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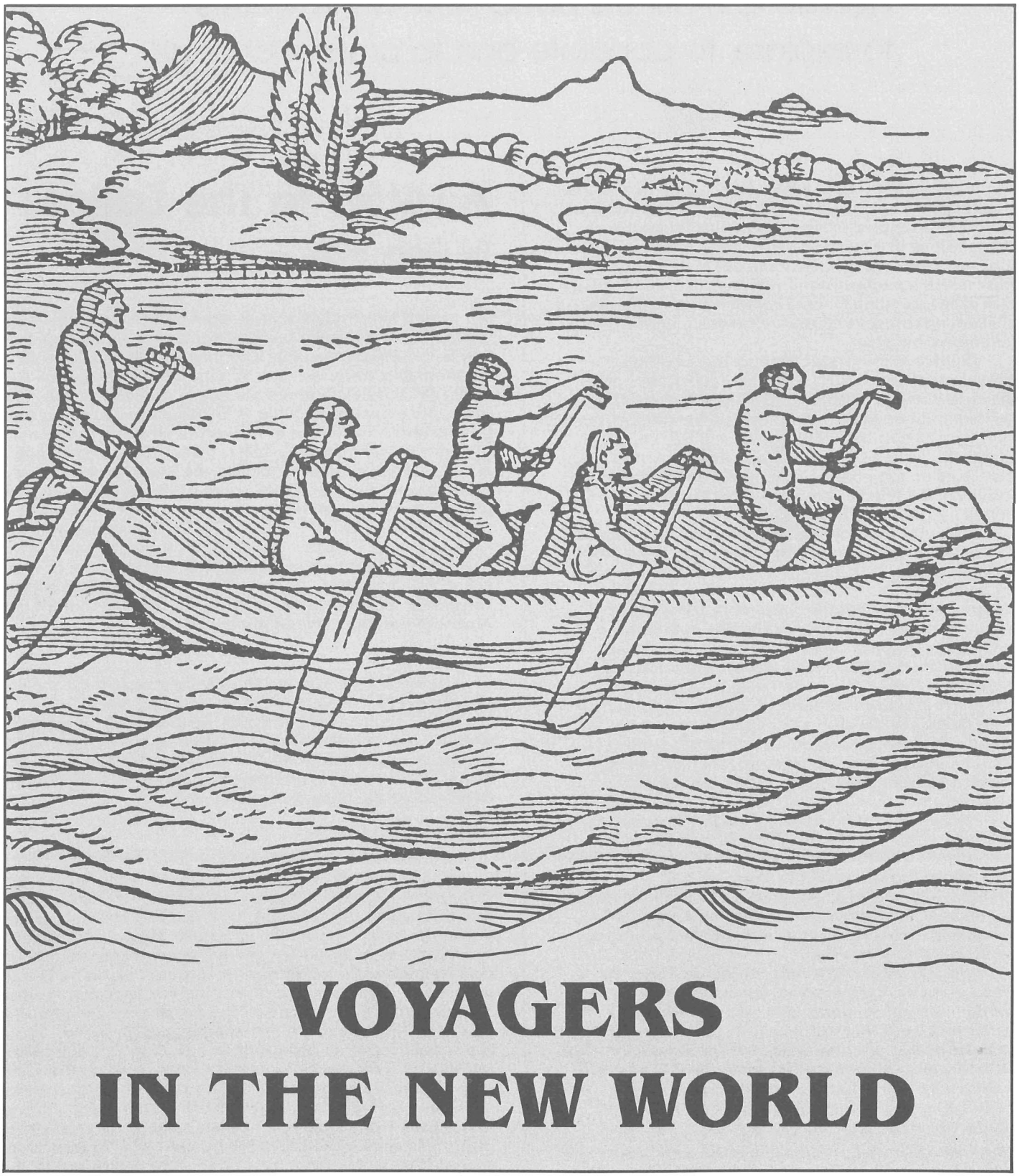


VOYAGERS IN THE NEW WORLD

Across Seas, Along Shores

Prehistoric mariners plyed New World waters to explore, to populate and to prompt change

In response to our last *Newsletter* on the New World ships of discovery, we received a letter from a reader that ultimately prompted the focus of this succeeding issue. Admonishing Institute researchers to be aware of prehistoric maritime materials and traditions in the course of their search for early historic evidence, INA member Gary Blair called attention to the scholarly school of thought concerning voyages to the Americas that preceded the Europeans' by ages.

The idea of prehistoric transoceanic crossings is a controversial notion that awaits more substantive proof than presently is available for widespread scholarly acceptance, although many scientists quietly allow that such voyages probably transpired. As yet, no INA projects or associates, or Texas A&M nautical archaeology students, have fixed on this problem specifically, and therefore we include Blair's letter as a reminder that the topic is a potent one awaiting further study.

More certain evidence has been assembled about the nature of prehistoric seafaring *within* the New World, and it is on this subject that the present *Newsletter* focuses. A particularly relevant report has been prepared by INA member Michael Creamer concerning a project he has assisted, sponsored by the National Institute of Anthropology and History (INAH) of Mexico, under the direction of chief underwater archaeologist, Pilar Luna, with whom INA has worked on numerous occasions. Creamer's article on the study of Mayan maritime enterprise on the Caribbean coast of Quintana Roo reveals not only the sophisticated nature of aboriginal seafaring efforts but also the innovative nature of research being conducted by modern archaeologists to unravel the Maya's secrets.

Additionally, an article is included which is intended as a general introduction to current knowledge of native vessels and trade in Middle and South America. Presented in a popular format—that is, without source citations—the material nonetheless is drawn from scholarly works and has received invaluable input from INA member Margaret Leshikar, an authority on prehistoric watercraft of the Americas.

With this latter article, not only do we wish to introduce a body of information, but we also wish to open the door to future general reports by INA associates concerning aspects of maritime history. The breadth of knowledge among Institute scholars and Texas A&M nautical archaeology students far exceeds what is indicated by the *Newsletter*'s customary project reports. It is our interest to begin sharing some of this information with INA supporters in this and future issues.

Page 1 illustration by G. Benzoni in Historia del Mondo Nuovo, *1563.*

A Letter To The Editor

By Gary Blair

I would like to attach a small addendum to the approaching celebration of the Columbus Quincentennial—a short dedication to the ancient mariners who intentionally or accidentally, but inevitably, traversed natural routes across the earth's two great seas and encountered the coasts of the Americas. That such voyages were possible is indisputable; scholars have described the unavoidable, conveyor-belt quality of primary oceanic winds and currents such as the Gulf Stream, the tropical Atlantic and Pacific tradewind belts, the South Atlantic drift, the Peru Current, the Kuroshio Current of the North Pacific, and the Indian Ocean trades. However, the influences wielded in the ancient New World by the ancient Old apparently were of a subliminal type, such that there is clear secondary evidence but nothing as blatant as a handwritten logbook, an officially witnessed land grant, or even the remains of some ancient cargo ship that was swept away on the Canary Current into American waters . . . at least not as yet.

