i *'ō'ō* axillary feathers). Photo: S. Conant.

type of wood most frequently used for such spears/*kāhili* poles (see Brigham 1899:15-16; 1892:11; Handy and Handy 1972:287). Identification of thin sections of wood samples confirms that all of the "spear" type poles in the sample collection are made of *Alphitonia ponderosa*, one of two botanical species jointly known as *kauila* to the ancient Hawaiians.

The second variety of *kāhili* pole is more complex. In these specimens a central wooden shaft was used — again usually made of *kāhili* or, in at least one case, of *'ulu* (breadfruit, *Artocarpus altilis)* and another of *wauke* (paper mulberry, *Broussonetia papyrifera)* — around the lower portion of which an elaborate handle was assembled. These handles, among the most finely crafted of Hawaiian artefacts, were constructed by alternating stacks of perforated turtle-shell disks and cylinders of human bone or ivory. Analysis of the turtle-shell has shown most of it to be from the *'ea* or hawksbill turtle *(Eretmochelys imbricata).* Two different colours of turtle-shell are used; a dark brown from the dorsal scutes on the back, and a lighter brown or amber from the plastral scutes on the underside of the shell. Ivory was obtained primarily from walrus tusks *(Odobenus rosmarus)* imported mostly by whalers after 1820, and probably also from sperm whale teeth *(Physeter macrocephalus)* either brought in by passing ships or obtained locally. Human bone *(Homo sapiens)* was taken from the long bones of the arms and legs, one of the traditional residing places of a person's mana or spiritual power. Table 3 provides a summary of the biological materials identified in the *kumu* examined and some of the different pole types are identified in Figure 5.

In later historic times a wide variety of different types of poles was made and used. The most common were long slender poles of imported conifer wood painted in shades of brown, black, maroon and white to resemble the more traditional bone/ivory and turtle-shell poles. Analysis of several of these poles shows them to be made from *Pinus lambertiana.* Other later *kāhili* poles were made of *koa (Acacia koa)* and *kauila,* turned on a lathe and then shellacked or French polished. The most elaborate *kumu* were made by laminating a number of short segments of various Hawaiian woods to a central core and lathe-turning the assembled pole to a uniform diameter. One reason for creating this type of pole was apparently to display the beauty and diversity of native Hawaiian woods. Laminated poles in the Bishop Museum collection include woods from endemic tree species such as *kauila* and *koa,* Polynesian introductions such as *kou (Cordia subcordata),* and *kamani (Calophyllum inophyllum),* and at least one postcontact introduction, the monkeypod *(Samanea saman).*

Trim. Pā'ū (Skirts), Streamers, and Pāpale (Caps)

Trim on Hawaiian *kāhili* consists of three separate components: the *pā'ū* or skirt, the streamers (which may have been known as *kapa*), and, sometimes, a

pāpale or cap on the top. Because trim was often renewed each time a *kāhili* was reassembled, it is difficult to determine what type of trim, if any, might have been present on the earliest *kāhili.* Skirts served to hide the unsightly lower ends of the branches of the *hulumanu* and may have originally been made of *kapa* cloth, which is found on one of the specimens in the Queen Emma collection. Most *pā'ū* consist of a cardboard cone to which either fabric or dyed feathers are sewn with cotton thread. Fabric skirts were made in a variety of different styles and colours with yellow, white, red, and blue being the most common. Analysis of skirt fabrics reveals that those skirts appearing to be "original" are made of silk or cotton.

The feathered *pā'ū* were made by sewing dyed feathers (usually of some domestic bird such as chicken, duck, or goose) to a cardboard cone that had,

Table 3. List of plant and animal species used in *kāhili* poles.*

Scientific name	Hawaiian and Vernacular Names	Part used	Number of *kāhili*
PLANTS			
Alphitonia ponderosa	*kauila*	trunk	20
Acacia	*koa*	trunk	5
Mixed (laminated) Hawaiian woods		trunk	6
Artocarpus altilis	*'ulu,* breadfruit	trunk	1
Pinus lambertiana, other conifers	pine	trunk	23
?	ash	trunk	6
unidentified or not sampled			14
ANIMALS			
Eretmochelys imbricata	*'ea,* hawksbill turtle	shell	15
Odobenus rosmarus	walrus	tusks	14
Physeter macrocephalus	*palaoa,* sperm whale	teeth	?
Homo sapiens	human	long bones	1
unidentified mammal bone	probably human		4

* A total of 75 *kāhili* was examined.

Figure 5. A sample of *kāhili kumu* (pole) types. From left to right the pole numbers and the materials of which they are made: 12 (painted conifer), 143 (ivory and light- and dark-coloured turtle-shell; the light coloured rings are made from the ventral shell), 36 (*koa* wood), 18 (laminated native Hawaiian woods), 4 (reused *kauila* spear). Photo: E. P. Kjellgren.

in most cases, first been covered with ordinary balanced plain-weave linen or cotton cloth. Most feathered skirts feature two colours in patterns that include alternating vertical or horizontal stripes, crescents, or checkerboard squares. Predominant colour combinations are yellow and red, but yellow and white, yellow and green, purple and white, and other colours also occur. Feathered *pā'ū* are usually accompanied by smaller fabric skirts which are attached to the base of the cardboard and hide the juncture with the *kāhili* pole.

