THE NAVIGATORS
Pathfinders of the Pacific
Contents

Introduction ............................................. 1
Sam Low, Ph.D.
The producer of The Navigators describes a storm-tossed voyage during which Mau Piailug outwits a satellite navigational computer.

The Polynesians:
A Pacific Odyssey ................................... 2
Patrick V. Kirch, Ph.D.
A foremost archaeologist tells how scientists have revealed the seafaring genius of Polynesian navigators.

Wind, Wave, and Stars:
A Sea of Natural Signs ............................... 8
Stephen Thomas
Mau Piailug teaches a young American navigator to steer a canoe by star and ocean swell.

Canoe House Tales:
The Poetry of Discovery .............................. 14
Marjorie Sinclair
Polynesian poetry and Micronesian songs reveal the inner life of a seafaring people.

Teacher's Guide ........................................ 17
Classroom projects and discussion make The Navigators a useful tool for teachers.

Museums .................................................. 18
Museum exhibits for further exploration.

Bibliography ............................................. 19
An annotated list of useful books and articles.

Glossary .................................................. 20
Unfamiliar words are defined.

The Pacific Ocean, is larger than all of the earth's continents combined. The islands in this vast ocean area were settled by intrepid seafarers who began their voyages of exploration thousands of years before the Pacific was "discovered" by Europeans.

Cover: A Satawalese sailing canoe skims through heavy seas. (Courtesy Stephen Thomas)
A storm-tossed night reveals the genius of Mau Piailug.

By Sam Low, Ph.D.

While filming The Navigators we journeyed with Mau Piailug and his crew to the tiny coral island of West Fayu. On the third day, I watched Mau as he intently studied the sky at dusk. “We must leave right away,” he told me. Mau had discovered signs of bad weather in the sky and predicted a storm would arrive that night and would last for at least three days. If we didn’t leave immediately, we would be stranded on West Fayu.

Within minutes Mau had launched his 28-foot outrigger canoe, and I was aboard the expedition’s 60-foot schooner with my camera crew. We headed out through the narrow opening in the reef, intending to sail in company on the 60-mile voyage to Satawal. As darkness fell, the wind picked up and the sky clouded over. Soon we could no longer see the canoe in the pitch black of the stormy night.

The film crew sailed in comfort aboard the schooner. We navigated by compass, chart and a unique satellite navigational system. Somewhere in the gloom, Mau and his men endured sheets of rain that blanketed the sea around us and whipping winds that gusted to 40 knots. The sea was a confused roil of waves as surface winds threw new wave sets against the underlying swells caused by distant trade winds. Without a compass or even the stars to guide him, Mau must be steering his canoe by these swells, yet I could not understand how it would be humanly possible to do so.

I slept fitfully that night, aware that the schooner’s engine was started twice when the wind died, to be shut down again as the wind picked up, often blowing from a new direction. With the dawn we were only twelve miles from Satawal, having made good speed through the night.

The captain and I agreed Mau was lost. We would sail to Satawal and retrace our course in a search pattern for his canoe.

As Satawal rose slowly from the sea directly ahead of us, we took turns using binoculars to scan the island. A tiny speck bobbed off the entrance through the reef. Could it be?

As we drew nearer, the canoe took on sufficient detail to identify it. Not only had Mau unerringly found his way through that tempestuous night, he had reached Satawal before us!

It was a humbling experience. Having studied Mau’s techniques, I understood how it was possible to navigate without instruments, relying instead on a world of natural signs. I even thought with practice I, too, could learn to navigate as he did. That thought had vanished with the storm. I was reduced to my appropriate status, a prisoner of my own culture; a slave to gadgets, pilot books and charts; a “sailor” accustomed to a dry bunk even in the worst storm. After that night, my admiration for Mau and for men like him who sailed across vast and empty seas was unshakable. Sadly, I realized that I could never enter Mau’s world, I could only refine my appreciation for it.

I hope that the film we have made contains some of the awe that we all felt in the presence of Mau Piailug, and as we discovered the archaeological footsteps left behind by ancient navigators who voyaged across the relentless Pacific thousands of years ago. In the annals of seafaring, their achievement is second to none.

Sam Low, producer of The Navigators, is an anthropologist whose films focus on seafaring peoples around the world.
The Polynesian: A Pacific Odyssey

On remote tropical islands, scientists discover clues to the ocean voyages of an ancient seafaring people.

By Patrick V. Kirch, Ph.D.

The tropical sun beat down on the sandy plain where I worked with my Tongan assistants to clear fan trees and tangled underbrush from the site of an ancient Polynesian village. From where I stood, on a gentle rise, I looked out at the lagoon surrounding the Tongan island of Niuatoputapu. The deep azure waters of the lagoon lapped at a glistening white beach. Geologists have determined that Niuatoputapu is rising—tectonic plates the size of continents beneath the Pacific Ocean are thrusting the island slowly and inexorably upward. If this is true, I reasoned that the ancient beach and its accompanying settlements would now be found above the modern beach, somewhere on this gentle sandy slope.

“Sio mai, Petu,” One of my assistants had spotted something.

As we pulled away the tangled brush, I saw it too—a small, seemingly insignificant potsherd. On the surface of the sherd were complex geometrical designs, which the ancient potter had pressed into the clay while it was still damp. The designs were familiar. Other archaeologists had found similar pottery throughout the southwestern Pacific. Called Lapita, its discovery here on this remote Polynesian island would help archaeologists understand a puzzle that has intrigued us for many years: Who were the Polynesians? Where had they come from? How had they settled such a vast area of the Pacific?

Polynesia (the term literally means “many islands”) forms a triangle with Hawaii, Easter Island and New Zealand at the apices, containing an area more than twice the size of the continental United States. Today, we can travel by jet from London to Hawaii in less than a day. Centuries ago, the great European navigators who “discovered” the Pacific spent months, even years at sea to make the same journey. Imagine their surprise, after slowly tacking their way across thousands of miles of uncharted waters, to find even the most remote islands of the Pacific had already been discovered and colonized. The people of these islands had no written language. They used no compass, charts or navigational instruments. Their conquest of the Pacific was a mystifying feat.

The more astute European explorers, like Captain James Cook of the British Royal Navy, quickly realized that the native peoples of such widely scattered islands as Hawaii, Easter Island and New Zealand were closely related. These islanders spoke mutually intelligible languages and shared many cultural traits. “How shall we account for this Nation spreading itself over such a vast ocean?” Cook asked upon discovering the Hawaiian islands in A.D. 1778. In the two centuries following Cook’s discovery of Hawaii, many theories have been proposed to explain the settlement of this vast ocean area. One theory held that the Polynesians were descendants of South American Indians who drifted into the Pacific on rafts; another proposed that the islands were settled from Asia, during a slow process of accidental discovery by canoes blown out to sea during violent storms; and, for a time, the most radical theory was that Polynesia had been settled by a seafaring people who sailed from Southeast Asia on intentional voyages of discovery. This last theory would eventually win out, but only after a long process of collaborative research by scientists in the fields of anthropology, linguistics, ethnobotany and archaeology.

