



Wind, Wave, Star, and Bird

By DAVID LEWIS

Photographs by NICHOLAS DEVORE III

THE OLD NAVIGATOR, Tevake, wore the wrinkles and silvered hair of age, and a serenity and steadiness of eye beyond any I had ever seen. I came to recognize that look in other master navigators of Polynesia, but none had quite so farseeing a gaze as Tevake.

In my elderly gaff ketch *Isbjorn* we were pounding through heavy seas somewhere southwest of the island of Taumako, in the western Pacific's Santa Cruz group.

No fewer than 15 people, including sleepy children, wailing babies, and a new bride recently purchased with feather money, occupied every bunk and foot of cabin space, wedged in with mats, taro pudding, breadfruit paste, *nyali* nuts, and a squealing piglet. It was a scene out of ancient Polynesia.

We were, in fact, reliving the Polynesian past. I had arranged this round-trip voyage between two remote islands solely for the purpose of learning how Tevake's ancestors had managed to find their way across, and colonize, the vast Pacific Ocean.

We had put out from Taumako be-

fore dawn, but the stars had not faded before heavy clouds shut down. Not so much as a glimmer of the sun broke through. Then a northerly squall swept down on us, laying the lee rail under and sending *Isbjorn* scudding through the tropic downpour. The wind veered northeast, east-northeast, finally southeast. My sense of direction was paralyzed from the squall's onset. At each subsequent wind change, I again lost my bearings.

Yet, for eight solid hours, with never a moment's respite, Tevake stood with his feet planted wide apart on the foredeck. He held a *lo lop* palm leaf as an umbrella, his sopping wet lavalava flapping around his legs, concentrating intently on the sea, unmindful of chill and weariness, his only movement an occasional gesture to the helmsman.

He held course by keeping a particular swell from the east-northeast, unfelt by me, dead astern.

"It is *hoa hua dele tai*, the sea wave," he said. "It lift up stern without rolling boat. Must wait for it long time, maybe ten minute. It not there all time."

It may seem incredible that a man

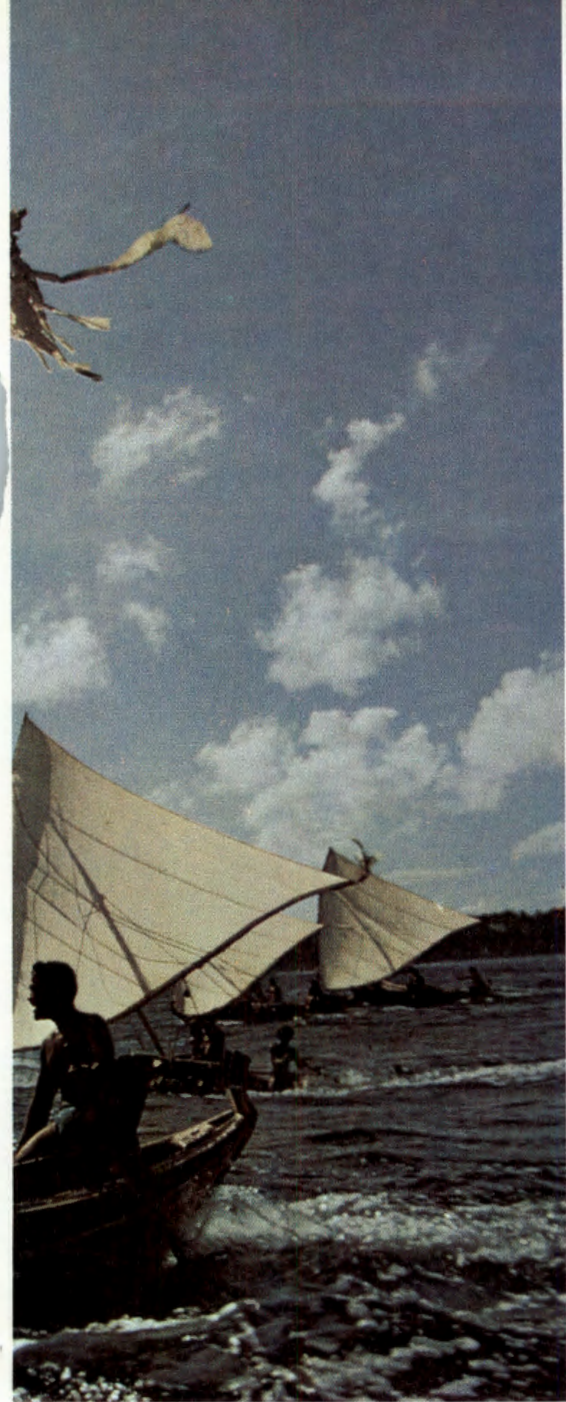
Without compass or chart, Tevake pilots the author's ketch through Pacific waters, relying on an astounding knowledge of stars, currents, and barely perceptible ocean swells. The traditional voyaging skills preserved by the Santa Cruz Islander and a dwindling handful of other navigators explain, says Dr. Lewis, how ancient Polynesians could find and colonize a constellation of islands scattered over 15 million square miles of ocean.



Morning's fresh breeze fills the sails of Satawal outriggers, vessels little changed—except for Dacron sails and painted hulls—from those seen by Sir Francis Drake. Caroline Islands mariners confidently take their tiny craft as far as Saipan, 550 miles across open sea.

could find his way across the open Pacific by means of a slight swell that probably had its origin thousands of miles away, in the northeast trades beyond the Equator. Around two in the afternoon, however, something loomed up through the murk on the port bow.

"Lomlom," said Tevake with satisfaction. Soon he pointed to a second island, Fenualoa, taking shape to star-



board. He had made a perfect landfall in the half-mile gap between them, having navigated for 50 miles without a single glimpse of the sky.

I am no stranger to the complexities of navigation, having three times crossed the Atlantic single-handed and circumnavigated the globe in a catamaran. Nevertheless, Tevake's feat impressed me greatly. He had unerringly

passed the stern test of landfall using only the skills of his ancestors.

