

The University Museum undertook the second campaign of excavation on the Kyrenia shipwreck with the very kind permission of the Department of Antiquities of the Republic of Cyprus. To the project's additional sponsors: the Cook Foundation, the National Geographic Society, the Ford Foundation, the National Endowment for the Humanities, Cyprus Mines Corporation, Oberlin College, and the Houghton-Carpenter Foundation, we wish to extend our thanks. The Cyprus Mines Corporation continued to provide considerable on-site technical assistance, loan of equipment, and medical services. Mr. Julian Whittlesey, designer of the system of stereo recording, returned to Kyrenia to consult in this work. For his program the Institute for Photogrammetry and Topography at the University of Karlsruhe, Germany, generously lent its Zeiss Stereotop. Many were the companies, individuals, and government agencies on Cyprus who contributed their help to the project. Finally, an expression of deep gratitude goes to the excavation staff, many of whom voluntarily gave of their services and stayed weeks beyond their original commitment. The accomplishments of the 1969 expedition are the direct product of its spirited crew.

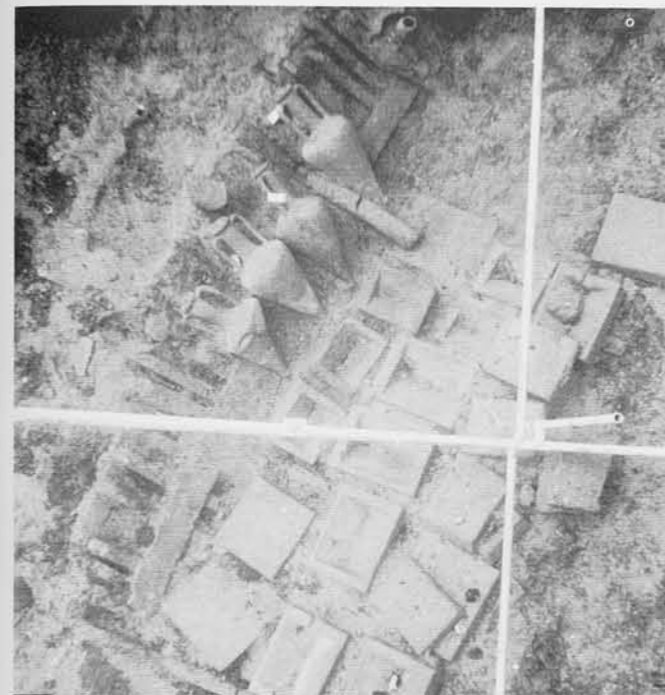
A GREEK SHIP IS RAISED

During the summer of 1969 the expedition to Kyrenia completed excavation of the Greek ship, accomplishing what had been projected as two seasons of diving in one expanded campaign of five months. By the end of May the diving barge was reanchored over the wreck, and the site cleared of the sand and plastic sheets which had been laid over it as winter protection at the end of the 1968 excavation. Already many of the archaeologists, students, photographers, and technicians in the crew—eventually to number over forty—had assembled, and full-scale diving operations began. We were fortunate that more than 50% of the staff were members returning from the previous summer. Under their guidance the newcomers soon learned the skills of excavating and recording their finds under water. We followed the procedure of the past year, diving in teams of two to six and spending forty minutes working time on the bottom each morning and thirty minutes in the afternoon. Over 2,000 individual dives were logged this season, bringing the working hours on the wreck to better than 1,000. This represented a considerable increase over the 1968 campaign.

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Stereo-mapping continued throughout the excavation for recording the find positions of the remaining amphoras, grain mill blocks, and smaller cabin objects. As the ship's hull began to emerge, photogrammetrist Mr. Joachim Höhle joined the expedition, bringing with him stereo-plotting instruments on loan from the University of Karlsruhe. In combination with the staff photographer, Höhle recorded and plotted to an accuracy of ± 0.02 meters the wooden hull as it was uncovered. The remaining portion exposed after his departure in late August was then plotted with a system of pointing rods. This manual technique was capable of both planar and depth measurements and yielded an accuracy comparable to the stereo method. The results of both the stereo and pointing measurements are being assembled by Miss Laina Wylde into plans showing the ship's original construction.