One of the first clues to the origins of the Polynesians was found by examining the crops they grew. According to ethnobotanists, who study how human societies use and interact with the plant world, all of the plants that we now cultivate were domesticated from species that once grew wild. The process of domesticating wild plants led to varieties that yielded much greater harvests, but could only grow and reproduce with the aid of man.

The ancient Polynesians cultivated a wide variety of plants such as taro, breadfruit, yams, and bananas. Ethnobotanists have discovered that the wild ancestors of all these Polynesian crops are found in the region of Southeast Asia and New Guinea. It was here that they were first domesticated, to be carried throughout the Pacific by adventurous seafarers. Similarly, the three...
animals kept by the Polynesians—pigs, dogs, and fowl—were also domesticated in Asia and were unknown in the Americas until after the time of Columbus. Thus, even before systematic archaeological excavations, the evidence provided by domesticated plants and animals indicated that the Polynesians migrated from the west.

Linguistic research supports this picture. A first step in linguistic analysis is the comparison of words. Captain James Cook noted that all the Polynesian languages, such as Tahitian, Hawaiian and Samoan, shared similar words and so he guessed that all these languages were related. Modern linguistic studies now also show that Polynesian languages share similarities with hundreds of languages throughout the western Pacific and island Southeast Asia. One such language is Malay, spoken in many areas of island Southeast Asia. The Malay word for "coconut," a staple crop in both Malaysia and Polynesia, is *Niu*. In Hawaiian the word is *Nia*. The Malay word for "eye," *mata*, compares with the Hawaiian equivalent, *maka*; and the word for "five," is *lima* in both languages. These languages share hundreds of similar words because both Hawaiian and Malay are descended from an ancient tongue called Proto-Austronesian. Proto-Austronesian is an extinct language once spoken somewhere in the area of Indonesia, Taiwan, and the Philippines. As the ancestors of the Polynesians spread out from this homeland, linguists argue, their language underwent slow and regular changes, gradually becoming the family of languages we now call Polynesian. The languages spoken by the people who remained in the Proto-Austronesian homeland diversified and gradually evolved into the many languages spoken throughout island Southeast Asia today.

By studying the similarities and differences in Pacific languages, a family tree can be constructed. This tree shows that the ancestors of the people now speaking Tahitian and Hawaiian branched off from each other relatively recently; while the ancestors of both Tahitian and Hawaiian speakers branched off from Proto-Austronesian speakers in the very distant past, perhaps six thousand years ago. Thus linguists are able to demonstrate not only that the homeland of the ancestral Polynesians was in Southeast Asia, but also that the direction of their Pacific migration was from west to east.

While ethnobotanists and linguists can show that the ancestral Polynesians originated in the west, they cannot tell us exactly when these seafarers pointed their canoes toward the rising sun, or what routes they followed to settle the most remote islands of the eastern Pacific. Answers to these questions are provided by archaeology, the scientific excavation of the material remains (such as pottery and stone tools) left behind by the settlers of the Pacific.

Before 1950, most scholars assumed that the Polynesians and other Pacific islanders had migrated into the Pacific relatively recently, perhaps only a few hundred years before the arrival of the first Europeans. They further assumed that archaeological excavations would yield few material remains from the prehistoric period. These assumptions were shown to be utterly false in the decade following World War II when pioneering archaeologists like Kenneth Emory of the Bishop Museum, and Edward Gifford of California put spade to earth in Pacific island sites and found large arrays of prehistoric stone, bone, and shell tools and ornaments, as well as pottery sherds.

In 1950, a revolutionary scientific technique was developed that provided a way to date archaeological materials such as those from Polynesia. Called radiocarbon (or carbon 14) dating, this technique uses the steady rate of decay of radioactive carbon atoms as a "natural clock." Radioactive carbon exists naturally in our atmosphere and is taken into plants during photosynthesis. Plants, in turn, are eaten by animals and so carbon 14 atoms are taken into their bodies as well. While they are alive, the amount of radioactive carbon...
14 in plants and animals is in equilibrium with that in the atmosphere. When they die, however, no new carbon 14 is taken in and these atoms begin to decay, to lose their radioactivity. The rate of decay is now known, so organic materials can be dated by measuring the amount of radioactive carbon that remains in them. One of the most common artifacts used in such dating is wood charcoal from ancient hearths.

Radiocarbon dates showed that Tonga had been settled by 1250 B.C., thousands of years earlier than had been supposed. With this discovery, scientists realized that the Polynesian islands were settled during a process that required many thousands of years to complete, and that the prehistory of Polynesia was a rich and complex subject, worthy of intensive study. Archaeological surveys and excavations have now been conducted throughout Polynesia, as well as on Melanesian and Micronesian islands further west. As a result, the story of the peopling of the Pacific islands is rapidly emerging.

Perhaps the single most important archaeological clue to the actual voyaging routes of the first Pacific settlers is a style of pottery called Lapita. This reddish earthenware pottery is distinguished by a rich embroidery of designs made by pressing wooden tools into the clay while it was still damp. The artistic style of these designs is so distinctive that archaeologists are able to say that Lapita pottery was made by people who shared a common culture—the "Lapita people." Lapita pottery has now been discovered in dozens of archaeological sites from New Guinea and the Bismark archipelago in the west, through the Solomons, New Hebrides and on to the islands of Fiji, Samoa, and Tonga, 2800 miles to the east. Artifacts from archaeological excavations on these islands (including finds of adzes, fishhooks, ornaments, coral files, and Lapita pottery) document the rapid migration of this early seafaring people, the ancestors of the modern Polynesians, the eastern Melanesians, and many of the Micronesian peoples.

In 1976, I was able to fill in an important piece of the Lapita puzzle through my excavations on the Tongan island of Niuatoputapu. As the leader of a Bishop Museum archaeological expedition, I had gone there to excavate the settlements of the first people to discover and colonize Niuatoputapu, people who had brought Lapita pottery with them aboard their voyaging canoes. We soon discovered that the island was rich in the vestiges of ancient Lapita villages. Excavating in the earliest sites, we found pottery decorated with intricate geometric patterns arranged to form ornate and beautiful designs. Several years later, when I was excavating an early settlement on the island of Tikopia, more than 600 miles to the west of Niuatoputapu, I found more of this decorated Lapita pottery. The designs were virtually identical, testifying to the common cultural roots of the early Pacific peoples.

Other archaeological clues also affirm that the Lapita people were expert seafarers. Flake tools made of obsidian and chert are frequently found in Lapita sites. By using spectrographic analysis, archaeologists have been able to detect minute differences in the chemical make-up of these materials—a "chemical fingerprint." This research shows that some of the obsidian was quarried in Talasea, New Britain (an island just north of New Guinea) and carried by canoe to the Reef and Santa Cruz Islands, 1200 miles away. This inter-island trade flourished for more than six centuries, a testament to the navigational skills of the ancient "Lapita people."