One, or more commonly two, streamers made of various types of ribbon (the older ones usually silk), are tied around the base of the skirt, the knot being either a bow or half-bow of varying length. The free ends of the ribbon form dangling streamers and are often cut at a 45° angle or in a fish-tail pattern for decorative effect. The colour of the streamers is sometimes different from (but complementary to) that of the *pā'ū* and streamers of two different colours are often used. Streamers were frequently renewed, so it is difficult to find out what types or colours originally decorated many of the surviving *kāhili*.

Like the *pā'ū*, the *pāpale* or "cap" was constructed from a piece of cardboard to which fabric and/or dyed feathers were sewn. The *pāpale* was stitched to a frame, consisting invariably of a cross made from two short lengths of old umbrella ribs tied together with twine, then secured to the top of the pole, which was notched to accommodate it. Colours and patterns of *pāpale* almost always match those of the *pā'ū*. Most *pāpale* are decorated only on the top side, all but invisible from the ground, whereas, in a few others, the decoration appears on the underside only, presumably because *pāpale* were seen from below in normal use.

Assembly of the Components

Unfortunately, there are few historical sources to shed light on the precise ways in which the components were assembled into a completed *kāhili*. Nonetheless, by examining the assembled extant specimens, the process can be inferred. The various components — *'au*, *kumu*, *pā'ū*, streamers, and *pāpale* — were probably assembled as follows: First, the top of the pole, in some cases, was wrapped either with *kapa* or, later, cloth. Next, the *'au*, starting at the top and spiralling down, were tied on with either *olonā* cordage or commercial twine. Proper spacing and attachment of the *'au* must have been by far the most difficult aspect of the assembly, since this had to be done precisely so as not to leave unwanted gaps in the finished *hulumanu*. Once the *'au* were tied in place, trim was attached, probably in no particular order. The *pā'ū* could be slipped up from the bottom of the pole to cover the ends of the lowest *'au*. The *pā'ū* was tied in place, using cotton or some other convenient twine, over which the streamers were tied to complete the decoration. In attaching the *pāpale*, the umbrella-rib frame was probably first tied to the top of the pole and then the ornamented disk stitched to it with thread.

Because none of the components was permanently attached to any other, each could easily be combined and recombined into an almost infinite variety of possible configurations. This flexibility is responsible for the great abundance of forms and innovations seen in Hawaiian *kāhili*, particularly those surviving from the later historic period.

ORNITHOLOGY OF HAWAIIAN STANDING *KĀHILI*

Feather Identification and Sources of Supply

In the course of examining each *kāhili* and describing its structure, any feathers already detached, or that became detached in the process, were labelled and set aside for comparison with bird specimens. Comparison of feather samples with bird specimens resulted in many positive identifications, but some samples remain unidentified, particularly those from presumed domesticated birds (e.g., chickens, ducks, geese). Although some museum catalogue entries for *kāhili* specified feather sources, many of these entries proved to be incorrect.

At the time many of the standing *kāhili* we examined were originally assembled, *kāhili* makers would have had access to feathers from commercial sources, because use of feathers in the millinery trade was extensive during the late 1800s and early 1900s (Berger 1981:8; Wetmore 1925:86). As a result, "exotic" bird feathers could have come from virtually anywhere in the world. This situation made the task of identifying feathers from non-native bird species difficult, though we made many tentative identifications.

Of the species of native birds available to them, the Hawaiians selected relatively few to provide feathers for the *kāhili* we examined. Bird species whose feathers were used in *kāhili* can be separated into three major biogeographic groups: exotic, indigenous and endemic. The feathers of exotic species (those birds not naturally occurring in Hawai'i) were most difficult to identify, and some remain without positive identification. Indi-genous birds are those that naturally occur in Hawai'i and elsewhere; all were seabirds. The endemic species (species found only in Hawai'i) whose feathers were positively identified in *kāhili* were forest songbirds.

It was not possible to determine when the feathers used in a particular *kāhili* were actually collected. As mentioned above, standing *kāhili* were often assembled for a particular occasion of State and then disassembled and stored for future use. The materials may have been stored as assembled branches or simply as loose feathers, core and lashing fibres. If adequately protected from insects, exposure to extremes of light and humidity, etc., feathers may retain their colour and shape for decades, even centuries. Thus, it is possible, though perhaps unlikely, that some of the native bird feathers that occur in *kāhili* assembled as late as 1928 for the Cook sesquicentennial were collected before Cook's arrival in 1778.

It seems likely that both feather colour and some characteristics attributed to the source bird species by the Hawaiians influenced the choice of feathers used in *kāhili*. The significance of colour remains obscure, although we know from historic usage, as well as pan-Polynesian parallels that red and yellow were associated with the Hawaiian *ali'i*. Some individual *ali'i* seem to have preferred certain colours. For example, black is the predominant colour in the *kāhili* of Lili'uokalani, and reputedly one of her favourites. Two pure white *kāhili* (15 and 21) were made for the funeral of Mrs Bishop, allegedly as symbols of her pure character. Black, red, white and yellow are the most frequently used colours of feathers. When feathers are dyed, they are most often dyed red or yellow. Further research is needed to clarify the importance of feather colour and its iconographic significance in Hawaiian culture.