The first phase of our 1969 diving season was excavation of the entire circumference of the wreck site. During the previous summer we had cleared more than 300 amphoras from the upper levels, had come upon a cargo of stone grain mills beneath them, and excavated



Jarred only slightly by the ship's impact on the bottom, the millstone cargo rests in three rows over the keel. Originally, one of the V-cut blocks would have been worked over the flat stone to form a milling set.

(Opposite page) With a system of pointing rods, draftsman Peter Leonard makes final measurements of the hull's curvature.



Diver lifts one of the lower millstone blocks from above the ship's keel.

(Left) The expedition's assistant director, Dr. David Owen, removes one of the Rhodian wine amphoras. Beneath him are two of the hopper-shaped milling blocks.

a small trench to expose a tantalizing look at the ship's hull. We did not know, however, the extent to which the timbers might be preserved. Nor did we know how far the ship's small objects of wood or pottery had been thrown when the vessel jolted to its final resting place on the sea bottom. So, using seven air lifts of varying sizes, we began clearing a three-meter-wide trench around the area excavated the year before. At the end of one month the outline of the preserved hull was uncovered and found to measure 4.8 x 11.4 meters. Recovered also was a considerable spillage of pottery from the fore and aft cabin areas of the ship, which indicated that the vessel had indeed impacted on the bottom with considerable force. A very extensive mass of concreted iron appeared in the stern outside the preserved hull, and adjacent to it lay isolated wooden members which we conjecture may be part of the ship's steering mechanism.

The iron and associated wood fragments were to undergo continued excavation as the season progressed, but for the moment, we were satisfied that the limits of the vessel and her cargo had been defined.

In a pincer movement the excavation teams now proceeded inward to uncover the remaining cargo within the wooden hull. Ninety-six amphoras whole and fragmentary were excavated, bringing the ship's total to 403 lifted in the two campaigns. Again some of the jars contained almonds. At the same time, almonds were being found outside amphoras, resting in masses within the hull. The more than 9,000 almonds recovered in this way suggest that the nuts were mainly being transported aboard the



Amphora from the island of Samos was taken aboard before the ship sailed southward to Rhodes and then Cyprus.

ship in sacks of perishable material, such as burlap.

The heavy grain millstones, uncovered in 1968 and left in place to protect the wood beneath them, were ballooned to the surface in wire baskets. These 29 blocks cut from a volcanic stone bear a variety of mason's marks—single Greek letters chiseled into their sides. The pairing of top with bottom stones has not yet been resolved. Not only is there an odd number, but also their disparity of size, variety of mason's marks, and different types of finish are sources of conflicting evidence. It seems, therefore, that these are the remnants of an earlier cargo, now serving essentially as ballast in the ship. However, this may well be the largest

excavated collection of milling stones of the hopper design. Thus, it will form a most interesting segment in the final study of the merchant ship, bearing, as it does, on both ancient milling technology and trade patterns within the Classical world.

Forward and aft of the amphora and millstone cargoes the excavators began uncovering more items from the ship's cabins. Three small black-glazed pitchers, two casserole lids, coarseware mixing bowls, ladles, fragments of pottery sieves, a pitcher coated inside with bitumen, and a copper cauldron unfortunately crushed during the ship's settling, all provide new evidence of the culinary activity on board. Used for the crew's meals were thirteen black-glazed *echinus*



Black-glazed pitcher from the merchantman's stern cabin area.

bowls, numerous flat plates again black-glazed, and a fourth drinking cup, indicative of the number of crewmen on the last voyage. Adding weight to this supposition are three new oil jugs (*gutti*), combining with the single example from 1968 to total four, and four small *echinus* bowls or salt dishes. Parts of four wooden spoons and a lathe-turned wooden bowl in fragmentary condition complete the dining utensils. Just forward of the bow cabin area lay two concentrations of lead weights once attached to fishing nets. Among the weights to the port side of the cabin were found a seal impression in lead depicting Athena Promachos and three bronze coins. A fourth bronze coin appeared amidst the weights from the second net just forward of the cabin.