The makers of Lapita pottery reached...
The Pacific was settled by one of the most extensive migrations in human history. Scientists are now able to trace these daring ocean voyages and date the discovery of the Pacific's major islands. (Courtesy Bishop Museum)

Niutoputapu and other Tongan islands by about 1250 B.C., and probably colonized the Samoan islands not long after. These were the first Polynesian islands to be settled. Although the archaeological picture for Micronesia is not yet well understood, pottery has been found in early sites on Ponape and Truk, and more finds are expected. It would appear that these islands were also settled by descendants of the Lapita people, perhaps beginning in the first millennium B.C. Thus the people of central and eastern Micronesia, including those of Satawal (the home of Mau Piaut) probably share a common ancestry with the Polynesians.

Once the Lapita people had settled Tonga and Samoa, a number of gradual changes in language and culture over the next several hundred years resulted in the development of a uniquely Polynesian culture. One of the most important changes was the gradual loss of the potter's art, for reasons that we can as yet only guess at. It may also be that in the widely scattered islands of Tonga and Samoa, the first true Polynesians sharpened their voyaging and navigational skills, to the point where they would be able to discover and settle nearly every spot of land in the remote eastern Pacific.

Possibly as early as 200 B.C., but certainly no later than 300 A.D., at least one voyaging canoe laden with crop plants and domestic animals made the long up-wind voyage from western Polynesia (perhaps Samoa) to discover the Marquesas Islands. Not long after, the Society Islands (including the famous isle of Tahiti) were settled. On the verdant island of Huahine, about 100 miles northwest of Tahiti, my colleague Yoshiko Sinoto of the Bishop Museum has made startling archaeological discoveries which bring these voyages to life. In 1981, Sinoto excavated two planks, a steering paddle, and a mast from a Polynesian voyaging canoe. These wooden artifacts were miraculously preserved by a tidal wave which inundated the village more than 1100 years ago, burying them in a protective layer of mud. From the length of the paddle, Sinoto estimates that the canoe it belonged to must have been 80 feet long. Here at last was the tangible evidence that allows us to reconstruct the kinds of canoes that made the longest voyages of all—to New Zealand, Easter Island, and Hawaii.

Easter Island and the Hawaiian Islands were probably settled by voyagers from the Marquesas as early as the fourth century A.D. In the Halawa valley, on the eastern end of Molokai, I excavated an early Hawaiian site during the summers of 1969 and 1970. In this fertile valley, a permanent stream and rich alluvial soils provided ideal conditions for taro irrigation. Here, early seafarers found the kind of environment they were seeking on their long voyages. Halawa was an ideal place to plant crops, harvest the deep bay for fish and mollusks, and establish a new community. From the dark, charcoal-stained layer that marks the remains of their village, we recovered artifacts that were unlike those seen by Cook when he discovered Hawaii centuries later. These early adzes, fishhooks, and ornaments are closer in style to those found in early Marquesan sites providing evidence that the first Hawaiians came from the Marquesas, thousands of miles to the south. Other early Hawaiian sites, on Oahu and at South Point on Hawaii, provide similar evidence. Some centuries after the first settlement of Hawaii from the Marquesas, later voyagers arrived from the Society Islands, bringing new ideas and new types of artifacts.

New Zealand was settled from the Society Islands by about 900 A.D. Before the close of the first millennium after Christ, Polynesian navigators had managed the incredible feat of discovering and settling the most remote islands on earth.

Breadfruit is a clue to Polynesian origins.

What motives lay behind these great feats of voyaging and discovery? Perhaps the pressure of growing populations on small islands, and subsequent wars for scarce land and food, drove weaker factions off in search of unoccupied lands. While some islands may have been settled in this manner, it is unlikely that "population: pressure" can explain the whole picture of Polynesian dispersal. Perhaps the younger sons of chiefs set out to discover lands where they could be chiefs themselves and establish their own lines as dominant. Or, could it simply have been that the ancestral Polynesians were imbued with a sort of "wanderlust," a culturally-ingrained desire to search ever...
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eastwards, in the anticipation that new islands would always rise above the horizon? One thing is certain, the Polynesians did not just drift to their island homes. They were skilled seafarers and navigators who had the courage to set forth on purposeful voyages of discovery and colonization.

Curiously, once most of the distant islands had been discovered and permanently settled, the long-distance voyages ceased. In some regions, such as Tonga, large vessels continued to be used to carry people and cargo back and forth between Fiji, Tonga, and Samoa. In the remoter islands, however, voyaging and navigation underwent a decline. There is no evidence, for example, that voyages between Hawaii and the Society Islands persisted after about 1300 A.D. By the time Cook arrived, Hawaiians were no longer building or using large oceangoing canoes. Instead, their vessels were built for fishing and shorter travel between the inter-visible islands. Had the news that all of the previously empty islands had been found and occupied been communicated back to the more westerly islands?

Once the Polynesian islanders were exposed to European methods of ship construction and navigation, they quickly lost traditional skills. Today, not a single Polynesian navigator practices the ancient methods. Only the few navigators of Micronesia, who share distant roots with the Polynesians, carry on traditional canoe-building and voyaging skills. The methods used by Mau Piailug and other Micronesian navigators probably differ in detail from those once used by the Polynesians, but they are basically similar, relying on the natural patterns of wind and wave, and the observation of star paths.

There is now a cultural revival among younger Polynesians, a heightened awareness and growing interest in the great feats and knowledge of their long-departed ancestors. The voyage of Hokulea made the findings of archaeologists come alive with a new intensity. The Polynesian peoples have a right to be proud of their seafaring ancestors, for the story of the settlement of Polynesia surely ranks among the great human sagas of all time.

Dr. Patrick Kirch is a foremost archaeologist and head of the Bernice P. Bishop Museum's archaeology division. He has excavated on many Pacific Islands.
Canoes

Ts. Pahi
The Tahitian Pahi was a large double canoe rigged with crab-claw sails similar to those of Hawaii. Captain James Cook measured two large Pahi and found them to be 76 feet long. "They have high curved sterns," he reported, "the head also curves a little, and both are ornamented with the image of a man carved in wood ... They manage them very dexterously and I believe perform long and distant voyages in them ..."

Tongan Tongiaki
This double canoe of Tonga was reported by early explorers to average 70 feet in length. In 1616 the Dutch captain, William Schouten, recorded his impressions of a Tongiaki, "... the rig of these vessels is so excellent and they go so well under sail that there are few ships in Holland that could overhaul them."

Wa'a Kaulua of Hawaii
A double hulled canoe designed primarily for sailing short distances between Hawaii's islands, the Wa'a Kaulua is probably a specialized adaptation from earlier and more powerful long distance voyaging canoes. By the time Captain Cook discovered Hawaii in 1778, long distance voyaging between Hawaii and other Polynesian islands had ceased. According to measurements made by Cook, a canoe like this would be about 70 feet in length with a beam of 12 feet.

Illustrations, Richard Berry
Wind, Wave, and Stars: A Sea of Natural Signs

Navigating without compass, sextant or chart, Mau Piailug finds his way by the teachings of his ancestors.

