

# The Piko Stone and Organization of the Stones of Kūkaniloko

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## Abstract

Over two decades researching precontact Hawaiian astronomical knowledge at Kūkaniloko, the organization of the site's stones became increasingly apparent – that the arrangement represents the Pacific Ocean between the Tropic of Cancer and the Tropic of Capricorn, indicating the equator, the doldrums, and the North and South Pacific Gyres, and that the same oceanic system is also indicated by the two sets of concentric circles on the piko stone.

Keywords: Kūkaniloko, precontact, cultural astronomy, piko, Pacific Ocean mapping

## Introduction

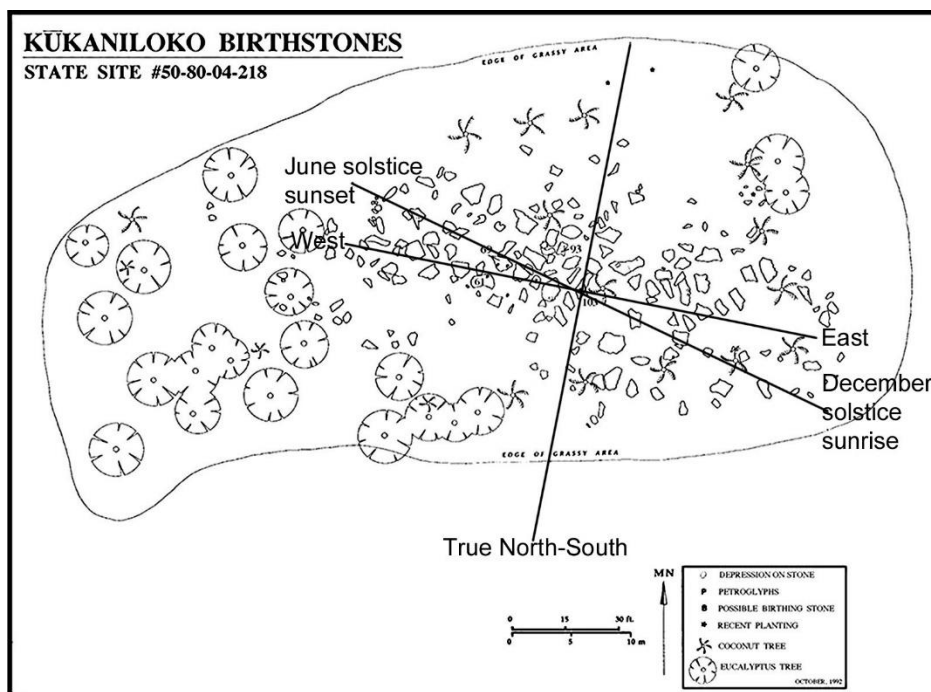
Kūkaniloko, best-known as one of two royal birthing sites in the Hawaiian islands and as the piko (center, navel) of O‘ahu, sits on a plain midway between two north-south running mountain ranges, the Ko‘olau Mountains nine miles to the east and the Wai‘anae Mountains seven miles to the west. The state’s archaeologists dated the site’s founding to the period 1100 to 1500 AD, but there are other sources that suggest earlier dates.

In addition to being a royal birthing site, Kūkaniloko was also a center of higher learning ( Lenchanko, 2015, p.7). Among the subjects of such higher learning were astronomical and astronomically related knowledges. For the past two decades I have been researching these knowledges as they are represented at the site, and this paper addresses just one element – the organization of the stones at Kūkaniloko.

## Organization of the site’s stones

The site is oriented so that its northwest end faces the June solstice sunset and its southeast end faces the December solstice sunrise. A stone at the southeast end is known as the canoe-steering stone and sometimes also as the solstice-sighting stone. These names for the stone refer to the site as a representation of a canoe and to the significance of the June solstice relative to the importance of the December solstice. As demonstrated in Figure 1 below.

**Figure 1.** *Site Plan, State of Hawaii Department of Land and Natural Resources, State Parks Division archaeological survey*



The best known of the stones are the Birth Stone and the Piko Stone. Less well known are the Canoe Steering Stone (aka Solstice Sighting Stone), the O'ahu Stone, and the Regulus Stone (the name I've called it, but there may be other names).

### **The Birth Stone**

The Birth Stone is situated on the west side of the site, just north of the Piko Stone. It is oriented so that the woman giving birth was facing Kolekole, the prominent gap in the Wai'anae Range. The significance of that orientation is that Sirius sets over Kolekole, and so, too, does the sun on the day of the November solar nadir. Sirius is deeply associated with pō, the realm of cosmogonic origins. The sun is Kāne who at the solar nadirs is 90° below Kūkaniloko, at the maximum depth of pō, and to be a chief one had to be a descendant of Kāne. Thus a child born at Kūkaniloko's Birth Stone faced and was metaphorically/symbolically connected to his/her deepest birthright origins.

### **The Canoe Steering Stone**

The Canoe Steering Stone is at the stern of the canoe that Kūkaniloko represents. It is at the southeast end of the site, steering the canoe symbolically from the December solstice sunrise to the June solstice sunset at the northwest. This orientation of the Canoe Steering Stone is also why it is a solstice sighting stone.

### **The Regulus Stone**

The Regulus Stone is close to the Birth Stone. There is a peak on the stone's western edge, and once a year, in August, a shadow "dagger" is cast from that peak to a pecked hole some inches away on the stone's surface. A child born at Kūkaniloko when that shadow dagger reached the pecked hole was destined to be the greatest chief of his/her era, as illustrated in figure 2.

