

# The Lionhearts of the Pacific: Polynesians- culture, history and navigation



## **GEM1506K HEAVENLY MATHEMATICS**

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## 1. INTRODUCTION



*The fame of your canoes can never be dimmed  
The canoes which crossed the ocean depths,  
The purple sea, the Great-Ocean-of-Kiwa,  
Which lay stretched before them.*  
Maori Lament

Polynesia, an exotic name one would perhaps hear when the conversation chanced on the topic of tourism or beautiful places. For long, the general opinion of it was that of some lightly populated islands, home to people who live to earn the tourist dollar. However this is not true. These “Pacific Vikings” had a long proud history and culture. Indeed, their marvelous techniques of wayfinding on the ocean may never be fully known. In this essay, we would like to give a brief introduction to the interested reader about Polynesia. We do not claim to be more than just a loose compilation of diverse opinions. Hopefully, the reader would be enticed to find out more about the Pacific Islanders on his own after finishing this essay.

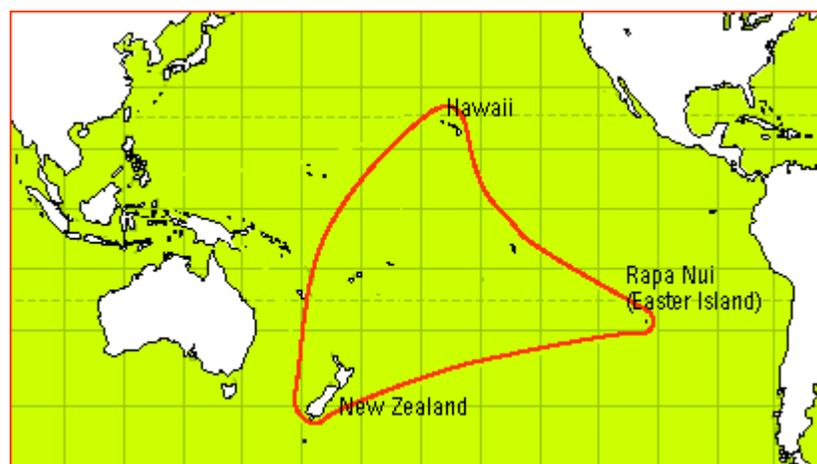
The Polynesians originated from a common stock but over time had diversified into their individual societies (i.e. Hawaiian, Tahitian, and Maori etc.). Though differentiated, they retained many common traits- in their shared language most notably and in their physical appearance. The lives of the Polynesians were closely linked with the ocean. They had sailed the sea hundreds of years before the Europeans, using voyaging canoes crafted from the island materials and stone tools. The ocean was integrated naturally into Polynesian culture, as they came from small islands surrounded by vast ocean expanses. No other culture had embraced the open sea so fully. They settled an area larger than continents. By the time the European explorers entered the Pacific Ocean in the 16<sup>th</sup> century, almost all the habitable islands had been settled for hundreds of years.

## 1.1. Brief History

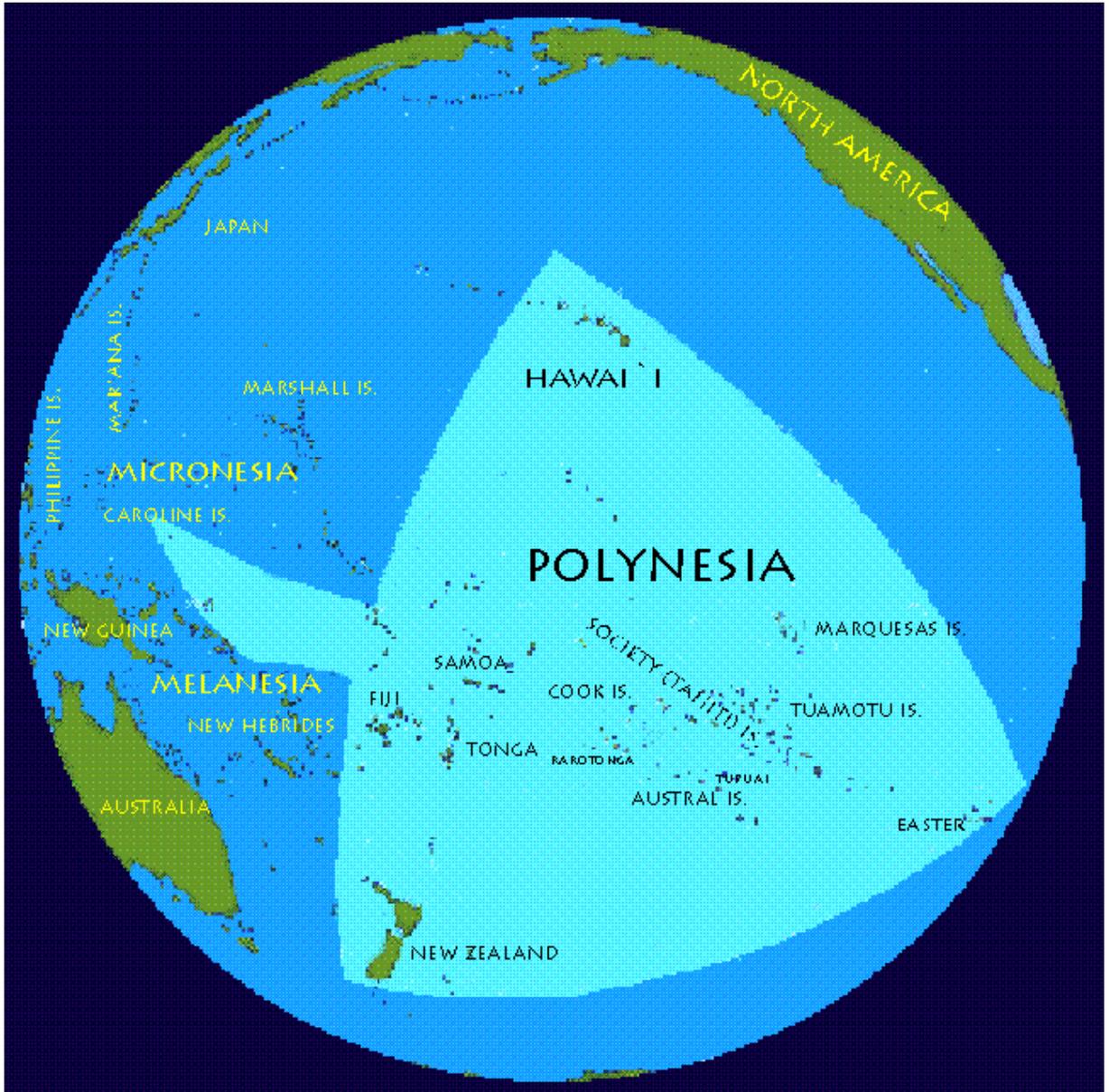
The ancient Polynesians belonged to a stone-age culture. This meant that they had not come into contact with metals. While 20<sup>th</sup> century anthropologist Thor Heyerdahl hypothesized that the Polynesians originated from Peru, (and demonstrated his theory of their journey on balsawood rafts with his 1947 Kon-Tiki expedition), most historians believed that they descended ultimately from the ancient sailing peoples of Southeast Asia. They are known as Austronesians, who from circa 4000 years ago voyaged around the archipelagoes of the western Pacific, expanding ever eastwards. They were said to have passed the Solomon Islands, Vanuatu and by about 1100BC, they arrived at Tonga and Samoa. As their population grew and conflicts over land became a problem, groups of them migrated eastwards, reaching the Marquesas Islands (Hiva) by around 300BC.

During the next thousands years, the Polynesians continued their island colonization. From the Marquesas Islands, they were thought to have migrated east to Easter Island (Rapa Nui) at around 300AD, north to the Hawaiian Islands at about 400AD and south to New Zealand (Aotearoa) estimated at 1000AD. This will be further elaborated in more detail in the later sections.

This progression of settlement could be deduced from the ethno-botanical evidence found in the Western Pacific islands, through central Polynesia (the Cook Islands, Society Islands and Hiva) and then to Hawaii. Of the 72 plants identified as being introduced to Polynesia by people, 41-45 are found in the Cook Islands, the Society Islands and Hiva; 29 are found in Hawaii, including taro, breadfruit, sugar cane, bamboo, yam, banana, coconut, gourd, sweet potato and mountain apple. Below are 2 maps of Polynesia.



Map of Polynesia on flat surface,  
it resembles a triangle.



Map of the Polynesia with respect to the globe.

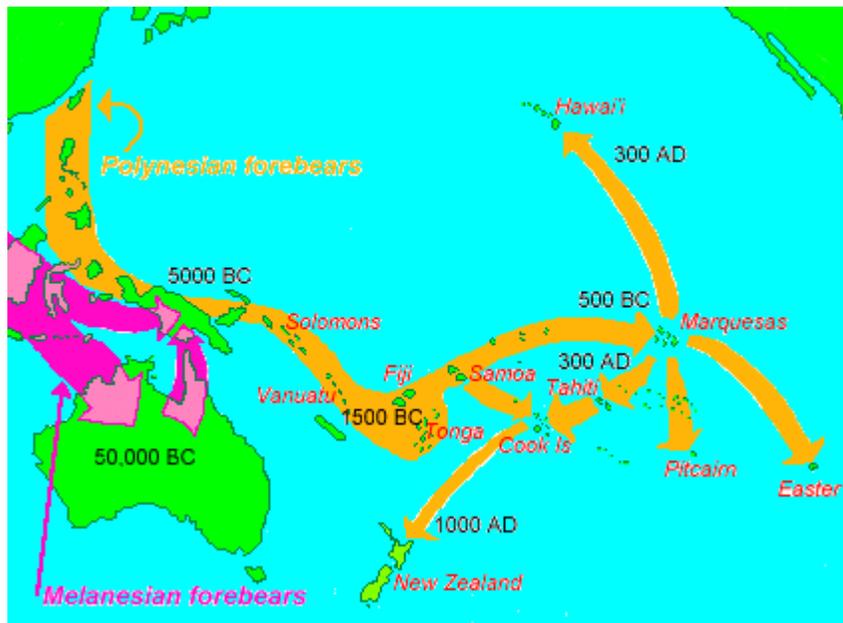
## 1.2. Historical and present theories on the Polynesian migration and settlement



When the first Europeans encountered the Polynesian settlements in the 16<sup>th</sup> century, they found it difficult to understand how the Polynesians did cross the Pacific Ocean without compass or sextant. They were forced to explain how what they see as a heathen, primitive group of people, managed to spread throughout the Pacific islands, establishing colonies that were separated by thousands of miles of ocean- all before the first Europeans had laid eyes on the Pacific Ocean.

There were many different theories formed at different points of time about how the Polynesians came to be in the Pacific Islands. Some say they came from South America and were related to the American Indians whereas others tried to explain it by mapping the migration to the Australian continent and Tasmania. However the theory of them migrating through chains of islands over time from Southeast Asia had so far





The above 2 illustrations show the present prevailing theory about the migration route of the Polynesians to the Pacific. It shows that the western Polynesia was probably the first to be settled where upon they migrated to the to the Marquesas Islands (Hiva) before spreading to the Society Islands, Easter Island (Rapa Nui) and the Hawaiian Islands.

Please note that the dates of settlement may not all totally tally with figures given at different positions in this essay as all dates are not conclusive. Thus, the different figures must be looked in the perspective of the enthusiasm of historians who were trying to better understand the origin and history of the Polynesians. The dates are constantly changing with new archaeological discoveries.

Controversies were also abounded; with scenarios that tried to explain reasons leading to populations on the dispersed and tiny islands in the Pacific. One early theory held that since the Polynesians themselves were not capable of making the transoceanic voyage and reaching such far-removed locations as Samoa, Tahiti, Tonga and Hawaii by themselves, the Christian God must have put them there. Over time, the Europeans abandoned this theological hypothesis in favour of ones that seem more rational. Thus, some asserted that the Polynesians must have reached the islands by accident. They could have reached the islands after being blown off-course; others claimed that ocean currents haphazardly carried Polynesians mariners to new shores. These theories display certain cultural bigotry and a lack of imagination. It illustrated an unwillingness to accept the Polynesians as sophisticated people with profound knowledge of navigation.

Another exciting possibility is proposed in Geoffrey Irwin's *The Prehistoric Exploration and Colonization of the Pacific*. He suggests that those who settled Polynesia may have used a deliberate strategy of exploration that allowed them to find islands without high probability of losing their lives. (Before, many scholars have assumed the exploration of the Pacific would involve high casualties at sea.) According to Irwin, the Polynesians used safe methods which involved waiting for a reversal in wind direction and sailing in the direction that is normally upwind (i.e. eastward in the Pacific) for as far as it would be safe to go given the supplies that were carried on its canoe. The return trip (westward) would be easy when the wind shifted back to its normal easterly direction. Irwin believes that this strategy is supported by the belief that the Polynesians had settled in the Pacific from east to west, from the islands of Southeast Asia and Melanesia to Samoa, Tonga, the Cook Islands, the Society Islands, the Tuamotus and Hiva. Although no factual evidence would prove this strategy of exploration was actually employed by Polynesian navigators, the strategy would have been obvious to anyone familiar with sailing.

Now, it can perhaps be deduced that the ancient Polynesians navigated their canoes by the stars and other signs that come from the ocean and the sky. Navigation was a precise science, a learned art that passed on verbally from one navigator to another for countless generations. This is demonstrated by *Hokule'a*, a replica Polynesian double canoe made by a team of Hawaiian canoeists in 1976, voyaged from Hawaii to Tahiti using ancient navigational techniques of their ancestors. Using no instruments, the canoe team navigated as their ancestors did, by the stars. The paths of the stars and rhythms of the ocean guided them by night and colour of the sky and the sun, the shapes of clouds, and the direction from which the swells are coming, guided them by day. These techniques will be covered with more depth in the later sections. By sailing from Hawaii to Tahiti, *Hokule'a's* team was able to prove it was possible for Polynesian peoples to migrate over thousands of miles from island to island.

Thus, it is clear that the Polynesians, despite the assertions of early European explorers, were not primitive. In fact, they were among the most advanced civilizations of their time.



### 1.3. Traditions and Religion of the Polynesians

Due to the zeal of the Christian missionaries to destroy the old Polynesian belief and gods, knowledge of the religion or religions before the arrival of Europeans remains relatively poor. It is based on the accounts of the first explorers as well as on accounts of linguists or priests installed on newly Christianized islands as in the Tuamotu Archipelago. However the reconstitution studies are still mostly controversial, as numerous problems will forever remain unresolved. For example, a great controversy followed the discovery by the Australian scholar, Ralph Piddington, in 1939 that the Tuamotuan chants on the god Kio (or Kiho. or I0) and recorded by Stimson and Emery at Vahitahi were similar to the Biblical Genesis.

A tradition published in Teuira Henry's Ancient Tahiti (taken from the Polynesian Voyaging Society website at <http://leahi.kcc.hawaii.edu/org/pvs/>) "attributes the discovery of Hawaii to a voyaging hero named Tafa'i (Hawaiian Kaha'i), son of Hema and an underworld goddess named Hina-tahutahu (Hina, the magician). Tafa'i "cut the sinews" of the islands of Tahiti (i.e., fixed them in their places), fished up the islands of the Tuamotu Archipelago and then "went exploring the trackless ocean northward." He found a chain of islands beneath the sea and fished it up, naming the first island "Aihi" ("Bit-in-fishing," now called "Hawaii"). "Next he drew up Maui and all the other islands of our archipelago. Then those intrepid navigators went south and returned with people to dwell on the beautiful new land, bringing with them their gods, their chiefs, and breadfruit and other plants." Later, Tafa'i tried to pull the Hawaiian islands south, closer to the Tahitian islands, but failed when the kapu forbidding the crew to speak or look back from the canoe was broken.