By Stephen Thomas

Piailug

It was late, very late, but still the lanternlight flickered over the white coral stones in the courtyard in front of the thatched house. Piailug and I had just fallen into silence after having talked for many hours. I watched the soft light flow over his smooth, brown face before it flowed past, to be lost in the moonless tropical night. Liliu, Orion's Belt, had just risen and was poised above Piailug's shoulder. As it flickered in the gusts of the winter trade winds the constellation seemed suddenly to belong not to Europe and to my race, but to one far older, one whose lifeblood from its earliest beginnings was entwined with the sea. This was my first night on the island of Satawal. I was with Mau Piailug, my teacher, one of the last of the fully initiated navigators, the Palu. Piailug still navigates without charts or instruments using only a world full of natural signs—stars, waves, birds—to guide his canoe. I had come as a Western navigator and skipper, having sailed thousands of sea miles in modern yachts, to learn his, a far older, art.

Six thousand years ago, a seafaring people left their homeland in island Southeast Asia to venture into the Pacific. They moved down the chain of Melanesian islands to Samoa and Tonga, and north into Micronesia. At about the time of Christ, they pushed eastward to the Marquesas and then outward to the uttermost reaches of the Pacific—Hawaii, Easter Island and New Zealand.

In Polynesia, these navigators are gone, swept aside by the rapid adoption of Western culture. But on the tiny coral atolls of Micronesia the skills of navigating without instruments still live on. Yet even here, in this Pacific wilderness, these ancient skills are threatened. The inter-island steamer that brought me to Satawal also carries tinned foods and batteries for transistor radios. Many young Micronesians leave their islands to seek education and jobs on Westernized islands such as Yap, Ponape, or Guam. Few stay behind to learn the ways of their fathers. Piailug and his fellow Palu fear they will be the last of the navigators.

A few days after my arrival on Satawal, I asked Mau to be my teacher. He questioned me carefully. Why did I want to learn these techniques? How would I use this knowledge? What did I know about currents? About their influence on waves? What about swells and drift? How much time did I have to learn the skills he has spent fifty years perfecting?

I must have answered satisfactorily, for he announced that I would be his student. I would live in his house and become part of his family. Navigational knowledge is an essential skill in Mau's island universe—a secret usually passed from one family member to another. I was honored by his acceptance of me as a pupil.

There are three things that any system of navigation must accomplish: a way to determine the direction to an objective; a way to maintain the course at sea; and a way to determine displacement from the intended course caused by winds and currents.

The Star Compass

To determine direction, the Western navigator reads a compass. The Palu reads the stars. At the age of five, Mau began learning...
the stars from his grandfather in a ceremony called merek keiki or “unfolding the mat.” Mau’s grandfather placed thirty-two lumps of coral on a woven pandanus mat to represent the rising and setting positions of the principal navigational stars. Unlike the sun, moon, and the planets, the stars always rise and set in the same place, as long as you do not drastically change your latitude. Mailap (or Altair), for example, always rises just north of east and sets just north of west. It is the cardinal direction in the Micronesian star compass. North is marked out by Feusemagut (Polaris), “the star that does not move,” northeast and northwest are defined by the rising and setting positions of Mun (Vega); and southeast and southwest are shown by the rising and setting of Tumur (Antares). Southerly headings are shown by the Southern Cross in five positions—rising, 45 degrees up, upright, 45 degrees setting and setting. Altogether, fifteen stars or constellations are used to define the 32 points of the Micronesian star compass. Instead of sailing east or west, the Palu sails a star course called faan tan Mailap (under the rising Mailap) or faan tupul Mailap (under the setting Mailap).

Because the stars rise four minutes earlier each evening, the principal navigational stars are not always in the optimum position for guiding a canoe. If the “regular” star for his star course is too far above or below the horizon to accurately steer by, the Palu uses one of many substitute stars. Now, after 45 years of study, Mau has memorized the entire nighttime sky. On a cloudy night, he needs only to see a small portion of the sky to orient himself and set his course.

Setting a Course: Wofanu

To determine his course to any destination, the Western navigator consults a chart. The Palu has no charts, so he must memorize the star courses between important islands. Star courses are taught in the canoe house in a lesson called Wofanu. Seated in a circle around the navigator, young men recite the star courses to and from every island in their world. Wofanu is the navigator’s chartcase. The more Wofanu a navigator knows, the greater his voyaging range. An average navigator will know Wofanu for those neighboring islands frequently visited on fishing expeditions. But a great navigator will know Wofanu for all the islands from Yap in the west to Kusai in the east and Guam or Saipan in the north – know his way around, in other words, a sea area as large as Western Europe! This is only a small portion of the immense body of data memorized by a navigator—knowledge that earns him the highest status that a man can achieve by his own efforts—that is, without being born into a chiefly clan.

“My grandfather spoke of navigation,” Mau explained. “If you learn it you will have a name. You will eat the navigator’s food, and at sea you will have more power than a chief.”

The Swells

Once an apprentice Palu has mastered the star compass and basic Wofanu, he begins to learn Kapesani Senak or the “Talk of Sailing,” a body of practical knowledge he must assimilate if he is to be a navigator. By day, or on cloudy nights, the Palu cannot use the stars to set his course so he steers by other signs. Micronesians are keen observers of nature, and have developed the ability to distinguish underlying swells.

Author Stephen Thomas and other students of navigation are taught the Micronesian “star compass” by Mau Piailug. Lumps of coral, spread out on a woven mat, represent the rising and setting points of stars.
As the earth turns, the stars appear to rise in the east and set in the west. At rising, Altair (Mai lap) defines east and at setting this star defines west. Vega (Mul) marks northeast and northwest. Antares (Tumur), rises in the southeast and sets in the southwest. Polaris (Fuesemogut) - the star that never moves — shows north, while the Southern Cross (Poop) in its upright position marks south. The Micronesian "star compass" contains 32 points of direction, more than can be shown here.

Imaginary lines join a star and a distant "reference island" to divide a voyage into segments or etak. This conceptual model allows a Satawalese navigator to plot the progress of his canoe without a chart.
his course, the Palu employs a mental plotting system called etak. As the voyage progresses, he pictures his canoe as staying in one place while the islands move around him. He uses an island or reef off to one side of his course as a “reference island” and calculates its movement under different stars, although he may never actually see the island during his voyage.

Imaginary lines or yaw radiating out from the canoe to the reference island and the stars beyond are seen to divide the voyage into segments or etak. It is by visualizing the reference island moving under a succession of stars that the navigator can mentally place himself along his course (see figure page 10).

The first and last segments or etak of a voyage are the “etak of sighting” and the “etak of birds.” The distance of the “etak of sighting” depends on the height of the island of departure. The “etak of birds” is measured by seabirds, mostly noddies and terns, that fish by day and fly directly home at dusk. The sight of a seabird making for home means an island is about twenty miles away and provides a certain course to landfall.