I beseech all of you at INA to keep a vigilant eye in your searching and travels through underwater America for the artifacts and ephemeral hull-traces of pre-Columbian voyagers. However precious are the relics of ships and men of the Age of Discovery, even more so are the priceless clues to the movements of the wanderers, refugees and heros of ancient times who reached the same distant shores.

At some point, scholars will have to confront the dumbfounding quantity of evidence which speaks of ancient contacts with America. In all of the pieces, large and small, of stone and terracotta art in the Americas, why is it that the ones which obviously do not represent aboriginal types "accidentally" convey very clear likenesses to nearly every human population that lived along the ocean-shores surrounding the American continents? Is it mere chance that the vast majority of those non-native embodiments delineate the Chinese, Indonesians, Ainu, Romans, Africans, Semitics, Arabs and Europeans? There is no racial shame or arrogance in admitting that later Asian seafarers are of the same Mongolian family as the earlier land-trekkers across the Bering Strait. With a map of Pacific currents and winds before you, it is evident that one of the shortest routes from Hong Kong to Acapulco is along the great circle, within reasonable distances to the Japanese and Aleutian Island chains. If you look down on a globe from approximately the

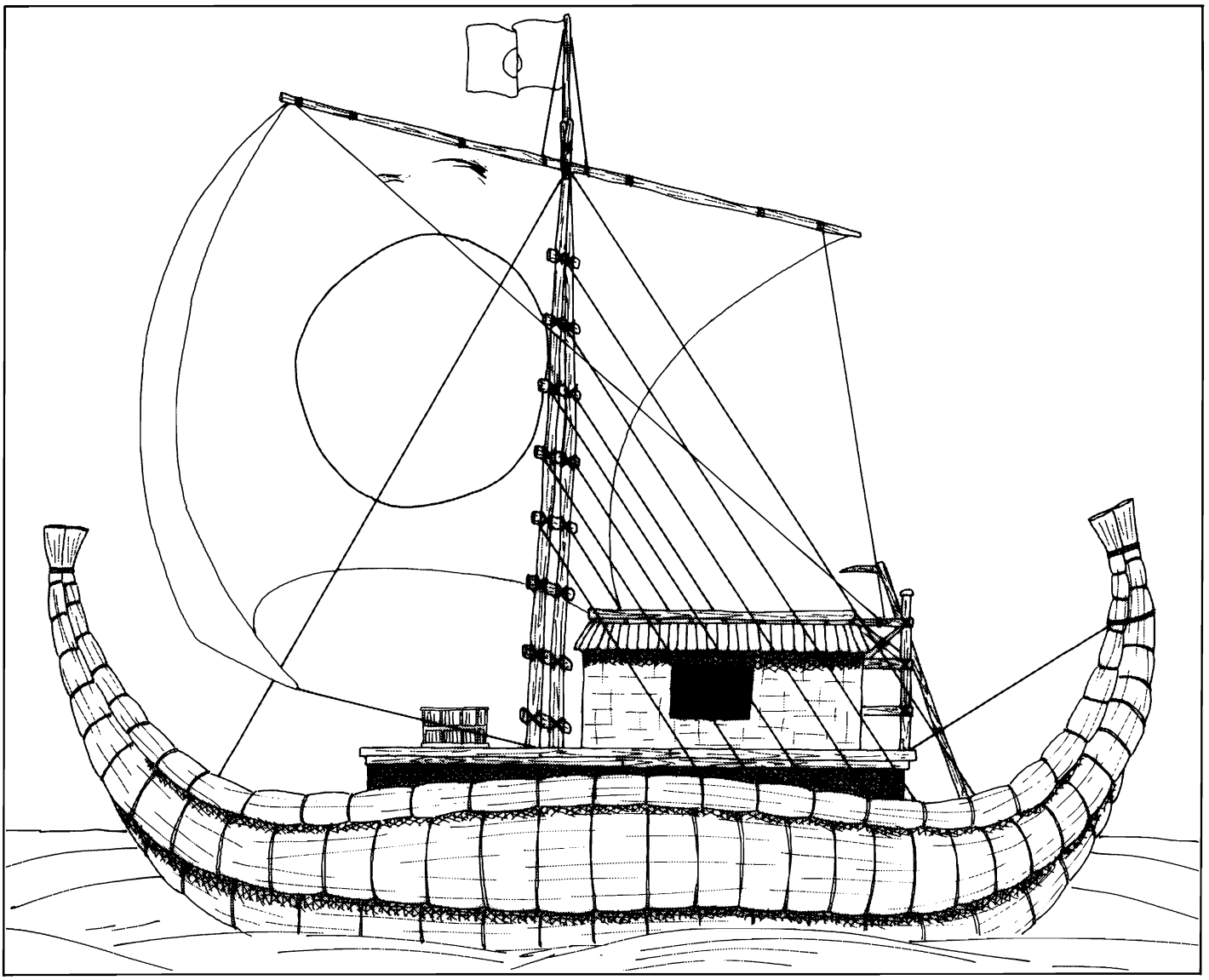


Illustration: Joe Simmons

Any number of "archaic" types of sea-going craft would have been capable of oceanic and coast-hopping journeys

North Pole, you can see that such a journey would be executed along a relatively straight coast, with rarely an open-sea crossing of even two-hundred miles. And were you to measure the distance from the Cape Verde Islands to the bulging northern coast of Brazil and deduct the daily westward set of the current, you might find that this voyage seems far less difficult than the well-documented Phoenician circumnavigation of Africa in ca. 600 B.C.

Any serious student of pre-Columbian art and culture must sense the surging enigma in the works of the Olmec, Maya, Zapotec, Costa Ricans, Chavín, and Mochica. The profuse variety of depicted humankind takes the breath away; the mind starts spinning out the impossible but unavoidable conclusion that the ships must be there somewhere, under the silt and muck, or under the embalming coral, rubble and detritus. Where is the ship of the pre-Odysseus man who survived an Atlantic crossing? Where are the remnants of vessels that brought the multitudinous characteristics of mainland and island Asia? Where are the anchorages of the native Africans swept across the Atlantean lake, long before the days of Amerigo Vespucci and company? Any number of "archaic" types of sea-going craft would have been capable of oceanic and coast-hopping journeys: Formosan bamboo sailing rafts, unseasoned balsa-log sailing rafts, papyrus reed-bundle ships, oceanic dugout and planked canoes, early Chinese planked and bulkheaded junks, Phoenician, Sumerian and Egyptian planked ships, and other Mediterranean and Atlantic-coast vessels of the long and round varieties.