The connection between discovery and fishing is part of pan-Polynesian tradition of islands being fished out of the sea. A fisherman named Huku is said to have found Rakahanga Island while on an aku fishing voyage from Rarotonga; later the three Maui brothers came to the same area and began fishing. Maui-mua caught a shark; Maui-roto an ulua; and Maui-muri the island of Manihiki (Tairi "The Origin of the Island Manihiki"). Maui is also said to have fished up, among other islands, Tonga, Mangaia in the Cook Islands, and Aotearoa (New Zealand) (Buck 53).

This traditional association between fishing and the discovery islands suggests that fishermen, of whatever identities, were perhaps the most frequent discoverers of islands in ancient times, either while they roamed the ocean looking for new fishing grounds or chasing schools of pelagic fish, or after they were driven off course by storms on their way to known fishing grounds. A poetic way of describing their discoveries would be to say that the fishermen caught islands, not fish. Perhaps the name of Maui was given to anyone who discovered an island, in honor of some ancestral fisherman-explorer noted for finding islands."

In 1789, Bligh recounted that the Tahitians believed in the omnipresence of a divine being who was both all-powerful and the great ruler of all things. This god (Tahitian:

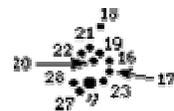
atua) was called Ore. On another hand, Morrison wrote in 1793 that the islanders of Tubuai believed in three "atua": the first, called Tane was also known as "atua nui" or "atua mana", he was the creator of the world and the cause of all things. His son, Oromatautua, presided over war and peace. The third, Tipahoamanu, was their messenger on earth. Morrison, as well, noted that some traditions were similar to the Old Testament. The Rev. William Ellis who lived on Huahine for four years, wrote in 1829 "Ta'aroa, their principal god, was invisible, uncreated and had existed since the beginning of time. He created all things as well as the first man out of red earth (Tahitian: 'araea), and the first woman from the bones (T: ivi) of the man". This tradition, as well as an account of a local Flood, presents a striking analogy with the Biblical version. Wallis Edmond de Bovis, a French naval officer, wrote in 1855 that Hiro, then considered god of the sea, was the first king of the Society Islands who rounded the famous Taputapuatea marae at Opoa. Hiro was also said to have introduced the "maro'ura" (red feather girdle) as a symbol of royalty, as well as the construction of huge boats (like the "pahi" which could be over 30 metres long).

For the Marquesans, the first man was called Tiki: he is also considered to be the god of sorcery. The same name (T: ti'i) was given to stone or wooden statues of inferior divinities who guarded the taboo places (T: tapu) such as the marae. Besides the great priest (T: tahu'a nui), more than twenty people were responsible for the ceremonies on the marae: priests (T: tahua pure), narrators of kings' genealogy (T: orero), servants (T: epo nui), narrators for the night ceremonies (T: haerepe), media in trance (T: taura) or tellers of war stories (T: rauti). The singers/dancers (T: Ariel) were sacred as were the priests: the two groups were comprised of people from the three main castes. The group of the priests had a strong hierarchy based on the importance of the related marae.

The Polynesians also believed in ghosts (T: 'oromatua): they were the souls (T: varua) which separated from the body (T: tino) after death (T: mate, pohe). Some could become sinister (T: varua 'ino). For the Tahitians, gods were not only present at the moment of the ceremonies in hand-made wooden, stone or wicker statues (T: to'o), but also in "ate", which were uncommon inanimate objects, plants or animals (e.g. the blue shark for the god Tone, a basaltic table for the god Taaroa, the frigate bird for the god Oro)."

However much of the information mentioned above cannot be taken as authoritative. The early explorers, faced with a bewildering variety of beliefs may have tried to coordinate their accounts of local religions to be on more familiar tones with Christianity. Today perhaps, by leaning more on the accounts of the locals (by no means the absolute truth as many had forgotten their heritage) and new archaeological findings, the mist on the Polynesians may start to lift.

The Polynesians also had star myths among their folklore. One of the more famous myths was about the Pleiades cluster. This is adapted from the Constellation Mythology at <http://www.coldwater.k12.mi.us/lms/planetarium/myth/index.html>

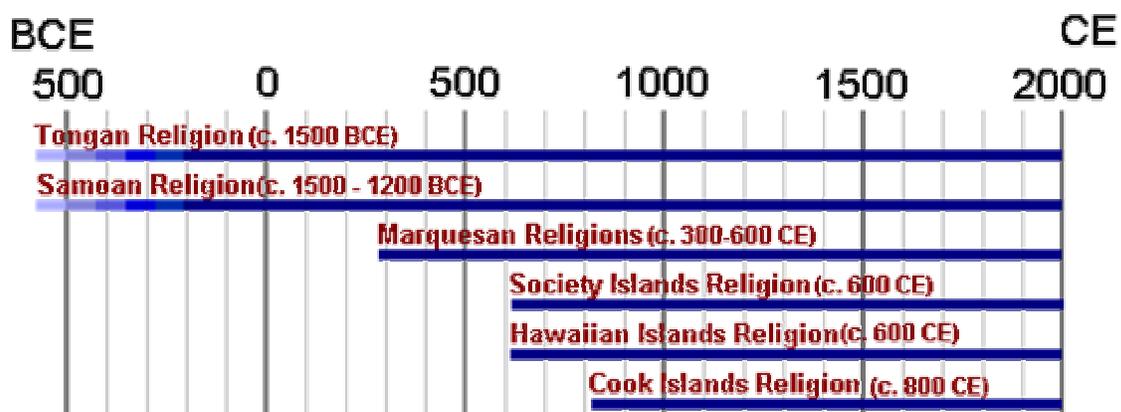


"They were called Makali'i, "Little Eyes". The Polynesians believe that long before men inhabited the Earth, they formed a single star. This was the most brilliant star in the

sky. Its light rivaled that of the quarter moon, and when it rose, its reflection sparkled and danced along the sea and the whole world was white from its brilliant light. The star was not only beautiful, it was also extremely conceited and was always bragging of its splendor among the other stars, saying, "I am more beautiful than any of you, even more beautiful than the gods or the jeweled heavens themselves." The god Tane, guardian of the four pillars of heaven, heard this and was angry. He determined to drive this ill-mannered star out of the sky, away into the dark regions. To do so, he sought the help of two other stars, Sirius and Aldebaran. Sirius was the second brightest star in the sky and had no sympathy with a rival who was brighter than himself. Aldebaran was located so close to the brilliant star that his light was always being dimmed by that of his neighbor. Both stars agreed to the plot against Makali'i.

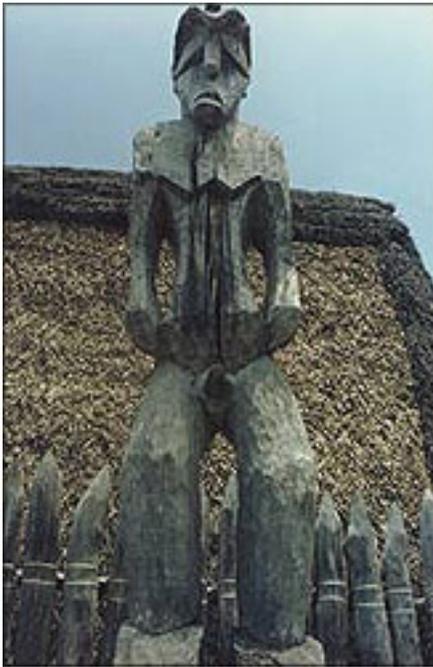
One dark night the three allies crept up behind their victim and got ready to chase him from the skies. Makali'i was badly frightened when he saw them coming and at first he ran and took refuge under the waters of a stream, the Milky Way. Sirius climbed to its source and diverted the course of the water. As it drained away, the poor fugitive was left unprotected and again it fled from them, under the arches of heaven and far beyond the silver palaces of the gods. Makali'i was swift of foot, and before long it had completely outdistanced the pursuers. It looked as though the star might escape altogether, but Tane was a god and not one to be outwitted.

Suddenly he picked up Aldebaran and hurled him with all his force against the great star. Tane hurled him with such a force that the star was struck unaware as it ran and smashed into six little pieces. Then the god and his star companions were satisfied and went away. The six little fragments limped back to their place in the sky. Since that time, Sirius shines as the brightest star in the sky and Aldebaran is undimmed by any near rival. The "Little Eyes," small as they are, remain exceedingly brilliant and sometimes whisper proudly to each other that they are lovelier as six than as one. They no longer dare brag aloud how beautiful they are, but when the nights are dark and quiet they still lean down close to Earth to see themselves in the mirror of the oceans, and then they know that they have no equal."



The above chart shows the estimated timeline of the establishment of religion among the Polynesians.

## Art and Artefacts



Statues of Hawaiian Gods

Beside the numerous artefacts related to religious beliefs such as the statues shown above, the Polynesians made arms, dress and ornaments for the frequent inter-tribal or inter-island skirmishes that took place on land and sea. Slings, spears, clubs and truncheons were used as well as war canoes.

The islanders excelled in making boats, which allowed them to travel hundreds and even thousands of kilometres. There were two main groups of boats (simple or double hull) built for three main reasons: war, fishing and traveling. Mono-hull boats comprised the "vaa", a small canoe with an outrigger and paddles, and the "vaa motu", similar but with sails, both for coastal fishing and short trips. Double-hull boats comprised the "tipairua" or "pahi" with sails for long voyages, the "pahi tamai", a war canoe with paddles, and the "tira" a canoe with paddles for fishing.

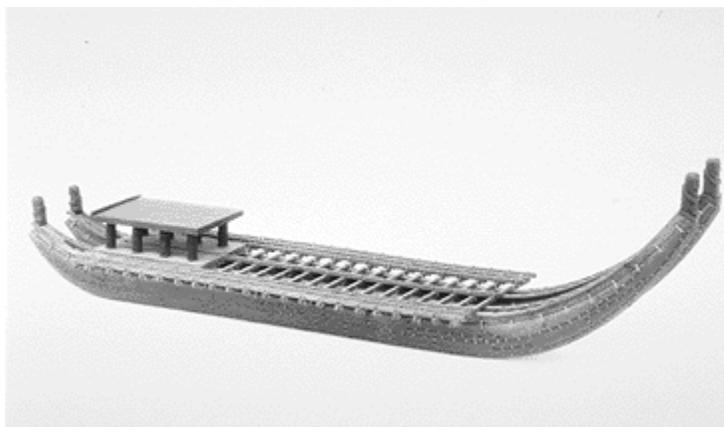
The building of a canoe was a religious affair, and there are deities specifically associated with this activity. So too, when voyagers went to sea, they asked for protection from the god of the ocean, Kanaloa, and the god or goddess of the weather

and winds, La'amaomao. There are also many gods and goddesses of canoes and canoe-building such as Lea and Kanealuka.

The canoes were built with only tools of stone, bone and coral, making the voyaging that the Polynesians did seem all the more remarkable. The canoe hulls were dug out from tree trunks with adzes or made from planks sewn together with coconut fibre twisted into strands and braided for strength. Cracks and seams were sealed with coconut fibres and sap from breadfruit or other trees. An outrigger was attached to a single hull for greater stability on the ocean; two hulls were lashed together with crossbeams and deck added between the hulls to create double canoes capable of voyaging long distances.

The canoes were paddled when there was no wind and sailed when there was; the sails were woven from coconut or pandanus leaves. These vessels were seaworthy enough to make journeys of over 2000 miles along the longest sea roads of Polynesia, such as the one between Hawaii and Tahiti. And although these double-hulled canoes had less carrying capacity than the broad-beamed ships of the European explorers, the Polynesian canoes were faster by an estimated ratio of 3 to 2.

As the Polynesians were ignorant of metallurgy, tools were made of wood, stone and animal products such as barracuda jaw, human bone, shark tooth or shell. The Polynesians also excelled in making rope and fishing nets with the fibre taken from the husk of the coconut. Pounders used to pulverize taro were made of wood or coral as well as basalt (black dolerite).



The figures above show two different styles of a “pahi”. These swift Polynesian canoes evolve over time through new discoveries and purposes. At some stages of time, the canoes were also influenced by Micronesian and Melanesian designs and in turn, influenced their designs. Canoes were a vital part of Polynesian culture and had social and religious purposes. Without canoes, the Polynesian step migration would be impossible.

### Case Study 1: Easter Island (Rapa Nui)



Easter Island is over 2,000 miles from the nearest population center, (Tahiti and Chile), making it one of the most isolated places on Earth. A triangle of volcanic rock in the South Pacific- it is best known for the giant stone monoliths, known as *Moai*, that dot the coastline. The early settlers called the island "Te Pito O Te Henua" (Navel of The World). Admiral Roggeveen, who came upon the island on Easter Day in 1722, named it Easter Island. Today, the land, people and language are all referred to locally as Rapa Nui.

There has been much controversy and confusion concerning the origins of the Easter Islanders. Thor Hyerdahl proposed that the people who built the statues were of Peruvian descent, due to a similarity between Rapa Nui and Incan stonework. Some have suggested that Easter Island is the remnant of a lost continent, or the result of an extra- terrestrial influence. Archaeological evidence, however, indicates discovery of the islands by the Polynesians at about 400AD- led, according to legend, by *Hotu Matua*. Upon their arrival, an impressive and enigmatic culture began to develop. In addition to the statues, the islanders possessed the Rongorongo script; the only written language in Oceania. The island is also home to many petroglyphs (rock

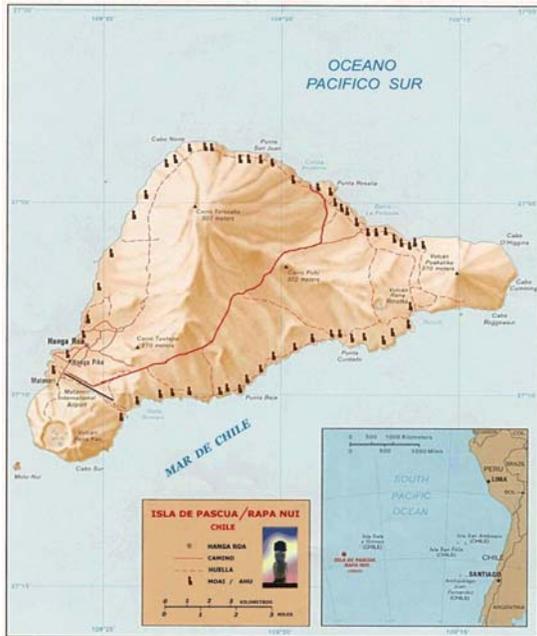
carvings), as well as traditional woodcarvings, tapa (barkcloth) crafts, tattooing, string figures, dance and music.