Devoid of written language or any instruments, guided solely by their senses, the early Polynesians ranged over an area bigger than all the Soviet Union and China combined (see the supplement map, **Discoverers of the Pacific**, distributed with this issue). For years scholars have debated whether this vast area was settled mostly by accident—by windblown castaways, by people wandering blindly—or by navigational skill of the first magnitude.

There is no longer any debate in my mind.

THOUGH I AM a New Zealander, the most memorable years of my childhood were spent in a miniature Tahiti called Rarotonga. There I attended a native school and listened enthralled to my Polynesian cousins retelling the glorious sagas of the ancient captains—Ru, Tangiia, Karika, and Kupe, the legendary discoverer of New Zealand, southernmost land in the Polynesian Triangle.

Years later the irresistible ocean lured me away from the respectable life of a medical practitioner in England, and I became obsessed with the mysteries of Polynesian voyaging.

In 1965, armed with a knowledge gained from the writings of early European explorers and missionaries, I set out to follow the traditional (and archeologically confirmed) migration route from the Tahitian archipelago to New Zealand, by way of Rarotonga.

"Sail a little to the left of the setting sun in November," had been the legendary Kupe's command. In a catamaran called *Rehu Moana*—"Ocean Spray" in Maori—I followed his directions.

Navigating entirely without instruments, steering toward stars setting in the southwest, and using the sun and swells as additional directional guides, as Kupe must have done, I reached New Zealand after 35 days at sea, with an error in latitude of only 26 miles.

Thus I proved to my own satisfaction that ancient tradition was correct. But a far greater surprise still awaited me. I was visiting in Tonga



Mother's deft hands weave away the morning (above) as her child naps in a suspended cradle (below). Seagoing ancestors brought the loom from Indonesia to Micronesia centuries ago, but few modern-day blessings, or banes, touch tiny Satawal. Some island men wear watches as insignia of prosperity, but they do not need to know—much less care—what time it is.



some months after my New Zealand voyage, and chatting one evening with a cutter skipper named Kaloni Kienga. I asked him for advice about traversing his reef-strewn archipelago.

"You head toward that star," he said, pointing to a member of the constellation Leo, "and when it has moved too high and too far to the left, you follow the next to rise from the same point on the horizon. Then the next, and the next, and so on until dawn. This we call *ka-veinga*, the star path."

I was flabbergasted. What I had assumed to be long-lost knowledge was being expounded in practical detail. The millenniums-old art of Polynesian navigation still lived!

Kaloni went on, illustrating by motions of his hands the shape of the waves I should encounter. "There are three seas between here and Nomuka. By recognizing which sea you are in, you will know how far you have traveled, even on the darkest night. These things my father taught me."

If Kaloni still knew and used these ancient arts, surely there must be other islanders whose lore could be recorded and saved.

The Australian National University provided a grant, and with my son, Barry, I set out to find the surviving Pacific navigators and sail with them. I hoped to learn to read, as they did, the messages inscribed nightly across the "roof of voyaging" by the slow-wheeling stars, and by the ocean swells that marched rank on rank across the lonely wastes beneath.

We found such men and learned their skills. And, oddly enough, we found many of them not in the central Pacific—the heart of Polynesia—but in outlying islands to the west, in the Gilberts, the Carolines, and the Santa Cruz chain.

I had heard many reports of the veteran navigator Tevake, of the Santa Cruz Islands. "You will just have to chance finding him," said a district officer on Guadalcanal. "He may be anywhere. He has only an outriggerless dugout now, but even in this—and as old as he is—he can't rest from the sea. He is forever roving the archipelago

and far beyond, as far as Tikopia.”

As luck would have it, I caught up with Tevake at his home island of Nifiloli, a strip of sun-bleached sand overhung with palms.

He was a striking figure, his wrinkled face distinguished by that sea-formed gaze. He agreed to take charge of *Isbjorn*, sailing her first to Taumako to pick up a bride for his son, and on a second trip to Vanikoro, about a hundred miles distant.

I had been duly impressed on the voyage to Taumako by Tevake's ability to detect surface currents and compensate for them. Usually they are no more perceptible to a seaman than is the drift of a free balloon to its occupants. Long ago Polynesian navigators correctly deduced that most Pacific currents follow the prevailing winds. Once a voyage had been accomplished, the mean set of the seas would be known, and passed on through the generations.

ON OUR SECOND VOYAGE, to Vanikoro, the waves were persistent and steep. Tevake said this indicated a current flowing a little east of north, and altered our course 18° to the right. He maintained that heading by keeping the brilliant star Canopus on our port bow. In the 3 a.m. darkness, surf breaking to port revealed the reefs of Utupua, a reference point we would have missed by a good ten miles had not Tevake corrected for the current.

On our trip back to Nifiloli from Vanikoro, *Isbjorn* pitched and allowed clumsily along beneath the supremely indifferent tropic stars. Tevake stood thoughtfully by the rail.

“Of course,” he said rather hesitantly, looking back at me over his shoulder, “you must know all about *te lapa*.” I truthfully denied knowing anything about it at all.

“Then look.” Tevake pointed over the side. “No, not on top, deep down. You see him all same underwater lightning.” The phrase was apt. Streaks, flashes, and momentarily glowing plaques of light kept appearing well below the surface. Tevake explained that *te lapa* streaks dart out from directions in which islands lie. The phenomenon

is best seen eighty to a hundred miles out and disappears by the time a low atoll is well in sight. He stressed that it was quite different from ordinary surface luminescence. Tevake told me it was customary to steer by it on overcast nights.

The following night after we hove to, lowering our sails to await daylight before threading the tortuous Matema reefs, clouds made the darkness more intense and *te lapa* more obvious. The flashes flickered along two distinct bearings. One series, Tevake averred, was “from” the volcano Tinakula, the other “from” Ndeni. Morning revealed the lofty Tinakula and Ndeni, both about 20 miles away in the directions Tevake had indicated.

What can be the nature of this sign? Oceanographers say it must be a form of bioluminescence, perhaps triggered by a backwash wave. At any rate the learned Gilbertese navigator Abera later described to me what he called *te mata* in terms identical with Tevake's, and the Tongan Ve'etutu spoke of the “glory of the seas, *ulo 'a e tahi*,” which was clearly the same thing. None of these have, as far as I know, ever been described before.