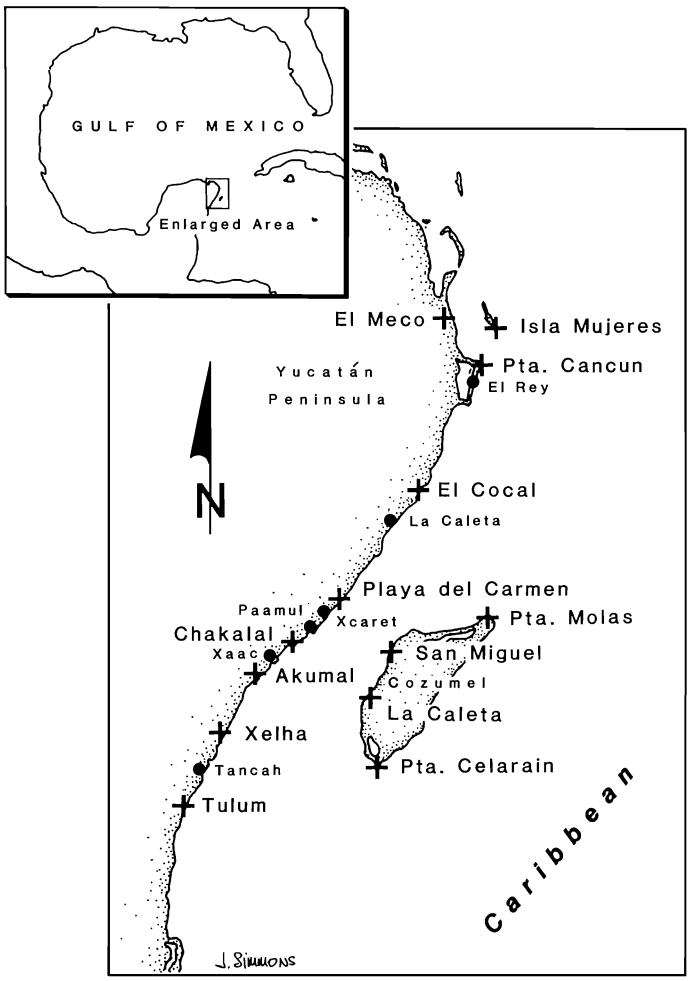
A resident of Santa Cruz, Calif., INA member Gary Blair is a wooden boat builder and a metro bus driver.

Maritime Secrets Of The Maya

Survey explores possible relationship between Mayan coastal ruins and coastwise navigation

By Michael Creamer

In 1984 and 1985 a series of surveys and experiments were conducted along the Yucatán coast of Quintana Roo to ascertain which Mayan coastal sites of the Postclassic (ca. A.D. 900-1500) were directly related to or visible from the sea. Under the direction of Pilar Luna, nautical archaeologists from Mexico's National Institute of Anthropology and History (INAH) and associates of INA and Texas A&M sought to determine whether site locations or specific site features could have had a bearing on coastwise navigation and, by implication, Mayan maritime trade. The primary question we posed was this: could any of these pre-Hispanic structures have served as diurnal or nocturnal aids to navigation?



Thirteen locations on the Caribbean coast of the Yucatán peninsula were found to share Mayan ruins and modern aids to navigation. (Illustration: Joe Simmons, after the original by Michael Creamer)

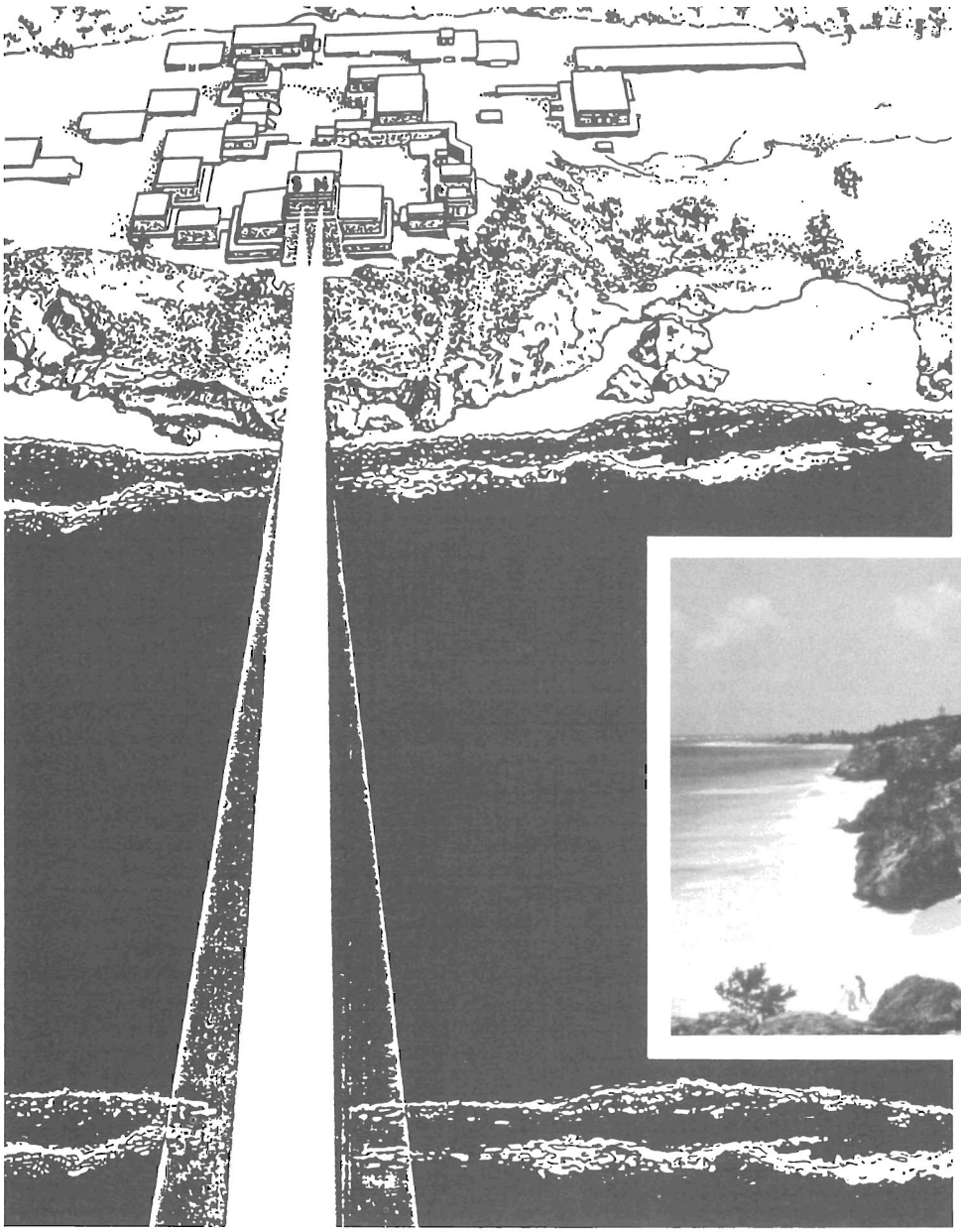
Archaeologists have written for years about the complexity and magnitude of waterborne commerce conducted by the Putún Maya. Trading in obsidian, jade, copper, gold, cotton, cloth, pottery, salt, honey, and the ubiquitous Middle American form of currency, cacao, the Mayan merchant class was second in power only to the class of priests and nobles. One model of trade proposed by Norman Hammond suggested that the Maya used transshipment points at Moho Cay in the Gulf of Honduras and at the island of Cozumel, at which bulk cargo carried by long-distance vessels was redistributed to local destinations by smaller canoes, as in modern maritime practice.