The population of Easter Island reached its peak at perhaps more than 10,000, far exceeding the capabilities of the small island's ecosystem. Resources became scarce, and the once lush palm forests were destroyed - cleared for agriculture and moving the massive stone Moai. In this regard, Easter Island has become, for many, a metaphor for ecological disaster. Thereafter, a thriving and advanced social order began to decline into bloody civil war and, evidently, cannibalism. Eventually, the islanders tore down all of the Moai standing along the coast. All of the statues now erected around the island are the result of recent archaeological efforts.

Contacts with Westerners proved even more disastrous for the island population which, through slavery and diseases, had decreased to approximately 111 by the turn of the century. Following the annexation by Chile in 1888, however, it has risen to more than 2,000, with other Rapanui living in Chile, Tahiti and North America. Despite a growing Chilean presence, the island's Polynesian identity is still quite strong.

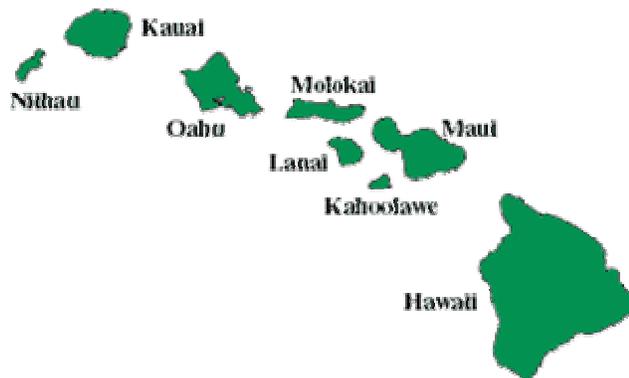


A canoe petroglyph found at Orongo, Easter Island and Herb's rendition of what the original may look like



Map of Easter Island

## Case study 2: The Hawaiian Islands



Some historians have claimed that sometime around the fourth or fifth century A.D., the first planned migrations came from the Marquesas, in extreme eastern Polynesia. For five centuries the Marquesans settled and lived peacefully on the new land - Hawaii. Around 1,200 A.D., the Tahitians arrived and subjugated the settled islanders. Tahitian customs, legends, and language thus became the Hawaiian way of life. A Hawaiian chant, the Kumulipo, links the royal families to the gods. They had their own mystical and ancestral roots. Religion was almost an art form to the Hawaiians. According to legend, (adapted from "In the Beginning Hawaiian Gods" by Betty Fullard-Leo),

"In the beginning in Hawaiian mythology, Po was a vast, empty land, a dark abyss where only one life form dwelled. This was the spirit of Keawe. A single light shown through the darkness of Po-a flame holding the energy of creation. In this chaotic vortex, Keawe evolved order. He opened his great calabash and

flung the lid into the air. As it unfolded, it became the huge canopy of blue sky. From his calabash, Keawe drew an orange disk, hanging it from the sky to become the sun. Next Keawe manifested himself as Na Wahine, a female divinity considered his daughter. In addition, he became Kane, his own son, also known as Eli or Eli-Eli, who was the male generative force of creation. In the Kumulipo, the best known of the Hawaiian creation chants, the feats of Eli-Eli are detailed in rhythmic litany. Na Wahine and Kane mated spiritually to produce a royal family, who became additional primary gods worshipped by the Hawaiian people. In ancient chants and rituals, three sons: Ku, Lono, and Kanaloa, along with Kane are the four major Hawaiian gods. Keawe made Kane the ruler of natural phenomena, such as the earth, stones, fresh water. Most importantly, Ku as Kukailimoku was god of war, but he also reigned over woodlands and crops, and in various forms was worshipped by craftsmen. Bird catchers and feather workers appealed to Kuhuluhulumanu, fishermen to Ku'ula, sorcerers to Kukoaie, for example. Kanaloa was responsible for the southern Pacific Ocean and as such was god of seamen and lord of fishermen. Lono, as lord of the sun and of wisdom, caused the earth to grow green. As a god of medicine, he had a particular interest in keeping herbs and medicinal plants flourishing. Lono was the god who presided over the makahiki season when war ceased and taxes were paid to the ali'i. Kane and Na Wahine also had daughters. Among them, Laka was the goddess of hula; Hina was the mother of Maui who pulled the Hawaiian Islands from the ocean; and Kapo was the goddess of the South Pacific and was largely worshipped on Maui. Among the major divinities were the goddess Papa, queen of nature, and the man she married called Wakea. In legend, Papa and Wakea's first child was born deformed like a taro root. From the child's grave, the first taro plant grew to furnish sustenance to the rest of the human race, which had its origins in this first couple."

Prior to the arrival of the missionaries in 1820, Hawaiians believed in many gods such as Pele, Hina and Lono. They were the sources of all power, or *mana*. *Mana* was the invisible force that flowed from the most senior spirits to energize everything in the universe, whether it be the wind, the growth of a plant, or the surge of an ocean wave. *Mana* became manifest in humans as outstanding talents, intelligence, strengths, and leadership charisma. *Tapu* (Hawaiian: *kapu*) were prohibitions instituted to protect the flow of *mana* from disruption and conserve it against accidental loss or theft by persons not entitled to it.

Most farmers revered Lono, who was considered a benign god. When crops ripened, farmers performed religious services to the gods by building a fire to honor whichever god they worshipped, be it Ku, Kane, Lono, or Kanaloa. During the ceremony, food was cooked and portioned out to each man who sat in a circle around an idol of that particular god. A kahuna offered the food to heaven. After the ceremony was completed, the people could eat freely of the cooked food, but each time new food was cooked in the imu (underground oven), a bit of it had to be offered to the god again before the common man could eat.

Traditional Hawaiian society before contact with the outside world was characterized by a complex religious, governmental and cultural system that reflected the harmonious relationship the early Hawaiians had with the natural world. Like all

societies, the Hawaiians had a set of rules or laws (*kapu*) to help guide their people. The *Kapu* System outlined actions that were appropriate and inappropriate for people of different ranks. For example, in the case of conservation, an *alii* (chief) could forbid people from eating or using certain plants, animals, or other resources. These restrictions could be for certain people and for certain times of the year. With the aid of *kapu*, the scarce island resources were protected from over-exploitation.

The *Kapu* System separated Hawaiian society into four groups of people:

- the *alii*, chiefs who ruled specific territories and who held their positions on the basis of family ties and leadership abilities - the chiefs were thought to be descendants of the gods and the highest chiefs, *alii kapu*, were considered gods;
- the *kahuna*, priests or skilled craftsmen that performed important religious ceremonies and served the *alii* as close advisers;
- the *makaainana*, commoners (by far the largest group) who raised, stored, and prepared food, built houses and canoes, and performed other daily tasks; and
- the *kauwa*, outcasts forced to lead lives segregated from the rest of Hawaiian society. They were clearly distinguished from the other classes by the tattoos which were applied on their foreheads or at the corners of their eyes. This class of people was probably descendants from those that were conquered in battle.

The *kapu* (laws) regulating conservation of natural resources were usually farsighted and just. However, prohibitions upon the commoners were sometimes severe. There were different *kapu* for different infractions. The most serious were laws of the gods, *kapu akua*, and laws of the chief, *kapu alii*. The chief had power over life and death. All he had to do was utter the word and a person would be killed. The chief could also utter a word to spare a life. As formidable as some *kapu* were there was also a *kapu akua* (a law of the gods) providing for pardon, clemency, absolution, and mercy. This was known as *puuhonua* or "refuge" from capital punishment.

No one knows the origins of the *kapu* system. Some say the Hawaiians remembered the One Supreme God Io and worshipped him in relative peace until Paa'o, a high priest and famous navigator, came from Tahiti around A.D. 1300. Fornander writes that prior to the arrival of Paa'o "... the *kapus* were few and the ceremonials easy; human sacrifices were not practiced; and government was more of a patriarchal rather than of a regal nature.

Many believe the *kapu* were established as a result of the Tahitian migrations, bringing to Hawaii a system of laws and rituals protecting the *mana* (spiritual power or energy) which existed in all living things. In part, this was symbolized by the worship of many gods (*akua*), the four principal ones being: Kane, the God of Life; Ku, the God of War; Lono, the God of Agriculture; and Kanaloa, the God of the Ocean. These gods took many shapes and forms and presided over families of deities. Hawaiians also had ancestral spirits called *aumakua*. The *aumakua* were both "guardian angels" and were spirits that could be called upon in times of need. Because the early Hawaiians depended on nature for everything, the *kapu* system was intimately connected with reverence and respect for the natural world. This *Aloha Aina* (love of the land) made the *kapu* system one of the earliest examples of environmental protectionism

Interestingly, *kanaka maoli*, commoners, could freely worship their personal gods, voicing their own prayers. For the *ali'i* (royalty), however, a *kahu-akua*, who was a

priest or keeper of the idol, uttered the prayer. The king was the only one allowed to command the construction of a luakini (sacrificial) heiau to honor Kukailimoku, the war god, which required sacrificial offerings of human life during its construction. Lesser chiefs could build mapele, stone temples, to invoke the blessing of gods like Lono who could insure abundant crops. These temples were surrounded with posts carved with images, while inside idols carved of wood, stone or sea urchin spines, or fashioned of feathers attached to woven netting represented various gods. Oracle towers that jutted 20 feet into the sky held offerings made to the gods on wooden platforms far above the ground. When someone died, their bones were buried and considered sacred, and burials in caves and sand dunes were common. Hawaiians believed that a good person's soul would transform into their aumakua and continue on as part of the family, but if they were bad, their soul would wander forever hungry in the dark.

As mentioned in the earlier passage of Hawaiian mythology, the locals believed that 'oha, or taro corm, was the "root of origin." It did not matter how many offshoots came from the 'oha. In Hawaiian terms, regardless of how distantly people were related, they were still all brothers and sisters. Even if they were 14th or 16th cousins, their roots were from the 'ohana, so they were 'ohana. The 'ohana included parents, grandparents, children, ties of blood and non-related persons and immortals like the 'aumakua, or family god. The 'ohana in nearly every sense were those adopted in friendship. A loved, non-related child could be made a ho'okama (son or daughter adopted in friendship). Members of the 'ohana, like taro shoots, were all from the same root. Taro gave the Hawaiian poi, and poi was god given, like the 'ohana. Pule (prayer) was important in the 'ohana. This helped to prevent unhappiness. Pule was so much a part of the 'ohana that to this day, the word 'ohana is often used to mean pule 'ohana (family prayer).

The 'ohana had many values such as affection and warmth. Hawaiians believed it was important to keep lines of communication open. Members of the 'ohana did not strain feelings by forcing other members to conform. In the 'ohana there was a sense of shared involvement, mutual responsibility, interdependence and helpfulness. The 'ohana meant love and loyalty. All its members practiced the spirit of sharing and caring. Forgiveness was very important. There was great respect for the elders. Members of the 'ohana knew that life was interconnected. The 'ohana who farmed depended on the 'ohana that fished. Each depended on the other for survival.

Thus, the 'ohana (family) made it possible for the Polynesian voyagers to venture forth to unknown lands. This seafaring 'ohana was able to travel thousands of miles on double-hulled canoes because it was in touch with nature and the gods. The 'ohana felt safe because there were no barriers between the spiritual and physical world. The Hawaiian was never separated from his makers and ancestors because the gods and demi-gods showed themselves everywhere; in the sky, in the earth, and in the sea. They could move from one realm to another.

The Hawaiian *Kapu* System of law was dealt its fatal blow when foreigners came. Captain Cook's arrival in 1778 opened the islands to the rest of the world and signaled the end of the ancient culture. Even though the white persons who came to the islands did not abide by the rules of the *kapu* system, they do not seem to be punished by the gods. In 1819, King Kamehameha II declared an end to the *kapu* system. In a dramatic and highly symbolic event, Kamehameha II ate and drank with women, thereby breaking the important eating *kapu*. Soon after, the sacred *heiau* (temples)

were destroyed and the images of gods were burned. As word of these events spread throughout the Islands, the *kapu* system rapidly unraveled.

With the *kapu* system abolished, the missionaries found the Hawaiians living in a cultural void and receptive to the ideas embodied in Protestant Christianity. To aid in converting a society with an oral tradition to Christianity, the missionaries developed an alphabet for the Hawaiian language, began translating the Bible, and started printing other important information in large quantities for many Hawaiians to read. In less than 20 years, the missionaries had established a school system that reflected Western society and the Protestant religion.

When the Europeans arrived in Hawaii in the 18th century, voyaging between Hawaii and the rest of Polynesia had already ceased for more than 400 years, perhaps the last voyager being Pa'ao or Mo'ikeha in the 14th century. The reason for the cessation of voyaging is not known. However, after the 14th century, the archaeological evidence reveals a dramatic expansion of population and food production in Hawaii (Kirch 303-306). Perhaps the resources and energies of the Hawaiian people went into developing their ties with families and gods on the islands to the south weakened. The European advent had a devastating impact on the local population; unleashing diseases such as influenza to the locals who had no immunity. Thus, pureblooded Hawaiians fell to about 5000 people. However, the population had increased and they are now trying to recover their heritage.

The Polynesian Calendar: Case Study- the Hawaiian Calendar



The Lunar Calendar of Tablet Mamari

The Hawaiians had a lunar calendar that varies from island to island. The calendar was critically important to their everyday life because it reflects the seasons and shows the harvest period. Indeed, the calendar year was split due to their respect for agriculture. This meant that it followed the movement of the moon (mahina) around the earth. The length of the month was 29.5 days long, corresponding to the 29.5-day cycles of the moon. This cycle of the moon was divided into three 10-day periods (anahulu). The first 10-day period was called "ho'onui," "growing bigger." The second 10-day period was called "poepoe," "round" or "full." These names probably came about as the day when the moon is full falls during this period. The nights with bright moons were referred to as "na po mahina konane"; konane means "bright moonlight." The third 10-day period was called "'emi," "decreasing" or "waning." The moon will begin to lose its brightness.

The Makali'i (the Pleiades) was much revered in the Hawaiian tradition as the place from which, according to legend, the first Hawaiian people came from. The stars' appearance in the night sky also signified the beginning of the Makahiki, the most important holiday of the year and a time of harvest. Late November is the beginning of the Ho'o-ilo (winter or rainy season) season. Winter officially begins when the Makali'i cluster begins to rise at sunset and set at dawn and is visible most of the night. Ho'o-ilo lasts for about four months until the beginning of Kau (summer) when the Makali'i begins to rise in the east at sunrise and is not visible at night. Na Huihui or Makali'i is a cluster of stars the English-speaking world calls the Pleiades or the Seven Sisters (One of the star myths of the Pleiades were mentioned in an earlier section).

Hawaiian agriculture was incredibly productive therefore the Makahiki was a much celebrated season. It was the traditional Hawaiian celebration of the harvest and time of personal rest and spiritual and cultural renewal. It was a time when all wars and battles were ceased, tributes and taxes paid by each district to the ruling chief, sporting competitions and contests between villages were organized, and festive events were commenced. Warring chiefs would lay down their weapons and instead throw huge feasts with offerings of pigs and taro (used to make poi) in honour of the god Lono, the god of agriculture and fertility. The chiefs hoped to ensure peace and productivity. Lono was associated with the clustering or dark clouds, as thunder, the partial rainbow, whirlwinds, rain and even waterspouts - all aspects of Hawaii's winter season. He could reestablish the vitality of the land and nourishes the gardens of the people.

Several of the rigid kapu (regulating religious and social laws) were also eased or temporarily set aside to allow more freedom of activity and easy celebration. It was a time of rest and renewal in preparation for the next growing season. The celebration of the mystical Winter Solstice is also celebrated during the Makahiki.