I said good-bye to my friend on his home island with the perfect cone of the sacred volcano Tinakula looming against the sky. There was something symbolic in the old navigator's parting words. Pointing up at a circling tropic bird, he spoke with pride and regret:

“My name, Tevake, same as his. One time I young and like him I go far and free.”

THE SEARCH CONTINUED as *Isbjorn* plied the seas to Tonga. It and Samoa lie in the heartland of old Polynesia.

Tracing the earliest settlement of the Pacific, scientists conclude from studies of artifacts (particularly a widespread archaic type of pottery called Lapita ware) that it was launched from somewhere in the islands of Southeast Asia. Through the millenniums, migrations swept generally eastward across the ocean, but ultimately the waves spread toward almost every compass point—

as far north as Hawaii, as far south as New Zealand, even westward again to the so-called Polynesian outliers in Micronesia and Melanesia.

The obscure people who made Lapita pottery reached Tonga before 1000 B.C. There, and in Samoa, they settled down and developed the language and culture we now call Polynesian.

From its cradle in the Tonga-Samoa region, Polynesian culture began its spread over the Pacific about the time of Christ. When Europeans arrived some 15 centuries later, they found Polynesians occupying a vast triangle that covers almost a fourth of the Pacific.

SOME YEARS AGO, in my catamaran *Rehu Moana*, I called at Easter Island, a possession of Chile. An islander named Teao remarked: "*E hoa, David, riva riva te pahi*—Friend David, yours is a fine voyaging canoe." The words were much the same as the Maori spoken in my New Zealand homeland, 4,000 miles away.

How were these ancient master mariners able to strike so far afield, never knowing a compass or a chart?

Part of the secret, as the cutter captain Kaloni Kienga had so unexpectedly shown me, was by steering down the star path, *kaveinga*; picking a star that came up (or sank) in line with your island target, and then steering toward that star and its successors.

"A compass can go wrong, the stars never," declared another Tongan captain. Indeed the points of rise and set of stars do provide a directional compass every bit as accurate as the magnetic instrument—that is, for a Pacific Ocean expert who carries a map of the heavens in his head.

I was to find star-compass techniques still practiced over much of the Pacific. I was even more impressed, however, by the island navigators' uncanny ability to steer by wave motion—swells reflected from islands beyond the horizon. The skilled navigator comes to recognize the profile and characteristics of particular ocean swells as he would the faces of his friends, but he judges their direction more by feel than by sight.

Almost literally he "steers by the seat

of his pants"—sensing the ocean swells through the scrotum.

The complex patterns produced by swells reflected and refracted among the islands are recognized by navigators throughout Oceania. The Marshall Islanders illustrate the process using so-called stick charts as teaching devices.

IN TONGA I became aware of even more sophisticated navigational concepts that were restricted to selected initiates. This closely guarded knowledge is the hereditary property of navigator families such as the Tuita (both the name of the family and the title of its head). Early in the past century, the Tuita Kahomovailahi, or Kaho, guided a lost royal flotilla to safety even though totally blind (pages 768-9).

"There are secrets only I and the devil know," Kaho had claimed, and I wondered whether those secrets had gone with him and his descendants into the grave. Through the kindness of His Majesty King Taufa'ahau Tupou IV of Tonga, I was introduced to today's distinguished Tuitas.

There was Fe'iloakitau Kaho, the 87-year-old great-grandson of the blind Tuita himself, whose modest home, little more than a shack, was adorned with the faded signed photographs of the European royalty who were his friends. I met the leading Tuita, with whom I sat for hours cross-legged on mats before the kava bowl; and finally Tonga's most distinguished traditionalist, Ve'ehala, governor of Ha'apai. Together they revealed to me the fragments that remained of their jealously guarded lore.

Ve'ehala explained how overhead stars were once used to determine latitude. "That star," he said, pointing up at Sirius, "when it rises to its highest point in the sky, will stand directly above Vanua Levu, the second island of Fiji. When it is right over your canoe, you know you have reached the latitude of Vanua Levu.

"Such a zenith star that points *down* to an island we call a *fanakenga* star. It is quite different, of course, from a *kaveinga* compass star, low down on the horizon, that you steer by."

I had long suspected that Polynesian

seafarers sailing to tiny, distant islands “expanded” such difficult targets by first steering for whole archipelagos, guided by their knowledge of land clouds, bird zones, altered swell patterns, and the like.

Ve’ehala now confirmed my theory. He gestured toward a dim line of very high trees. “You see those *puko* trees? We have a Tuita navigator’s proverb that says, ‘It is enough that we strike the *row* of *puko* trees.’ You need not hit a particular tree. In the same way a canoe captain would aim for the middle of the group, instead of for an individual island.”

FROM TONGA I AIMED my own “canoe”—salt-stained old *Isbjorn*—westward, toward Micronesia and the scattered archipelagos of the Gilberts, the Carolines, and the Marianas, all scenes of intense fighting during World War II. There we have a unique and priceless window into the seagoing past of the Pacific; there the navigating arts of Polynesia survive as nowhere else. Probably this is because the European impact was felt in Micronesia later than in Polynesia proper, by about a century.

Passing through the Gilberts, I heard tidings of a great *baurua*, or voyaging canoe, being built on the remote atoll of Aranuka, and promptly changed course.

When I hove to off the atoll, however, the fringing reef, lashed by bursting swells, looked unassailable. A fishing canoe with two men came by. One of the men, Tekiera, looked *Isbjorn* over and shook his head, explaining that only a light canoe could surf over the reef, even at high tide.

“But I can take you ashore,” he offered. “You swim good?”

I clambered down into his rocking canoe. A few strokes took us to the break of the surf, where Tekiera and I slipped over the side and waited.