The sophistication of these "Phoenicians of the New World," as J. Eric Thompson called them, is seen in their mass production of trade goods that reached as far afield as Panama and modern-day Mexico City. Standardized statuary torsos were finished off with modular heads and limbs. An economy-line of jadite axes was available for burial purposes, and nesting pots of gradually diminishing size appear to have been designed for easy shipment of large lots by water. J. A. Sabloff and W. L. Rathje suggested that the acres of raised platforms on Cozumel were all-weather storage areas for goods, useful in stabilizing market prices as well.

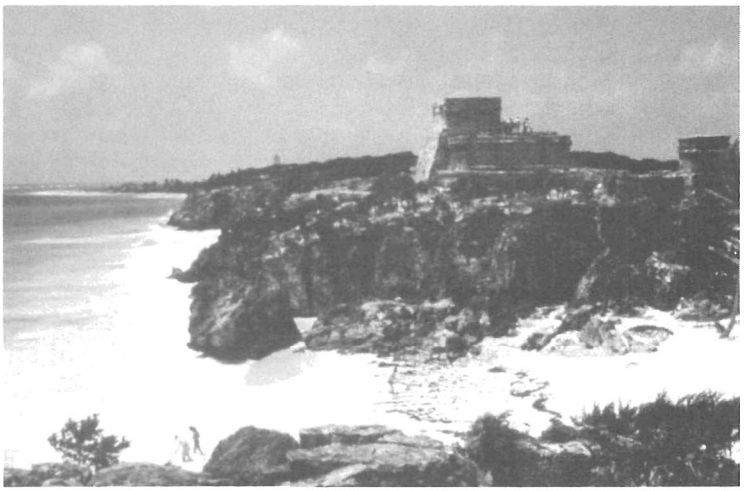
Modern and ancient similarities

Of the seventeen modern lighthouses and aids to navigation that INAH archaeologists studied during the 1984 survey, at least thirteen shared their rocky points, reefs and harbor entrances with Mayan structures or ruins. To test whether such areas might have been navigable in ancient times, experiments were planned for 1985 at Tulum with support from the National Geographic Society and from the Institute of Nautical Archaeology through a grant from the Kempner Fund. However, first it was necessary to prove that the *caleta,* or beach cove, at Tulum could have been a suitable landing place for indigenous craft. Thus, a four-meter dugout was recalled from duty as restaurant decor on Cozumel, and team member Ric Hajovsky launched the tender vessel within the reef confines. He successfully landed the little craft on the gently sloping beach without taking on so much as a cup of water. Our exercise in experimental archaeology demonstrated that at least one of the coastal sites could have served as a Mayan entrepôt for canoe traffic.

El Castillo, the Castle, at Tulum is the most significant Mayan coastal ediface that still can be seen from the sea. The three-story structure is poised above the transparent blue Caribbean on a shear palisade also some ten meters high. Two rectangular *ventanas,* or windows, pierce the seaward wall of the Castillo's third story. In a second experiment, crew members placed a pair of butane gas lamps on the convenient benches inside the upper tower; the coverage and alignment of



Left: *By placing lamps in two seaward-facing windows of the castle tower at Tulum, researchers discovered that the overlapping light beams, when viewed from offshore, marked a natural opening in the reef. (Illustration: David Canright)*



Above: *Perched at water's edge,* el Castillo *tower at Tulum is an imposing structure. In the distance, to the south, is a modern lighthouse. (Photo: Vel Lena Steed)*

the resultant light beams then were observed from the water.

We discovered that the windows of *el Castillo* do cast discrete light beams toward a natural opening in the offshore reef, and demonstrated that a large vessel drawing more than seven feet could be navigated through the cut at night using the Castillo Tower windows as range lights. Modern range light systems generally consist of two lights, one behind and higher than the other, which produces a vertical alignment when a vessel is on course within a restricted channel. In the case of Tulum's horizontal arrangement of lights through adjacent windows, the overlapping of a broad and a narrow beam caused by a difference in window shape proved to be equally satisfactory for navigating the reef channel and avoiding the numerous coral obstructions.

Survey system adapted

Brilliant, flashing strobe buoys were placed by the combined INAH-INA team to mark potentially dangerous coral heads offshore of Tulum. To position these obstructions on charts, readings were taken with a hand-bearing compass to points onshore, and a transit provided triangulation data from land. To further locate the buoys from the water, crew member Vel Lena Steed, a senior cadet at the Texas A&M Maritime Academy, adapted a technique from modern navigational practice which may prove useful in future surveys by nautical archaeologists.

Similar in principle to the system employed on the Molasses Reef Wreck under Donald Keith's direction, using compass bearings and an electronic measuring device from a data base tower, Steed's procedure relied on vertical angles taken with a sextant. When subjected to simple trigonometric calculations and combined compass readings, angles taken from land or sea with a sextant or transit and a baseline or stadia rod target of known height provide distance and bearing from a single point of observation. Complete descriptions of our experiments and the resultant analyses will be presented in forthcoming INAH and National Geographic Society reports.

It is unlikely that we can prove how Mayan mariners actually used Tulum's Castillo Tower or other coastal structures

The research demonstrated that the Maya marked points onshore with structures useful to navigation

Left: *Texas Maritime Academy Cadet Vel Lena Steed took vertical sextant angles from the survey vessel to locate buoys set as aids to navigation.* **Below:** *Paddling toward* el Castillo *tower in a dugout canoe, INAH team member Ric Hajovsky successfully landed the craft at an adjacent beach. (Photos: Michael Creamer; Bud Brinkley; Vel Lena Steed)*

without the discovery of a pre-contact canoe in nearby waters or until a new codex, a painted aboriginal manuscript, comes to light. However, the placement and construction of Mayan temples and shrines seems more than coincidental. The research we conducted demonstrated that the Maya most definitely marked appropriate points along the Mexican Caribbean shore with enduring stone structures that would have been helpful in coastwise navigation. The same dangers and destinations that interest modern navigators were commemorated by Mayan shrines and temples of 500 to 1,000 years ago. It further was shown that illumination of these structures, especially *el Castillo* at Tulum, allowed them to function in much the same manner as modern lighthouses and range light systems.

Many other questions remain to be answered regarding Mayan navigation and waterborne trade, and our results suggest that investigations should be continued in all related areas. We must be careful not to underestimate the level of sophistication the Maya attained in their intercultural and trade networks, but rather to attribute the same clever and conscientious thought to their maritime enterprise as they expressed in other aspects of their culture. Only then will we be able to credit these superior American navigators with the recognition they deserve.

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INA member Michael Creamer is a maritime consultant based in New York City and Galveston, Tex.