You can refer to the following website if you want to know more about the ancient Hawaiian calendar- <http://gohawaii.about.com/cs/mythology/>

*“The early Polynesians underwent hardships which few modern people could even visualize. The 4,000km voyage from the society to the Hawaiian islands may occupy a few inches on a map, but in a partially opened canoe laden with men, women, children and animals and precious seed plants it could easily become an appalling ordeal.”*

*Ben Finney*

## 2. CANOES

### 2.1. Ancient times

Ancient Polynesians ventured the Pacific with 2 kinds of canoes: outrigger ones and double ones. Though a lot of controversies existed among academics as to the specifics of Polynesian navigation, there is a surprising common agreement that the ancient people preferred double canoes for long-range voyaging, particularly migratory voyaging, mainly because of their greater stability and larger carrying capacity. Moreover, the broad central platform between the hulls of a double canoe provides a relatively larger and dry area to shelter people, plants and animals, and food supplies.

### 2.2. When contact with the Europeans started

They started to sail two very different types of double canoes called **tacking** and **shunting** canoes, from the way they sailed to windward. All vessels move to windward by sailing obliquely, first on one side of the wind, then the other, and so on until destination is reached.

#### 2.2.1. Tacking canoe

Like western vessels, it was brought from one side of the wind to the other by swinging the bow across the wind until the sails filled and the canoe could sail off in a new direction.

#### 2.2.2. Shunted canoe

From one side of the wind to the other by a unique maneuver in which the sail was shifted from one end of the canoe to the other so that the stern became the bow.

#### 2.2.3. Differences

- Hulls of a shunting canoe were equal ended so that either end could serve alternately as bow or stern, those of a tacking canoe had fixed, differently shaped bows and sterns.
- Hulls of a shunting canoe were unequal in size ( the hull always kept to windward being much smaller than the main hull), those of a tacking canoe were roughly of the same size.

- Shunting canoes were rigged with the Oceanic lateen sail (a full, triangular sail lashed to two yards and rigged with the apex at the bow, well forward of the mast). While tacking canoes used the Oceanic sprit ( a narrow, triangular sail lashed directly to the mast with the apex downward).
- The tacking canoe can be found throughout Polynesia. The shunting canoe has a more restricted distribution. The tacking canoe is therefore believed to be the one which first brought colonists into Polynesia, and hence is the primary interest of those who want to follow the footsteps of the Polynesians in their navigation adventures.

### 2.3. Materials

Hawaiian and other coastal-shaped canoes typically were made from hollowed-out logs to which one or more planks were added to raise the freeboard. Voyaging canoes were essentially plank-built craft; a number of planks were fitted edge to edge and sewn together with coconut fiber line to build the tall and narrow hulls.

### 2.4. How they sailed

Polynesian double canoes sail very much like conventional boats, but the steering is different. Most boats are steered with a rudder, which is turned right or left to deflect the water so as to turn the bow one side or the other.

Double canoes are steered mainly by paddles, which are raised or lowered to alter the relationship between the centre of lateral resistance of the hulls and the centre of effort of the sails. By lowering a paddle at the stern, the effective draft aft is increased and the vessel turns away from the wind. When the paddle is raised, the canoe turns into the wind.

Double canoes sail well running before the wind, but sail fastest on a beam reach (approximately at right angles to wind direction). The speed is about 16 to 18.5km/hr, similar to modern racing catamarans.

### 2.5. Limitations of the canoes

The strength limitation of the coconut fiber lashings and wooden crosspieces require that the hulls of the traditional double canoes be closely spaced, which tends to slow down the sailing speed. This is because close spacing between hulls increase wave interference and hence drag. This also severely limit the amount of sail that can be carried without danger of capsizing.

Historical evidence suggests that Polynesian navigation is mainly a west –to- east movement in the face of easterly trade winds and currents. Not only the capacity of the canoes were doubted, critics also point out that a craft without deep keel, centre boards or leeboards could not have resisted the tendency to resist leeway when pointed to windward. But experiments showed that a double canoe could in fact make good a wind course of 75 degrees. In other words, a double canoe could sail, subtract leeway from heading, to within 75 degrees of the true wind.

Sailing trials by people who tried to duplicate traditional double canoes with unavoidable blending of modern materials have convinced them that they are indeed sea-kindly craft. Their slim hulls cut through seas with little pitching, and the twin-hulled configuration makes for a stable vessel that hardly rolls. However, double canoes are susceptible to breaking apart and swamping. Each hulls tried to work independently, which in heavy seas results in tremendous stress on the cross pieces and lashing. it is in fact very difficult to bail a double canoe at sea—as one hull is emptied of water, its buoyancy submerges the other one further, so that bailing is almost impossible.

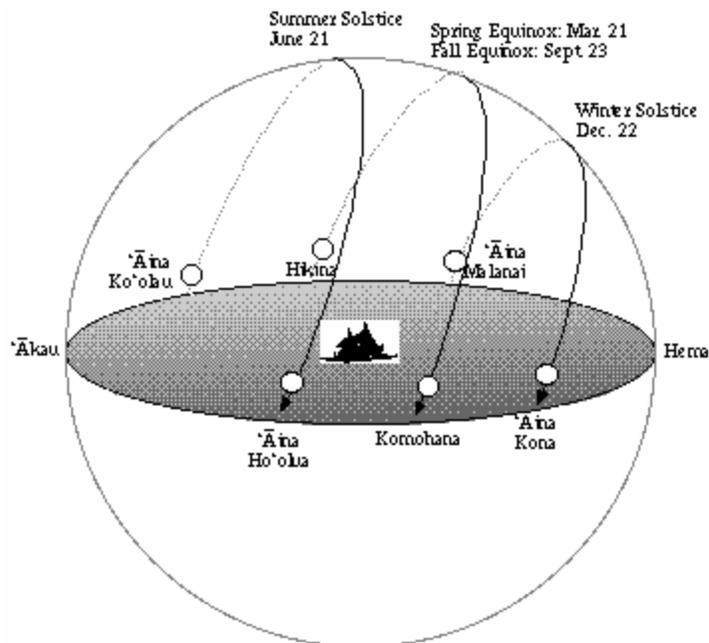
### 3. NAVIGATION

Skeptics feel that the Polynesians could not have undertaken voyages between distant islands, for they lacked the instruments and maps to enable them to tell their course and position by means of bearings or latitude-longitude coordinates.

However, we should not base our judgement on ethnocentric view, but to examine how the Polynesians carried out the three basic tasks of navigation common to all.

#### 3.1. Task one: Orientation and Course Setting

##### 3.1.1. Using the Sun



Navigators use the sun when it is low down on the horizon. When the sun gets too high, we cannot tell where it has risen and the sun will not be able to provide any information about the position of the navigator. We then have to use other clues that will be discussed later.

The sun always rises in the East and sets in the West and this allowed navigators to find confirm their directions by looking at their position with respect to the sun. For example, if the navigator was heading South, the rising sun would be on his left. The exact direction of the sun's path changes during the year as the earth revolves around the sun. The Polynesian islands are all located in the tropics. Hence, at the March and September equinoxes (Mar. 21 and Sept.23) the sun appears to be on the celestial equator. Islands exactly on the equator will see the sun rise due east and set due west the noon sun directly overhead (at zenith). During the June solstice, islands exactly on the equator will see the sun north of the celestial equator, rising and setting north of east and west. Islands on the Tropic of Cancer will see the noon sun directly overhead. During the December solstice, islands exactly on the equator will see

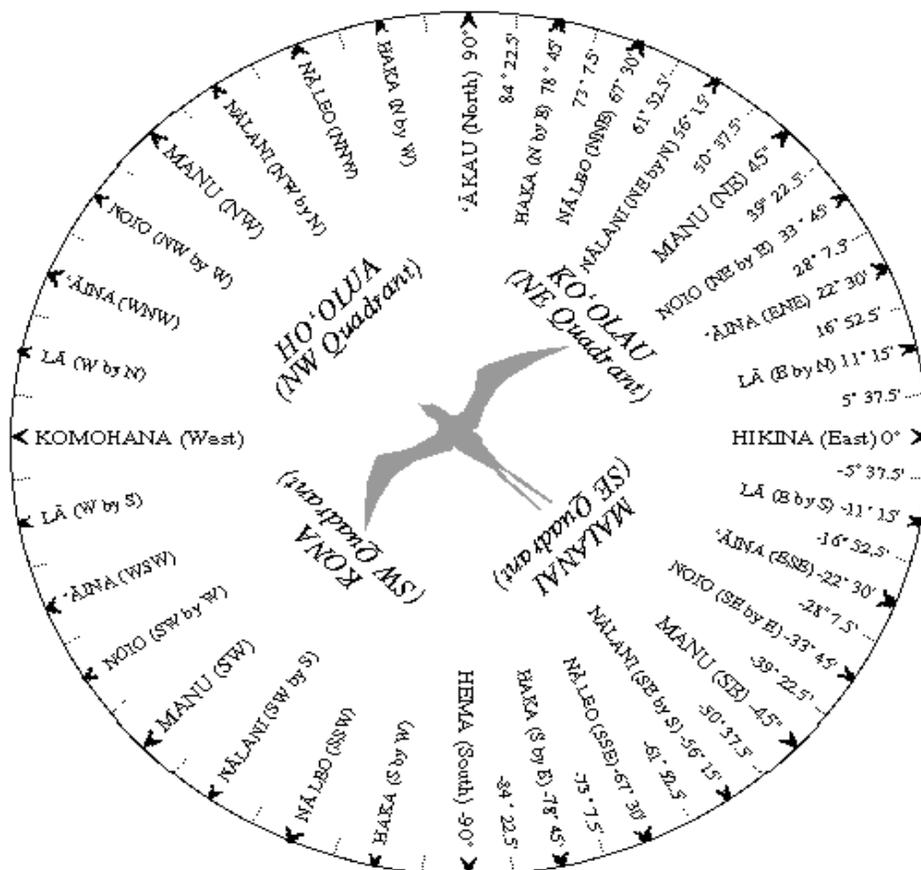
the sun south of the celestial equator, rising and setting south of east and west. Islands on the Tropic of Capricorn will see the noon sun directly overhead.

Though the exact positions change throughout the course of the year due to the inclination of earth's axis, and as the earth orbits around the sun, the latter appears to move in relation to the earth in the sky against a background of stars in the celestial sky along a curved path called the ecliptic.

### 3.1.2. Using the Stars

Stars are the Polynesian navigator's best directional guide for course setting and steering. The early Polynesians have long ago observed that stars rise and set at the same points on the eastern and western horizons, although they do so four minutes earlier each night. As they are low on the horizon just after rising or before setting, they offer directional points like those on a compass. They steered towards the succession of stars that bore similar bearing as their destination islands. Thus, it is amazing till today that the Polynesian navigators had to know so many stars, their respective bearings and the bearings of the islands.

One of the still-practiced ancient stellar navigation system in the pacific is called the "star compass" by which the people in the Caroline Islands, for example, visualize as a series of bearing along the horizon known by the rising and setting positions of the key stars. An experienced navigator might demonstrate this pure mental construct to his fellow islanders ashore by placing a circle of pebbles on a mat, but he only sailed with what's engraved in his mind.



They first divide the circular horizon into 4 cardinal points:  
East: Hikina; West: Komohana; North: Akau and South: Hema.

Then they bisect the angle between these to mark the intercardinal points, and then repeat this process twice more until 32 evenly spaced out points are obtained. Unlike their western counterparts, who name these 32 points by terms like N by W or NW, the Polynesian ones are named after the actual rising and setting points of the prominent stars closest to them. And since stars do not follow the exact degrees, drawing it out will not result in evenly spaced out bearings.

### 3.1.3 Wind and ocean swells

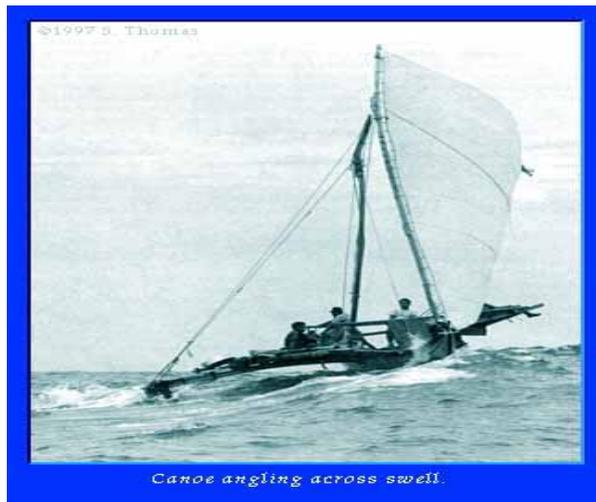
The direction of the prevailing wind can be used to hold a course. They had thorough knowledge of the seasonal variation of the winds as well as the wind changes caused by passing fronts and storms. The ancient navigators were also very familiar with the alternation of westerlies and easterlies in the Pacific. However, winds are not as stable as ocean swells (discussed later) as they may change directions during the day. Hence, the direction of the wind must be checked frequently against rising or setting celestial bodies and the ocean swells. Still, winds in the correct direction do help to speed up the journey.

Ocean swells are below the ocean waves. They are waves that have traveled beyond the wind systems or storms that have generated them, or waves that persist after the generating storm has died away.

Swells are more regular and stable in their direction than waves. This is because waves are generated by local winds which change very easily and frequently. Ocean swells can usually be felt better than they can be seen as most of them cannot be seen after traveling over long distances.

In the Pacific, the northeast trade winds generate a northeast swell and similarly the southeast trade winds create a southeast swell. Storms in the South Pacific during the Hawaiian summer generate a south swell and storms in the north Pacific during the Hawaiian winter generate a north swell. Since ocean swells are not dependent on the sky, [navigators](#) used swell directions on cloudy days, midday and overcast nights to keep on course. However, the direction of wind and swells can only be determined by reference to celestial bodies such as the rising or setting sun. The navigator picks out the most prominent of the ocean swells and keep track of their alignment in relation to the rising or setting sun or the North star.

Swells may change direction after some time due to the movement of the storm or waves that generated them. In places such as the doldrums, the swell pattern can be confused by waves generated by variable local winds from isolated and passing storms. When the sea patterns are disrupted, navigation by ocean swells is difficult.