**Figure 2.** *The Regulus Stone. Photo by Keale, used by permission*



On that day the star Regulus rises “in the sun,” meaning that the star’s light is absorbed by the light of the sun/Kāne, merging the star and Kāne. The Starry Night illustration in Figure 3 below shows this relationship.

**Figure 3.** *Regulus “in the sun”*

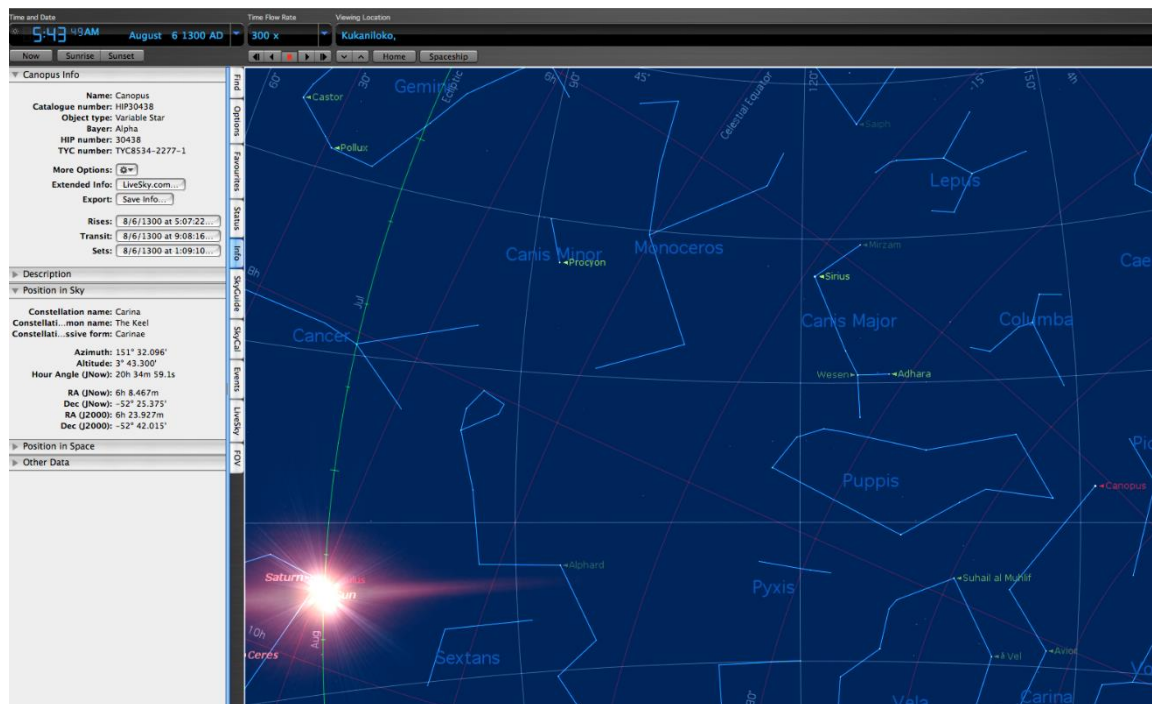
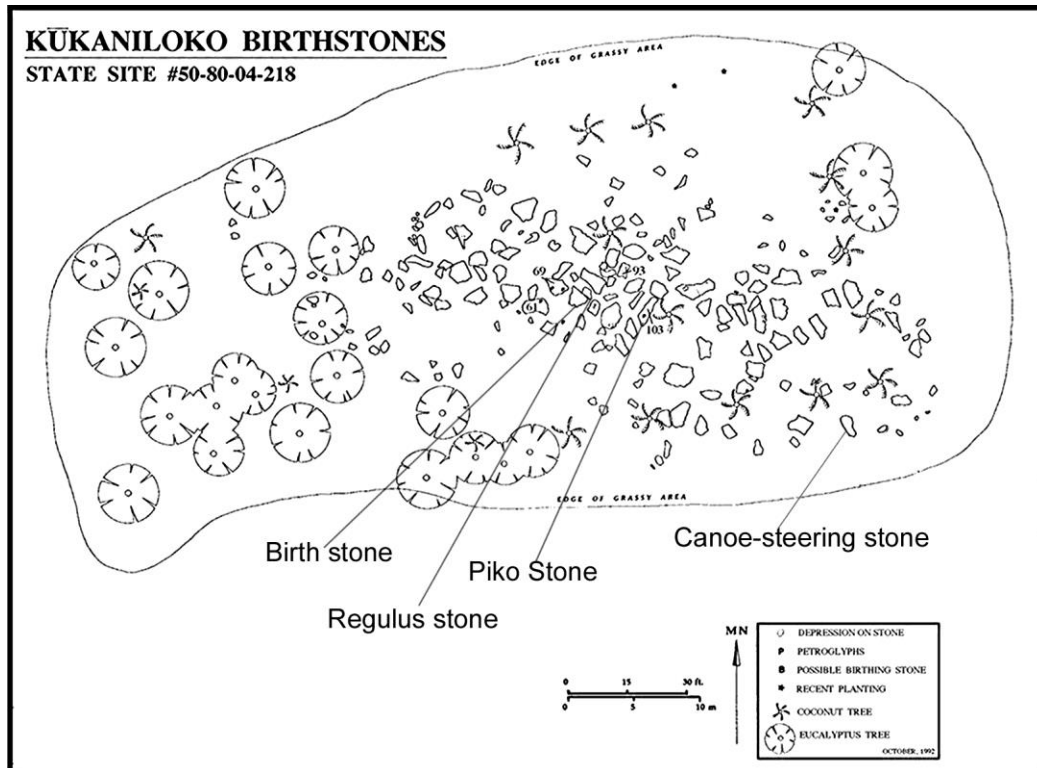


Illustration from Starry Night Planetarium program

Figure 4. Site Plan, State of Hawaii Department of Land and Natural Resources, State Parks Division archaeological survey with the canoe-steering stone marked



### The piko stone

The Piko stone is a diamond-shaped stone with fluting along its sides. It sits approximately at the center of the site.