Island And Mainland Seafaring

Aboriginal craft that amazed New World explorers are as mysterious to modern scholars of prehistory

By KC Smith

Within a day of setting foot in the Indies, Christopher Columbus began to record impressions of the curious floral, faunal and cultural phenomena he was witnessing. Not surprisingly, among the Admiral's lengthier first comments was a description of the natives' watercraft:

> They came to the ship in dug-outs ["*almadías*"] which are fashioned like a long boat from the trunk of a tree, and all in one piece, and wonderfully made . . . , and so big that in some came 40 or 50 men, and others smaller, down to some in which but a single man came. They row with a thing like a baker's peel and go wonderfully, and if they capsize all begin to swim and right it and bail it out with calabashes that they carry.

Columbus's moniker for the vessels reflected his maritime ken, for the Portuguese word *almadía* in fact referred to native dugouts of the West African coast. Only after he had seen many more of the New World hewn vessels, and presumably had discussed them with native translators, did he adopt the Amerindian term of *canoa.* As for the unfamiliar implement he likened to a "baker's peel," even his long years at sea could not help him to explain; his was the first European contact with a native canoe paddle.

During this and succeeding voyages, the Columbian crews continued to make note of aboriginal vessels, clearly fascinated by their simplicity, construction, and maneuverability. After one reconnaissance on shore, the Admiral noted that he had seen "a boat-house, very well arranged and roofed, so that neither sun nor water could do damage and in it there was another canoe, made of a single piece of timber . . . , the size of a *fusta* of seventeen benches, and it was a pleasure to see its workmanship." Likewise, the gentleman-sailor Michele de Cuneo, on board the second expedition, also compared the aboriginal canoe to a more familiar vessel: ". . . while we were lying at anchor we saw coming from a cape a canoe, that is to say a boat, which is how they call it in their language, going along with oars so that it looked like a well-manned *bergantino.*" Columbus's son Ferdinand, who chronicled his experiences as a young boy accompanying the fourth voyage, later recalled seeing "a canoe as long as a galley and eight feet wide, all of one tree and like the others in shape."

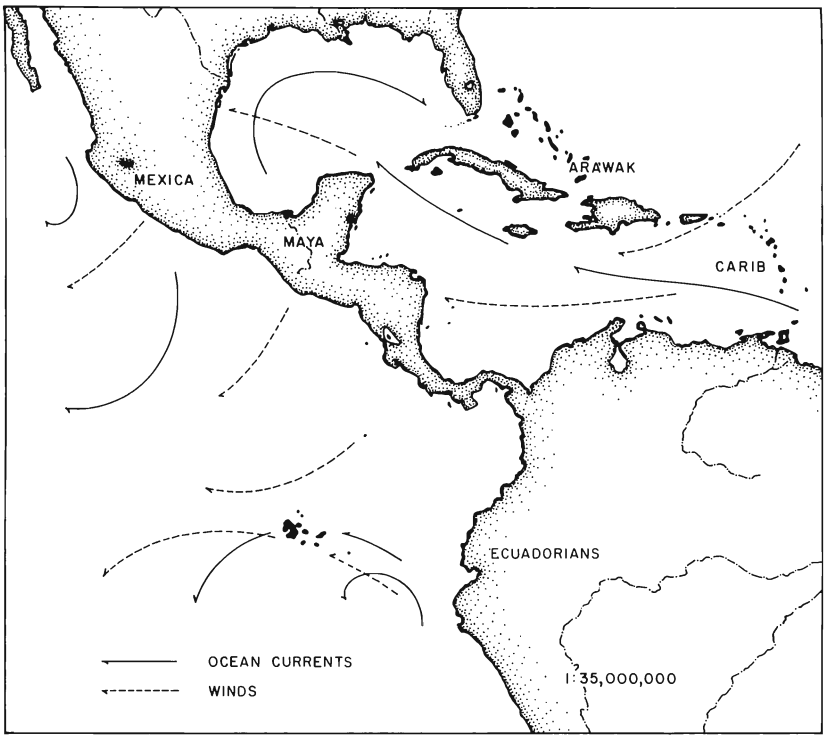
As to what that shape might have been and how it functioned for the natives, Columbus provided one of the most succinct descriptions in a letter sent to Spain:

> Each of these islands has a great number of canoes, built of solid wood, narrow and not unlike our boats in length and shape, but swifter in their motion: they steer them only by the oar. These canoes are of various sizes, but the greater number are constructed with eighteen banks of oars, and with these they cross to the other islands, which are of countless number, to carry on traffic with the people.

The utility of these accessible small craft did not escape the Spaniards—indeed, the Admiral himself might have perished when marooned in Jamaica during his fourth voyage, had he not dispatched two loyal mariners with Arawak men and dugouts to Hispaniola—and quite naturally, the colonial enterprise came to rely on local boats and paddlers for such tasks as transporting supplies between coastal and inland settlements. Likewise, Amerindians sometimes were taken aboard Spanish ships to help pilot through treacherous areas. Throughout the early historic chronicles, one finds a clear sense of amazement and admiration on the part of the Europeans for the size and seeming seaworthiness of the simple vessels that the natives handled so deftly.

However, as convenient as they were to move men and matériel, aboriginal watercraft of the New World had a local significance which 16th-century European ethnocentrism could not have fathomed. Beyond their role as tools of trade and subsistence was their symbolism of antiquity and cultural ingenuity—one which reflected a history of maritime utilization and movement as adventurous and successful as any the Old World had to share. Amerindians had populated the Caribbean via their boats; they had borne goods and ideas by water throughout the Americas; and they had incorporated small craft as integral elements into their cultural economies, not only in coastal areas but along inland water courses as well. From trees, reeds and skins they fabricated rafts and shallow-draft platforms, graceful sailing vessels, one-man tubs for cabotage, and ocean-going liners that carried more than a hundred voyagers, and they made these vehicles with stone and shell tools, and fire.

Whatever aspects of aboriginal boats the New World colonists may have failed to appreciate, they at least had specimens to observe, to use and to modify. Modern scholars of prehistoric maritime traditions have been stymied in their studies by a dearth of material remains. This is less the case in North America, where prehistoric boats have been excavated in numerous locations. Sites in Middle and South America, however, have been frustratingly stingy in providing evidence of hulls or hardware, for several explicable reasons. Not only are purposeful efforts to find such remnants recent and incipient, but also archaeologists have not established whether present technology is effective in targeting the subtle signatures of prehistoric craft. Moreover, the preservation of friable indigenous construction materials will have depended on the circumstances of their burial. It is significant that of the reported maritime artifacts presumed to be pre-Columbian, all were found either in completely dry or completely water-laden contexts: single paddles in the Bahamas and Cuba, and a canoe



Map denotes prevailing wind and current patterns. A 16th-century woodcut by Oviedo shows Spaniards transporting horses in native canoes lashed together. (Map: Kathy Reese; Illustration: Henry Huntington Library)

in Jamaica—all discovered in caves; a paddle found in a lake in Trinidad; and a dugout excavated from wet soil beneath modern Mexico City.