Although the coins are badly corroded, at least two can be read. One of these was minted during the reign of Antigonos Monophthalmos (316-301 B.C.), and the other struck in the reign of his son, Demetrios Poliorketes (306-294). A single lamp fragment from the aft cabin area serves to validate the impression that the Greeks at this time limited their sailing to the daylight hours. An unexpected refinement aboard the Kyrenia merchantman is an "inkwell" found adhering to the concretion of iron in the stern. This concretion, which weighed approximately 1,400 pounds, was raised to the surface and will undergo restoration in the summer of 1970. Between the preserved hull in the stern and the concretion lay a marble columnar



One of four identical drinking cups used by the crew on the last voyage.

pedestal, its context on shipboard yet an enigma. Scattered throughout the stern area were over 100 flat lead rings which probably served in guiding the brail lines used to reef the ship's sail. Amidships and resting directly on the hull were ten double knobs, resembling yo-yos. That they, too, served in the ship's rigging is a strong possibility. However, as with so many of the rather unique objects from the vessel, their function may be known only after further study.

Once the ship had been completely cleared of its contents, it was seen to be remarkably intact. As much as 50% of the original wood remained. In the course of its 2,200 years on the bottom the ship had split into two sections, the division occurring just to the starboard of the

keel. A wooden pulley had fallen into the separation. This pulley may have served in raising and lowering the yard that held the ship's sail. The port side, which is the better preserved, contained some twelve unhewn tree limbs laden forward amidships. Beneath these and running aft under the rows of millstones was the ship's ceiling planking. After stereo recording, these "flooring" planks were then systematically removed. Carved into their upper surfaces were graffiti that may have been "keying" signs for the ship builders. The frames, or ribs, of the vessel are so solidly preserved that they retain the curvature of the hull well above the bilge line, and the counter curve where they slope to the keel. The outer strakes were joined one to



Bronze cauldron, crushed during the ship's collapse, once served the crew for cooking meals.

another by mortises and tenons secured with wooden dowels. It is clear that the vessel was built in the "shell-first" manner, that is: the outer planking was assembled first, while the ribs were later laid within it and fixed in position by copper spikes driven in from the outside and clenched over the inner rib face. Interesting also is the regular alternation of ribs: one type spans the keel and in a second piece presumably runs the full height to the gunwale, while its neighbor originates just short of the keel and terminates well above the bilge line. The entire outer surface of the preserved hull was found sheathed with lead affixed by regular rows of copper tacks. This "armour," the earliest known use of the technique, was intended to guard the



Wooden pulley, badly attacked by teredo worms, had fallen beside the mast step. Probably the sailors used it to raise and lower the ship's yard.

The pulley disassembled shows how the single sheave turned in sockets. The two halves were joined by dowels. Then a rope or metal binding around the grooved exterior would have held the pulley as a unit.



hull from marine borers. At the bow the construction changes. Here the outer planking is in two layers joined with thick wooden dowels. Approximately one-third aft the bow, the intricately carved mast step was located. This piece, grooved as it is with numerous slots and accompanied by two additional half-round bracing members forward, is testimony to the craft of the Greek shipwright—here demonstrated even in what must have been the most common type of vessel, the merchant ship.