Regarding the "character" of the bird whose feathers were used, an understanding of how the Hawaiians regarded the various bird species might explain, for example, whether a black feather from an *'iwa* (great frigatebird, *Fregata minor*) had the same significance as a black *'o'o* (*Moho* spp.) feather. Keauokalani calls the *'iwa* "a royal bird." In writing of the *mamo (Drepanis pacifica)*, the "chief of small, mountain birds", he notes that "this bird has a proud appearance, as though with pride and haughtiness". The *'i'iwi (Vestiaria coccinea)* "flies up and down as if it despises laziness and idleness" (Keauokalani MS 1859). Whether such notions of a bird species' "character" played a significant role in the use of its feathers in artefacts remains an enigma. Rarity or difficulty in procurement of feathers may also have determined their value to some extent (Berger 1981:105-6, Peale 1848:8).

Domesticated and Exotic Bird Feathers in Kāhili

Only two species of exotic birds could be positively identified from the feathers present in the *kāhili* sampled (see Table 4). These two were the peafowl *(Pavo cristatus)* and the domestic chicken *(moa, Gallus gallus)*. The spectacular "eye" feathers that comprise the tail, tail coverts and lower back feathers of male peafowl (i.e., peacocks) are distinctive, and were used in 16 of the 75 *kāhili* examined. Sometimes barbs from below the "eye" of these feathers were stripped from the vane and used in bunches. Eight *kāhili* contained peafowl contour feathers (that is, feathers that give shape or "contour" to the body) of the following types: downy feathers and brown and white barred feathers, either of which could have come from any age or sex of bird; and black or bluish-black iridescent feathers from adults. Peacocks had been given as a gift to Kamehameha III and Queen Kalama at least as early as 1848 (Richards 1970:300), and the feathers that appear in the *kāhili* may have come from descendants of this or other domesticated stock, or from a millinery supplier.

Table 4. List of domesticated or exotic bird species whose feathers were used in *kāhili*.

Scientific Name	Hawaiian and Vernacular Names	Number of *kāhili* with this species	Feather Type	Number of *kāhili* with this feather type
Gallus gallus	*moa*, red junglefowl	11	contour	11
Pavo cristatus	common peafowl	17	contour	7
			"eye" feather	10
			"eye" feather barbs	5
Dromaius novaehollandiae	emu	2	contour	2
Anas, Cairina	domestic and/or muscovy ducks	23	contour and flight	23

Rooster hackles, or the neck feathers of male chickens, have a distinctive shape, and were identified in two *kāhili*. In seven other *kāhili*, feathers tentatively identified as chicken contour feathers were mixed in with feathers tentatively identified as some variety of domesticated waterfowl (probably domestic ducks or geese). Chicken contour feathers can be distinguished from those of waterfowl because they are structurally looser.

Numerous feathers were attributed to the category "domestic ducks", which could include domestic ducks (*Anas* spp.), muscovy ducks (*Cairina* spp.), or small specimens of domestic geese (*Anser* spp.). Another category, "large waterfowl", could include geese, or perhaps swans (*Cygnus* spp.), and a number of different seabird species (e.g., albatrosses, shearwaters, boobies). Seabird feathers are similar in structure to those of many species of ducks and geese. The characteristically curled shaft and strong hooks that hold together the barbs of these feathers afford the plumage some of its water resistance. We suggest that most of the feathers we attributed to the "domestic duck" category are, in fact, domestic duck or goose, which would have been readily available commercially or from the local poultry yard. The feathers in these two categories, nearly always white to begin with, were usually dyed red or yellow.

Two *kāhili* had what appear to be emu *(Dromaius novaehollandiae)* feathers. The feathers may have come through the commercial trade or possibly from a specimen brought to Hawai'i as a curiosity.

Indigenous Bird Feathers in Kāhili

Five seabird species were positively identified as sources for *kāhili* feathers. Additional species may also have provided feathers, but the identifications remain unconfirmed. Black-footed albatross *(moli, Diomedea nigripes)*, red-tailed tropicbird *(koa'e-ula)*, great frigatebird *('iwa)*, sooty tern *('ewa'ewa, Sterna fuscata)*, and brown noddy *(noio-kōhā, Anous stolidus)* feathers were all identified from Bishop Museum *kāhili* (see Table 5).

Table 5. List of indigenous Hawaiian seabirds whose feathers wereused in *kāhili*. (Note: more than one species and/or feather type can occur in a single *kāhili*.)

Scientific Name	Hawaiian and Vernacular Names	Number of *kāhili* with this species	Feather Type	Number of *kāhili* with this feather type
Diomedea nigripes	*moli*, black-footed albatross	4	contour	3
Phaethon lepturus	*koa'e-kea*, white-tailed tropic bird	4(?)	central tail	2(?)
			flank	2(?)
Phaethon rubricauda	*koa'e-'ula*, red-tailed tropicbird	13	central tail	7
			flank, wing, tail coverts	8
Fregata minor	*'iwa*, great frigate bird	16	contour (male, back)	16
Sterna fuscata	*'ewa'ewa*, sooty tern	3	wing	3
Anous stolidus	*noio-kōhā* brown noddy	3	wing	3

Black-footed albatross contour feathers, with their distinctive shape and colour, were found in three *kāhili*. Two or three may also have had contour feathers from Laysan albatross *(moli, Diomedea immutabilis)*, but these white feathers cannot be distinguished with certainty from similarly structured feathers of large domestic waterfowl. The catalogue entry for *kāhili* 9 notes that it was "restored with albatross feathers", which, in this case, is probably correct.