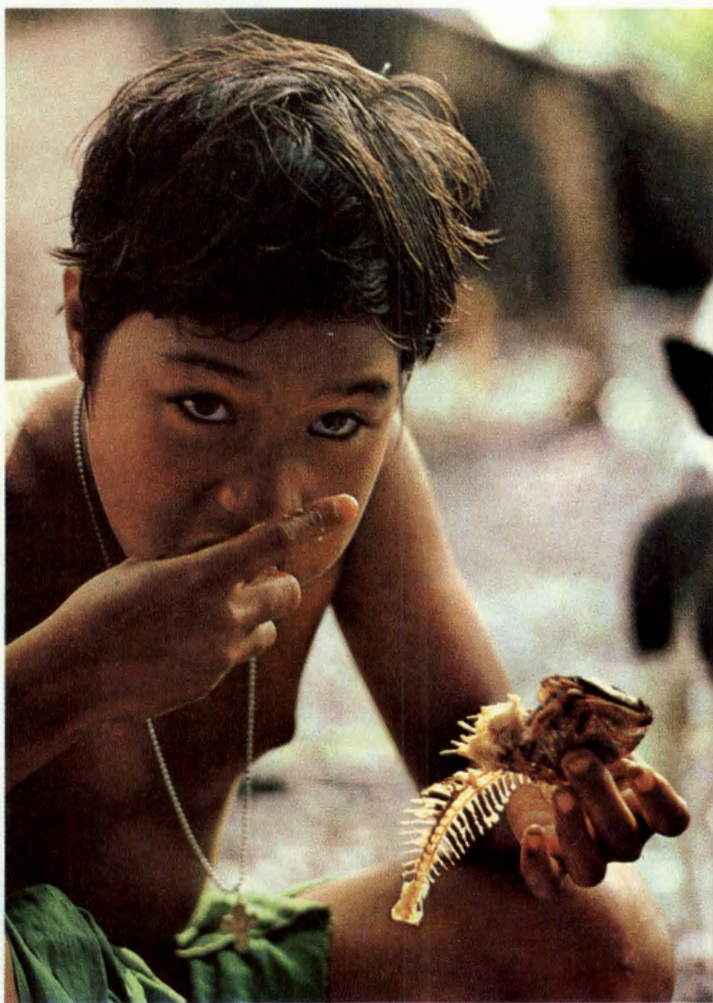
“Now swim!” I launched forward at full speed. Domed coral heads came into view beneath the swirling backwash, and my feet touched the reef.

“Hold,” cried Tekiera, but a wave climbed, tottered, collapsed in a welter of cascading foam, and sent me tumbling

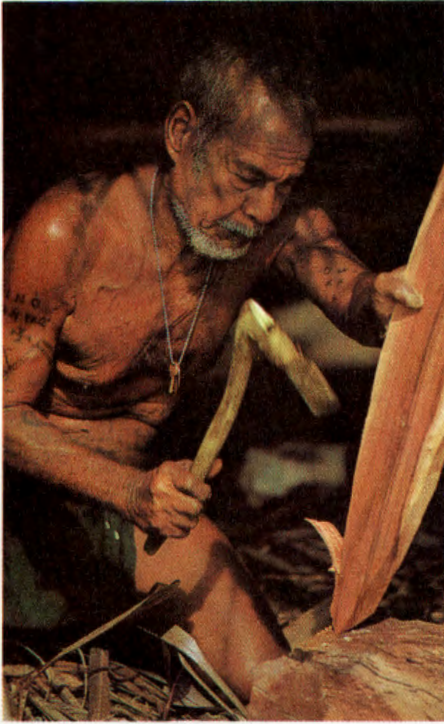
upside down. Twice more I was somersaulted before I hauled myself, cut and bleeding, onto the dry reef.

Once ashore, I was escorted to the large meetinghouse, the *maneaba*, with thatched eaves that stood only four feet above the ground and a roof that soared upward to a crisscross of massive beams a full forty feet overhead. The trade wind blew cool through the lofty building.

There I was greeted by the villagers, who grinned as Tekiera mimed my



Good to the bare bones, a freshly caught fish makes a tasty lunch for a Satawal youngster. Schooling includes reading, writing, arithmetic, and navigation, covering such questions as which stars to steer by when sailing the 100 miles from Yap to Ulithi.



With monumental patience, a Satawal canoe maker shapes a paddle with a steel adz, a task his forebears performed with tools of clamshell or stone. In the ancient manner, shipbuilders still caulk hull planks with breadfruit sap (below), after heating it with burning sennit, a cord made of coconut-husk fibers.

Braided three times by sailors in the canoe house (right), sennit becomes rope for ship's rigging, stout enough for the 1,100-mile round trip between Satawal and Saipan. The navigators for these voyages enjoy a status higher than island chiefs.



WILLIAM R. CURTSINGER

acrobatics on the reef. A feast of marinated raw fish, taro, and cooked pandanus served on shiny leaves was washed down with palm toddy.

The great voyaging canoe I had come to see was a glorious thing, traditional in every way. The planks, hand-sawed on the island from local *te itai* trees, were lashed together every few inches with cord made of hand-rolled coconut fibers. The ribs were bound in the same manner, and sticky breadfruit sap supplied the caulking. The massive outrigger float measured 23 feet.

Though only three-quarters planked up, the baurua was already a thing of beauty, with slim graceful lines, long curved ends, and the promise of great speed, strength, and flexibility. The craft would be used to carry people to nearby islands to take part in communal events. It had not occurred to anyone that navigational instruments or charts might be needed.

It must have been in such vessels that Pacific Islanders had made their great voyages of discovery and colonization. They date from the advent of the New Stone Age, when newly developed heavy woodworking tools made it possible to adz planks and join them to the frames of boats, just as bark or skin had been sewn in earlier times.

The swift and capacious vessels of the Lapita navigators were probably little changed by Captain Cook's day. In 1769 he recorded canoes "much faster" than his *Endeavour*.

Most were 55- to 60-foot V-sectioned craft, built of wide planks lashed to the frames with sennit and caulked with breadfruit sap. Hoisting their mat sails, they could cover 100 to 150 miles a day in open-sea conditions. In Polynesia the double canoe was the preferred style; in Micronesia, the single outrigger. Both were constructed with adzes of basalt or clamshell, drills fashioned from shark's teeth or shell.