State of Hawaii's Division of Parks archaeological survey site plan shows the orientation.

The notations are the author's.

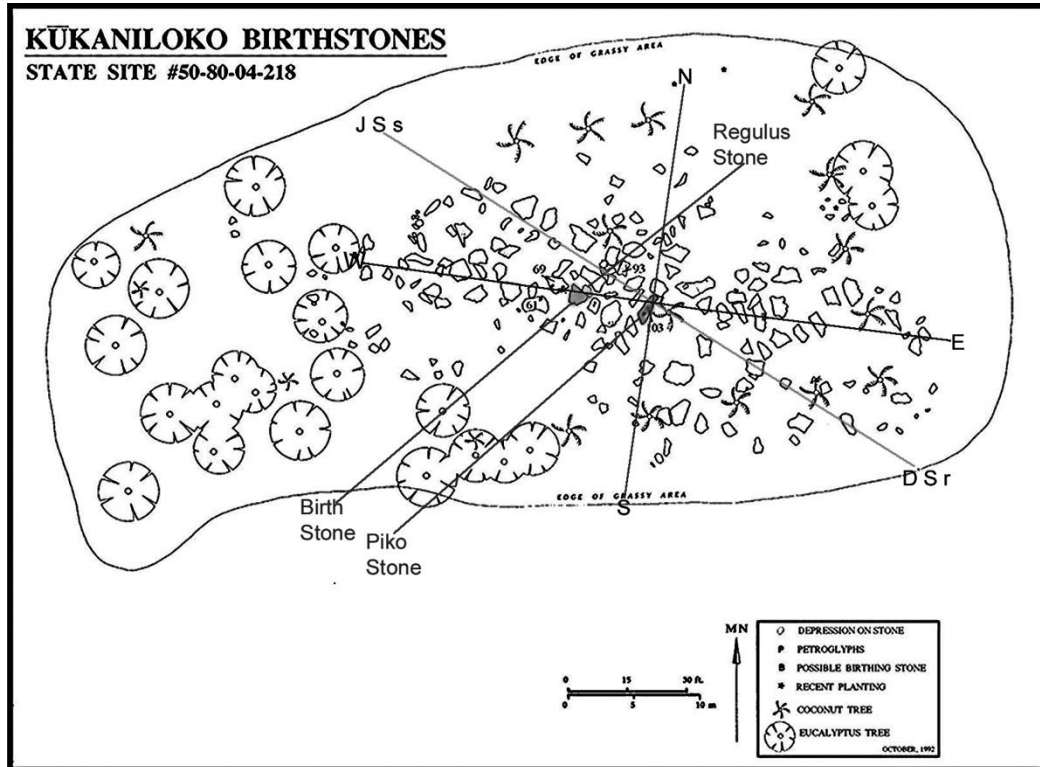


Figure 5 the Piko stone



Author's photograph.



The two stones flanking the piko stone, one on the northeast and the other on the northwest, may indicate the large winter swells, which are considerably larger at the northern end of O'ahu than they are elsewhere on the island.

The stone's northernmost point represents the June solstice which occurs when the sun reaches the Tropic of Cancer, its northernmost position. Its southernmost point represents the December solstice when the sun reaches its southernmost place, the Tropic of Capricorn, in its annual journey (see Figure \_\_ below). The widest part of the piko stone represents the equator, the east-west boundary between the northern and southern terrestrial hemispheres.

There are two sets of concentric circles incised on the stone's surface, the more prominent of the two is north of the equator (the widest part of the stone) and the fainter one south of the equator. Weathering has made the southern set difficult to see in photographs, though it remains visible upon close inspection of the stone itself. Each set of concentric circles has a central pecked puka (hole). A line drawn between the two pukas indicates True North – South.