In the absence of actual specimens, scholars have turned to other sources for information about aboriginal watercraft of Middle and South America. The most insightful have been native codices and artworks, including murals, models, and petroglyphs; and the early European chronicles. On the premise that some boat-building customs are indomitably enduring, modern forms also have been studied and compared to Contact Period descriptions of native vessels to identify features that have remained unchanged. Archaeological evidence that is inferential rather than empirical, but nonetheless valuable in tracing the antiquity and range of Amerindian watercraft, has come from surveys of maritime centers, the dating of insular populations, and the identification of cross-cultural artifacts or traditions among disparate populations.

Through this cumulative evidence, scholars now have a sense of the cultural connections in time and space which prehistoric watercraft connote and can hypothesize about vessel types, uses and distributions, even if they cannot precisely describe their construction and heritage. Excluding prehistoric North America, three areas in the Western Hemisphere have been identified in which maritime enterprise flourished, involving different ethnic populations with varying vessel traditions: throughout the islands of the Caribbean, along the Pacific coast between Peru and western Mexico, and from the Yucatán peninsula as far south as Panama.

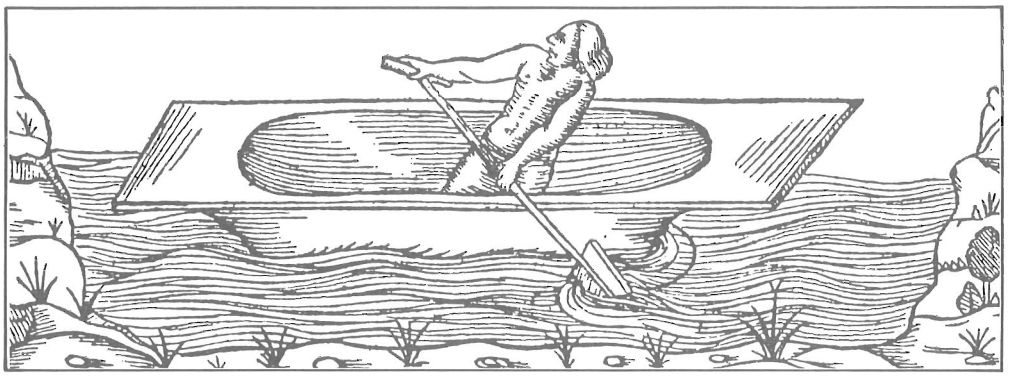
While the following discussion of these maritime traditions is based on current scholarly theories and hypotheses, it is important to note that *many* aspects of these subjects remain issues of debate; aboriginal knowledge of the sail is an example. Even the translation of critical passages from historic chronicles tends to vary among scholars, who often offer differing or conflicting interpretations. The object of this article is to introduce interested readers to some of the explanations in a popular and general format. Queries about sources are invited, although several have been cited at the conclusion for readers inclined to make their own explorations of the seafaring accomplishments of New World mariners.

Population of the Indies

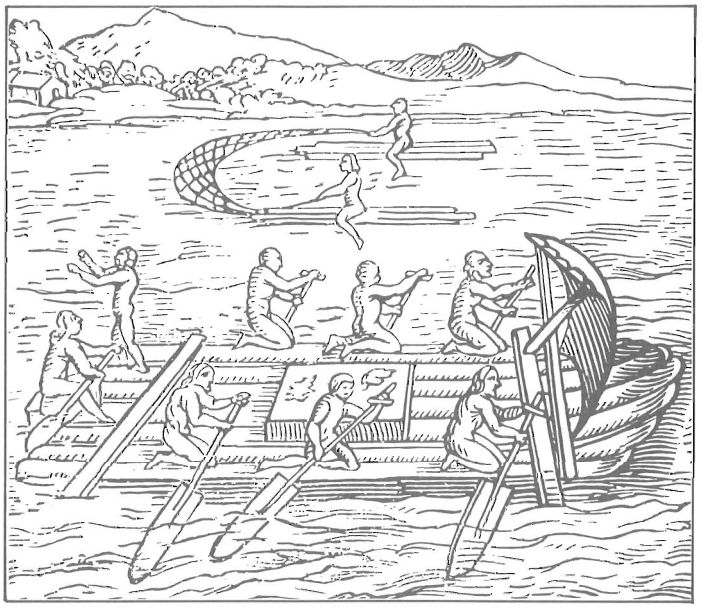
By demonstrating the age of insular populations, all of whom originally were immigrants, scholars are able to build a strong case for the antiquity and diffusion of prehistoric boats. Based on radiocarbon dates and material analogues in the Caribbean and northeastern South America, archaeologists now suggest that occupation of the Lesser Antilles began as early as 5500 B.C., and that pre-agriculturalists were living in several Greater Antillean locations between 3195 and 2600 B.C., although island-wide habitation was not consolidated for another 600 years.

That the initial discovery of the island chain may have been a fluke has been stated more than once. The scenario suggests that an unfortunate native aboard raft or canoe inadvertently was jettisoned amid Orinoco outflow into the Atlantic and carried by indomitable currents to the shores of Trinidad, Grenada, or some other distant oasis. Certainly, natural wind and water patterns could have permitted such a high-seas kidnapping. At some point, however, migration with greater premeditation was effected because tools and plants were moved as well as people, and it is with this date—at least two millennia ago—that the routinized use of watercraft as long-distance cultural vehicles was established in the Indies.

The exact homelands of the earliest voyagers remain unknown, as does the nature of their waterborne transit. It has been suggested, based on archaeology, that northeastern South American populations of 5000 to 2000 B.C. did not have the appropriate equipment for making dugouts and thus traveled to the Antilles on rafts; it took the addition of the shell gouge to their tool kits sometime after 2000 B.C. to enable the manufacture of canoes. However, in light of the early habitation dates proposed for the Indies, and the fact that stone and coral tools have been found at related sites, the possibility of canoe construction by early mariners warrants further consideration.



Right: *An Amerindian canoe, illustrated by Oviedo in* La historia general de las Indias, *1547.* **Below:** *Rafts of Ecuador as drawn by G. Benzoni in* Historia del Mondo Nuovo, *1563.*



Moreover, while island-hopping by raft up the Lesser chain seems reasonable given the short distances between landforms, the plausibility of open-sea crossings into the northern Antilles would have depended on the fortitude of the vessels.