**Pookoof**

Micronesian navigators believe that certain sea creatures—a species of flatfish, a pair of seabirds, a shark with special markings, a pod of killer whales, to name a few—reside in specific places around the islands. The system called Pookoof charts the star courses to these creatures, each with a unique name, from all of the islands in the Central Carolines. Legend holds that the creatures of Pookoof were placed in the sea by Fanur and Wareyang, the sons of Palulap, the great navigator, to help the Palu when lost. When one creature dies, another member of the same species takes his place. As one navigator put it, “We have Pookoof because we don’t have charts and sextants like the navigators from America.”

Micronesian navigators all claim to have sighted creatures from Pookoof. (I myself “sighted” one, a billfish very near to its prescribed location northeast of Satawal.) Some creatures undoubtedly inhabit specific areas which they find agreeable because of certain prevailing conditions. Off the Boston Harbor entrance buoy, for instance, one can nearly always find whales who are drawn there by the abundance of food in a series of underwater upwellings.

Undoubtedly, similar phenomena exist in Micronesia. In the absence of an objective means of determining position, failure to sight a member of Pookoof is not interpreted as a challenge to the system but as evidence that the canoe is in the wrong place.

**The Po Ceremony**

One aspect of the ancient art of navigation is no longer practiced. Until Christian missionaries put a stop to it, navigators were taught sacred magic rites in the Po ceremony, a period of seclusion and ritual instruction that lasted many months. These rituals covered every part of a voyage. As sole proprietor of sailing magic, the Palu had great authority. This authority was essential since a navigator often had to lead his crew through dangerous seas, through storms, through periods of thirst, hunger and fear. Using magic rituals, the Palu could invoke spirits to ensure the success of a voyage. In order to think with clarity, he performed a rite exhorting Yalulawe, the patron spirit...
In 1947, Thor Heyerdahl and a five-man crew set off from Peru aboard *Kon Tiki* to prove that South American Indians could have settled Polynesia. Heyerdahl’s theory was supported by early anthropological and archaeological studies which purported to demonstrate similarities between Polynesian and American Indian cultures, and by prevailing winds and currents which flow from east to west, from the American continent directly into the heart of the Pacific. Aboard even the most primitive craft, it seemed possible to drift with these winds and currents to one of Polynesia’s many islands.

*Kon Tiki* was made by lashing together nine balsa logs. A small hut was built atop the raft to provide shelter for the crew, and a mast was rigged with a square sail to take advantage of the following winds.

As Heyerdahl gave the order to set sail, dire predictions rang in his ears; the balsa logs would become waterlogged and sink, the lashings would fray and break, or heavy seas would wash the men overboard.

To the crew’s delight, the raft quickly demonstrated her seaworthiness. Waves big enough to crash aboard simply washed through the spaces between the logs; the balsa wood was so soft that it cushioned the rope lashings and prevented them from chafing; and sap in the logs made them almost waterproof so the raft easily maintained its buoyancy. The sea also provided an unexpected bounty—the crew caught so many fish they could have subsisted without the tinned rations they had stowed aboard.

On August 7th, 1947, *Kon Tiki* crashed on a reef that surrounds Raroia Island in the Tuamotu chain, just east of Tahiti, demonstrating that Polynesia could have been settled by drift voyages from South America. But proving such voyages possible does not mean they actually took place.

Modern research has now shown that the ancestors of the Polynesians were skilled navigators who set out to explore the Pacific from Island Southeast Asia, not Peru. Although Heyerdahl’s theories are no longer accepted by an overwhelming majority of scholars, the voyage of *Kon Tiki* was a courageous experiment and a stimulus for the later voyage of *Hokulea*, a replica of a Polynesian double canoe that sailed against the prevailing winds from Hawaii to Tahiti in 1976.
you have to navigate. But without magic, the navigator becomes merely a practical man. "First we throw away the taboos," Mau told me, "then we throw away the navigation." Traditionally, the seat of knowledge and love in Micronesia was in the stomach, close to the heart. But in the West it is in the head, away from the heart. The children who go to Yap, Ulithi or Guam are educated in the ways of the West. "My generation and all the generations before me strove to learn navigation," Mau said one night as we sat under the stars. "But the young don't care about it now. Instead they want to earn money. If they go away to the American high school in Ulithi or to college in Guam, they often do not return."

Young Satawalese men are expected to be competent sailors by their 12th birthday. (Courtesy Stephen Thomas)

Pialug and his contemporaries fear they are the last living representatives of an unbroken tradition of navigation and seafaring spanning more than two thousand years. It is a tradition that "wove myth, magic, ethics and metaphysics into a seamless web, the center of which was navigation. It is a web that is, above all, beautiful. Once, late at night, after we had been talking many hours I asked Pialug about the "Talk of Navigation." "I don't know about the others," he said, forcing the words out as if in a kind of pain, "but in my mind the talk of navigation is beautiful. Inside my body the same, I say the talk of navigation is beautiful."

Stephen Thomas is a western navigator who has sailed many thousands of miles. He has just returned from Satawal where he studied navigation with Mau Pialug, and is now writing a book on Carolinian navigation.

Hokule'ā

With her strangely shaped crabclaw sails, and her narrow twin hulls spanned by a deck lashed to crossbeams, Hokule'ā seems to be an apparition from some distant planet. She is, in fact, a replica of an ancient Polynesian canoe—as exact a copy as science can make. The canoe is named after the star that seems to hang over Hawaii (the Hawaiian word, Hokule'ā, means "star of joy"), a star that may have been a celestial beacon for early navigators who discovered Hawaii from islands to the south.

If the Polynesians made intentional voyages of discovery, they must have possessed both an accurate system of navigation and a seaworthy ocean-going canoe. Hokule'ā's scientific mission was to sail round-trip between Hawaii and Tahiti to demonstrate the seaworthiness and sailing ability of her ancient design, and to show that a trained non-instrumental navigator, Mau Pialug, could guide the canoe across 2500 miles of open ocean to an accurate landfall. Hokule'ā's twin hulls are each 62'3" long. They are spanned by crossbeams ('iako) which are 17'6" long and spaced 6' apart. A platform 42'6/1 by 9'6/1 is lashed atop the 'iako. The canoe's sails are shaped like giant crabclaws, following the pattern depicted in ancient petroglyphs and in sketches made by early European explorers. In practice, the upward curve of the booms allowed the crew to move about easily on deck, and the scoop formed at the top of the sail spilled wind during heavy gusts so that the rigging was not strained.

The knowledge necessary to build a voyaging canoe from traditional materials has been lost in Hawaii, so Hokule'ā was constructed of modern laminated woods and fiberglass. She is a "performance replica"—her shape is true to ancient design so that the performance of such canoes could be tested.

On May 1, 1976, Hokule'ā sailed from the island of Maui with a crew of 17 and 6 tons of cargo, bound for Tahiti. Making an average speed of more than 3.5 knots during the trip, she covered 2600 miles in 33 days without major incident. On her return to Hawaii, Hokule'ā encountered more favorable winds and sailed 2600 miles in 22 days. The voyage demonstrated the canoe could sail into the wind; carry a large enough crew and sufficient supplies to colonize distant islands; and that she was indeed sufficiently seaworthy to make long ocean passages.