Early in August it was clear that the hull could be entirely exposed and made ready for lifting by the middle of September. The choice was now before us whether to rebury the wood for the winter (as previously planned) or to

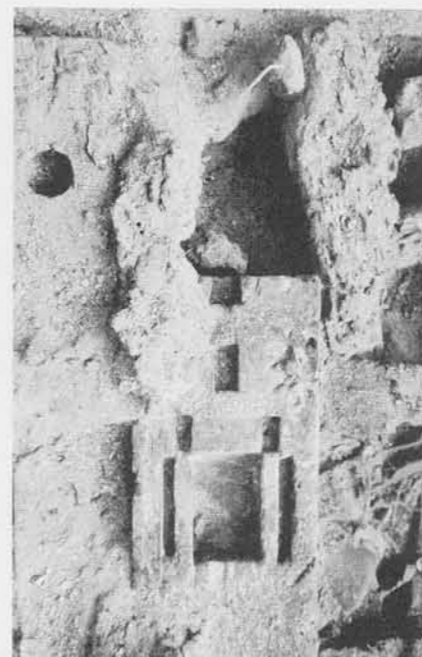


Diver brushes silt from the ceiling planks that served as the ship's "floor."

raise it in the remaining weeks of calm weather. Twelve of the diving crew volunteered to stay on if we should decide on this latter course. Paramount in our considerations was concern for the optimum conservation of the wood. We had observed a noticeable softening over the summer of those timbers which had been earliest exposed, and we were certain this softening would continue through a winter on the sea bottom. With the original packing of mud removed, increasing amounts of oxygen were reaching the ancient hull. Covering the ship with silt would not be sufficient to arrest this totally nor to insure that marine life would not attack the wood anew. The outer planks, for example, were even now so riddled by ancient teredo worms that a fresh

assault would almost certainly weaken them to the point of disintegration. Lastly, the thought that over the winter clandestine sport divers might find the timbers tempting as relics or treasure made our decision incontestable: to undertake the hull-raising immediately.

Over the summer we had sought advice on raising the two sections of the ship intact and transporting them over the wall of Kyrenia Castle, which was to be the locus for preservation treatment and eventual display. Because of its draft, helicopter removal would be too dangerous to the softened wood. No combination of lifting equipment could be found on the island to manage transfer of a ten-ton load from quay-side up over the eighty-foot castle wall. In short,



The elaborately cut mast step with its two forward bracing members at top of photo.

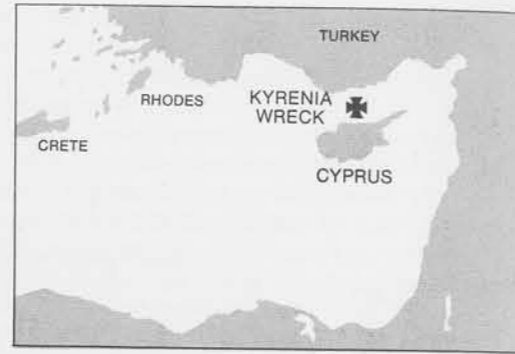
nothing short of removing a section of the castle battlements would permit an intact transfer. Incidentally, this last was generously suggested by the Antiquities Department of Cyprus but gratefully declined by the expedition. We concluded that the vessel would best be cut up into convenient sizes for the lift and subsequent transfer through the castle doorways. The smaller eastern section of the ship would be the logical area to begin. Using a compressed-air-driven underwater saw, this side was separated into manageable pieces of approximately one by two meters. After cutting, a flexible sheet of galvanized iron was slid beneath each section, and it was carefully moved into a rigid steel frame equipped with flexible bands which could adapt



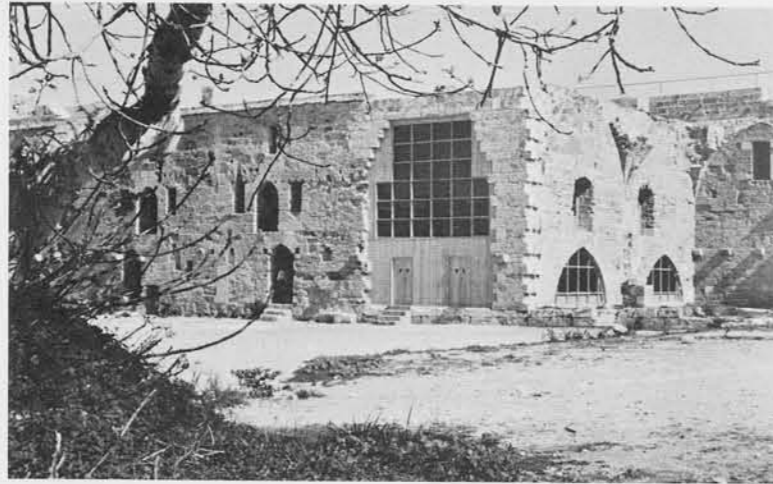
Lead sheathing projects beyond the preserved bow. It was tacked to the outer hull by the shipwrights to keep out marine borers—the earliest example of this technique.