Figure 6. 3D rendering by Mike Desilets, Ganda and Associates, marks by author

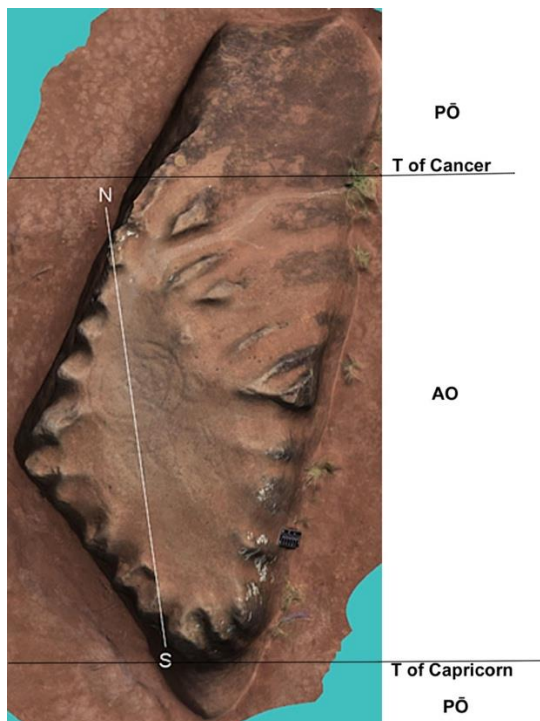
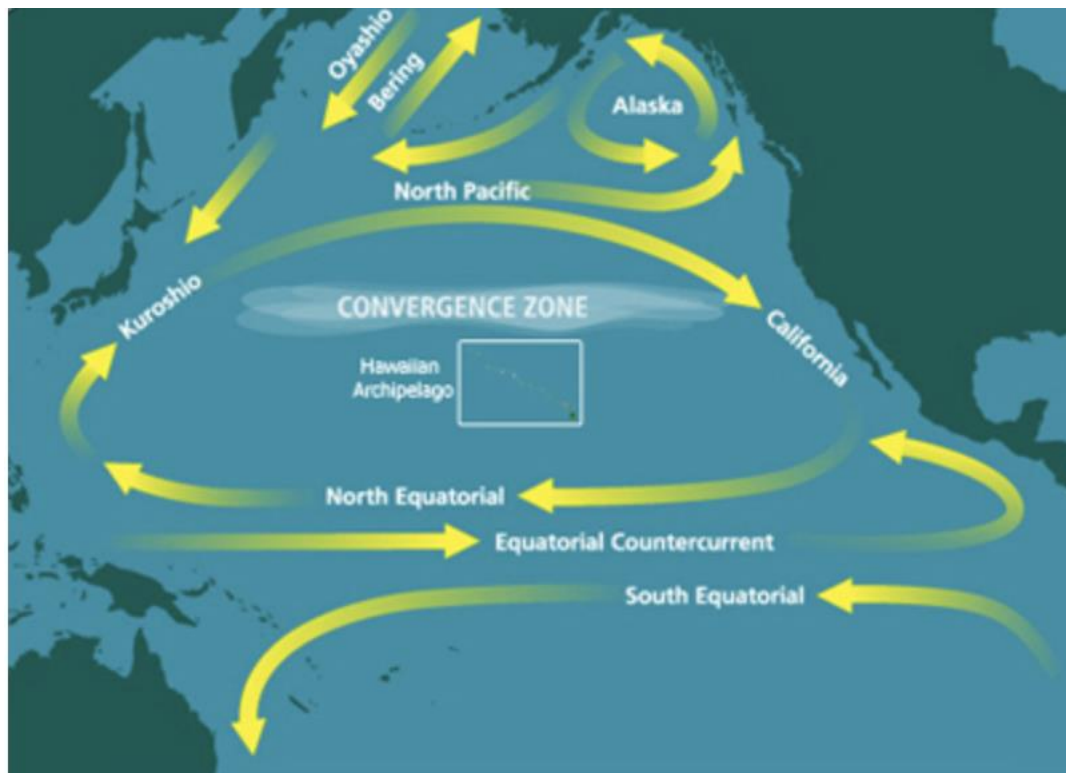


Figure 7. North and South Pacific Gyres showing the Hawaiian Archipelago's position within the North Pacific Gyre. Adapted from NOAA.



These two sets of concentric circles on the piko stone also represent the North Pacific Gyre and the South Pacific Gyre. The more prominent northern set accurately reflects the larger size of the North Pacific Gyre compared to its southern counterpart. Significantly, the placement of O'ahu's latitude within the northern set of circles correctly shows Hawai'i's position within the North Pacific Gyre, encoding yet another layer of oceanographic and navigational knowledge within this single stone.

Writing of Kūkaniloko, archaeoastronomer Michael Chauvin wrote,

The excitement and the controversy surrounding archaeoastronomy hit Hawaii in 1982 when Harry G. Kurth, a U.S. Army Major, 'discovered' a site on central Oahu that he described as a 'Hawaiian Stonehenge.' What Kurth, in fact, had stumbled upon were the stones of Kukaniloko . . . Describing the birthing stone as 'the stone to be trusted,' he [Kurth] opined that such a phrase more accurately described a stone star compass, similar to the 'stone canoe' used in the Gilbert Islands to train navigators, something described by Lewis as "A stone teaching device [that] is aligned astronomically to facilitate learning about the stars. At such times the pupil sits on the rectangular stone in the centre as if he were in a canoe. The bearings of the

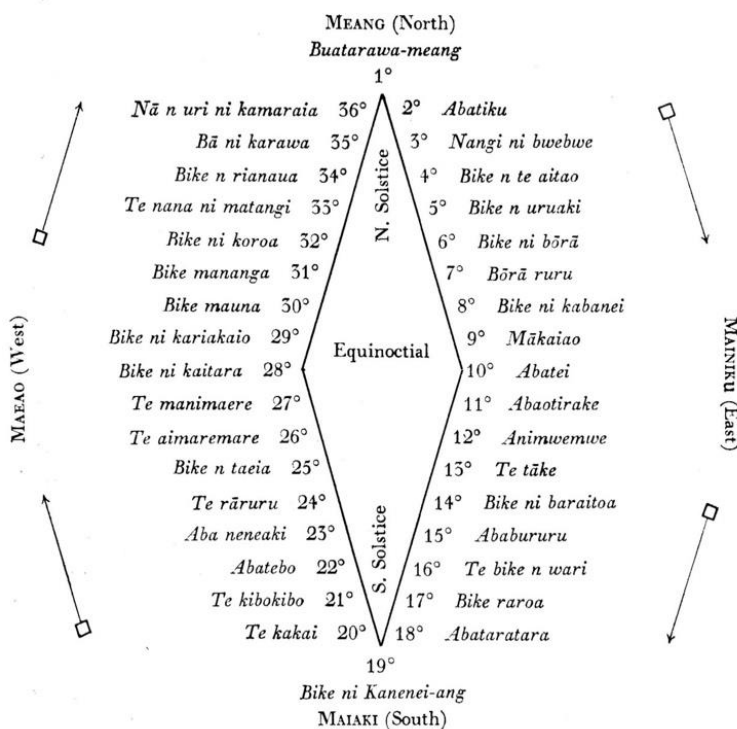


southern Gilbert Islands are taught in terms of the rising and setting of navigational stars. (Lewis, 1972,p186)”