Among Polynesians throughout the Pacific, Hokule'ā's voyage rekindled an ancient pride of accomplishment that had been dimmed by 200 years of European domination. Today the canoe sails on educational voyages among the Hawaiian islands where her crew educates Hawaiian children in the skills of their ancestors. For many years to come, Hokule'ā will continue to sail in the hearts and minds of a people whose ancestors were among the most daring seafarers on earth.

(Courtesy Polynesian Voyaging Society.)
The canoe has been at sea for a month, sailing northeast from Tahiti, guided by a navigator who follows ancient star paths. For the last two hours, he has been steering toward an almost imperceptible smudge in the sky—a low cloud that seems to hang over one spot of ocean. Slowly, the land is revealed beneath the cloud. It is one of the high islands in the Hawaiian chain. A kahuna—a priest—composes a chant to celebrate this hard-won landfall, one of many made by voyagers from Tahiti.

Here is Hawaii, an island, a man
Hawaii is a man indeed
Hawaii is a man
A child of Tahiti...

This chant is dedicated to Moikeha, one of the leaders of an early migration from Tahiti to Hawaii. The chanter may have been Kamahualele, “child of the flying spray,” a renowned kahuna.

Such chants and the myths and legends of Polynesia are a rich source of insight into the lives of this ancient people. Some chants celebrate the glory of voyages across broad sea stretches beneath the overarching sky—a world of winds, currents and stars that contained all the information needed by a navigator to make landfall. Others tell of the creation of the land and sea from a great void, the birth of gods and goddesses, and the adventures of great heroes. Without writing, the ancient Polynesians composed a vast oral literature which may be compared to the archaic Greek poem of Odysseus; to the creation stories of the Bible; and the great mystic adventures of Beowulf.

One of the mysteries the Polynesians puzzled over was the creation of the islands themselves. How, they asked, did the islands rise out of such expanses of ocean? To explain the mystery, generations of kahunas created the tales of Maui—trickster, hero, demi-god; and of Tahaki, another demigod blessed with beautiful red skin (a sacred color), curly red hair, towering shoulders and penetrating brown eyes. The stories of their exploits were sung by bards during celebrations, by men in community houses while making canoes, by mothers to their children.

Maui’s story is long and complicated, changing in detail from island group to island group. In one version, his mother threw him at birth into the sea. Seaweed and waves cradled the baby; jellyfish swaddled him in their flesh for protection; winds carried him to shore. Grown to manhood, Maui performed outstanding feats. With a rope made of his sister’s pubic hair he captured the sun. That is why (say the legends) the sun moves slowly through the sky and people can cook their food before dark. Maui stole the secret of fire from the fire god, a Polynesian Prometheus. With his magic fishhook, he pulled islands into daylight from the darkness at the bottom of the sea. He fished up New Zealand with a hook made from a jawbone. It was tough work and he chanted an incantation to make the heavy weight of the island/fish lighter: “Why, Oh Tonga Nui! Art thou sulkily? / Biting below there?...” Finally the fish, which was also land, emerged. Leaving it in the care of his brothers, he went to fetch a kahuna to perform appropriate religious rites. While Maui was gone, his brothers began to cut up the fish and eat it. This is why, today, New Zealand has rugged mountain landscapes.
When he finished pulling up the Hawaiian archipelago, Tahaki sailed back to Tahiti. There he gathered “people to dwell on the beautiful new land, bringing them with their gods, their chiefs and breadfruit and other plants.” The tales of this legendary demi-god may have been based on an actual navigator who led the first migration from Tahiti to Hawaii.

What can we make of these stories of fishing up islands and anchoring them in place with the powerful thrusts of magical spears? Perhaps these too are poetic metaphors for real events in the Polynesian past. From the vantage point of a canoe, bound on a voyage of discovery, new islands would appear to rise mysteriously from the sea, as if by magic. The navigators who discovered these new lands may have been seen by the less venturesome people left behind as heroes who did indeed “fish up” these islands. Furthermore, the position of these newly discovered islands must often have proved elusive – the currents, winds and star paths were not yet known with certainty. They appeared to move, to swim like fish. It may have required dozens of voyages over many centuries before the navigational way points were thoroughly understood and the journey became routine. Finally, the locations of the islands were fixed as if thrust through by a spear and so pinned to the ocean floor.

The unwritten poetry of Polynesia contains many of these stories. But most importantly it reveals the perceptions, the inner feelings of the people who inhabited the Pacific. In many societies the words spoken in chant and poetry have a special power. They not only convey information or knowledge about past events, they also influence events in the future - the words have magical potency.

In the isolated atolls of Micronesia's central Caroline Islands, the people still live as the ancient Polynesians, in a world without writing – a world in which the spoken word conveys all of society’s accumulated wisdom. Here the techniques of navigation, the locations of schools of fish, and the proper ways to make a canoe or build a house are passed on orally from father to son. Here too, the words have power.

Using a special effigy and a potent magical incantation, a Micronesian navigator can change the weather:

Black weather pass to either side.  
Go away to the south;  
Go away to the north;  
No more wind! Like an inland pool . . .
Dwindle, dwindle, rain
Go away, go away, rain
I send fire, I send fire
Fear the strong fire, fear the strong fire.

Other chants are used to prepare oneself for sea. Before setting off on a voyage, a navigator from Ifaluk atoll may first invoke the spirit of navigation. Then he rubs sand on his chest and chants:

Sand, Sand
kindle a fire within me.
Sand, Sand, that it may be light in there.

The "light" and the "fire" are knowledge, the clarity of vision needed to follow the star paths and the courage needed to remain steadfast. A second song repeats the request for knowledge:

May a fire light up inside me . . .
Wave a torch inside me to keep it light.

A chant recorded from the island of Puluwat, not far from Satawal, tells the adventures of a fisherman who probes the reefs around various islands with a stick. A parrot fish is disturbed and flies before the probing stick, swimming to the reef surrounding another island. Again the probing stick, and again the fish swims, each time he follows a star course from one island to the next. Told in canoe houses for generations, the story of this fisherman's journey contains the knowledge that young navigators must memorize, the sailing directions between these islands.

In the seafaring society of Micronesia, the women are often left at home. They yearn for their husbands and lovers and are anxious about their safety. They often compose and sing songs while weaving or cooking in the company of other women.

He could not sleep at night.
As I lay by him, he said, "I must go away."
I have no heart for work,
I lie and think of him,
I think, "If only he could have stayed."

I think of my beloved gone to Yap.
While my body sleeps here,
Can I go to him in a dream?
Can I go to him like rain falling?

The Micronesian Pulu, like the ancient Polynesian navigator, carries his complicated knowledge of the sea with him—the appearance and the sequence of stars moving across the horizon, the significance of bird and fish, the direction of sea-swells, the vagaries of wind. Around this heroic figure gather human feelings—yearning, danger, dream and achievement—expressed in poetry, song and chant.