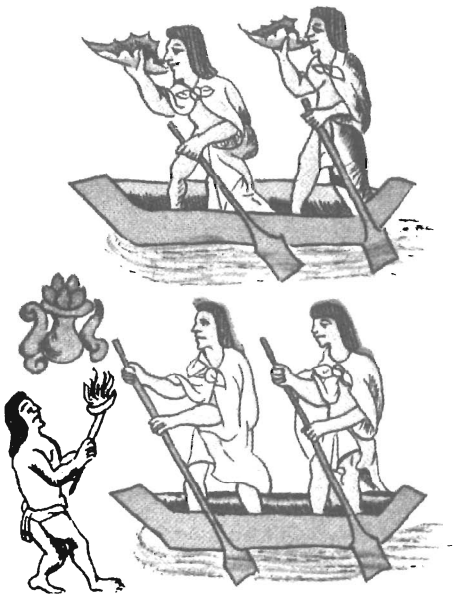
The two Amerindian groups whom the Iberians first encountered entered the islands in separate migrational waves. The Arawaks, who brought ceramics and agriculture, began to spread northward from ca. A.D. 100, reaching the Bahamas a millennium later. The Caribs, after whom the Caribbean Sea is named, arrived a few hundred years before the Spaniards, driving the southernmost Arawaks out of the Lesser Antilles and into the Greater chain. That both groups were formidable seafarers was reflected not only in their distant island-hopping migrations but also in cultural patterns of subsistence and trade. Archaeological evidence in the form of faunal remains and artifacts has attested that offshore marine resources were exploited widely by the Arawaks to augment grown foods, and also by the Caribs, who were poor incipient horticulturists.

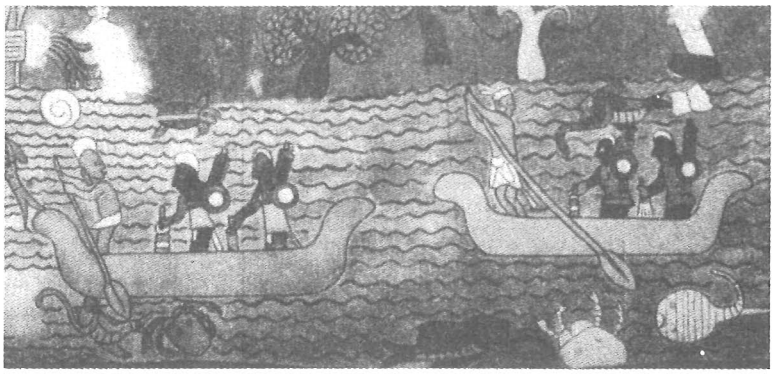
Likewise, comments in chronicles demonstrate that interisland travel for various reasons was commonplace. Las Casas described the inhabitants of the Mona Passage area, noting that "each day the Indians from this island would sail to that island in their canoes and small boats, and those from that island would sail to this one, and so they would talk, so that each would know what was in the other's land." Of the Caribs, who frequently raided Arawakan villages to seize foodstuffs and slaves, Columbus wrote, ". . . each and all of them wage war against the other neighboring islands, and for the purpose of attacking them, make voyages of a hundred and fifty leagues at sea, with their numerous canoes."

While aboriginal representations in artworks and artifacts are limited, there is no dearth of historic descriptions about Antillean small craft as they had evolved by the Contact Period. The Europeans were quick to note affinities and differences between Arawakan and Cariban boat-building: both groups fashioned large and small dugout canoes, which they rarely decorated, from single tree trunks of varying size; both used stone axes and fire to hollow the logs, and the Caribs may have widened their boats with wooden stretchers; and both groups propelled with banks of paddlers, who kneeled on thwarts or in the bottom of the boat. The Caribs also constructed a built-up boat, which the Spaniards called a *piragua,* affixing washboards to the sides of a canoe and elevating the prow. It is unknown whether the Arawaks had a similar tradition, or whether either group had knowledge of sails. In the latter matter, modern arguments are based on inference because the chronicles are ambiguous; conventional interpretations suggest that the Caribs may have been sailors, but the Arawaks likely were not.

The extent to which interaction occurred between the islands and the mainland also is unresolved, and if there has been any myopia in past reconstructions it is here that scholars have excelled. Essentially, they have failed to view aboriginal migration and trade from a maritime point of view. Bolstered by evidence and arguments for transoceanic crossings, the notion of short jaunts across the Caribbean has been accepted with little regard for prevailing winds and currents from the Atlantic and within the basin. Exemplifying this was the hypothesis proposed in 1969 that a major migration of Amerindians occurred around 1500 B.C. between Central America and the Greater Antilles, with the migrants traveling via the mid-Caribbean island chain—the landforms that extend northeast from Honduras—to arrive first in Jamaica and then Hispaniola. While this hypothesis since has been discounted, the reasons for refutation ironically have nothing to do with whether men in a canoe could have paddled or sailed that distance—essentially uphill—across prevailing air and water patterns.

This is not to imply that communication could not have occurred from west to east; the diffusion of ball courts, honey bees, ceramic styles, and other material culture attest that exchanges from Middle America to the Antilles did transpire. However, modern maritime scholars are far more scrutinizing of what was hydrodynamically possible when hypothesizing about regular or serendipitous routes. Some have suggested, for example, that exchanges were launched from the northeasternmost shores of the Yucatán, only 120 miles west of Cuba and perpendicular to prevailing conditions. After this crossing, voyagers could have ridden the Cuban Countercurrent south-





Left: *Painted books of Mesoamerica, called* códices, *have been an important source of information about aboriginal watercraft, such as those depicted in the Aztec Florentine Codex.* **Above:** *Small coastal boats were depicted in a wall painting in the Temple of the Warriors at Chichén Itzá.*

ward past the insular network called the Gardens of the Queen, then paddled or sailed easily to other island shores.

Pacific maritime enterprise

Archaeology also has traced the travels of Amerindian watercraft by documenting the diffusion of artifacts or traditions from one culture to another. This is particularly relevant at sites associated with waterways, or where the distance-from-origin of a unique custom is so great that distribution via land routes would have been formidable. This evidence of course does not always pinpoint a maritime culture. The Olmec of the Middle and Late Preclassic (ca. 1200-400 B.C.) probably did not drag multi-ton slabs of rock from the Tuxtlas Mountains to their heartland nearly 50 miles away; more likely, they fashioned barges and used local rivers to float the stone home, despite the fact that they were not a water-oriented population. On the other hand, while the reported presence of Ecuadorian-style pottery dating to 2400 B.C. on coastal sites in Georgia, but at few locales in between, could be explained by overland transport, more likely the ceramics arrived in aboriginal canoes launched from the east coast of Panama and guided northward via natural wind and current patterns.

Some of the earliest exchanges spread outward from Ecuador in the form of spectacular pottery traditions dispersed widely throughout Mesoamerica and Peru as early as the Formative Period (ca. 3000 B.C.). Also based on similarities found among disparate ceramic traditions, a later maritime trade network has been postulated among the inhabitants of the Santa Elena peninsula of Ecuador and people in the northern Andean highlands and on the west coast of Mexico between 1500 and 1100 B.C., and with other areas from that period on. At about the same time, the Soconusco region of Guatemala and the Guayas area of coastal Ecuador also were in close contact through sea trade—a distance of 1400 miles in a direct voyage or 2000 miles following the coast. Likewise it has been suggested that the introduction into western Mexico of metallurgy, a technology known in Ecuador from 2000 B.C., almost certainly was through a scheduled and routinized maritime trade. Even after Ecuador lost its eminence as a cultural innovator around 300 B.C., inhabitants may have continued to dominate communication by sea between the major New World civilizations.