Most of the tropicbird feathers found in *kāhili* are from the red-tailed tropicbird *(koa'e-ula)* rather than the white-tailed tropicbird *(koa'e-kea)*. This judgment is based on the red colour of unfaded central tail feathers (tail feathers are also

known as rectrices), and the size of the black and white flank and tertiary (the third row) wing feathers (which are larger in the red-tailed tropicbird). Some black and white feathers from immature tropicbirds were used; the black and white feathers from immature birds can be distinguished from adult black and white feathers on the basis of pattern, and size again allows identification of the species in many cases. The white wing and tail feathers of tropicbirds have black shafts, a character not obscured by dyes.

The two red, central tail feathers of red-tailed tropicbirds lend a distinctive appearance to the eight *kāhili* in which they were used. These slender feathers can reach more than 45 cm, and the unfaded feather is a striking combination of red, black and white. The white and black feathers of white-tailed tropicbirds are nearly as long, and faded feathers are difficult to assign to one of the two species. Red-tailed tropicbirds, which nest in dense cover on the ground or in natural cavities, might have been an easier source of feathers than their cliff-nesting, white-tailed relatives.

The iridescent back and neck feathers of breeding male great frigatebirds were used in more (16) than those of any other indigenous bird. Although the glistening black, green and blue hues are similar to those found in feathers of feral chickens (i.e., jungle fowl), frigatebird feathers taper to a sharp point, unlike chicken feathers. Interestingly, two later *kāhili* made for educational purposes (INV-007 and INV-008) use chicken feathers trimmed to look like frigatebird feathers. Black feathers either from *'ō'ō* or frigatebirds were used in numerous *kāhili*, and even the most brittle and dirty frigatebird feathers still retain their iridescence.

We were able to positively identify the feathers of two other seabirds. Two *kāhili* (B.6850 and B.6851) contain the trimmed primary (first row) flight feathers of brown noddies *(noio-kōhā, Anous stolidus)*. The catalogue entry for *kāhili* B.6850 and B.6851 reads "brood tern", a term we have been unable to trace in the ornithological literature. *Kāhili* B.7250 and its mate B.7251 contained the trimmed primaries of sooty terns *('ewa'ewa, Sterna fuscata)*. The catalogue entry for *kāhili* B.7250 reads "kala", which Titcomb and Gagné (1976:117-26) construed as *pakalakala* or gray-backed tern *(Sterna lunata)*. Interestingly, *kāhili* INV-O10 and INV-Oll contain complementary parts of the trimmed primary flight feather type also found in *kāhili* B.7251. The feathers in INV-O10 and INV-Oll retain the shaft and the leading edge, while the *hulumanu* of *kāhili* B.7251 appears to be made of the portions trimmed out of the same type of flight (i.e., wing and tail) feathers.

Endemic Bird Feathers in Kāhili

Feathers from two species of endemic forest birds were positively identified from a variety of *kāhili* (Table 6). Six *kāhili* contained the bright vermilion contour feathers of adult *'i'iwi*, lashed in bunches with feathers from *'ō'ō*, red-

tailed tropicbirds and other species. The extinct Hawai'i *'ō'ō* (*Moho nobilis*) provided black feathers from the wings (probably primaries), tail (rectrices), and

Table 6. List of endemic Hawaiian bird species whose feathers were used in *kāhili*.

Scientific Name	Hawaiian and Vernacular Names	Number of *kāhili* with this species	Feather Type	Number of *kāhili* with this feather type
Moho nobilis	*'ō'ō* Hawai'i *'ō'ō*	20	axillary	5
			wing	1
			tail (pairs 1-4)	12
			tail (pairs 5-6)	5
			contour	1
Drepanis pacifica	*mamo*	1(?)	undertail or uppertail coverts	1(?)
Vestiaria coccinea	*'i'iwi*	6	contour	6

body (contour) and yellow feathers from the shoulder (axillary) and undertail regions. *'Ō'ō* rectrices were called *puapua*, *'ō'ō*, axillary feathers were called *'ē'ē*, and uppertail or undertail coverts (those feathers covering the stiff rectrices) were called *pue* (Buck 1957:538). The rectrices of *M. nobilis* are distinguished from those of the nearly extinct *M. braccatus*, and the two extinct *'ō'ō* species, *M. apicalis* and *M. bishopi*, by their size and the shapes of the feather tips. In general, *M. braccatus* has smaller flight and other contour feathers with a brownish cast; they are easily distinguishable from flight and contour feathers of the other members of the genus. Rectrices of *M. apicalis* were white-tipped, unlike those of other *Moho*. The wing feathers (primaries, secondaries and tertiaries) of *nobilis, bishopi* and *apicalis* would be difficult to distinguish from one another. However, because most of the rectrices and yellow axillary and undertail coverts were attributable to *M. nobilis*, we concluded that wing feathers were most likely to have been from this species. The axillary feathers of *M. nobilis* are distinctive in structure; the short shaft and long barbs render the feather soft and loose, even in comparison with the similar axillary feathers of Bishop's *'ō'ō (M. bishopi)* from Moloka'i.