In the foreground, a cargo of roughhewn logs. Beyond, stretches the ship's ceiling planking, running beneath the millstones. At right, a few of the Rhodian amphoras lie, as originally laden, against the ship's port side.





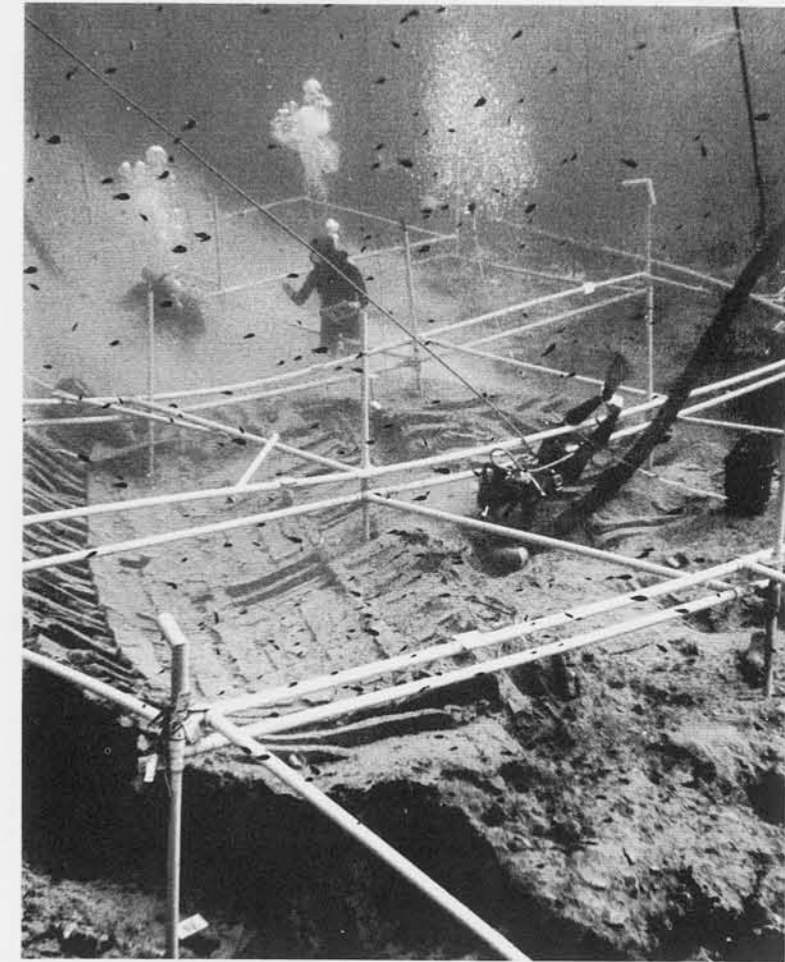
(Above) Inside the expedition storeroom at Kyrenia Castle, the amphoras are shelved, and the smaller finds are undergoing conservation. (Right) Gallery restored by the Cyprus Department of Antiquities to house the Kyrenia ship for conservation and future exhibition.