Kurth thought the ‘stone to be trusted’ was a stone of this kind, and that this was indicated by both its orientation and its shape, as well as by the design of a petroglyph on its surface and a series of bumps and serrations along its perimeter. The 4’ x 2.5’ diamond-shaped object was a ‘complete observatory on a stone.’ He called it a ‘major discovery.’ (Chauvin, 2000, p118)

Sir Arthur Grimble (1888 – 1956) was a British colonial administrator in Kiribati, then called the Gilbert Islands, where he learned the language, studied and collected myths and oral traditions of the Kiribati people. He recorded information on Kiribati astronomy and navigation, part of which included thirty-six ten-day periods or stages by which the sun’s annual journey was tracked. Referring to Biria, a Kiribati navigator of his acquaintance, Grimble reconstructed "a diagram made by Biria of sticks and pebbles laid on the floor to illustrate the principles set forth above. The sticks represent the horizon, the pebbles the ten-day stages, to which I have appended the names enumerated by my informant. The circles [which look like the sign for degree] after the numbers 1 – 36 represent the pebbles. Grimble’s diagram is below:

Figure 8. Arthur Grimble’s diagram of the 10-day stages of the sun, from *Migrations, Myth and Magic*, p. 229.

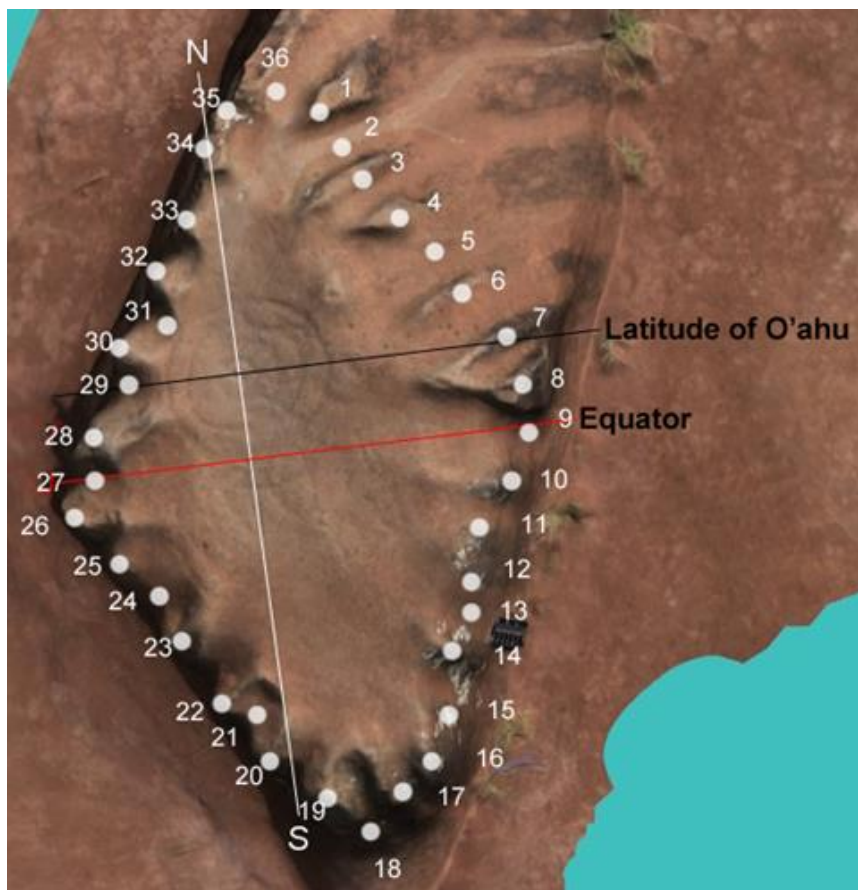


The ten-day week, called *anahulu* in Hawai'i, was the standard week, just as Grimble noted for Kiribati (formerly the Gilbert Islands). The sun moves roughly  $1^\circ$  per day along the horizon. The stone thus represents the sun's travel in a solar year. While this at first seems to be short of a solar year, when the apparent absence of the sun's movement for two to three days at each of the solstices is taken into account, the thirty-six *anahulu* plus the solstices complete a solar year.

Figure 9 below shows the thirty-six *anahulu* using Arabic numerals in the order from 0/36, with 36 representing the northern (June) solstice at the Tropic of Cancer, 18 representing the southern (December) solstice at the Tropic of Capricorn, the line between 9 and 27 representing the equator. The vertical center line runs true north-south, and the horizontal line runs true east-west.

The center puka (hole) of the northern set of concentric circles represents the location of Kūkaniloko/O'ahu at  $21^\circ$  north latitude, in *anahulu* terms two *anahulu*, 20 days of the sun's travel, from the equator.