Eight aboriginal vessel types were described in post-contact chronicles concerning the Pacific coast, and an extensive study of modern local watercraft between Panama and the Straits of Magellan has confirmed that four of these still are in use: the reed bundle float, the dugout canoe, the balsa-wood sailing raft, and various simple log rafts. In several cases either the modern design or the means of construction have remained virtually unchanged by 500 years of technological contact. Native craft that were abandoned over time included the hide float, the gourd raft, the sewn bark canoe, and the *dalca,* a boat formed of wooden planks sewn together. Of particular interest in this study is the wide range of forms which Pacific coast craft have embodied—a function now, as in prehistory, of the indigenous fabrics and tools available for vessel manufacture.

Sixteenth-century chronicles also suggest that Pacific coast mariners of Ecuador and Peru had the benefit of sails in pre-Columbian times. Based on historic and modern evidence, scholars have concluded that native sailing rafts carried triangular, fore-and-aft sails and were maneuvered by a system of centerboard navigation. Of dugouts, it has been suggested that despite some innovations adopted from European and North American small craft, the sails carried by modern sea-going canoes represent the aboriginal type.

Mesoamerican sea power

On the eastern side of Mesoamerica, maritime travel that was particularly brisk arose much later in time than on the Pacific coast. Evidence suggests that by the Late Preclassic (ca. 300 B.C.-A.D. 250), the coastal Maya of Belize had initiated an incipient system of waterborne commerce, based primarily at Cerros and connecting ports on the eastern littoral to islands offshore. The system also included a canoe route leading inland into the southern Maya heartland. From a slightly later period, two archaeological sites on waterways in Belize—at Lamanai and Nohmul—have been noted as possibly including Mayan river port facilities.

However, it was primarily during Terminal Classic and Postclassic sequences (A.D. 600-1200) that use of waterways for economic purposes became well established in the Mayan highland and lowland areas. After the fall of Teotihuacán in the late 7th century A.D., urban centers throughout Middle America were left without a centralized distributor of materials and products on which they had become so dependent. Into the resulting economic and political maelstrom sailed the Putún Itzá—people from Gulf-coast homelands in Tabasco and Cam-

peche. Arriving with formidable maritime skills and intent on controlling access to cacao, cotton, salt and hard-stone resources, they moved quickly to secure water routes on the western and southwestern borders of the Petén region, to gain influence in the northern interior lowlands, and to form a waterborne trading route around the entire Yucatán peninsula.

Ultimately, the range of the Putún maritime enterprise extended from Tabasco to Panama, and so effective was their network that by the time of the Spanish Conquest, their language was the *lingua franca* of trade from Veracruz to Honduras. However, with the cultural decline of these people around A.D. 1250, the Mayan administrative center in the Yucatán was moved to Mayapán, and control of maritime trade networks was part of the shift in power. Interregional exchange continued at a healthy pace, but it was marked by several notable changes, including the strengthening of trading ports along the coast of Quintana Roo.

The European chronicles are unfortunately vague about the vessels that plyed waters between the Bay of Honduras and the northern peninsular port of Xicalanco, or of those which wound their way along inland riverine systems. Many descriptions post-date Contact by at least three decades, during which aboriginal adoptions of Iberian technology could have transpired. Ferdinand Columbus did describe a canoe, seen in the Bay Islands off Honduras during the fourth voyage, that had a palm-leaf shelter amidships like a Venetian gondola to give protection to children, women, cargo and truck. Bernal Díaz reported seeing off the Yucatán coast in 1517, "ten large canoes, called *piraguas,* full of Indians from the town, approaching us with oars and sails. The canoes were large ones made like hollow troughs cleverly cut out from huge single logs, and many of them would hold forty Indians."

Some of the best evidence has come from Mayan murals, artworks and artifacts, though these often were highly stylized. The dugout canoe appears to have been the basic form of vessel, varying in size and probably shape depending on the trading range. A mural from Chichén Itzá depicts small coastal boats with high prows and sterns, capable of carrying only a few passengers, who stood during the portage. The paddler was forward and apparently stood on a slightly-elevated thwart. Sea-going dugouts were larger, carrying up to forty people, heavily constructed, and may have been outfitted regularly with palm-leaf shelters or sails. Scholarly opinion varies as to whether these long-distance canoes were built-up in any manner at the ends or along the gunwales, perhaps by means of washboards or cane made watertight with pitch, for additional protection.

Along inland waterways

The nature of the boats and the extent of their use at the Mexica (Aztec) metropolis of Tenochtitlán recently has been studied in depth, based on chronicles, artworks, and the only extant example of a vessel believed to be pre-Columbian. Excavated in 1959 in Mexico City, beneath which is buried the former site of the Mexica heartland, the craft is displayed in the modern-day capital at the Museo Nacional de Antropología.

Watercraft were indispensible to daily cultural activities in the aquatic environment of the Mexica, whose locus was an island-city at one end of a five-lake complex. One of the oldest and most essential uses involved the procurement of lacustrine resources. As the city's eminence evolved, small craft were used for trading ventures, particularly to import goods from around the lakes to vend at central markets, and tributes paid to the great city from outlying areas were delivered "on the backs of men or in canoes." Vessels also were an important part of various rituals and ceremonies, and they especially were used in warfare by the Mexica, who purposefully built up their canoe forces and routinely conducted exercises to maintain maritime military might. When Lake Texcoco endured a ten-year period of flooding during the rainy seasons, local residents sought refuge in their canoes and *piraguas;* and when hydraulic modifications of the lake were initiated—the digging of ditches and canals, the building of bridges, and the construction of causeways, dikes, dams and aqueducts—maneuverable watercraft were essential. And of course, canoes were indispensible to the maintenance of the city's floating gardens, or *chinampas.*

Not unlike other shallow-draft craft of the New World, Mexica canoes were carved from a single log in several styles for various uses. In general, they were light, fast, flat-bottomed boats with a hard-chined, raking bow and stern. Some were decorated, some had awnings, and some may have had interior fittings. Their sizes are suggested by estimates of human carrying capacity derived from representations, the largest probably sufficient to transport about twenty people. Mexica canoes were propelled by paddles with standard-length shafts and rounded blades as well as by long-handled, flat-bladed paddles and poles.

With this brief journey through the scholarly knowledge of prehistoric watercraft in Middle and South America, one current should be clear: that the antiquity, diversity and skill of New World maritime enterprise cannot be underestimated. One's appreciation grows even greater when broaching additional related subjects such as the case for pre-Columbian transoceanic travel, or the varied traditions that arose in North America, which in some respects are far better understood than those in the southern hemisphere. Modern-day scholars have set a course toward fuller knowledge; and though becalmed a bit by the absence of vessel remains, they continue to seek evidence in aboriginal representations, historic observations, ethnographic analogy and archaeological recovery. In time, their full-billowed studies will lead to certain understanding.

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