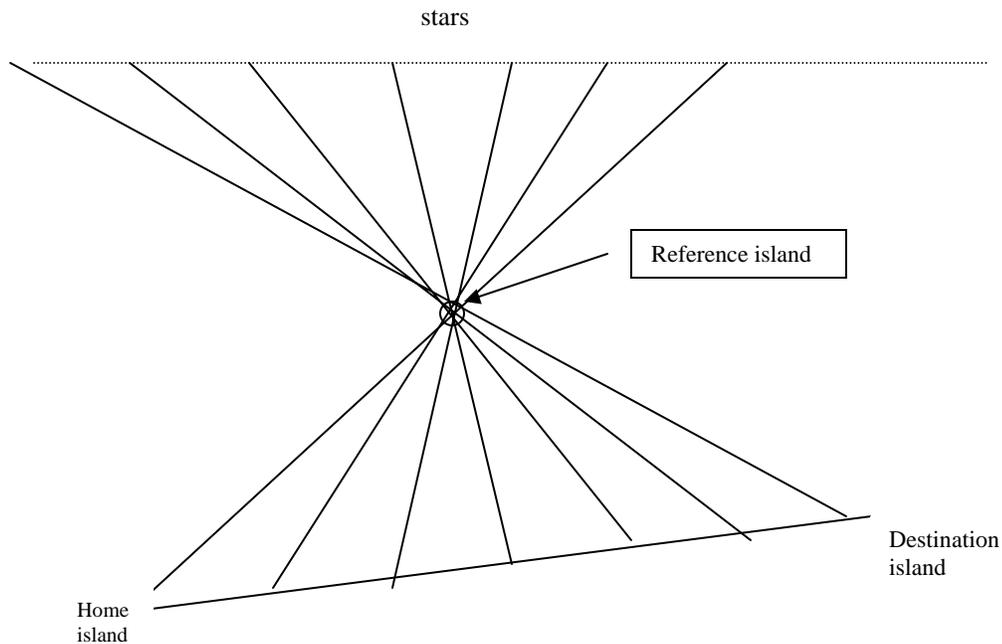
(from <http://www.museum.upenn.edu/Navigation/putting/putting.html>)

### 3.2 Task Two: Keeping on Course

Unlike westerners who employed a method called “dead reckoning” to calculate their position and the approximate distance of the vessels from the last known location, the Pacific Islanders used a conceptual system independent of compass bearings, mileage and coordinates.

Though little historical records are left, it is known from the Carolinians that they keep track of the progress by dividing the course into successive segments marked by star bearings of a reference or etak island. They then have to mentally calculate when the canoe passes from one segment to another.

This is an abstract concept, not a precise one, as the reference island may be too far away to be seen. Essentially they only need to know how the bearing from the canoe toward the reference island shifts from one star to another along the horizon. Thus, when the correct number of segments are accomplished, they know they should be near the destination.



In addition, for voyages made in a north or south direction ( for example, from Tahiti to Hawaii, crossing the equator), an island navigator can measure his progress from the changing angular elevation of stars above the horizon. For instance, the Pole Star, Polaris, which lie directly above the North Pole, hardly moves as the earth rotates beneath it.

The Hawaiian name for Polaris is Hōkū-pa'a, or the "immovable star". It is known that its angular elevation above the horizon decreased as one sailed south, and would disappear if one sailed far south enough.

Moreover, a star's declination, known as its celestial latitude, is the angular distance from the celestial equator. As it progresses from east to west across the sky, a star passes directly above all places on the globe whose latitude is the same as its declination. Therefore, is an islander knows what star has the same declination as the latitude of his destination island, he could tell whether he was approaching that island by observing if the star was passing directly above him.

### 3.3 Task Three: Making Landfall

The pacific islands are mainly low-lying land or coral atolls. These are difficult to be sighted by the navigator especially if visibility is low.

Wave patterns change as they get refracted and reflected when the navigator is near land. The behaviour and the type of sea animals like dolphins in the sea will also change near the islands. Drifting land vegetation in the sea, reflection of sun or moonlight from white sand;

High islands may interrupt the trade wind clouds, causing a noticeable piling-up effect of the clouds long before the peaks of the islands or the tallest coconut trees can be seen.

The colour of the clouds also means something to ancient navigators. They knew that when land was near, the colour of vegetation on the islands will be reflected onto the clouds above the island and the clouds will be greenish in colour. Usually this will be done once the navigator roughly confirms land is nearby by his gut feeling or some other methods as mentioned in this report.

Hence, navigating without instruments is not a precise science. Its accuracy largely depends on the weather, sky conditions and memory of the navigator. Anyway, accuracy was seldom a big issue that ancient navigators considered. They usually try to hit a group of islands around his designated island. The bigger the group, the more likely is the navigator going to reach it. Moreover, islands in the Pacific are seldom found standing alone. For example, the Hawaiian Islands extend more than 1000 miles across the ocean east to west. While sailing to Tahiti from Hawaii, the navigator can target a 400-mile wide group of islands between Manihi in the western Tuamotus, and Maupiti in the eastern Society Islands. Once he can reach any one of the islands in this group, he can then identify the island and find his destination with respect to the island.

### 3.3.1 Birds

Ancient navigators also knew which birds flew far out to sea and which stayed close to land. Even the different sounds of the birds can tell an experienced navigator how far away from land is he, allowing him to depend on the birds even in low visibility. These birds seldom fly more than 75km/hr.

Some birds like the manu-o-Ku (white tern) and the noio (noddy tern) fly out into sea in the morning to feed and return to land at night to rest. The flight patterns of these birds are very useful for locating land. When the birds leave for sea in the morning, the navigator can sail in the direction the birds are coming from to find land. Similarly, in the evenings when the birds return to land, the navigators can follow them back. In spite of this, during nesting season, the habits of birds change. Navigators can then use their new flight patterns if they know it or use other navigation methods. Generally, sighting of large groups of birds are more reliable signs of islands than one or two birds stray birds or small groups.

Most of the birds used are the long-tailed cuckoo, the shining cuckoo, godwits, and the golden plover. However, these birds are small and tend to migrate individually. Below is a table of some migratory birds in the Pacific islands.

<b>Name</b>	<b>Summer range</b>
Black-winged petrel	Northern central pacific
Cooks petrel	Eastern central
Pacific Chantam Is. petrel	Eastern pacific
Pycroft's petrel	Probably north pacific
Black petrel	Eastern tropical pacific

Wedge-tailed shearwater	Central pacific
Sooty shearwater	North pacific
Fleshy-footed shearwater	North pacific

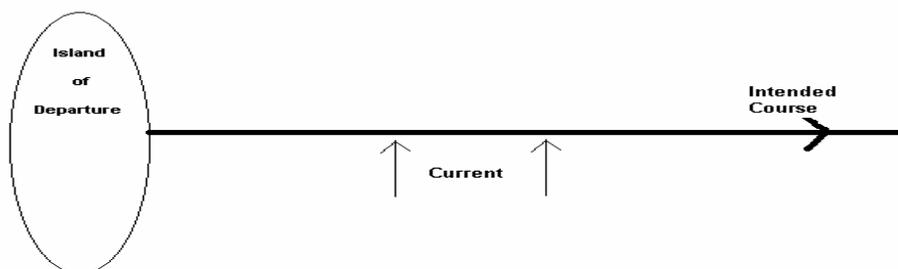
### **Other navigational methods**

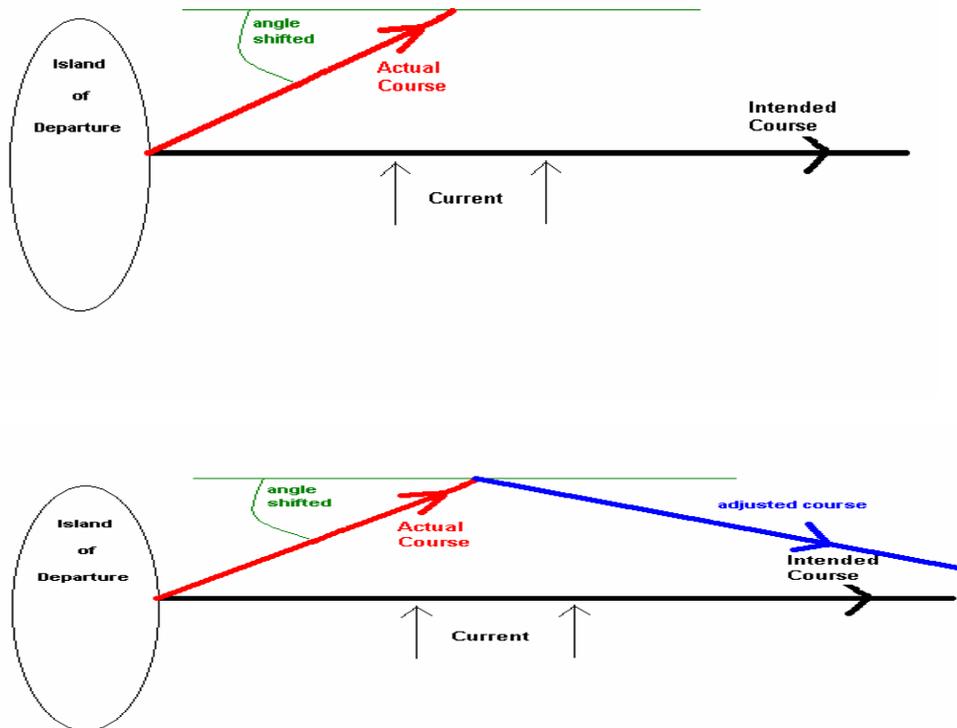
Stars are not visible in the day, and the sky may be overcast at night. Sailing conditions vary with the seasons. In fact, during a voyage, stars may be available for navigation only about 20 percent of the time; daylight and cloud-cover at night hide them from the navigator during the other 80 percent of the time. The navigator must learn how to make suitable adjustments for the voyages he plans to make. Of course, this would require years of navigating experience. In this section, we shall explore some alternative methods navigators can use for their voyages. These methods can be used on their own but are also often used in conjunction with the stars.

### **Landmarks**

Ancient navigators can steer by landmarks. Two obvious landmarks are chosen and a straight line is visually drawn to join them. Another pair of landmarks can be similarly chosen and the intersection of the 2 straight lines obtained would allow the navigator to find a particular spot, such as a deep-sea fishing ground. If the shape of coral reefs or other underwater landscape observable from the surface are known, they can also be used for navigation.

When the navigator leaves for the open ocean, a slightly different navigational method is used. Referring to his specific star course, he aligns his canoe in the desired direction and starts sailing. After some distance when he reaches the point where the island from which he left can only be seen as a small dot on the horizon, he looks back to see how his departure island lies with regard to his sailing path. If the island is in direct alignment, the current can be neglected. If not, he then estimates the strength of the current by observing the angle shifted. This is illustrated in the following diagram.





## The Moon

Navigators used the size and shape of the moon to tell them what day it was. Everyday at the end of the day, they would tie a knot in an accounting rope to see how many days they have been at sea.

To use the moon for navigation, the rising and setting positions of the moon each night with respect to another celestial body. As the moon and the sun travel across the sky, the moon is always positioned either east or west of the sun. This forms a sometimes curved line separating light and dark on the moon's surface. This line is aligned approximately north and south although exactly at the equator the line would be horizontal.

## Hoku hele / "Traveling Stars" (Planets)

Like stars, planets are also observable and their motion can be used by navigators. Planets are distinguished from stars by the way they move and are given different names.

Planets appear to move among the fixed stars over time (hence their Hawaiian names **hoku** hele or **hoku** 'ae'a which means "Traveling Stars" or "Wandering Stars"). Their rising and setting points can be determined using nearby stars and they can be used for navigation once their positions have been determined.

The Hawaiian names for the visible planets are:

Mercury: Ukaliali'i ("Following the chief," i.e. the Sun)

Venus: **Hokuloa** ("Long Star"), **Hokuao** ("Morning Star"), **Hokuahiahi** ("Evening Star"), **Hokuali'i** ("Chiefly Star"), **Hokuali'iwahine** ("Chiefly [female] Star")

Mars: **Hoku'ula** ("Red Star"), **Holoholopina'au**, **'Aukelenuiaiku** ("Great traveling swimmer, son of Iku")

Saturn: **Makulu** ("A drop of mist")

Jupiter: **Aohoku** ("Starlight"), **'Iao** ("Dawn"), **Ikaika** ("Strong," "Powerful")

### **Seamarks** (betia)

Ancient navigators also used living seamarks are called "aimers". They are usually related to particular symbols in the surroundings of islands or along routes between islands. Examples of aimers are a tan shark making lazy movements, a ray with a red spot behind the eyes, a lone noisy bird, a swimming swordfish, and so on. Each such sighting named uniquely and is located within a particular 'drag' on a particular star course from its associated island. For example, "on the course from Puluwat to Eauripik there is said to be a row of whales, each situated a day's sail directly south of an island. Each whale has its own distinctive characteristic" (University of Pennsylvania).

## Ancient Navigational Routes by Polynesians



*Within the circle of the sea,  
It holds a fish of note.  
Its holds a fish  
O'er which the rainbow arches,  
Spanning the immensity of Ocean.  
It is - my land.*

### **1 Navigation from Tahiti to Hawaii and back**

#### 1.1. Some facts:

Tahiti to:

<u>Island</u>	<u>Bearing</u>	<u>Distance</u>
Hawaii.	N. 8° W.	2,242 miles

Optimum passage time (allowing an average daily run of 120 to 140 miles):  
16.0 days

About the **Hokule`a** :

<http://leahi.kcc.hawaii.edu/org/pvs/build.html>

**Hokule`a** was completed in 1975. It has two 62-foot hulls; eight `iako, or crossbeams, joining the two hulls; pola, or decking, lashing to the crossbeams between the two hulls; rails along the decking; and two masts.



## 1.2. Introduction

The voyage Hôkûle`a made in 1796 from Hawaii to Tahiti and back set a new standard in experimental voyaging for it was the first time a reconstructed craft had sailed both ways over a long oceanic course. Hôkûle`a 's voyage to Hawaii and back in 1980 replicated the 1976 voyage and extended its significance in that both legs were navigated without instruments. Considered together, the first leg of the Voyage of Rediscovery from Hawaii to Tahiti in 1985 and the last leg from Tahiti back to Hawaii in 1987 comprise the canoe's third roundtrip between these two Polynesian centers. To have made not one but three round-trip crossings between such distantly separated islands stands as an accomplishment unparalleled in the field of experimental voyaging, particularly since Hôkûle`a was guided by non-instrument navigation on all legs except the return one to Hawaii in 1976.

## 1.3. Brief Outline

This was the longest distance traveled by the Polynesians. However, weather conditions made this journey easier. A canoe proceeding northward from Tahiti, in those favorable weather conditions, could sail full and by and fetch up slightly windward of Hawaii. If Hawaii were missed, the larger of the more western islands would be sighted. Proximity to the latitude of Hawaii could be gauged by the altitude of Polaris, either visually or by a measuring stick. This voyage is physically possible and perhaps the easiest of all the long distance voyages; currents would set craft westwards but would be countered by the weatherliness of the canoes.

The return voyage could be made in the same manner, except that the canoe should sail full and by the south-east trades.

## 1.4. The route and the First Two roundtrips

Although the alignment of the Hawaii-Tahiti route across the trade winds lends itself to two-way voyaging, it is not perfectly idyllic, as the islands do not fall exactly on a north-south line, and the trade winds do not blow always from due-east. If Hawaii and Tahiti were on the same meridian of longitude, and if the trade winds and accompanying currents were directly out of the east, sailing both north and south between the two would present no problem at all. It would simply be a matter of sailing a canoe on a reach across the easterly trade winds, pointing only slightly into the wind in order to make up for leeway and the westward set of the ocean currents that accompany the

trades. However, the meridian of Tahiti lies hundreds of miles to the east of that of Hawaii, and the trade wind and current flow varies significantly along the route. In fact, the route crosses three separate wind zones, each with a distinctive ocean current flow: the Northeast trade winds, the Doldrums and the Southeast trade winds.

#### 1.5. Northeast Trade Wind Zone

During summer in the Northern hemisphere, the Northeast trade winds are usually predominant roughly from around 28°-30° North (some 400-500 miles north of Hawaii) to around 9° North (about 600 miles south of Hawaii). Although these winds are named for the quadrant for which they blow, their actual direction in the zone between Hawaii and their southern limit is more typically east-northeast than straight northeast. In this zone the North Equatorial Current flows westward with an average speed of about half a knot or about 12 nautical miles a day.