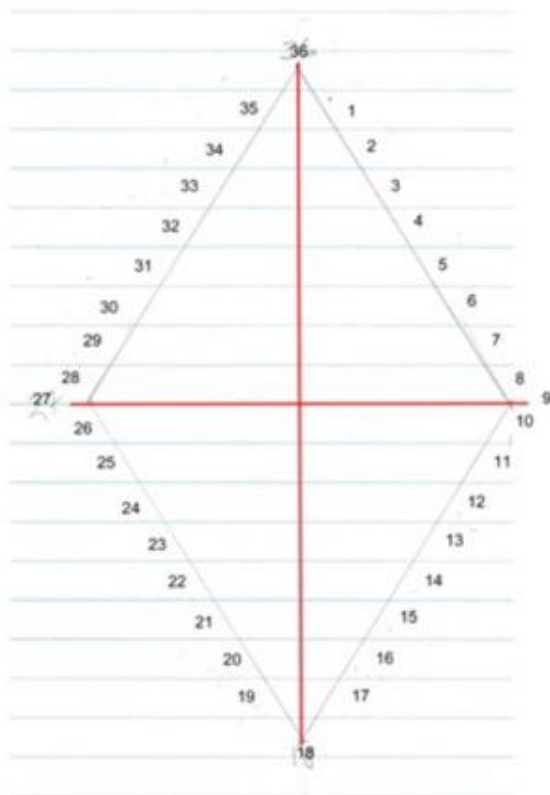
Figure 9. The piko stone with *anahulu*, N-S, the equator, and the latitude of O'ahu indicated.



Piko stone, Mike Desilets photograph used by permission, author's numbering and notations.

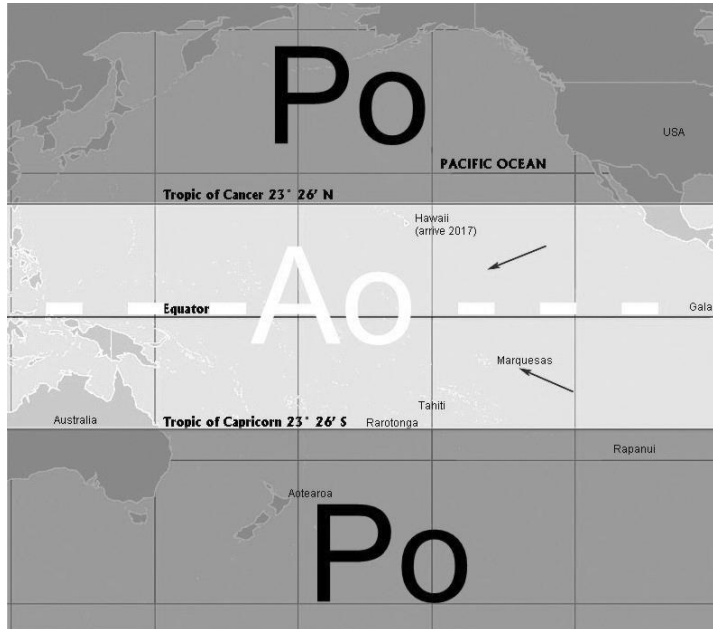
The Tropical world, the world of Polynesia except for Aotearoa (New Zealand), was bounded by the Tropic of Cancer and the Tropic of Capricorn. The use of thirty-six anahulu to mark the sun's passage from Tropic to Tropic may have functioned in a fashion similar to latitude, but restricted to the Tropics.

Fig 10. Diamond-shaped conception of the year. Author's drawing.



The region within the Tropics was the terrestrial region of ao. The regions north and south of the Tropics were there terrestrial regions of pō.

Figure 11. Terrestrial regions of pō and ao



Attribution:map from Wikimedia commons, ao and pō designations by author

### A zenith tube

Although not at Kūkaniloko there is an interesting stone next to a carved hole in the ground at Puu/Pu'u Pueo on Kaena/Ka'ena Point. Puu/Pu'u Pueo is a landscape marker for the set of Aldebaran from the point of view of Kūkaniloko.

Figure12\_ possible zenith tube guarded by a honu (turtle) or mo'o at Puu/Pu'u Pueo



Author's photograph

The place name Puu/Pu'u Pueo has two meanings that are pertinent here. Pueo's most widely known meaning is owl. Kāne has owl associations/connections, one of which is Kāne-i-ka-pahu'a, described by Beckwith as "Kane in the guise of an owl, who thrusts with wings and talons at the enemies of his worshipers in time of battle and turns aside their weapons (Beckwith, 1940, p.52)." The other applicable meaning of pueo is the main purlin of a house, meaning the main structural part of the roof (other than the roofbeam). Antares is both the main (front) post of the celestial house and the roofbeam; Aldebaran is both second (rear) house post and the main purlin of the roof.

The hole at Puu/Pu'u Pueo may be, or have served as, a zenith tube. At the May solar zenith Aldebaran is with Kāne/the sun, at the zenith. One cannot look directly at the sun without damaging one's eyes. To sight the zenith sun one can instead look down into a dark-bottomed container or hole partially filled with water and safely see the reflection of the sun.