With Polynesian ability to preserve food for long periods, a range of 5,000 miles in not-too-unfavorable winds was possible for these great canoes—ample for exploratory probes eastward.

The Polynesians generally sailed into the (Continued on page 771)





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(Continued from page 754) wind by tacking, coming about and changing the side of the sail presented to the wind, as modern sailors do. The Micronesians (and the Polynesians of the Tuamotus and some western island groups) changed course by shifting the sail from one end of the canoe to the other, with the same side always to the wind. Thus the vessels were "double ended," with bow and stern having the same design.

Both outriggers and the method of tacking by changing ends seem to have originated in Indonesia. They spread not only eastward into the Pacific but also westward across the Indian Ocean, as far as Madagascar. In A.D. 77 the Roman scholar Pliny the Elder described ships from Ceylon as having "bows at each end."

I wonder what Pliny would have said about a canoe of stone. I had heard of one on the island of Beru, not far from Aranuka. When my son and I reached the island and located the "stone canoe," it proved to be a teaching device that I had never before encountered. Built by the father of the navigator Temi Rewi, and modeled on one his father had made, it was a simple array of stones enclosing a larger flat rock. The origin of the device has been lost in time.

Rewi's son sat upon the central stone imagining himself in a canoe, while his father taught him the star paths and currents of the southern Gilberts. A little later, the "canoe" was used to represent an island. By their size, shape, and angle, the stones at the four corners represented the swell patterns around the island. The tallest, for instance, depicted the main swell from the east.

Rewi lowered his voice: "Look under the seat stone." There, hidden from view, was a rounded lump of brain coral. "This secret stone," said Rewi, "represents the sea-god, who is the most

important of all. He helps us sail over the sea because he rules the sea."

After leaving the hospitable atoll of Beru, I found at Tarawa, also in the Gilberts, a wiry old *tia borau*, or man for voyaging. His name was Iotiabata Ata, and his ultralight 30-foot canoe was a perfectly balanced sailing machine, outrigger alternately flying airborne and slicing clean through the waves.

Iotiabata took me on a voyage from Tarawa to nearby Maiana to show me, when we were well out of sight of land, how the massing of trade-wind clouds over the invisible islands, and their breaking up as they drifted downwind, indicated the position of both atolls. Though their lagoons lay below the horizon, I could see clearly the green reflection on the undersurface of the clouds, and pointed it out to Iotiabata.

"I did not wish to embarrass or insult you by mentioning this green," he said. "For after all, you are a navigator, of a kind, yourself—and even Europeans notice this obvious sign."

I was somewhat chastened as I continued in *Isbjorn* to the Caroline group.

ALONE in all the world, the Caroline Islands of Puluwat, Satawal, Pulusuk, and Pulap retain an entire traditional blue-water voyaging society. Oceanic voyaging without charts or instruments persists as a way of life. Of Puluwat's 400 people, 18 are trained *ppalu*, navigators with status higher than chiefs. In a recent 16-month period, Puluwat's 15 big sailing canoes made 73 interisland passages.

In such a setting, one might expect to find an exceptional navigator. I found him seated in his canoe house, a man of only 46 who had been initiated as a navigator more than twenty years earlier and had roved through the central Carolines ever since. His thighs were tattooed with the traditional mark of the sea, leaping porpoises, and his shoulder with a more modern emblem, the Rising Sun of Japan.

Old man of the sea, Yaleilei once rolled the sennit and swung the adz, helping to build the canoes he voyaged on. Now locked to the land, he passes the day in a Satawal canoe house and looks longingly toward the sea.



In the lap of learning, a boy watches as coconut meat, destined for a cooking sauce, is grated into a bowl.

His name is Hipour, and he is now my "name brother." Together we made two voyages—a relatively short one in Hipour's canoe to Pulusuk in the Carolines, and a six-day journey in *Isbjorn* to Saipan in the distant Marianas that confirmed my rediscoveries of ancient navigation techniques.

Hipour's 25-foot voyaging canoe was moored in the lagoon, cocooned in mats to protect it from the sun. Unwrapped, its tall red-and-black sides swept up in bold sheer lines toward identical bow and stern. Massive crossbeams supported an outrigger float.

Though Pulusuk lay only 40 miles to the south, no seamanlike precaution was neglected. The muscular tattooed islanders put aboard spare poles, spars, coils of rope, and hanks of cord. Next the mast, yards, sail, and steering paddle were loaded, and finally food for our crew of eight: baskets containing leaf-wrapped bundles of freshly cooked breadfruit, as well as sour fermented breadfruit that would keep for ten days or longer. Drinking coconuts were tossed into the canoe, along with those indispensable instruments, the bailers.

Hipour gathered in the rope that is the main means of steering; his son-in-law Teruo took the helm, and we slipped out of the shelter of the palms to where the sail felt the thrust of the trade wind. The canoe leaped forward into the sea wrack frothing in the channel and porpoised over a dozen lines of rollers until it was well clear of the land.

Hipour kept the two main Puluwat islands, Alet and Puluwat itself, just overlapping astern. He showed me the three important swells that were running, the most helpful being the Big Wave from Altair ($8\frac{1}{2}^{\circ}$ north of east) that we held on our beam.

As the land dropped far astern, a crewman stationed at the mast noted the sun's exact height at the time of the island's disappearance.

Then we were alone at sea, together with the slow-arching sun, the wave lines, and the seabirds. Yet these allies ensured that the canoe's steadily extending track was as precisely known as if drawn by the most sophisticated instruments. Had we sailed by night,

our star course would have been a shade to the left of the Southern Cross risen midway to its zenith.

"We sail this way," Hipour explained, "to go around Maihun—Reef of Spirits That Eat Canoes."

Trolling lines were put over the stern, and before very long fish were flapping in the bilge among the bright-green drinking nuts. The first few caught were eaten raw, with handfuls of breadfruit. Later a crewman lit a fire of dry coconut husks in an aluminum pot half filled with gravel; more fish were thrown on the fire, without gutting or scaling, and quickly scorched before being eaten.