#### 1.6. Doldrums

Although it is sometimes possible to sail from one trade wind zone to another without interruption, sailing vessels frequently have to work their way slowly through the doldrums, a band of calms and light, variable winds punctuated by squalls, heavy overcast and rain, and sometimes interrupted by still, cloudless, torrid days. This band is typically 200-300 miles wide and is located during much of the year between approximately 4° and 9° North. Here the Equatorial Countercurrent flows eastward, typically at around 12-24 miles a day.

#### 1.7. Southeast Trade Wind Zone

Although the Southeast trade winds are centered in the Southern Hemisphere, in this part of the Pacific they typically cross over the equator and extend as far north as the southern limit of the doldrums, generally located around 4° North (240 miles from the equator). Although below the equator these winds typically blow from between east and southeast, as they cross the equator and flow toward the low pressure trough of the doldrums, they become more southerly, particularly during the summer. Like its Northern Hemisphere counterpart, the South Equatorial Current of this zone flows westward at about 12 miles a day.

The south-southeast slant of the route from Hawaii to Tahiti means that a canoe had to be worked hard to windward against the trade winds in order to make up the deficit in longitude. The strategy adopted by the Polynesians in 1976 and 1980 was to try and gain as much easting as possible in the Northeast trades and the Doldrums in order to get to the east of Tahiti, and then, when sailing in the Southeast trades, to hold onto as much of that easting as possible in order to avoid being driven to the west of Tahiti.

Upon clearing Hawaii, the east-northeast angle of the trades enabled the canoe to sail to the south-southeast and, before entering the doldrums, to attain a position of about 160 miles to the east of the meridian of Tahiti in 1976 and 125 miles to the east in 1980. On both voyages, as the canoe slowly crossed the shifting zone of calms and light variables, the Eastward Flowing Equatorial Countercurrent gave Hôkûle'a a welcome boost eastward, pushing the canoe still farther to the east of Tahiti (to a point

about 285 miles to the east of Tahiti in 1976 and 225 miles in 1980). Then, again on both voyages the canoe was able-despite the unfavorable, south-southeast angle of the trade winds encountered upon exiting the doldrums- to hold onto enough of these hard-won miles of easting to make landfall in the western Tuamotus and from there easily sail to Tahiti. Both crossings took slightly over a month-32 days in 1976 and 31 days in 1980- and it was equally remarkable that the landfalls in the Tuamotus were within about 15 miles of each other.

On both crossings, however, some problems were experienced. In 1976 the south-southeast trades encountered upon exiting the doldrums extended much farther south than had been estimated and steered the canoe onto a course that would take it to the west of Tahiti if the wind had not eventually become more easterly around 650 miles south of the equator. That shift enabled Hôkûle'a to turn back to the south-southeast to make a landfall on Matavia, the westernmost atoll of the Tuamotus, and from there to sail to Tahiti.

In 1980 gale-force trade winds encountered soon after clearing Hawaii caused the canoe to lower sails and drift for a while and then to tack to the northeast to regain lost easting before continuing on its course to the southeast. Thereafter sailing conditions were fairly mild and the canoe reached first the Tuamotus and then Tahiti without incident.

Both times, the navigation also proceeded according to plan. The generally good visibility over the route (except in the doldrums where overcast skies frequently obscured the sun, moon and stars) enabled Mau Piailug in 1976, and Nainoa Thompson in 1980, to utilize star sights to keep the canoe on the right heading or monitor its heading whenever adverse winds forced the canoe off the intended course. Although in 1976 the novelty of the long route into unfamiliar seas and Southern Hemisphere skies may have made it difficult for Mau Piailug to keep in mind the exact track as it is curved towards Tahiti, the canoe made landfall in the Tuamotus just as he had expected. In 1980, the post voyage comparison of the satellite derived track of the canoe when navigator Nainoa Thompson's estimates of where the canoe were sailing revealed that (except for one period when an unexpectedly strong current affected the course) he was fairly accurate in mentally tracking the canoe's progress and in visualizing where the canoe would make landfall in Tuamotus.

The windward position of Tahiti made the legs home to Hawaii much easier and faster than the outbound ones. Both times Hôkûle'a was able to sail swiftly back, reaching across strong and relatively steady trade winds (with fortunately, minimal doldrums conditions at the convergence of the southeast and northeast trade wind systems) to draw abeam Hawaii in slightly under 20 days in 1976, and in twenty-two days in 1980. From there the canoe was able to sail downwind to Oahu in a few days to complete the voyages in 22 and 26 days, respectively. Although without the services of Mau Piailug the 1976 return to Hawaii had to be navigated by modern means, in 1980 Nainoa Thompson employed his non-instrument systems to guide Hôkûle'a back to Hawaii accurately and without incident.

## 2 General Methods used during the Tahiti to Hawaii journey

Polynesian navigators generally had to memorize the courses they made as well as all the natural conditions (i.e. wind, currents, bird movements, etc) that affected their expeditions, and used these to back-track in their minds, so as to locate their approximate bearing to their home island and estimate the sailing time required to reach it.

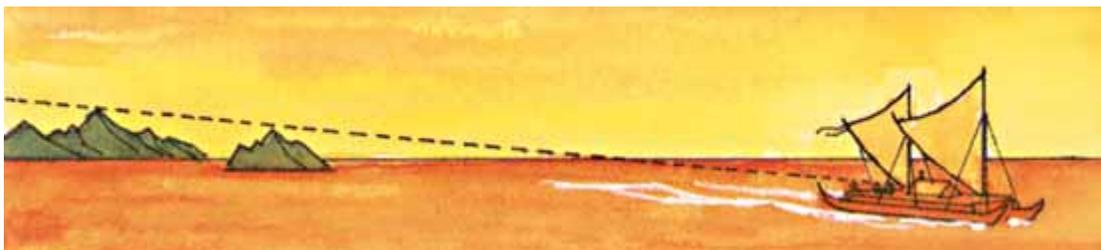
Upon detecting an unexplored island, the altitude of stars passing overhead and the places on the horizon of rising and setting stars would be carefully observed and incorporated into the minds of the navigators. This would allow them to locate that particular island again. Hence places for astronomical study were constructed, often as rock platforms oriented in some relationship to certain celestial events.



Navigator at an observatory

By aligning a canoe with landmarks, departing canoes could set out upon known courses. The rising and setting places of recognizable stars provided a compass. Knowledge of the paths of such stars rising or setting in sequence enabled navigators to maneuver on bearings which had been worked out from experience. When stars were obscured (during cloudy days or afternoons), dominant ocean swells, marching consistently across vast areas, were dependable direction indicators. The presence of low islands might be detected by clouds building in rising warm air and appearing stationary while smaller clouds drift with the wind. Over atolls, clouds may reflect the green of sunlit lagoons. Other indicators of low islands below the horizon were reflected ocean swells interrupting the dominant swells of the open ocean, drifting flotsam and the daily flights of shore-based birds seeking fish as far as thirty miles from home. Island groups presented larger, safer targets than isolated islands; once a landfall was made at any island in a known group, the canoe could be sailed to a specific island.

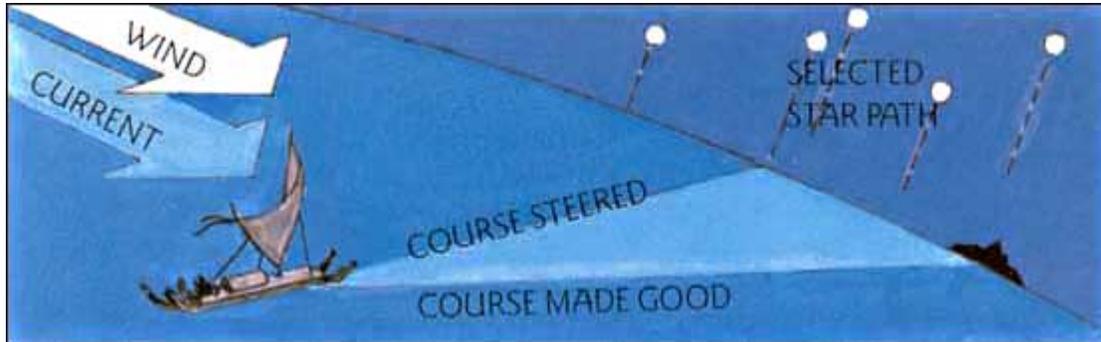
### **NAVIGATING BY LANDMARKS:**



Departing at sunset, navigators set their course to a known destination by alignment with landmarks. The drift of the vessel from that alignment might indicate the direction and strength of the current. To counter this phenomenon the navigator could later pick up his bearing from a familiar star.

For the voyage from Tahiti to Hawaii, navigators countered the strength of the south-east trade winds, doldrums and north-east trade winds by locating the altitude of Polaris. This was done either visually or through simple tools like a measuring stick.

### NAVIGATING BY STAR PATHS:



On east-west courses navigators steered towards stars known to rise or set over their destination. Steering was attuned to compensate for the leeway (side-ways drift) caused by the winds and currents, the angle estimated from prior experience. To maintain this angle they guided on stars straight ahead, replacing them with others in the same path when these guiding stars rose too high to be useful or set below the horizon.

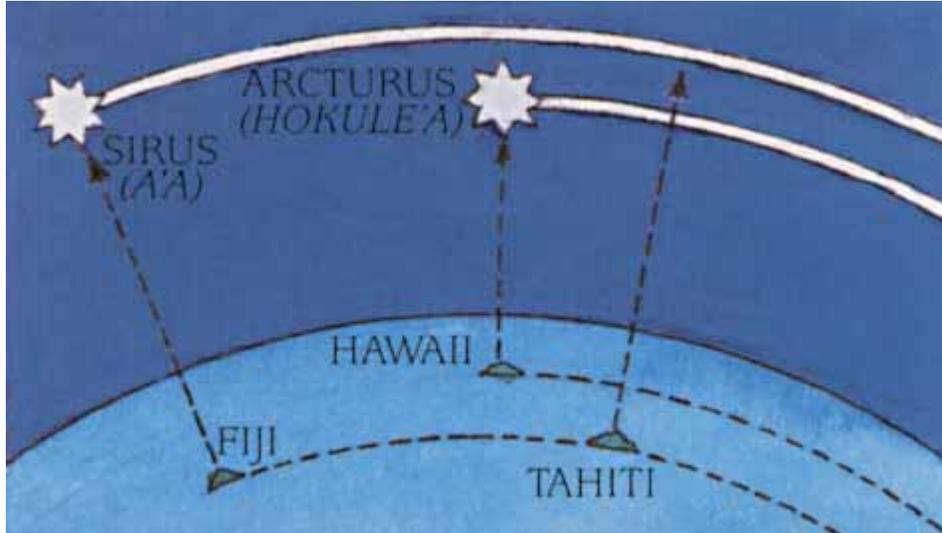
The zenith stars of an island are those which appear to pass directly overhead, such as Hokule'a (Arcturus) for Hawaii and 'A'a (Sirius) for Tahiti. On a voyage from Tahiti to Hawaii, the navigator would first be concerned with making sufficient easting to arrive at the latitude of Hawaii upwind of his objective; then, when Hokule'a appeared to arch directly overhead, the canoe could be turned downwind, and sailed directly westward to Hawaii. If there were any uncertainty of latitude, the canoe could be sailed in long downwind tacks to expand its land finding range. After a laborious voyage, the name Hokule'a (star of gladness) is most appropriate as a star that leads to a happy landing.

However, such basic principles are much easier to express in words than in practice. On its 1995 return voyage the canoe replica *Hokule'a* sailed northward under heavy clouds which concealed the stars. Only a very brief sighting of *Hokupa'a* (Polaris) was made. Its altitude above the horizon informed the navigators that they had arrived at the approximate latitude of Hawaii. They turned the canoe downwind, and two nights later saw the glow of the lights of the town of Hilo.

There was, in addition to knowledge gained by training and practical experience, evidence of a special talent which exceeds conscious reasoning and enters the realm of the intuitive. Incidents have been recorded of landfalls accurately predicted by Polynesian sailors aboard European vessels after overcast skies or accidents had

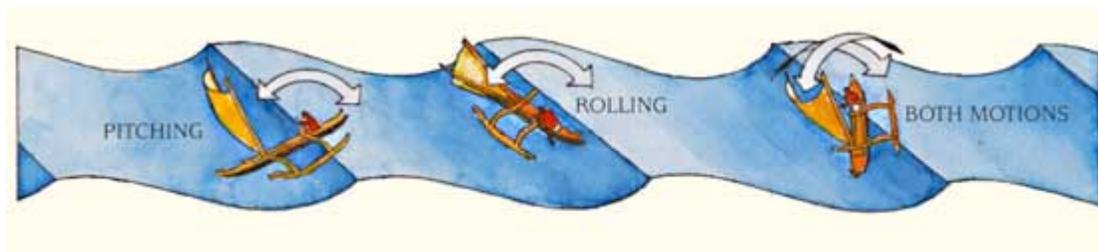
caused uncertainty about the ships' positions. All sailors learn that success is possible only by trimming sails and ship to a dynamic balance with natural forces. It was a lesson not lost on the Polynesians, whose survival on land as well as at sea depended upon maintaining equilibrium with nature.

### NAVIGATING BY ZENITH STARS:



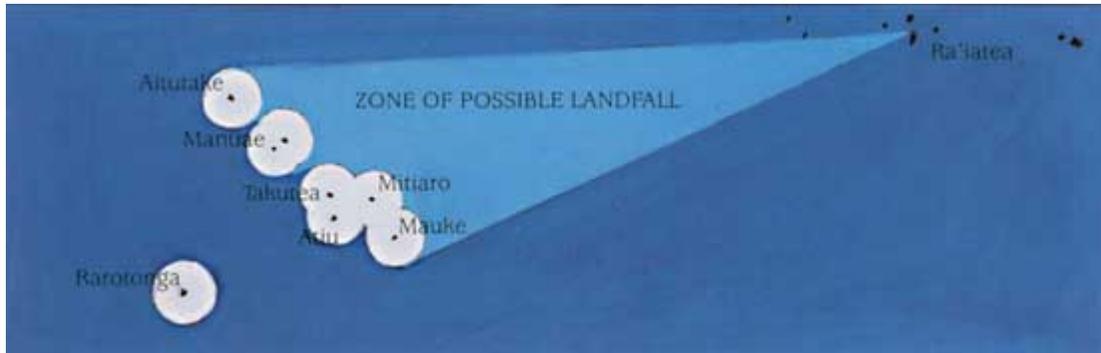
Zenith stars for an island are those which seem to pass directly overhead. Such stars also appear to pass directly overhead on the same latitude at any position east or west of that island. On north-south courses, a navigator who kept upwind of his destination until its zenith star was overhead could then turn downwind to make a landfall. The range of visual sighting could be broadened by taking wide tacks downwind. *Höküle'a* (Arcturus) is a zenith star for Hawaii Island. *A'a* (Sirius) is a zenith star for Tahiti and Fiji.

### NAVIGATING BY OCEAN SWELL:



Prevailing winds or storms generate swells which pulse across the ocean for large distances. Under overcast skies navigators could maintain their heading by keeping a constant ratio between the amount of pitching or rolling induced by a dominant swell, holding direction until guiding stars became visible again.