The 5th and 6th (outer) pairs of rectrices of *M. nobilis* were important elements in four *kāhili* in our sample, as well as a number of the hand*kāhili* we briefly examined. These feathers, which were the shortest pairs of rectrices, were

distinctively marked, white, yellow and black feathers. Called *pīlali*, they are illustrated in a hand-painted plate (Plate LXXII) of *M. nobilis* appearing in Rothschild's lavishly illustrated work on Hawaiian birds (Rothschild 1893-1900). The *hulumanu* of several hand *kāhili* are composed entirely of *pīlali* (that is, rectrix pairs 5 and 6).

Kāhili 26 contained some yellow feathers that may have been uppertail coverts (called *ko'omamo*) of the extinct *mamo (Drepanis pacifica)* from Hawai'i Island. However, the possibility exists that these feathers were undertail coverts (*pue*) of *M. nobilis, M. bishopi,* or *M. apicalis* (Buck 1957:538). Generally the yellow undertail and uppertail coverts of birds in the genus *Moho* are distinguished by colour, even with some fading, from the uppertail and undertail coverts of *D. pacifica,* as the shades of yellow are distinctive. However, the feathers in *kāhili* 26 were faded and extremely dirty; a positive identification will require additional effort and suitable specimens for comparison.

Numbers of Hawai'i 'Ō'ō (Moho nobilis) Used to Construct Kāhili

The Hawai'i *'ō'ō* was the bird whose feathers were used in the greatest number of *kāhili* in our sample (20, or 27%). Feathers from all parts of the bird were used: wing, tail, body, and axillary (shoulder). Axillary feathers comprise the entire *hulumanu* of *kāhili* 19. *Pīlali* comprise the entire *hulumanu* of standing *kāhili* 5, as well as some hand *kāhili* and major parts of the *hulumanu* of *kāhili* 6, 36, and B.7250. The fact that so many Hawai'i *'ō'ō* feathers were used prompted us to attempt to estimate how many birds would have been required to supply the feathers in some specific *kāhili* , as well as a larger sample of the 75 standing *kāhili.* We began by counting or estimating how many of each feather type could be obtained from a single bird. Then, by counting the numbers of feathers in a sample of branches and counting the numbers of branches in individual *kāhili,* we obtained an estimate of how many of each feather type were in each *kāhili.*

Conflicting accounts exist as to how feathers were collected from birds. Some sources report that the *kiamanu* or bird-catcher plucked only a few of the desired feathers, releasing the bird to grow more feathers and to reproduce (Buck 1957:217-8). On the other hand, Keauokalani writes that "the *koa'e* is a delicious bird, tasting almost like the *nene*", and calls the "*uwanau*" (dark-rumped petrel, *Pterodroma phaeopygia sandwichensis),* "most delicious of birds" (Emerson 1895:101-111). In his *Hawaiian Antiquities,* Malo reports that *'ō'ō* and *mamo* "are used as food" (Malo 1951:38). Several authors argue that the difficulty of catching birds, the large number of suitable feathers offered by some birds (e.g., *'i'iwi, mamo*) and the scarcity of protein make it likely that birds caught for feathers were killed and eaten (Emerson 1895:101-111; Perkins 1903:368-465; Henshaw 1902:54-106;1903:113-45, Munro 1944:87). Wilson (Wilson and Evans 1890-9:105) wrote, "The O-O is esteemed a great delicacy by the natives, and used formerly to be eaten by them...". Cook (1784:2:206) reported that large numbers of small red birds (certainly *'i'iwi*) were offered for sale in bundles of 20 or more on Kaua'i. Henshaw and Munro both speculate that the use of the shotgun in the 1800s contributed to extinction of the *mamo* and other birds (Henshaw 1902:52, Munro 1944:92). Today, destruction of habitat, the effects of introduced predators and avian diseases carried by alien birds are all recognised as important factors in the extinction of many Hawaiian birds.

Taking into account the controversy about methods of bird and feather collection, we made our estimates of numbers of birds required to make *kāhili* in two ways. Our minimum estimate is based on the assumption that all suitable feathers were removed from any captured bird, whereas our maximum estimate was based on the assumption that no more than six of each feather type were removed from a captured bird. We note that, if all feathers suitable for use in *kāhili* were removed from an individual Hawai'i *'ō'ō*, it would surely have died, being unable to fly without wing feathers. Thus, the minimum estimates are based on the presumption that birds were killed for their feathers.

We chose five *kāhili* (1, 5, 13, 19, and 27), each containing distinct Hawai'i *'ō'ō* feather types, to examine in detail for our estimates. Table 7 shows our estimates of the numbers of feathers in those *kāhili* and the minimum and maximum numbers of birds we estimate were required to construct the *kāhili.* Table 8 shows the estimated total number of Hawai'i *'ō'ō* feathers of each type found in most (18), but not all, of our sample of standing *kāhili* that contained Hawai'i *'ō'ō* feathers. Also shown in this table are minimum and maximum estimates of the numbers of birds required to supply the feathers, based on the assumptions described above.