to the curvature of the hull. A diver would then attach a line from the barge and fill the lifting balloon. As the balloon carried the load upwards, the diver followed, deflating the balloon gradually so that the frame would not rise too abruptly as it neared the surface. At the barge each basket was winched onto an awaiting boat. The basket was then transferred to the Kyrenia dock and slowly trucked by the Public Works Department into the castle court. There the wood was washed and placed in fresh-water tanks. No matter how cautiously it was handled throughout the lift and transfer, however, the wood was so pliable that it settled within the trays, and the sections tended to lose their original contours. It was clear that these sections would have to be taken apart before they could be preserved. So, it was decided to dismantle the larger western side of the hull on the bottom, and raise each piece separately. This we did, after intensive labeling to insure accurate reassembly. First the ribs were removed and turned on their sides into new

rigid lifting trays designed to meet their greatest length. Next the mast step complex and keel were lifted, and finally the outer planks were cut into manageable lengths and raised. Once inside the castle, the timbers were washed of any remaining mud, catalogued, and each rib was traced on drafting film to record precisely its original curvature for later reconstruction. The wood then went into one large fresh-water bath. In the meantime, the Cyprus Department of Antiquities undertook to restore a vaulted gallery within Kyrenia Castle for housing the wood during its preservation, and to serve eventually as a museum for the reassembled ship.

In early summer the expedition storeroom at the castle was made ready for use by our conservator. Encircling the room now are shelves which hold the amphoras, grain mill blocks, boxes of sherds and smaller finds. Worktables and sinks are in use by Miss Frances Talbot who joined the expedition from the Institute of Archaeology, University of London. She has



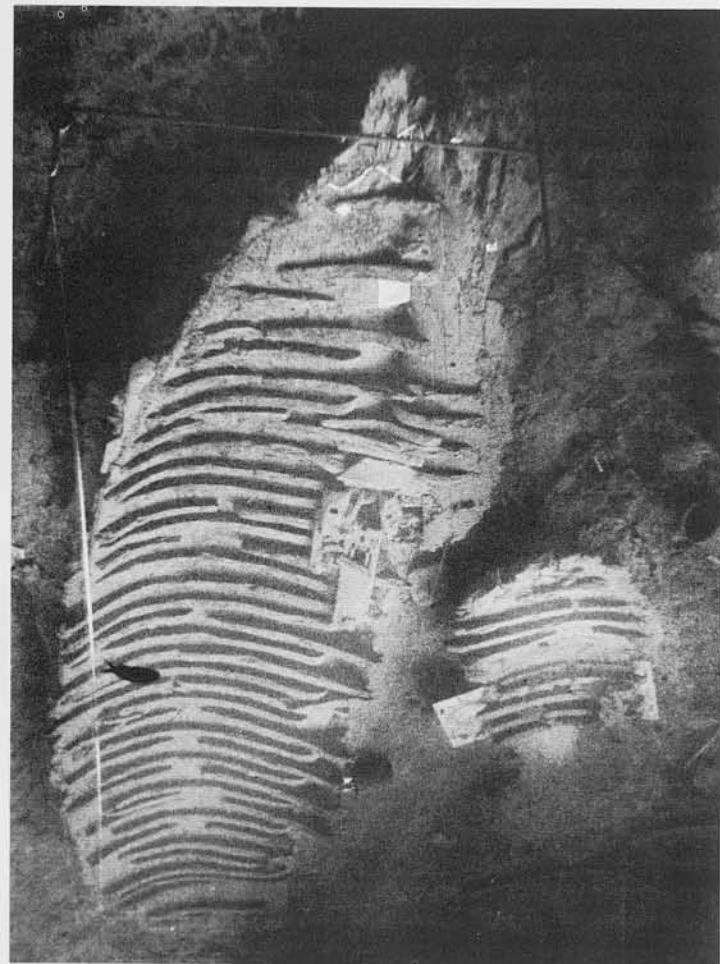
Working amid plastic grid frames that serve for orientation, an excavation team works to uncover the hull. This view from the stern shows the ceiling planking on which the cargo of grain mill blocks was laden.

virtually completed restoration of the 1968 finds and is at present working on the considerable amount of material recovered in 1969.