## NAVIGATING BY ISLAND GROUPS:



Signs of unseen land expand low or obscured island targets by 25 or 30 miles. In island groups these extensions often overlap, forming broad targets. In locating an island within a group, voyagers targeted at the approximate center of the group, then changed course to specific destinations after sighting the familiar island. Sailing from Ra'iatea to Rarotonga, navigators would first locate any known landfall in the Cook Islands chain and then sail to that position for an accurate course to Rarotonga.

Similarly, for the voyage from Tahiti to Hawaii, navigators would first locate the entire chain of islands ( one of which was Hawaii ) and then locate the exact position of Hawaii through other sightings especially its zenith star.

## NAVIGATING BY SEA COLOR AND THE SIGHTING OF FLOTSAM:



As the sea's color changes as one sails from the open sea (deep blue) to a familiar reef (green), navigators would be able to check their positions.

Once in the open oceans, navigators use the fact that drifting wood or leaves show that land lies in the windward direction and that drifting seaweed may indicate an up current reef.

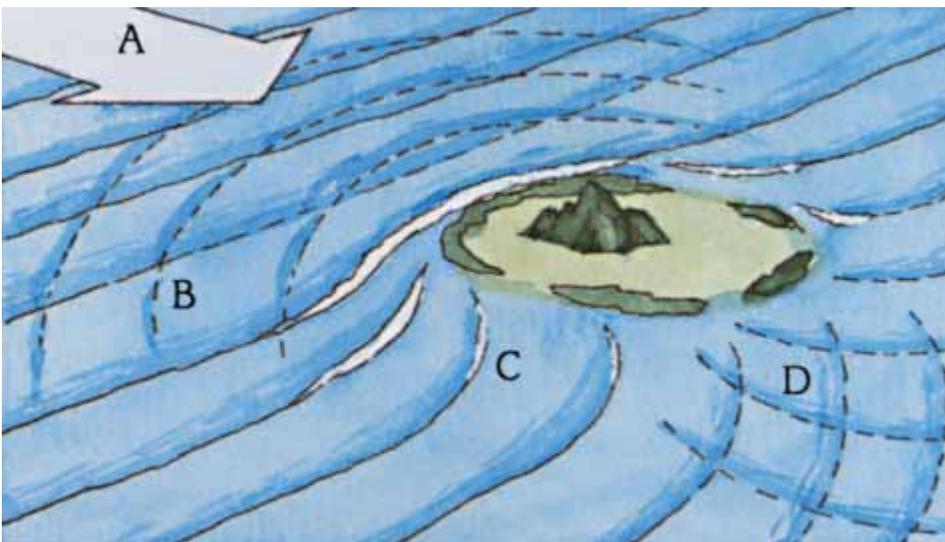
Furthermore, through their nautical knowledge, navigators knew that a greenish tinge on the underside of a cloud reflected sunlight from a distant lagoon too far away to be seen.

### **NAVIGATING BY SIGHTING FISHING BIRDS AND CUMULUS CLOUDS:**



Fishing birds heading out to sea at dawn or returning at dusk point the direction to their home island. Also, Cumulus clouds generated by warm updrafts may rise high above an island, appearing stationary while fragments of the main cloud and scattered cumulus clouds drift away in the wind.

### **NAVIGATING BY SWELL PATTERNS:**

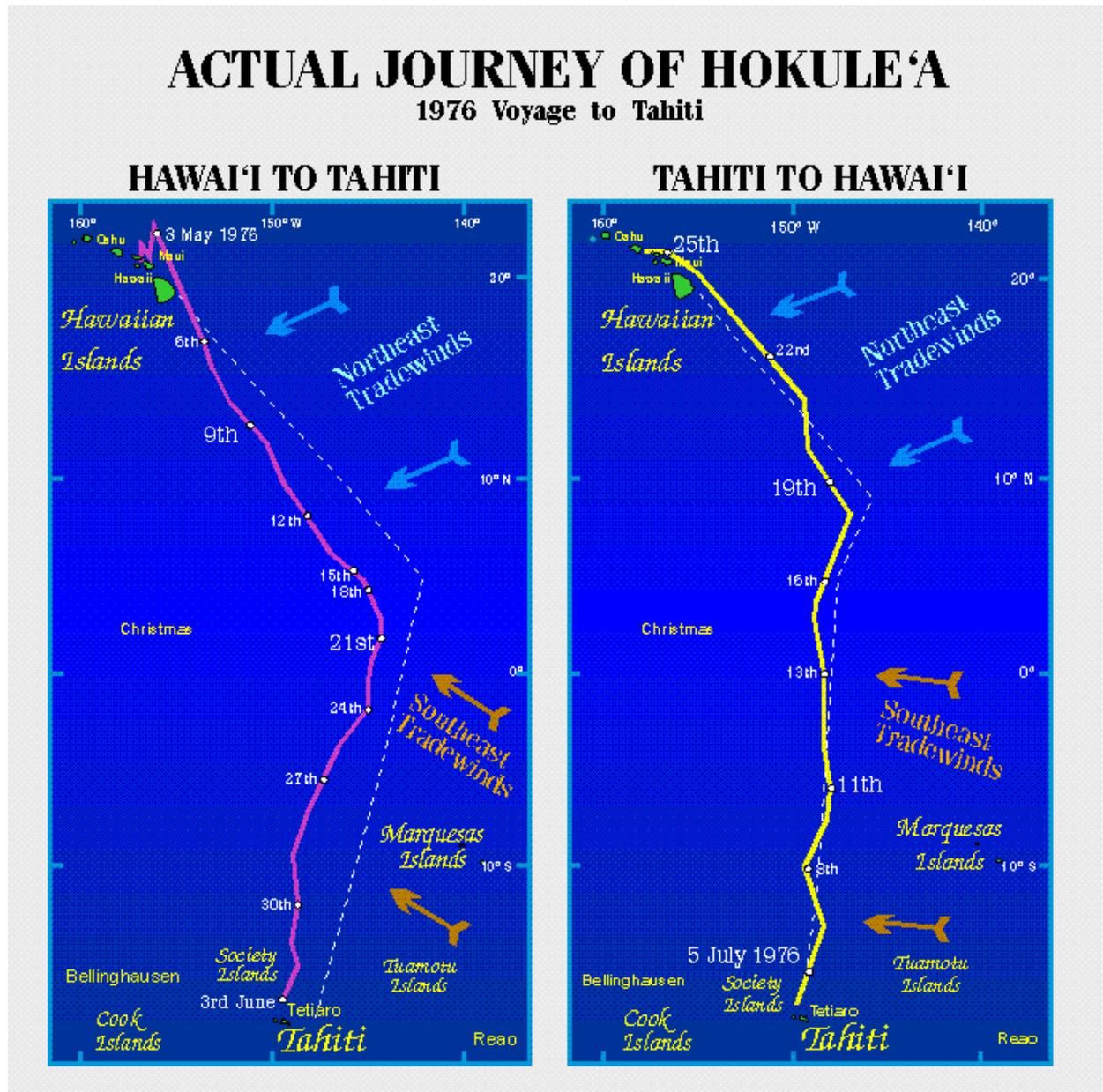


A dominant swell bounces back from an island and bends around it, creating swell patterns which can be read to find an unseen landfall. (A) main swell; (B) reflected swell; (C) refracted swell; (D) shadow of turbulence.

Figures taken from: <http://www.hawaiiantrading.com/herb-kane/ah-book/c4.html>

### About the model

- Objective/s : To allow students to visualize the Tahiti to Hawaii journey as done by the Polynesians;
- The stars used
  - The effect ocean currents
  - The effect of winds



<http://leahi.kcc.hawaii.edu/org/pvs/1976map.html>

**Procedure:**

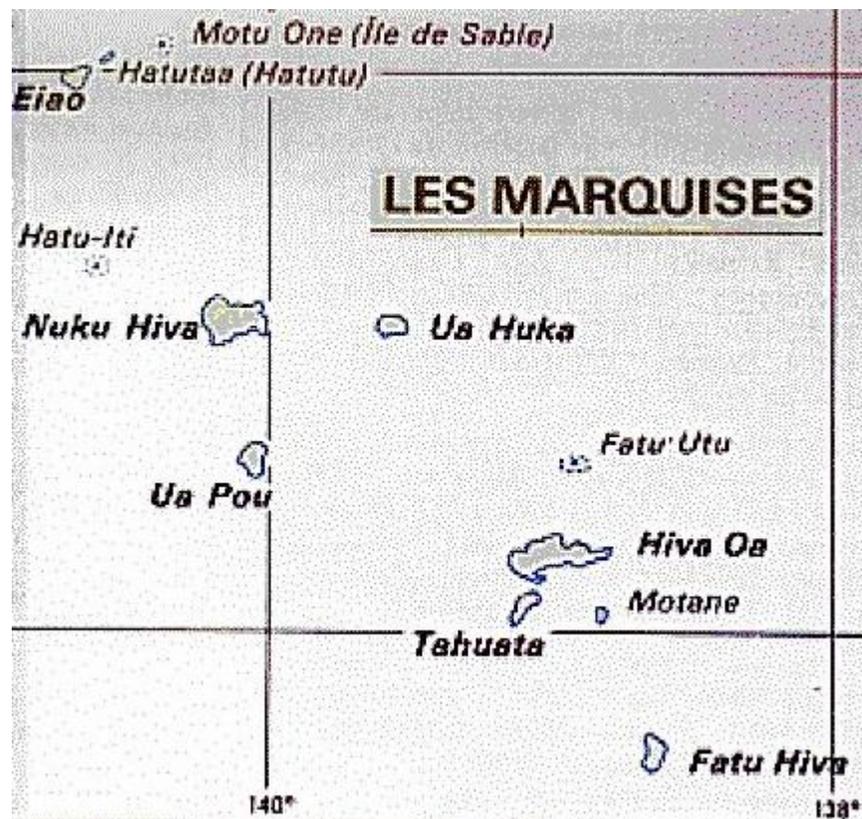
1. Locate the relevant stars (i.e. obtained from the Star Compass) as used by the Polynesians on a transparent sphere.
2. Place the land mass into the sphere and attach it so that it rotates within the transparent sphere.
3. Place the land mass according to cardinal points required.
4. Locate the two relevant islands (i.e. Hawaii and Tahiti)
5. Route out the actual journey on the land mass.

**Outline on how to use the model:**

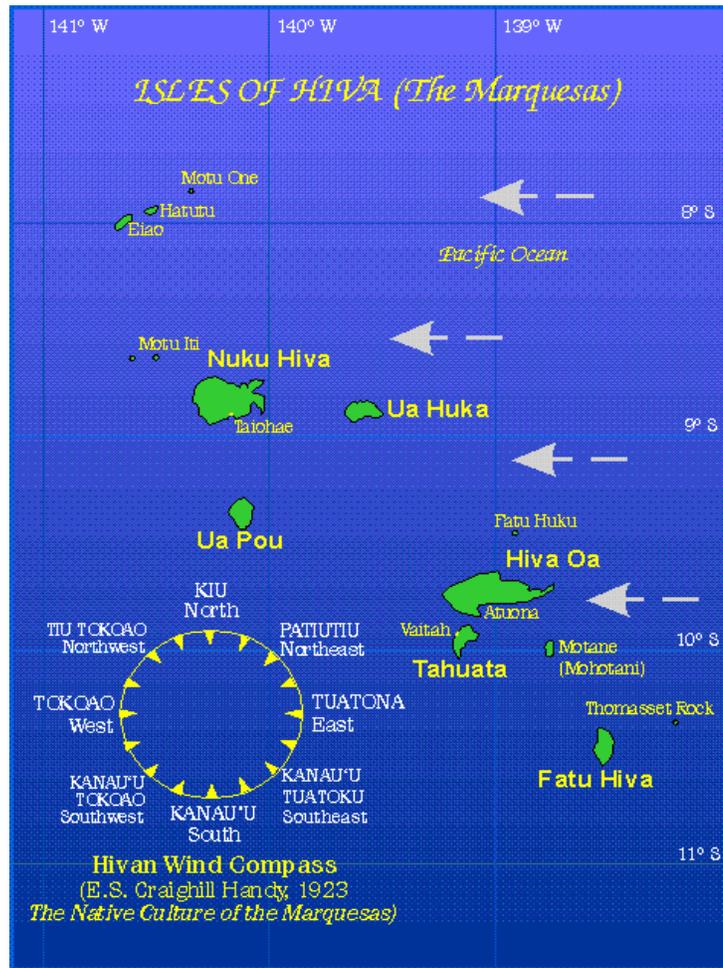
1. As you rotate the land in an east-west axis, you are able to observe the stars used by the Polynesians as you travel along the carved out route.
  - Sailing north from Tahiti to Hawaii, you would see the Southern Cross culminating progressively lower in the southern sky as you sail north.
  - Upon crossing the equator, Polaris would come into view and it would be seen to move progressively higher and higher above the Northern horizon as the voyage progressed northwards.
2. The effects of the trade winds and doldrums can also be seen through the slant of the route.
3. The zenith star, *Hokule'a* (Arcturus) can also be used along with the pole stars to estimate the progress of your voyage. You will see it climb higher and higher into the sky, until your canoe has reached the latitude of Hawaii. The star would appear to pass directly overhead.

## 2. The journey from Nukuhiva to Hawaii

The Marquesas Islands form a comparatively compact group and the islands near to one another were in frequent contact. Yet it was some time after the southern islands had been discovered and became known to the Europeans before the northern ones were discovered by accident in 1791. Nukuhiva was one of the islands in the cluster of Marquesas Islands. Forster J.R had shown the name of Nukuhiva as a Marquesan island on his chart as early as 1778, although somewhat in the wrong location, and no one realized that this was a clue to the existence of the northern part of the group.