Did the capture of endemic forest birds and the use of their feathers in Hawaiian artefacts — *kāhili*, cloaks, capes, helmets, basketry images, and *lei* — cause the extinction of any of these species? We believe it would be impossible to satisfactorily answer this question even if virtually all precontact Hawaiian artefacts are as closely examined as our sample of *kāhili* has been. Although some individual artefacts may have required what seem to be immense numbers of feathers (Tables 7 and 8), and although it seems likely that most birds that were caught were actually killed, it seems unlikely to us that feather-collecting by early Hawaiians caused species extinctions. We base this speculation on the facts that capturing small forest songbirds must have been extremely difficult, and that feathers, properly cared for, could have lasted for decades. Furthermore, the numbers of people permitted to wear or possess feather artefacts was relatively small. Some particular species (e.g., Hawai'i *'ō'ō*) may have experienced population declines, but extinction due to feather-collecting seems improbable. The dramatic changes in habitat wrought by agricultural development and the effects of introduced predators (e.g., the Polynesian rat, *Rattus exulans*)

Table 7. Estimates of numbers of feathers and individual birds of *Moho nobilis* that were used to make selected *kāhili*.

Kāhili Catalogue Number	Feather Type	Maximum Number of Feathers per Bird	Number of Feathers in *Kāhili*	Max. and Min. Number of Birds Required*
1	primaries and dark rectrices ratio approx 2:1	16 primaries 8 rectrices	6,000	500/250
5	light rectrices (pairs 5-6)	4	1,500	375/375
13	rectrices (pair 1)	2	6,240	3,120/3,120
19	axillary	25-30	11,360	1900/380
27	rectrices (pairs 1-4)	8	6,050	1000/760

* The maximum number is estimated based on the assumption that fewer than 6 of each feather type were removed. The minimum number is based on the assumption that all available feathers were collected.

Table 8. Estimates of numbers of feathers and individual birds of *Moho nobilis* (Hawai'i *'ō'ō*) used to make 18 *kāhili* examined to produce this table. Not all *kāhili* with Hawai'i *'ō'ō* feathers were included.

Feather Type	Maximum Number of Feathers per Bird	Total Number of Feathers in *Kāhili*	Max. and Min. Number of Birds Required*
primaries and dark rectrices (pairs 1-4)	16 primaries 8 rectrices	80,000	13,333/3,333
light rectrices (pairs 5-6)	4	65,100	16,275/16,275
yellow axillaries	25-30	18,100	3,000/600

* The maximum number is estimated based on the assumption that fewer than 6 of each feather type were removed. The minimum number is based on the assumption that all available feathers were collected.

as well as predation by the Polynesians themselves, are more likely to have contributed to the extensive extinctions of birds now known to be associated with the colonisation and occupation of Hawai'i by the Polynesians (Olson and James 1991:7; James and Olson 1991:7). Although we chose to focus our attention on a single bird species in this discussion, one could estimate, with sufficient time, the numbers of birds required to supply certain other feather types (e.g., the central tail feathers of tropicbirds).

Our current research clearly shows that the construction of just the modest sample of *kāhili* we examined required the capture of many thousands of Hawai'i *'ō'ō*. Even the use of firearms, about which we know very little, to collect feathers during the postcontact period would not have rendered this an easy task. It is no wonder that Malo wrote that "the feathers of birds were the most valued possessions of the ancient Hawaiians" (1951:76).

REFERENCES

Anonymous, MS n.d. A Description of A Kahili I Saw Made... Hawaiian Ethnological Notes. Archives, Bishop Museum, Honolulu.

Berger, Andrew, 1981. *Hawaiian Birdlife*. Honolulu: University of Hawaii Press.

Bingham, Hiram, 1847. *A Residence of Twenty-One Years in the Sandwich Islands*. Hartford: Hezekia Huntington; New York: Sherman Converse.

Brigham, William, 1892. *A Preliminary Catalogue of the Bernice Pauahi Bishop Museum of Polynesian Ethnology and Natural History, Part 1., Kahilis, Feather Ornaments, Mats, and Kapas*. Honolulu: Bishop Museum Press.

———1899. Hawaiian Featherwork. *Bishop Museum Memoirs*. 1(1):21-4.

Buck, Peter (Te Rangi Hiroa), 1927. *The Material Culture of the Cook Islands (Aitutaki)*. New Plymouth: Thomas Avery and Sons (for the Board of Maori Ethnological Research).

———1957. *Arts and Crafts of Hawaii*. Special Publication 45. Honolulu: Bernice P. Bishop Museum.

Chinen, Clarice, MS 1980. The Kahili: Royal Insignia of Hawaiian Royalty. [photocopy of paper for B. Harger, University of Hawai'i, Mānoa.] Department of Anthropology, Bishop Museum, Honolulu.

Cook, James, 1784. *A Voyage to the Pacific Ocean for Making Discoveries in the Northern Hemisphere in the Resolution and Discovery, Volume II*. London: Nicol and Cadell.