In the Pacific, poetry is not a separate artistic act, it is part of daily life. The recitation of a chant may be a religious act, the conveying of history, a family chronicle or genealogy. The spoken word is the only way that wisdom is passed on, so it is sacred. A mistake of one word in a sacred chant may bring death or disaster. At one time, long ago, everyone in the Pacific heard the chants—they were in everyone's thoughts and dreams. Some of the words have endured. Now written down, they open a window on the past, they are a gift to us from unknown composers from a nearly vanished world. A Tongan poet still sings:

If I give you a mat it will rot,
If I give cloth, it will be torn,
The poem is bad, yet take it,
That it can be a boat and house to you.

Author and teacher, Marjorie Sinclair has spent the greater part of her life studying and writing about the oral literature of the Pacific.
Teacher's Guide

A guide to discussion topics, projects, and resources for further exploration of the themes presented in The Navigators.

How to use the film

The Navigators can be used to:

• provide students with the feeling that they have personally visited the Pacific islands and have met the major personalities involved in Pacific research.
• serve as a focus for future discussions and class projects.
• stimulate a natural curiosity and interest in learning more about the Pacific than is covered in the film.

Before Viewing the Film

It is suggested that the teacher talk about the film before showing it to the class to present the major categories of information that will be discussed after the screening.

The Navigators documents our current understanding of the origins of the Polynesians, their routes of migration and their navigational expertise. Ask your students to think about what evidence is presented to support the conclusions that are reached.

The film tells about life on the tiny Micronesian island of Satawal. Ask the students to pay attention to the important role played by navigators and to the various skills they use to find their way without charts or instruments; to the way that young people learn traditional skills without schools or books; to the reasons that non-instrumental navigation has survived on this island; and to the changes that are now threatening Satawal’s traditional way of life.

After Viewing the Film

DISCUSSION TOPICS

I. Our understanding of the origins of the Polynesians, their routes of migration and navigational expertise, is the result of research by humanities scholars in such fields as archaeology, anthropology, linguistics, history and mythology.

• What kinds of questions do these scholars ask?
• What kinds of evidence do they use to answer them? What specific clues do they use to determine the migration routes of the Polynesians?
• How does the combination of different research techniques allow us to come to conclusions about the origins of the Polynesians and the timing and manner of their migration throughout the Pacific?
• What evidence exists that the Polynesians were skilled navigators and seafarers?
• How are the journals of early Europeans who explored the Pacific invaluable tools for Polynesian research?

II. Compare the voyages made by Kon Tiki and Hokulea. What did these voyages actually prove? Is there a difference between showing that a voyage is possible and showing that it actually happened?

III. Archaeologists attempt to reconstruct the culture and way of life of extinct societies by studying their artifacts. They often examine existing societies for clues to how life might have been lived in the past. What clues are provided by life on Satawal that might help archaeologists reconstruct the ancient societies and cultures of the Pacific?

IV. Anthropologists study existing human societies to gain an understanding of how people with different cultures view their world and organize their lives. What might an anthropological study of Satawal reveal about both the residents of that island and about ourselves?

• The people of Satawal have no writing or metallurgy. How is knowledge recorded and passed on between the generations without books? What takes the place of libraries and schools? How are buildings, boats, clothing and other necessities of life created?
• What different skills are necessary to build a canoe? What materials are used? How are the people of Satawal more self-sufficient, less dependent on other nations for their survival, than we are?
• The navigators of Satawal have no charts or instruments to guide them on voyages. What substitutes do they use for these technical devices?
• Why has non-instrument navigation survived on Satawal but died out elsewhere?
• How and why might the conceptions of time, space, weather and even individual options be different on Satawal from those of an industrial society?
• How has the adoption of Christianity changed the role and status of a navigator on Satawal?
• Some people “look down” on societies that are not as technologically advanced as their own, calling people who do not know how to write or have not discovered the processes of metallurgy “primitive.” With an understanding of the accomplishments of Mau Piailug and the people of Satawal, do you feel such terms or attitudes are warranted?
• The introduction of western ideas will obviously have an enormous impact on the young people of Satawal. Discuss what might happen to them. If you were an all powerful and benevolent dictator, what policies would you adopt to either accelerate or retard these changes?

For Further Research

Over the past two hundred years, Western ideas have moved into the Pacific, imported by whalers, missionaries, settlers, traders and tourists. Many of the Pacific islands have fallen under the control of various colonial powers.

• Discuss how the establishment of a
cash economy, schools, churches, and new technologies have changed the cultures of the Pacific.

- The roles played by women and men on Satawal seem to be clearly divided. How do these roles differ from those in our society? How are these roles changing in the United States? What changes might occur on Satawal as Western ideas and institutions become more common?

- Explain the impact of French, German, English, Spanish, Dutch, Japanese and American contact in the Pacific. If there are differences, how do you account for them? Were these colonial powers motivated differently or did they seek different goals?

- List the strategic and commercial resources that have attracted Western powers to the Pacific during the last two centuries.

- The Pacific was not “discovered” by Europeans until they had developed powerful sailing ships, charts and the magnetic compass. Discuss why some of these European explorers might have doubted the ability of the Polynesians to have explored and navigated across the Pacific before their arrival.

- Under the impact of Western civilization, the people of the Pacific have lost much of their cultural identity and pride. Describe ways that the work of scholars might reawaken this identity and pride.

- Discuss areas in your community where scholarly research has added to your understanding of your own history and cultural background, or that of the indigenous people who lived in your area before you.

**Projects**

Arrange a trip to a local planetarium to identify some of the stars used in navigation. Perhaps a special performance can be arranged to demonstrate the rising and setting points of stars (the star compass) in the latitude of Satalal (8 degrees north), or the appearance of the sky as it changes with the seasons. Discuss the prodigious accomplishment of Micronesian navigators who must memorize the nighttime sky for every day of the year.

Visit a local museum that has a display of Pacific artifacts. Arrange a discussion of what these artifacts reveal about daily life on a specific island or how they can be used to trace migration across the Pacific. Organize a lecture by a local professor who specializes in Pacific archaeology.

Arrange a visit to a local boatyard (perhaps a yard where they are building wooden boats). Examine the complex geometrical shape of any boat, whether it be an ancient canoe or a modern racing yacht. How is this shape arrived at? How does the builder translate the lines of the boat from a plan to the finished hull? Discuss the feat of memorization necessary to construct such a boat without plans.

Xerox some of the illustrations made by various European explorers of the Pacific (Dodd’s book has a good selection, see bibliography). You will find great differences between them in detail, rendering, the events that are recorded, and the way that the Pacific islanders are depicted. Discuss what these differences tell us about the artists who drew them and the explorers who commissioned them.

**Audio-Visual Distribution of The Navigators**

For purchase or rental of film and videotape copies of The Navigators, contact Sue Marshall Cabezas, Documentary Educational Resources, 5 Bridge Street, Watertown, Massachusetts, 02172, (617) 926-0491. Cost (within the United States) for purchase of a film copy is $500.00; cost for a one-time showing rental is $50.00. These costs are lower than the normal rates because the producer has agreed to take no royalties.