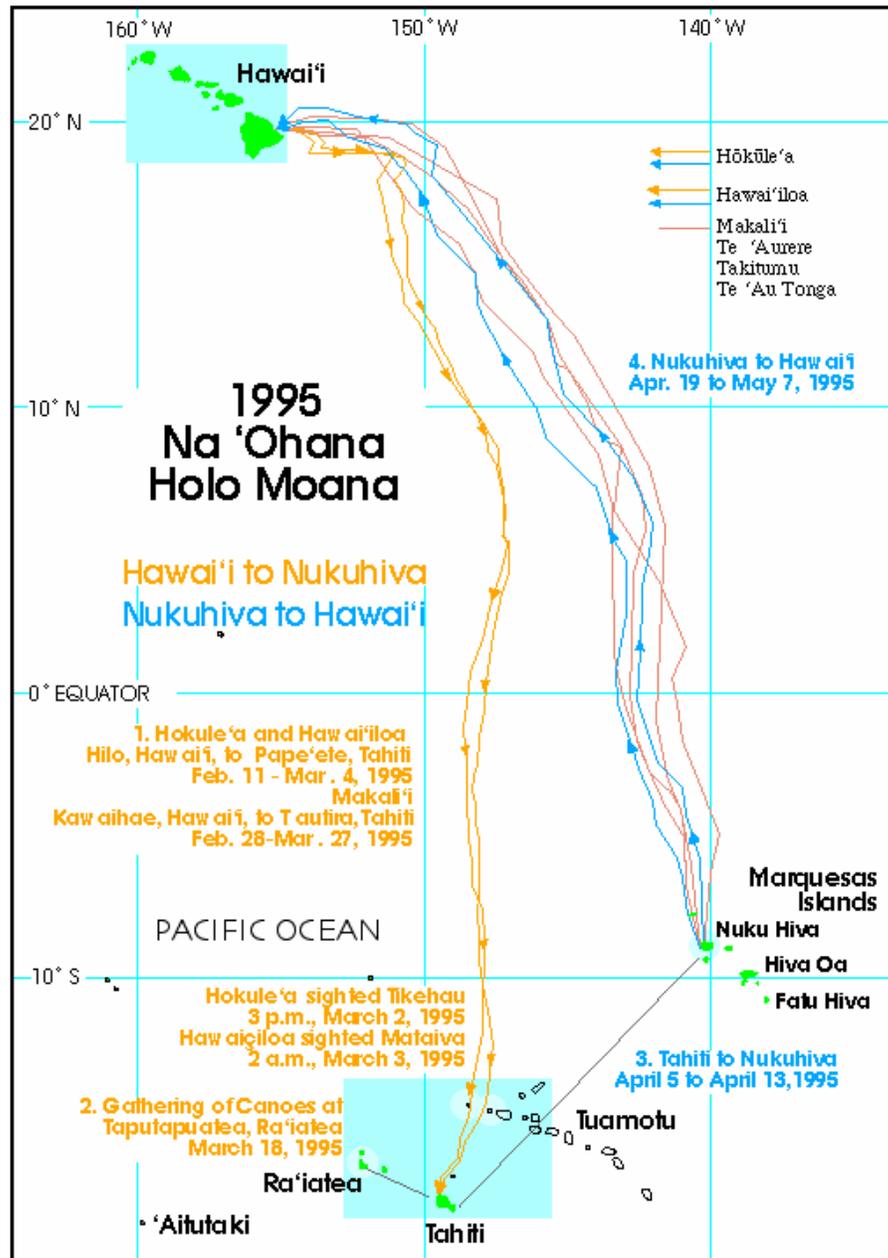




In 1995, there were 6 canoes that sailed to Hawaii from Nukuhiva independently. The voyage was called Na 'Ohana Holo Moana, meaning "The Voyaging Families of the Ocean". The canoes were Hokule'a, Hawai'iloa, and Makali'i, Te 'Au Tonga Takitumu and Te 'Aurere. The 6 canoes met two Tahitian canoes--Tahiti Nui and 'A'a Kahiki Nui--at a place called Taputapuatea, on the island of Ra'iatea--a place of great teaching in navigation, which was the most appropriate place to start the voyage that would take these canoes to the Marquesas Islands. Some believe these islands are the homeland of the first people to come to Hawaii.



The navigators for the canoes were trained for five years, and recognizing that for their voyaging traditions to remain strong, they had to build strength in numbers. Six canoes made the voyage from the Marquesas to Hawaii, over 2,200 miles of open sea. Five of them were guided by navigators from their own islands, trained to sail in the ancient way. They used transponders to track the positions of the canoes for documentation and safety. They staggered the departures from the Marquesas, so that each canoe was by itself. If they were all together, one canoe would be leading, and everybody else would be following. So everybody sailed independently. All the canoes made it to Hawaii. The tracks of the canoes were similar--the navigational system works.



The map illustrating the journey of the six canoes between Nukuhiva and Hawaii.

### 3. The journey from Tahiti to New Zealand (Aotearoa)

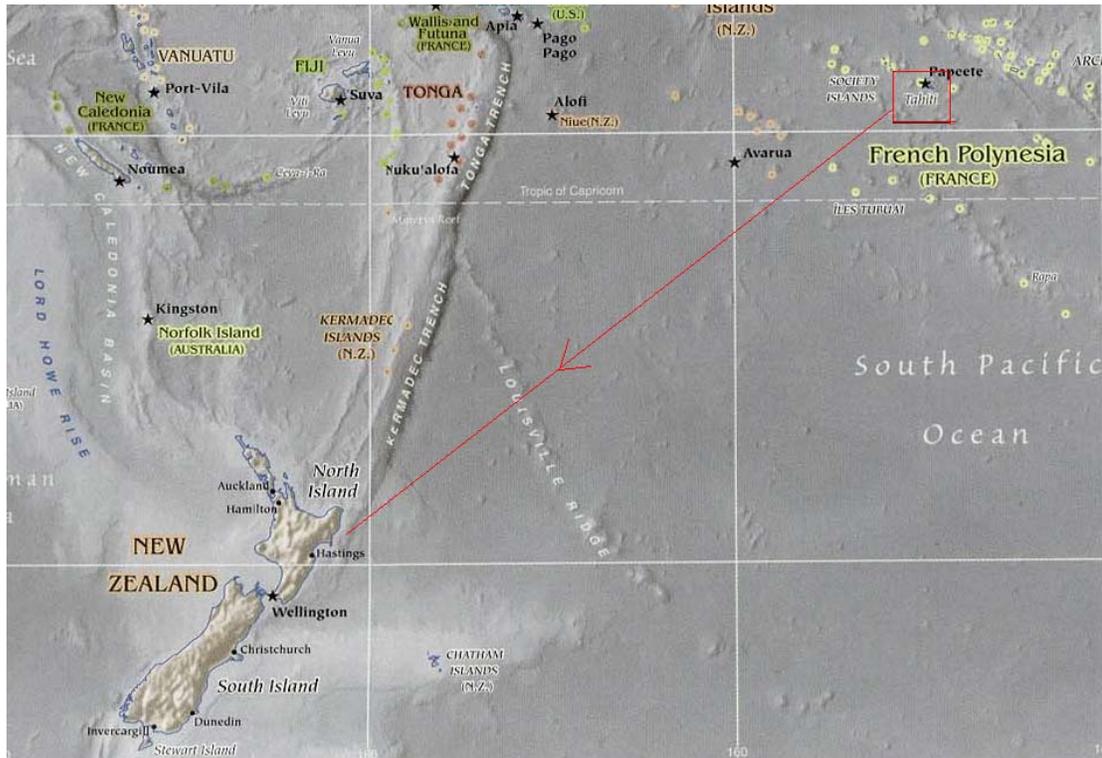
New Zealand, being large and isolated, tends itself to the possibility of reasonable conclusions about the arrival and development there of man. The people of the central belt were too alike, the processes of early cultural change are too uncertain, and the nature of early accidental settlement too capricious, for the conclusion to be reached that any part of the Polynesian central islands did not furnish accidental settlers to New Zealand in the formative period. What can be said, however, is that at an early date a common culture was evolved, and that the main component in the culture was unmistakably Eastern Polynesian. This comes as the unavoidable conclusion from the linguistic affinities of the later people, coupled with certain facts about the archaeology.



At the turn of the century, S. Percy Smith, the founder of the Polynesian Society of New Zealand and first editor of its journal, devoted himself to locating the Hawaiki from whence the Maori people came, and to chronicling their migration. He analyzed the various tribal migration traditions to develop an outline of Maori settlement: after the initial discovery of Aotearoa in 950 AD by Kupe, and a subsequent visit there in 1120, a "Great Fleet" of canoes left Hawaiki in 1350 to colonize this great land.

Smith has been rightfully criticized by David Simmons and other contemporary scholars for having cut and pasted together diverse tribal traditions to come up with such an overly systematized and impossibly precise account of Maori colonization. But, a case can be made that they have taken their rejection of Smith's scholarship a step too far by denying that the Maori migration traditions ever had anything to do with colonization from overseas. It was suggested that the Hawaiki of Maori tradition really refers to the first settlements in the north of the North island, and that tales of migrating from Hawaiki refer to colonization movements from the north to the south part of the island, and were composed and recited to justify claims to status and land. However flawed the scholarship of Smith and others of his day who attempted to trace the Maori migration through oral traditions, it does not necessarily follow that the traditions themselves should be labeled as myths that had nothing to do with actual voyages from an overseas homeland. In the first place, comparative studies of language and cultural patterns, and analyses of archaeologically-recovered artifacts, indicate that people who colonized Aotearoa came from central East Polynesia. Although this evidence does not allow us to say definitively from which island or islands they sailed, it points to the Society and Southern Cook Islands as the most likely candidates. Maori traditions include sailing directions which specify not only a course southwest from Hawaiki but also that a canoe should sail at a time of the year when the winds are most favorable for making that crossing.

The distance from Tahiti to New Zealand is about *2,073 miles* and in the direction *Southwest 54°*. As explained in the previous section, it is reasonable to assume that the ancient canoes could, in the moderate conditions in Oceania, attain sea speeds of up to eight knots, and maintain a daily average of at least 140 miles. However, daily runs on a passage to New Zealand would be lower and would not exceed 120 miles daily. With this estimation, the time taken for the journey from Tahiti to New Zealand would be approximately *17.3 days*.



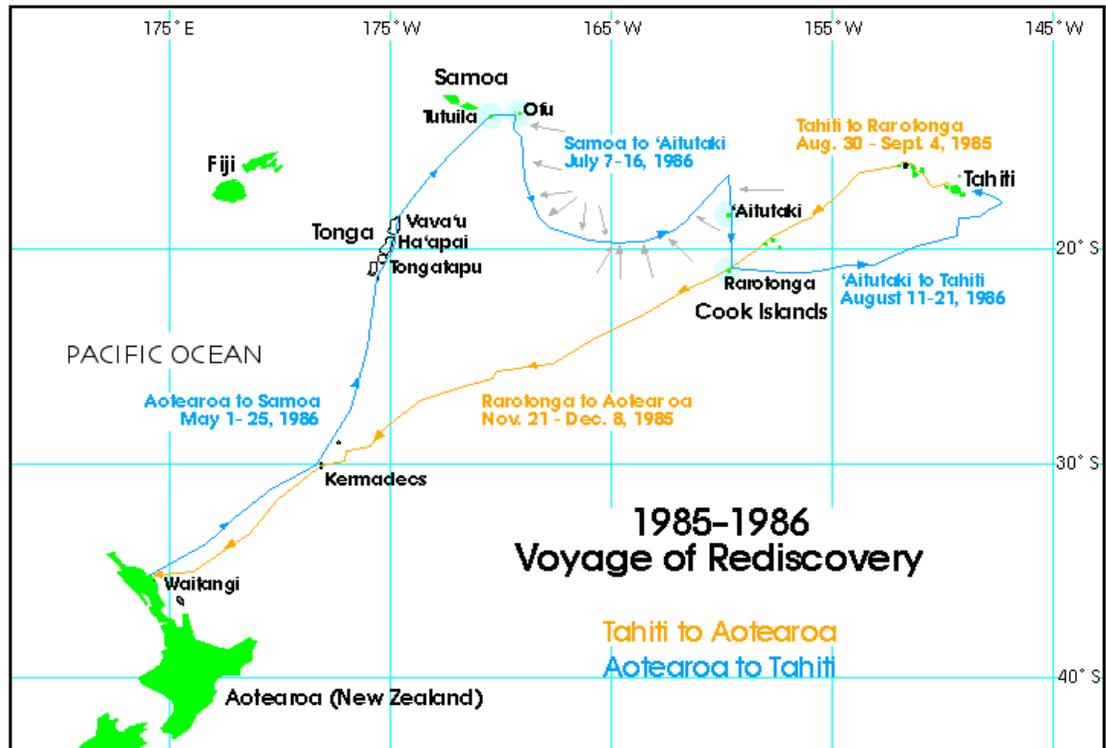
A voyage from Tahiti to New Zealand direct is much more difficult than that to Hawaii. Trade winds would cover a very small part of the passage, and the variables of Capricorn would prove difficult to transverse. The beginning and end of the southern summer, although still subjected to some cyclonic tropical storms, would afford the best conditions for voyaging. At that time, on the direct route to East Cape, a fair proportion of easterly and northeasterly winds may be anticipated after losing the trades. Currents are weaker, averaging between five and twenty miles daily, but are variable in direction.

The main difficulty would have been directional control. Owing to the prevalence of westerly winds in the latitude of New Zealand, it would not have been possible to make southing for a known difference of latitude and then make westing along a parallel of latitude; it would have been necessary to sail along a rhumb-line track between points, and although the setting circumpolar stars – Crucis, Pavonis, Achernar and Canopus – could have afforded some guidance, the protracted nature of such a passage would mean greater incidence of navigational errors. The optimum passage time would be 17 to 18 days, but it is more likely that the average daily run would not exceed 120 miles; passage time could thus last three weeks or more.

### 3.1 The voyage of re-discovery: 1985-1987

The team mapped out a two-year voyage with seven major legs that reflected the other migratory and voyaging routes of ancient Polynesia-Hawaii down to **Tahiti**; Tahiti to the Cook Islands; Rarotonga down to **Aotearoa**; Aotearoa up to Tonga and Samoa; then against the tradewinds from Samoa to the Cook Islands and back to Tahiti-the west-to-east migration route that Thor Heyerdahl said couldn't be done;

Tahiti up to the Marquesas; and finally from the Marquesas back to Hawaii. The entire voyage would cover 16,000 nautical miles.



Even though the distance from Rarotonga to Aotearoa was shorter than the trip from Hawaii to Tahiti, it would take Hokule'a to the tropics and into the subtropics for the first time. This was thought to be the most dangerous of all the legs on this voyage. The water was colder in the region and it had more complicated weather conditions. From the beginning of November to the end of March-the Southern Hemisphere summer-hurricanes spawn in the Coral Sea, come up hurricane alley, through Tonga and Samoa, and head to the southeast. They cut right across the planned path of the canoe. They are infrequent but they do visit the North Island of Aotearoa. But there were advantages to sailing in summer. High pressure systems settle in and that was what they want, they want to be north of the high pressure center where there would be trade winds. From Rarotonga they would sail west-southwest, so they needed trades.



Aotearoa is so much further south than Hawaii, so the star patterns relative to the horizon are very different, and the navigational system they had been using did not work as well that far south. The further you get from the equator, the less available for steering the stars around the north and south celestial poles become. When you go far to the south, the northern stars are below the horizon, the southern stars never rise and set, and the paths stars take in the sky get more and more horizontal. Steering by the rising and setting stars becomes much more difficult. The stars rise in their houses but then veer off sharply as they continue to cross the sky, so once they are up in the sky, it's hard to tell where they rose from and where they will set on the horizon.

The team arrived in Aotearoa [on December 7, 1985, sixteen days after departure from Rarotonga]. The Maoris came out to greet them in Nga Toki Matawhaorua, with 88 paddlers. Hector's group had relaunched this canoe to help revive Maori ocean traditions. Chanting was heard even before they could be seen. And then the canoe was sighted to rise on the top of a crest and settle back down in a trough. We cannot claim that their voyage exactly replicated any earlier crossing from Hawaiki to Aotearoa. Nonetheless, we believe that they have realistically demonstrated how to sail a double-canoe of Polynesian design from Rarotonga to Aotearoa during the late spring, and that their voyage lends credence to the hypothesis that at least some of the original Maori settlers could have exploited the easterlies common that time of the year to make their way to Aotearoa. That another reconstructed double-canoe, the Hawaiki-Nui, the product of a joint Maori-Tahitian project initiated by the Maori carver Metahi Whakataka (Greg Brightwell), successfully crossed from Tahiti to Rarotonga to Aotearoa just a few weeks after them, further supports this hypothesis.



The Nga Toki Matawhaorua

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