Davies, John, 1851. *A Tahitian and English Dictionary*. Tahiti: London Missionary Society's Press.

Ellis, William, 1782. *An Authentic Narrative of a Voyage Performed by Captain Cook and Captain Clerke, in His Majesty's Ships Resolution and Discovery During the Years 1776, 1777, 1778, 1779 and 1780*. London: Robinson, Sewell, and Debrett.

Emerson, Nathaniel, 1895. The Bird-hunters of Ancient Hawaii. *Thrum's Hawaiian Almanac and Annual*, 1895:101-11.

Handy, Edward and Elizabeth Handy, 1972. Native Planters in Old Hawaii: Their Life, Lore, and Environment. *Bernice P. Bishop Museum Bulletin*, 233: 287.

HEN, MS 1922. Kahilis. Lahilahi Webb Collection of Notes, data from Lucy K. Peabody, January 22, 1922, translated by Mary Kawena Pukui. Hawaiian Ethnological Notes (HEN), Vol. I. [typescript.] Archives, Bishop Museum, Honolulu.

Henshaw, H., 1902. Complete List of the Birds of the Hawaiian Possessions, With Note on Their Habits. *Thrum's Hawaiian Almanac and Annual*, 1902: 54-106, 1903: 113-45.

James, Helen and Storrs Olson, 1991. *Descriptions of Thirty-two New Species of Birds from the Hawaiian Islands. Part II. Passeriformes.* Washington, D.C.: American Ornithologists' Union.

Judd, Laura, 1928. *Honolulu Sketches of the Life Social, Political and Religious, in the Hawaiian Islands from 1828-1861.* [Reprint of the 1880 edit.] Honolulu: Honolulu Star-Bulletin.

Kamakau, Samuel, 1961. *Ruling Chiefs of Hawaii.* Honolulu: Kamehameha Schools Press.

Keauokalani, Kepelino MS 1859. Short Notes Pertaining to Hawaiian Life, Descriptions of Hawaiian Birds, Paper II. Hai Manawa and other Catholic papers. [typescript] Archives, Bishop Museum, Honolulu.

Loomis, Elisha MS 1825. Copy of the Journal of E. Loomis. Hawaii Mission Children's Society, Honolulu.

Malo, David, 1951. *Hawaiian Antiquities (Moolelo Hawaii)* trans. Nathaniel B. Emerson. Honolulu: Bishop Museum Press.

Munro, George, 1944. *Birds of Hawaii* (rev. edit.). Vermont: Bridgeway Press.

Nordhoff, Charles, 1974. *Northern California, Oregon, and the Sandwich Islands.* Ten Speed Press.

Olson, Storrs and Helen James, 1991. *Descriptions of Thirty-two New Species of Birds from the Hawaiian Islands: Part I. Non-Passeriformes.* Washington, D.C.: American Ornithologists' Union.

Peale, Titian, 1848. *United States Exploring Expedition, 1838-1842, Volume 8, Mammalia and Ornithology.* Philadelphia: C. Sherman.

Perkins, R., 1903. *Fauna Hawaiiensis, Volume 1, part 4. Vertebrata: Aves.* Cambridge: Cambridge University Press.

Phelps, Steven, 1976. *Art and Artefacts of the Pacific, Africa, and the Americas, The James Hooper Collection.* London: Hutchinson.

Pukui, Mary and Samuel Elbert, 1971. *Hawaiian Dictionary.* Honolulu: University of Hawaii Press.

Richards, Mary, 1970. *The Hawaiian Chiefs' Children's School.* Rutland, Vermont and Tokyo: Tuttle.

Rose, Roger, MS 1991. Bishop Museum Standing *Kāhili* Working Master List. Department of Anthropology, Bishop Museum, Honolulu.

Rothschild, Walter, 1893-1900. *The Avifauna of Laysan and the Neighboring Islands.* London: R. H. Porter.

Scott, Winifred, 1930. The Story of the Kahili. *Paradise of the Pacific*, 43(12):16.

Stewart, C. S., 1830. *Journal of a Residence in the Sandwich Islands, During the Years 1823, 1824, and 1825.* London: Fisher, Son, and Jackson.

Titcomb, Margaret and Wayne Gagné, 1976. List of Hawaiian Bird Names. *'Elepaio*, 36(10):117-26.

Webb, Elizabeth, n.d. Editorial Correspondence. *Alameda Times Star* (California). [undated newspaper clipping of an interview with E. Lahilahi Webb, Archives, Bishop Museum, Honolulu]

Wetmore, Alexander, 1925. Bird Life Among Lava Rock and Coral Sand: The Chronicle of a Scientific Expedition to Little-Known Islands of Hawaii. *National Geographic Magazine*, 48(1):86.

Wilson, Scott B., and A. H. Evans, 1890-9. *Aves Hawaiiensis. The Birds of the Sandwich Islands.* [Reprint of the 1890-1899 edit. published by R. H. Porter, London.] Reprint Edition 1974 by Arno Press Inc., New York.