I lay down on the rough-hewn planks, pulled a mat over myself, and went to sleep, and thus missed the first sighting of Pulusuk. Evening was near when I awoke, and the atoll was growing larger minute by minute. We had averaged $4\frac{1}{2}$ knots.

The moment the canoe glided through a gap in the reef, a line of men waded out, took hold, and guided her to a sandy mooring. Under a sinking quarter moon we splashed ashore and seated ourselves cross-legged facing the Navigator-Chief Beiong and Pulusuk elders to go through the rituals of greeting, while curious women and children peered shyly out at us from around cooking fires under the palms.

CHIEF BEIONG proved to be a gentle-mannered, quietly impressive man. "How could some men have been so foolish as to forget every reef and island under the stars?" he asked when he learned of my mission. "Here we have not forgotten. For a navigator, it is a matter of dignity to struggle upwind for five days without compass to Truk for cigarettes instead of waiting for the big ship to arrive."

He told me the story of a canoe from the island of Woleai, also in the Carolines, which had been storm driven far to the southeast and headed for the nearest landfall, Kapingamarangi, a remote Polynesian outlier.

"They knew the star course," the chief said, "but none of the crew had been there before. When they landed,

they could not understand what was said, for the Kapingamarangi tongue was quite different from their own."

Had they truly reached Kapingamarangi, or were they somewhere else? Being navigators, they were too proud to ask. Instead they lingered for nearly a week until they heard children at play mention the island's name. Then they sailed home, their dignity unimpaired.

WE, TOO, SAILED for home—Hipour's island of Puluwat—where we began planning an ambitious round-trip voyage of more than a thousand miles.

An ancient sea route had been kept open between the Caroline and Mariana archipelagos from time immemorial. It had been abandoned after Spanish massacres in the Marianas in 1686. Although later cautiously reopened, the old trade route had apparently not been sailed since early in this century.

The Carolinians had retained memory of the sailing directions in their songs. Could Hipour retrace the route, using only these word-of-mouth directions some three generations old?

He accepted the challenge with enthusiasm. The trip would be made in *Isbjorn*. We unshipped the compass and stowed the sextant, the charts, and our wristwatches below. The crew consisted of Hipour in command, Ulutak the interpreter, and Barry and myself as unskilled labor. The route was the traditional one—to uninhabited Pikelot, a hundred miles to the north, then across 500 miles of open ocean to Saipan.

We set out from Puluwat in the late afternoon. The land receding astern was watched intently, to assess the direction and strength of the current.

Within the main Carolines voyaging area, the North and South Equatorial Currents approach each other, both flowing strongly west; they are separated by an equally brisk equatorial countercurrent that runs in exactly the opposite direction. Since these streams continually vary in width by as much as a hundred miles, and transitory but strong recurving segments flow between them, the set at any one time



Towering waves menace a Satawal outrigger on a stormy ride to distant Saipan. Togomei anxiously searches the swells while helmsman Kaboy stands on the steering paddle for leverage against the roiling sea.

"Time and again I thought we'd be swamped," reports photographer Nicholas DeVore, "but the crew knew exactly what they were doing." After nine heaving days in forbidding squalls, clammy fog, and winds as high as 50 knots, they made the Saipan landfall.

may be north, south, east, or west—and can change without warning.

Hipour knew alternative star courses for every possible current. He began by using the famous Pleiades as our guide. When that star cluster set around eleven o'clock, we kept the Big Dipper and Polaris aligned with appropriate portions of the rigging, about 20° before the starboard beam.

A little before dawn I noticed a bright star that was strange to me. Nudging the dozing Ulutak, I asked what it was.



He repeated my question to Hipour, who grinned and replied, unexpectedly in English, "Satellite!"

A shout near midmorning announced that we had passed over a deep reef, which was revealed by the lighter blue of the sea. Hipour bore away westward, and we streamed fishing lines astern. Soon a dorado was flapping on deck, followed by a large barracuda—or rather its head and formidable jaws. The body had been sheared clean away by a single bite of a shark.

"Ow!" yelled Hipour, miming great pain. He rubbed an old puckered scar on his thigh, legacy of a shark that had attacked him as a boy while he was spearing fish off a reef.

An hour later Ulutak raised Pikelot ahead. We had sailed a hundred miles to a perfect landfall on a 500-yard-long speck in the sea. Because of the safety screens provided by the series of deeply submerged reefs and the zone of homing birds, the navigation is regarded as routine. Parties frequently sail from

Turtle kabobs—intestines skewered on coconut fronds—broil over a crackling fire as the voyagers to Saipan hole up on West Fayu, just one day out of Satawal, hoping for a favorable wind.

"We waited a week," laments deVore, who labeled the turtle innards as "crunchy, juicy, and very tasty." The main course, the rest of the turtle, roasts beneath the coals.

Here the voyagers also took the opportunity to patch the leaking hull of the Pacifica, one of two canoes to make the journey. They hauled the boat ashore by brawn over a bed of coconut-log rollers.

Puluwat to Pikelot on the spur of the moment, while drunk on palm toddy. They always arrive.

Toward sunset, we reluctantly issued forth into a wild sea, using the motor to assist the drive of the canvas. Saipan's actual direction from Pikelot, said Hi-pour, was a shade to the left of the setting Little Bear position, or about 345°. (Laying off this bearing on the chart after our return, I found it to be almost precisely as he had said—344°.)

But this was not the steering course for Saipan. We should encounter a west-going wind and current the whole way, he had been taught; counteracting these in moderate winds would call for a heading toward the North Star. However, in strong winds such as we were encountering, it had been customary to make an even greater correction for the first hundred miles or so.

Our course for the moment would, therefore, be toward the rising Little



Bear, 10° or 12° east of north, although Saipan actually lay 15° or 16° west of north. When, in the navigator's judgment, the time was right, we should alter course to due north.

FOR FIVE MORE DAYS we sailed, reading only sun, stars, and swells.