Visitors to Kyrenia Castle, most of them Cypriotes, had expressed interest to see the objects from the excavation. Since the finds point to an interesting and rarely-illustrated aspect of Mediterranean history, it was felt that the public should not be denied some view of the material. Towards this end the excavation opened its storeroom temporarily to groups in the company of the castle custodian. However, a more permanent and less distracting arrangement needed to be made. Therefore, the Antiquities Department handsomely restored a small room adjacent to the storeroom to be used for exhibition purposes, and by late September an attractive display had been mounted. It is hoped that in the future a more complete story of the excavation may be assembled in these quarters to complement exhibition of the preserved ship in its own gallery across the castle courtyard.

In cooperation with the National Geographic Society Mr. Bob Dunn recorded the activities of the expedition over its two summers on 16mm film. The results are being readied now for educational use, and will stand as a permanent record of the project.

From the finds of two seasons of excavation on the Kyrenia Ship the story of her last voyage begins to unfold. Of the ten distinct amphora shapes—each perhaps representing a different port of call—we can now identify two types positively: those of Samos and Rhodes. A possible source for the volcanic grain mill blocks is the island of Kos. Thus, the log of our merchant vessel might have told us of a trading ship sailing southward along the Anatolian coast, threading her way through the Dodecanese islands. Borne by the prevailing winds, she would have turned eastward in search of a market for her Rhodian wine. That she made some port on Cyprus is suggested by one of the bronze coins and perhaps also by the almonds, since Cyprus



The 4th century hull, its cargo and ceiling planking removed, lies ready for lifting. Sectioning of the smaller starboard side has already begun. Because she came to rest on a soft muddy seabed, the hull remained remarkably intact, and the ship's curvature was preserved.

sail, stowing it in the stern—and probably also the mast, lowering it aft. Then, as the cargo shifted, captain and crew would have realized the fate of their vessel. We have reason to believe that they abandoned ship and made an attempt to reach shore. For the absence of any cache of precious coins, personal possessions, or skeletal remains suggests the crew did have time to gather up its belongings—and the captain to retrieve his earnings from the voyage.

Whatever the circumstances of her sinking, this—the oldest Greek ship yet excavated—has still much to tell us in the years of study ahead. The tracing of her voyage is yet unfinished; her home port remains unnamed. Yet, from the construction of her hull we are already learning a great deal about the skills and techniques which the Greeks applied to their civic and domestic wooden architecture. The challenge of building a seagoing hull capable of many years of service was, as the Kyrenia Ship demonstrates, ably answered by her designers. How many years did our ship sail before her destruction? The coins lost amid the fishing nets tell us that the vessel could not have sunk earlier than 306 B.C. The University Museum's Carbon-14 analysis of the almonds points to a date of 288 ± 62 B.C.; yet the same dating method indicates that the trees used for the ship's planking were cut in 389 ± 44 B.C. Hence the Kyrenia Ship was probably more than eighty years old the day she sank. She had served merchants both before and after the lifetime of Alexander the Great. Now, twenty-two centuries later, she will serve us as a monument unique in the history of seafaring.

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was a famous producer of almonds in antiquity.

Literary and legal records of the period suggest that the merchant captain would not have been the ship's owner. Rather, he probably had taken out a loan to charter the vessel for the sailing season, a loan to be paid off by a portion of the profits from the voyage. Sailing with him were at least three other crew members, perhaps some of them with vested interests in the cargo.

What tragedy, then, sent their ship to the bottom here, less than a mile from the ancient anchorage at Kyrenia? There are no submerged reefs or treacherous capes in sight. There is no evidence of fire or piracy. There are only the storms which sweep in without warning against this unprotected coast. In such a gale the sailors would have first thrown out anchors, hoping to ride out the sea. As the ship was battered by waves and wind, they would have lowered the



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1967 has been a Research Associate in the Museum's Underwater Archaeology Section, while directing the expedition to Cyprus. Currently he is an Assistant Professor in the Department of Art at Oberlin College.