NOTES

1. The project was made possible by a grant from the Hawai'i Bishop Research Institute, which we gratefully acknowledge. Rose, the principal investigator, was responsible for general administrative oversight of the project and establishing the ethnohistorical context of Hawaiian *kāhili*; Conant, the co-principal investigator, undertook the identification of biological components of *kāhili*, particularly feathers; Kjellgren documented construction techniques, made estimates of the number of feathers used, and prepared feather samples for analysis. We were assisted by consultants and colleagues who contributed their expertise: Isabella Abbott, plant and fibre identification; Gail Murakami, Hawaiian woods; Dale Kronkright, conifers and nonindigenous woods; Linda Hee, fabrics and textiles; George Balazs, marine turtles; Sara Collins, mammal bone; and Phillip Bruner, Mary Louise Kekuewa, and Terrence Emerson, birds. An earlier version of this paper was presented at the XVIIth Pacific Science Congress, Honolulu, 1991.
2. Queen Emma bequeathed her collection to Charles R. Bishop for an institution that eventually became the Bishop Museum, as did Bernice Pauahi, who inherited *kāhili* from Ke'elikōlani and, apparently, Victoria Kamāmalu. Nearly one third of the original museum building was set aside for their display, in the Kāhili Room.
3. This section is based on a search through published historic voyage and exploration literature to 1820 and selected dates thereafter, including some early missionary accounts and reports. English-language newspapers published in Hawai'i were examined for contemporary accounts of all state and royal funerals that could be found, up to that of Prince Kūhiō in 1922. Particular attention was paid to individuals now interred in the Royal Mausoleum at Mauna'ala. Newspaper accounts, as well as general 19th and early 20th century historical and ethnographic sources, were consulted for any reference to the manufacture, use and significance of *kāhili* in Hawaiian society. Manuscript resources in Bishop Museum Archives collection and accession files were also searched for any possible mention of *kāhili*. Photographic resources in Bishop Museum were an invaluable source of documentation.
4. Kekuhaopio. *Hoku o Hawaii.* [typescript translation.] Library, Bishop Museum, Honolulu.

5. *The Polynesian*, January 13, 1865.
6. This widespread Polynesian practice lends further evidence to the fact that Hawaiian *kāhili* were a definite component of the precontact material arts. To what extent the large or standing *kāhili* (*kāhili kū*) may have been influenced in their later development by outside factors is more problematical.
7. Mary Kawena Pukui, "Featherwork", tape H-131 B, April 4, 1965, transcript, Department of Anthropology, Bishop Museum, Honolulu. [see also "Hawaiian Source" 392-94 for similar transcript, MS, Archives, Bishop Museum, Honolulu.
8. Very little is recorded about *kāhili* makers and the ritual and ceremony that accompanied their work. We suspect from the few references available, however, that throughout the 19th century, and probably in the precontact era as well, *kāhili* were made by women associated with chiefly households. Men assisted by procuring most of the feathers and, no doubt, by fashioning the wooden portions of *kāhili* handles, although women are likely to have fabricated and polished some of the turtle-shell and ivory ornamentation. The subject is too complex for extended discussion here. At least some men were recognised as expert *kāhili* makers by the early 20th century, and probably earlier.

ADZERA AND AGARABI: CONTRASTIVE CERAMICS IN PAPUA NEW GUINEA

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In Papua New Guinea's Morobe Province, contemporary pottery is the latest stage of craft activity whose roots extend into prehistory. A viable pottery industry in the Upper Markham River Valley is a developmental outgrowth and continuation of Adzera (Atzera, Azera) ceramic ware. Three periods of pottery production can be delineated: the contemporary industry (May and Tuckson 1982), the historic-protohistoric (K. Holzknecht 1957), and the prehistoric (Specht and H. Holzknecht 1971). The present paper describes a previously unreported collection of Adzera sherds and discusses the known distribution of this utilitarian ware. The inquiry is expanded by comparing Adzera with Agarabi pottery, a quite different utilitarian ware manufactured in the adjacent Eastern Highlands Province, on the eastern fringe of which the two wares are found in single context at both prehistoric sites and contemporary villages.

The Adzera sherds were collected by J. David Cole, University of Washington Micro-Evolution Project, from two archaeological sites in the Upper Markham River Valley, KMK and KML (Figs 1, 2). The terrain, characteristic of much of the river valley, is very flat and the soil is gravelly with a light cover of grass. The valley is flanked on either side by high mountains.

At the time of collection, the cultural material at KMK and KML consisted of fragments of pottery lying on the ground's surface; no test pits were excavated. A technique of free-hand forming is indicated, probably piece-building with ring or spiral coils and bonding by finger as well as paddle and anvil (Shepard 1976:394). The sherds are remnants of utilitarian pottery vessels with squat, globular bodies and everted rims. Known Adzera ceramic forms and features not present in the collection are double vessels, clay drums, and figure modelling (K. Holzknecht 1957: Figures 30, 32, 38; May and Tuckson 1982:140-4).

DESCRIPTION

Site KMK

Cole collected 36 sherds at site KMK. The colour ranges from gray to brown with interiors usually lighter than exteriors and occasionally exhibiting a reddish cast. Medium coarse paste is basically clay with some nonclay inclusions. Usually less than 1 mm in diameter, the inclusions are reddish or grey in colour; a few are white. Sherd thickness ranges from 6-14 mm, with most sherds falling between 7 mm and 11 mm. Body sherds are thicker than neck and rim sherds.