**Museums**

The following is a partial list of museums with collections or exhibits of artifacts from Micronesia or Polynesia. Those listed with an asterisk have major collections. Check with your local museums, historical societies or other cultural centers to learn more about resources in your own area.

- The American Museum of Natural History (*), Central Park West at 79th Street, New York City, 10024.
- Bernice P. Bishop Museum (*), 1525 Bernice Street, Honolulu, Hawaii, 96819.
- The Brooklyn Museum, Eastern Parkway, Brooklyn, New York, 11230.
- Buffalo Museum of Science, Humboldt Park, Buffalo, New York, 14211.
- Cranbrook Institute of Science, Bloomfield Hills, Michigan, 48013.
- Denver Art Museum (*), 1300 Logan Street, Denver, Colorado, 80203.
- Field Museum of Natural History (*), Roosevelt Road and Lake Shore Drive, Chicago, Illinois, 60605.
- Los Angeles County Museum of Natural History (*), Exposition Park, 900 Exposition Boulevard, Los Angeles, California, 90007.
- Robert H. Lowie Museum of Anthropology, University of California, Berkeley, California, 94720.
- Milwaukee Public Museum, 800 West Wells Street, Milwaukee, Wisconsin, 53233.
- Peabody Museum of Natural History, Yale University, New Haven, Connecticut, 06520.
- Peabody Museum of Salem (*), 161 Essex Street, Salem, Massachusetts, 01970.
- Peabody Museum of Archaeology and Ethnology (*), Harvard University, Cambridge, Massachusetts, 02138.
Bibliography

William Alkire, An Introduction to the Peoples and Cultures of Micronesia, An Addison-Wesley Module in Anthropology, 1972. A good overview of Micronesian culture. William Alkire is the author of many books and articles on this area of the world. A generous bibliography accompanies this article.

J.C. Beaglehole (editor), The Journals of Captain James Cook, Cambridge, Cambridge University Press, for the Hakluyt Society, 1967-68. Three volumes containing Cook's journals made during three voyages to the Pacific. A fascinating firsthand account by one of the most intelligent and persistent of the Pacific explorers.

Peter Bellwood, Man's Conquest of the Pacific, New York, Oxford University Press, 1979. A large and detailed book, this is the standard reference for the prehistory of island Southeast Asia, Melanesia, Micronesia and Polynesia.


Jack Golson (editor) Polynesian Navigation: A Symposium on Andrew J. Sharp's Theory of Accidental Voyages, Wellington, the Polynesian Society, 1962. A collection of essays from a symposium refuting the concept that castaways accidentally settled Polynesia. Particularly useful is the article by G.S. Parsonson which contains many quotes from early European explorers, the firsthand observers of ancient Polynesian sailing craft and skills.

A.C. Haddon and J. Hornell, Canoes of Oceania, Honolulu, Bishop Museum Special Publication no. 27, 28 and 29, 1936-1938. The most complete compendium of information existing on the voyaging canoes of the Pacific.


Herb Kawainui Kane, Discoverers of the Pacific, a beautiful and detailed map with canoe drawings which was inserted in the National Geographic edition for December 1974. Write to the Geographic to obtain a copy.

Herb Kawainui Kane, Voyage, the Discovery of Hawaii, an Island Heritage Book. A fictional account of a Polynesian voyage. Particularly useful are the notes to the reader which provide a short lesson in Polynesian voyaging and culture.


David Lewis, We, the Navigators, Honolulu, The University of Hawaii Press, 1972. The sourcebook for understanding non-instrument navigation in the Pacific, a very readable account of Lewis' research and travels in the Pacific.


Katherine Loomala, Voices on the Wind, Honolulu, Bishop Museum Press. A very readable account of Polynesian mythology and folklore.


**Glossary**

**Atoll**
A coral island consisting of a ring-shaped reef enclosing a lagoon.

**Lapita**
A type of pottery characterized in its earliest phases, from 1600 B.C. to 500 B.C., by complex geometric designs. Discovered in archaeological excavations from the Bismark Archipelago to the islands of Fiji, Tonga and Samoa, Lapita pottery allows archaeologists to trace the migration route of the first settlers of Polynesia.

**Proa**
A canoe used in Micronesia. The canoes of Satawal change direction by “shunting” — moving the sail from one end of the canoe to the other. The hull is asymmetrical, shaped like an airfoil, so water flowing around the hull balances the drag of the outrigger and allows the canoe to sail in a straight direction.

**Sowinet**
The Satawalese term for “master of dividing,” a respected person chosen to divide a valuable commodity among recipients. Mau Piailug is chosen to divide fish after a communal harvest of the reef.

**Sennap**
The Satawalese term for “master canoe builder.”

**Sennit**
Rope made from coconut fiber.

**YaLuLawe**
A patron spirit of navigators.

**Huahine**
An island about 100 miles northwest of Tahiti. Here, archaeologist Yosihiko Sinoto has discovered the only known remains of an ancient Polynesian voyaging canoe.

**Adze**
A tool similar to an axe, but with its cutting edge mounted at a right angle to the handle. Adzes are used in shipyards today and were one of the most important tools used by the ancient Polynesians.

**Micronesia**
 Literally meaning “small islands,” the area of Micronesia encompasses the western region of the North Pacific including the Caroline, Gilbert, Marshall and Mariana Islands.

**Melanesia**
Literally meaning “dark islands,” Melanesia includes an area stretching from New Guinea through the Solomons and New Hebrides to and including the islands of Fiji.

**Polynesia**
Literally meaning “many islands,” this area is bounded by a vast triangle with its apices at New Zealand, Hawaii and Easter Island. This triangle contains an area almost twice the size of the continental United States.
The Navigators

A Continuing Project

The Navigators project continues. What began as a single film, has now developed into plans for a unique effort to preserve and present the seafaring heritage of the Pacific through a book, a traveling museum exhibit and a new film.

Stephen Thomas, author of *A Sea of Natural Signs*, will return to Satawal in the winter of 1984 to continue his studies with Mau Piailug. Thomas is preparing a book which will do more than provide a complete description of Carolinian navigation, it will investigate a unique system of thought that integrates vast amounts of memorized data with a world view that, to us, would seem mythical or "magical."

Sam Low, producer of *The Navigators*, plans to join Thomas on Satawal to document the world of the navigators on film before it is forever lost. Included in this new film project will be "archival" footage for further study and an exploration of how the people of Satawal are coping with the forces of change that are now encroaching on their island.

The Peabody Museum of Salem, Massachusetts, one of the world’s foremost maritime museums, also houses one of the best collections of Micronesian and Oceanic artifacts in the United States. The museum’s director, Mr. Peter Fetchko, has joined with Low and Thomas in planning a traveling exhibit to feature the arts of Micronesia’s remote islands. Complementing the exhibit will be a display of photographs and a series of video viewing stations which will provide vivid sequences of life on Satawal.

Now in its development stage, this new project should help to preserve a seafaring heritage that was once found throughout the Pacific. Now extant only on the isolated atolls of the Central Caroline Islands, this way of life is rapidly fading under the influence of the "modern" world.