One morning, as I steered by the sun shining through the wheelhouse window, I realized how automatic the processes of observation and judgment were becoming. The sun at this hour was curving away southward, yet I needed no conscious effort to adjust course. With the far more experienced Hipour or Ulutak at the helm toward evening, the steering star that became visible in the darkening sky would always appear right on the forestay.

The fourth evening from Pikelot we hove to at nightfall, for Saipan could not be far away. We estimated we were about opposite and well to windward

(east) of Saipan, and had overcompensated for wind and current. Long swells from the east, undisturbed by any unseen island, reassured us that the Marianas must lie in our lee. The great height of these islands, the relatively short distances between them, and the reported abundance of homing birds, including boobies, formed a continuous "screen" in our lee. Only at night could we pass through it unwittingly.

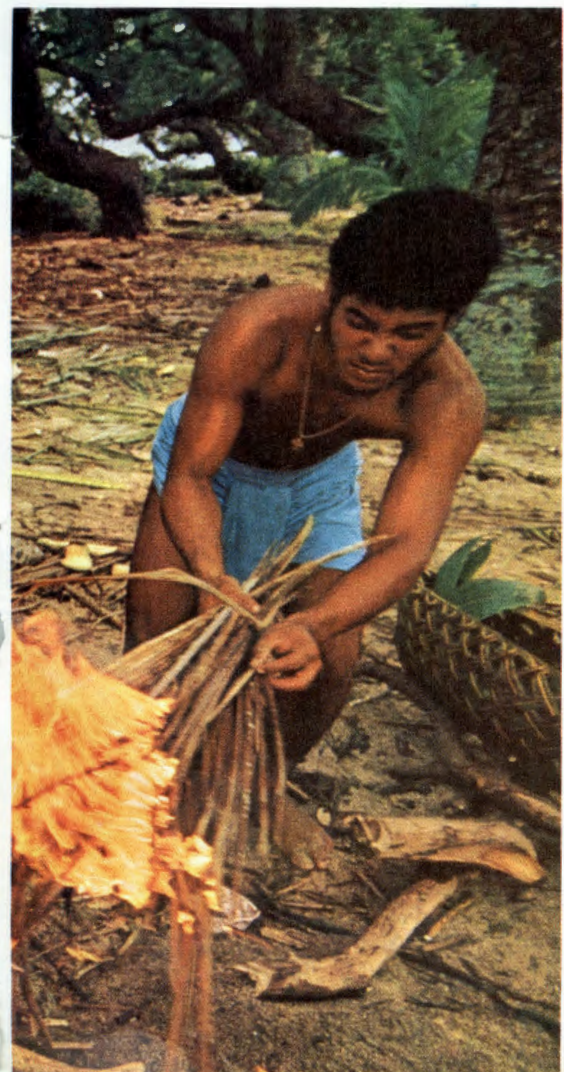
In the morning we got under way, following a course designed to cut obliquely through the Mariana chain. Before long, Hipour and Ulutak, who had been intently scanning the sea, began to make out occasional pairs of terns, noddies, and boobies. Later in the morning they spotted a distant flock of five boobies circling after fish; at noon, four boobies and a noddy. The casual observer may not notice seabirds, even close inshore. That day brought home to me how many can be seen by men whose lives often depend on it.

Around 4:30, a wheeling flock of a dozen boobies appeared and excitement mounted. Land must be very near; could we but keep the birds in view until dusk, they would fly unerringly toward it.

Visibility deteriorated as the tense afternoon wore on. Ulutak's eyes had become red and bloodshot; he had now climbed into the lower rigging. Then his triumphant yell announced the sighting of an undulating object 16 to 18 miles away, in the haze over the port bow—unmistakably an island.

Three of the boobies broke off their fishing and flew off low and arrow straight toward the distant bit of land. It proved to be Farallon de Medinilla, the first island beyond Saipan and 50 miles north by east of its bigger neighbor. I recalled the saying of the Tongan navigators: "It is enough that we strike the *rov* of puko trees."

Saipan itself materialized out of the haze soon after noon the next day. That evening, exactly a week after leaving Puluwat, we nosed alongside the pier, with Hipour and Ulutak calling excitedly to compatriots ashore. A European lady gazed down disparagingly at me on *Isbjorn's* weatherbeaten deck.



"That," she said to her husband in a penetrating voice, "is a most degenerate-looking old half-caste."

That night we celebrated. Hipour and Ulutak, wearing only their scanty breechclouts, were completely at ease as they did the rounds in the company of the old half-caste.

WHAT HAS BEEN preserved in Puluwat is not only the heritage of Micronesians and Polynesians. It is the last legacy of uncounted generations of the great captains of all mankind. Hipour paid me a true compliment following our successful voyage to Saipan and back.

"Your name will from now on be 'Hipour'. I shall be called 'David'."

In token of my "adoption," Hipour suggested I might like to be tattooed. This was how I found myself, rather to my own alarm, lying on a mat before the men's house. A bamboo instrument tipped with frigate-bird bone was poised, while onlookers cheerfully regaled me with predictions of how much it was going to hurt (not very much, it turned out).

The scene was one from yesterday—the pandanus-thatched houses under the palms, the circle of grinning, tattooed men in their breechclouts, some with hanging earlobes, the giggling bare-breasted women. Nothing was of this century. Nothing, that is, except the tattooing pigment. It was concocted not from some exotic herb, but from the contents of an old flashlight battery!

Barry and I bade a reluctant farewell to Puluwat that night after re-installing the compass for the long 1,500-mile haul to the Gilbert Islands. The next noon sight showed we were 40 miles off course. A search brought the culprit to light—a knife, lying forgotten beneath the compass bracket, that had affected its magnetism.

"We would have been far better off," remarked Barry, "to have kept on using the stars."

IN THE 1,700 AND MORE sea miles sailed without instruments as a pupil of the last great navigators, I had learned to steer by star horizon courses, to find latitudes of islands by knowing their zenith stars. I had learned, too, the various methods used by the Pacific navigators to expand their small targets into wide screens, marked by cloud formations, bird zones, wave patterns broken by islands, and other signs. I had seen the mysterious te lapa flashing far under Pacific waters.