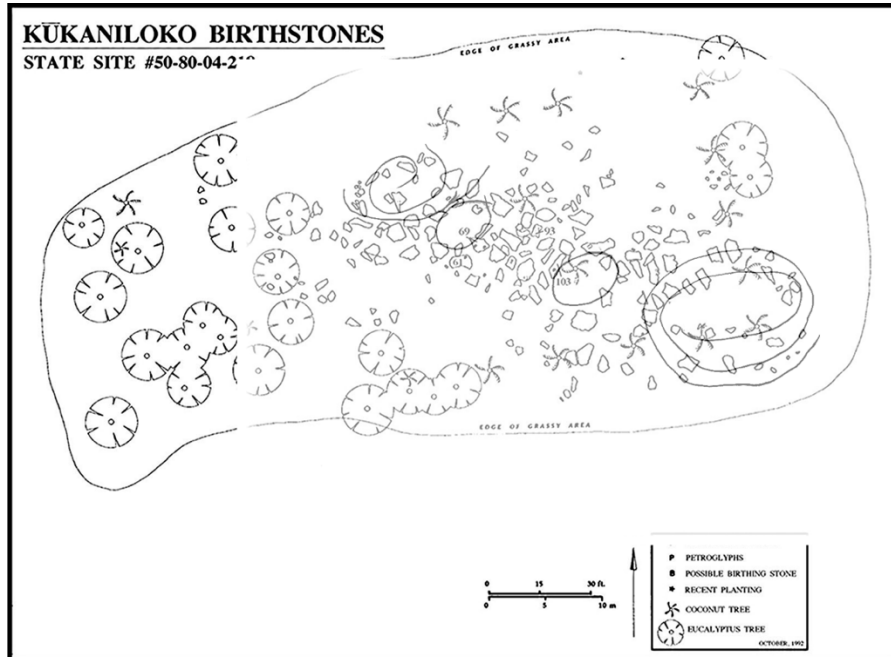
It can also be used to sight Aldebaran at the zenith on the night of the November solar nadir. One can, of course, look up at Aldebaran at night, but a possible reason to use the zenith tube is to time the solar nadir event, when the sun is with Antares 90° below the location. Aldebaran reaches the zenith at that time. Thus Aldebaran reflected in the zenith tube tells the observer it is the solar nadir.

The only kino lau for Papa I've found is honu. But as cosmogonic mothers Papa, Haumea, and La'ila'i established lineages, thus mo'o. Although it may not be fully provable that the hole was intended to be or used as a zenith tube, the coincidences of location, its being a landscape marker for Aldebaran, and the appropriate animal head/s do argue for the hole as a zenith tube.

## **Overall organization of Kūkaniloko's stones**

The organization of Kūkaniloko serves multiple functions/purposes. Some of these suggest that navigation was taught at Kūkaniloko. Among them are the piko stone of Kūkaniloko and what I propose is a chart of the Pacific Ocean. When I first began researching Kūkaniloko's astronomical associations I saw what seemed to be an organization of the stones that I drew as a tracing made over the site map.

Figure 13 Organization of Kūkaniloko's stones



The apparent organization placed over the site map.

Figure 14\_. An illustration of Pacific currents, from <https://kpiacademy.com/ocean-currents/>

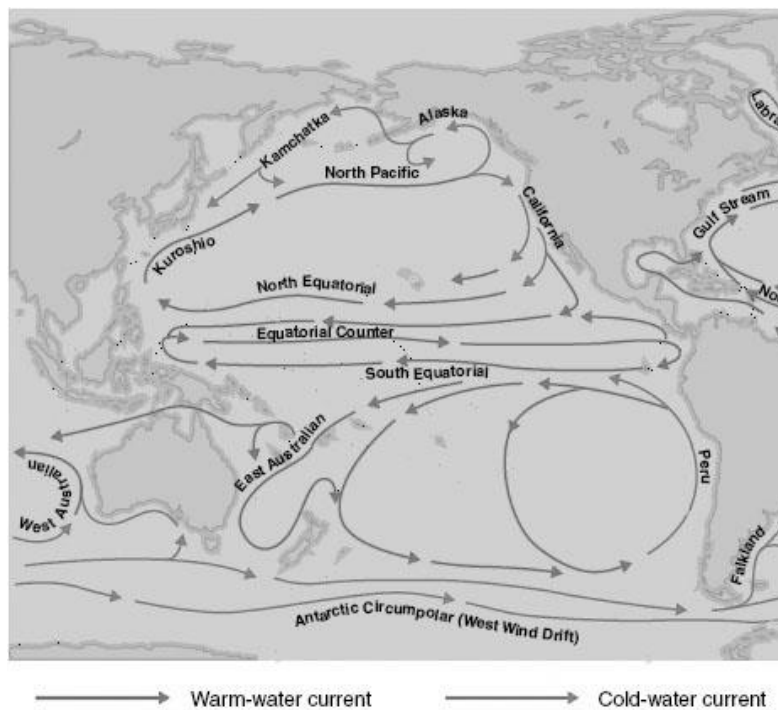
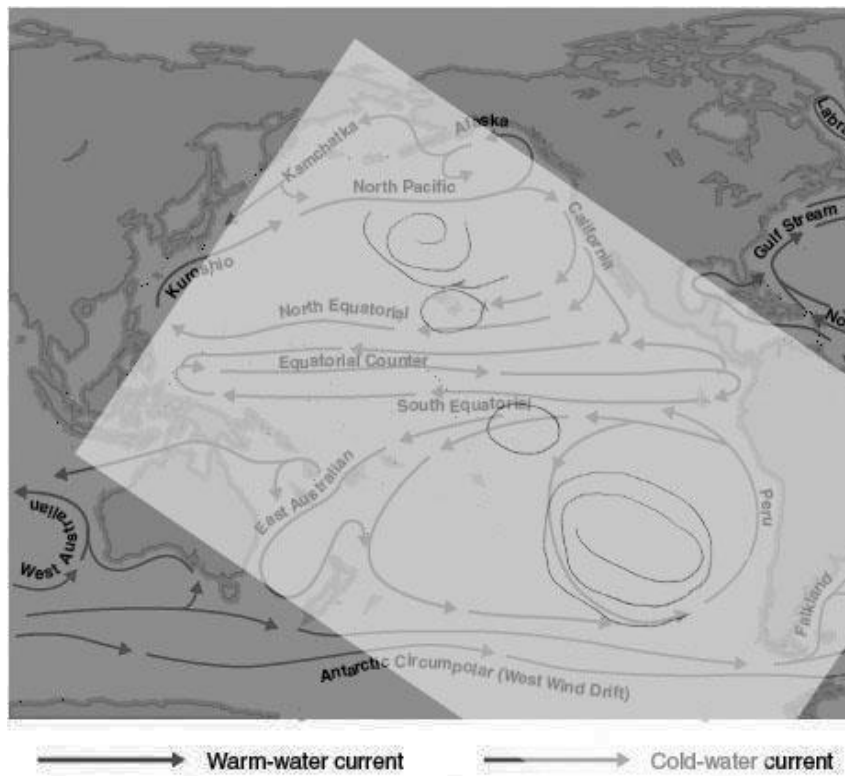