What my friends Tevake, Hipour, Iotiabata, and the others had demonstrated beyond argument was that the ancient methods of navigation were also fully adequate for deliberate two-way voyages across those enormous empty sea-lanes that we know the Polynesians crossed many times a millennium ago.

*Mine is the migrating bird
Winging over perilous regions
of the ocean,
Ever tracing out the age-old path
of the wandering waves. . . .*

So runs the Tuamotuan *fangu*, or sacred chant. But now, in the words of Te Rangi Hiroa, New Zealand's most distinguished Maori scholar, "the glory of the Stone Age has departed out of Polynesia."

A few months after I returned to my home in New Zealand, Tevake wrote to ask if I was setting down all that he had taught me, adding that he was beginning to feel very old and was rapidly becoming weaker. I replied immediately, reassuring him.

Months later I heard the sequel. The spirit of Tevake, the dying tropic bird, could not be confined but must soar one more time to ultimate freedom. The veteran navigator had bade formal farewell to his family and lifetime friends on Nifiloli and, seating himself in a one-man canoe, had paddled out into the ocean he loved on a voyage of no return.

Winged navigators, gannets soar above their New Zealand rookery. Along with frigates, terns, and boobies, they roost ashore and feed at sea. Dawn and dusk flight paths point the way to land—journey's end for weary mariners.

ALFRED H. BAILEY







*Toy canoes glide on a silvered sea,
an outrigger returns home, and lazy
afternoon settles over Satawal. A boy's
play betrays his dream: to feel the swells,
to follow the stars, to steer a man's
canoe along the seaways of those
who have gone before him. □*

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THE ISLES OF THE
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HERMAN MELVILLE once described the relationship between human genius and man's perception of it as a "shock of recognition." I like to think that Melville, who wrote so eloquently of the Pacific and its peoples, would have enjoyed this month's four-part presentation on the Pacific Islands—for it all began with just such a shock.

Author David Lewis made a casual inquiry of a Tongan about sailing directions through a reef-studded archipelago. "I was flabbergasted by his reply," he recalls, "for it meant that the age-old lore of the sea by which the Polynesians had populated the Pacific was still known—by a few, but known."

David devoted three years to the search for that ancient knowledge, and found it, an achievement that helped earn him the Gold Medal of the Royal Institute of Navigation and the Superior Achievement Award of the Institute of Navigation of the United States, a rare double, richly deserved.

To bring this epic tale to our members, our editors, photographers, and writers logged a combined 200,000 miles of Pacific travel—though not without hazard. Photographer William Curtsinger was attacked and twice slashed by a shark while swimming in the lagoon of a remote and uninhabited island. The fact that David Lewis is a physician and had a supply of antibiotics probably saved Bill's life.

His colleague, Nicholas DeVore III, found himself just in time to join a Micronesian crew for an extraordinary canoe voyage of 550 miles across the open ocean. Nick suffered from intestinal flu the whole way: "Nine days on a wet roller coaster." He was alert enough to notice, however, that the crew had added a new element to the ancient navigational repertoire of wind, wave, star, and bird—jet contrails, marking the Pacific sky and pointing the way to land.

Artist Herb Kawainui Kane, who grew up in the steep Waipi'o Valley on the "Big Island" of Hawaii, combines the talents of artist, sailor, and amateur anthropologist. "All Polynesian culture relates to the canoe," claims Herb. He and his friends in the Polynesian Voyaging Society hope to underline that point when they sail a 60-foot double-hulled canoe to Tahiti and back in 1976, using navigational techniques that the world thought were long forgotten.

Several times this past year we had the pleasure of "pulling out all the stops" for an article we thought deserved it—the world-ranging and timely story on gold, the survey of American wilderness at a crossroads moment, the achievement of our frontier in space, Skylab, our account of the glory of the Phoenicians, and that mind-dazzling summary of our new knowledge of the universe itself.

At the moment, our writers and photographers are sailing in the wakes of Columbus and Drake, ranging the new Alaska, exploring the remains of Maya and Celtic civilizations, probing the archives of the American Revolution—but we will let their work speak for itself in forthcoming issues.

It seems a shame that our popular associate in geographic adventure, the award-winning National Geographic Society television series, will be represented by no new programs this year. Word that we had been unable to obtain a commitment from the networks for prime viewing time reached my desk just before the news that one of last season's documentaries had won two coveted Emmy awards. In this case, the shock preceded the recognition.

Silvestro Brown

- ISLES OF THE PACIFIC**
I—Coming of the Polynesians 732
Recent research, says famed anthropologist Kenneth P. Emory, finally allows us to reconstruct one of the great explorations of all time—the discovery of the Pacific Islands.
- II—Wind, Wave, Star, and Bird 747**
Putting away his compass and charts, veteran voyager David Lewis rediscovers the "lost" arts of the Polynesian navigators. Photographs by Nicholas DeVore III.
- III—The Pathfinders 756**
Two thousand years of Pacific seafaring spring to life in the paintings of Hawaiian artist Herb Kawainui Kane.
- IV—Problems in Paradise 782**

Even the idyllic South Seas face growing environmental hazards, conservationists Mary and Laurance Rockefeller learn. Photographs by Thomas Nebbia.

SUPPLEMENT: Islands of the Pacific and Their Discoverers, distributed with this issue.

The Enduring Pyrenees 794
Robert Laxalt, himself of Basque descent, and photographer Edwin Stuart Grosvenor travel through the sequestered mountain domain of the French-Spanish border.

The Columbia River 821
Writer-photographer David S. Boyer traces the river that, more than any other in North America, has been tamed to work for man.

China's Newest Treasures 848
A shroud of jade and a flying horse highlight the trove of Asian art now touring the Western World. Photographs by Robert W. Madden.

Caribou: Hardy Nomads of the North 858
Jim Rearden tells of Alaska's still-immense herds of barren-ground caribou—the "buffalo" of the last U. S. frontier.

COVER: "Eyes full and sparkling," wrote Bounty mutineer James Morrison of Polynesia's women. Photographer H. Edward Kim confirms the observation in this portrait of a girl of Bora Bora.