Figure 15. Tracing laid over the Pacific currents illustration



The stones thus seem to represent a "map" of the Pacific Ocean, showing the north Pacific current, which runs clockwise, the south Pacific current, which runs counterclockwise, the doldrum regions just north and south of the equator, and the equator. Not only is the site a "map," it is also a canoe. The canoe-steering stone is at the southeast end of the site – the stern of the canoe – and the bow is at the northwest end of the site. The canoe is sailing to northwest. It would, though, only require a stone in the northwest end to be designated as a canoe-steering stone for the canoe to be sailing in the opposite direction. The canoe and the map can be conceived of separately. They can also be conceived of as simultaneously coexisting. They can additionally be a canoe sailing the Pacific.

## Discussion

As stated earlier, the narrow ends of the site point NW to the June solstice sunset and SE to the December solstice sunrise. The Ko'olau Mountain Range is 9 miles east, the Wai'anae Mountain Range 7 miles west. The "canoe-steering stone" is at the southeast end. The site represents, among other things, a canoe. A stone at the SE end of the site, the stern of the canoe, is known as the "canoe-steering stone."

Kūkaniloko is sufficiently distant from the mountains that the azimuth of a star, or the sun, rising or setting over a mountain peak or a valley between mountains remains unchanged regardless of where within the site one is. In other words, Kūkaniloko is the backsight, and the mountains the foresights. The stones within the site appear to have been deliberately arranged so that the whole site, in addition to being a canoe, serves as a "map" of the Pacific Ocean. There are several lines of closely grouped stones across the widest part of the oval. Just north and just south of those grouped stones is a space empty of stones. North and south of the empty areas are what seem to be spirals of stones. It looks as though the spiral in the north goes clockwise and the spiral in the south goes counterclockwise. If that understanding of the stones' arrangement is correct, then the two spirals would be the north and south Pacific currents, the empty spaces on either side of the grouping across the center – the equator – may represent the doldrums. So the site is both a canoe and the Pacific Ocean.

The piko stone within the site uses time as a measure of space and space as a measure of time. The anahulu year of 36 10-day weeks – framed as a diamond-shaped stone with 36 flutes along its perimeter – is the solar year – 360 days plus the five days of solar standstills at the two solstices (combined) is on the stone. So is the location of Hawai'i relative to the equator. Some stars are also marked there using *pukas* in the stone's perimeter to indicate the direction of star rise and star set. The *piko* stone used the 36 flutes along the diamond's perimeter as both something akin to our circle of 360°, which also represents the stellar year, and a representation of the solar year of 365 days. So space and time can be conflated, stand for one another, be more than one thing.

Perhaps one of the most useful results arising from the research at Kūkaniloko is the clarity with which it shows that astronomical relationships are not the same as astronomical orientations or astronomical alignments. Kūkaniloko does have astronomical orientations, for example the site's lengthwise axis runs from the June solstice sunset to the December solstice sunrise. There are, though, astronomical relationships and associations that are not strictly astronomical orientations.

The birth stone's relationship to the Regulus stone is specifically for a birth at the Birth Stone at the time the shadow dagger appears on the Regulus stone, rather than an orientation to Regulus either when it is rising or setting. The piko stone includes an indicator of true north-south, rather than solely to the stars that indicate true north-south. The piko stone also indicates two understandings of the equinoxes, that which takes place at the equator (the widest part of the stone) and that which takes place at Kūkaniloko (north of the equator, at the center mark of the northern set of concentric circles). The northern mark does not align with any one star at an equinox, but an imaginary line to the sunrise and an imaginary line to the sunset from that mark do indicate equinoxes sunrises and sunsets.

Associations and relationships are less readily determined than orientations or alignments. The cultural uses, meanings, symbolism, and functions of celestial objects and events are not necessarily readily evident. In many cases it is important to have access to the multiple names by which any one object or event was known. Among the names for Aldebaran, for example, is Haumea. Haumea is a goddess of childbirth, is the name Papa took after leaving Wākea, and is at times used interchangeably with La'ila'i and Hina, all of whom are female and mothers (Beckwith. 1940, pp.276-291). This is appropriate at a royal birthing site, but it reflects more than birth. It associates the birth and birth-giving with cosmogony and with the lineage of which the child is a product.

The extent of astronomical associations and relationships, and their interweavings, evident at Kūkaniloko are unlikely to be fully replicated at most, or perhaps any, other sites because of the unique placement and purposes of Kūkaniloko. There are, though, at least two other diamond-shaped stones, one near the center of Maunawila Heiau in Windward O'ahu and one on Kaho'olawe. Neither of these stones has fluting or concentric circles, but they may have served to recall the "model" of the *piko* stone for those experts familiar with the knowledge from Kūkaniloko.

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