"The bow plank that was a glowing golden color just last week... it's turning brown. Oxygen must be getting to the wood. We don't dare leave that hull on the bottom over another winter. But how are we going to raise her?" Laina Wyld Swiny, architect in charge of mapping the ancient ship, up from her morning dive, voiced our worst fears. Were we about to lose the precious treasure lying 27 m (90 ft) below... the most perfectly preserved ancient Greek ship ever found?

It all began in the autumn of 1965. Town councilman Andreas Carabola, diving for sponges, chanced upon a mound of 80 graceful amphoras emerging from a carpet of eel grass on the flat seabed less than a mile from Kyrenia, his home on the north coast of Cyprus. For two years he kept his secret until meeting my husband Michael Katz and me and guiding us over the wreck. In the most dramatic dive of our lives we were alone with the ancient jars, now homes for darting squidfish, untouched by man for 2,300 years.

Two summers of excavation peeled away layers of cargo, dining wares, tools, ship's rigging, and even four bone eyestalks from a sailor's sandals. Cradling them like open hands was the still curving ship that had borne them from foreign ports and at last took them to the sea floor. Sixty percent of the ship and more than 75 percent of her representative timbers lay exposed. How could we raise the softened wood before the coming autumn storms?

The ship had sunk on an even keel, her cargo intact, striking the soft bottom and then rolling onto her port side. While currents slowly buried and preserved that side, the bow and stern broke away under the weight of an anchor, amphoras, millstones, and iron ingots. Then the exposed starboard side, easy prey to teredo worms, fell outward, breaking off from the keel and leaving most of the cargo compressed in the better-preserved port side. Could we raise each side intact? We learned through the American Embassy that no helicopter in the Mediterranean was capable of hoisting 5 tons of our ship off the bottom. We would have to take the delicate hull apart piece by piece.

With rolls of Dymo tape, Laina labeled every scrap of wood. Using three different methods of mapping for insurance, our 54-member team recorded the hull with stereo photos, manual triangulation, and a new invention: movable vertical rods called "the chesscutter".

As the first autumn storm strained the moorings of our diving barge, the last lifting trays of wood broke surface and reached the safety of a fresh-water holding pool inside a vaulted gallery of the massive Crusader castle that dominates Kyrenia harbor. Like first parents we scrubbed, bathed, and photographed each timber, then cataloged and made full-scale tracings of each side until thousands of pieces of the old ship were safely recorded. It took seven people five years. Our goal was to preserve and reassemble the original ship inside this gallery.

"We cannot settle for less than 100 percent saturation," said conservator Frances Talbot Vassilades, fresh from studies at London University. "Look how this test piece twisted and shrank at lower concentrations... we cannot risk doing that just to save time. So let's start figuring on years, not months of treatment." The saturation would be with a water-soluble wax called polyethylene glycol. PEG for short. Visits to European labs had shown that PEG was our only hope. But no one had yet reached 100 percent saturation. So riddled was our ship's Aleppo pine with ancient teredo worms that the timbers easily soaked up the preservative in heated tanks. Almonds treated in seven months, but hull members demanded over a year for each tank load.
At the end, 6,000 separate pieces of the Hellenistic ship lay successfully preserved on shelves in the castle. But who could put Humpty-Dumpty back together again?

Just as Michael Katzen's first lecture in Cyprus had brought the tip leading to Andreas and this spectacular wreck, Michael's lecture in Lancaster, Pennsylvania, attracted the attention of electrical contractor J. Richard Steffy. Dick Steffy's basement models were already testing construction theories for the Yassada Byzantine ship, but the chance to work on an actual hull sparked him to leave his comfortable business, move with his wife and two sons to Cyprus, and immerse himself in unraveling the secrets contained in the ship's timbers.

The Ship Speaks

Over four years, aided by Michael and apprentices Robin Piercy and Chip Vincent, Dick pieced the Kyrenia ship back together, pinning the brittle wax-treated timbers to each other using stainless steel rods. "The men who built the Kyrenia ship were real craftsmen," he says. "In fact they were sculptors. Today we are in a hurry and we penny-pinching to use the least materials. So we start a ship by building a skeleton of ribs, or "frames," bolted to the keel, and then we wrap sown boards around the outside to plank the ship. Kyrenia's builders adzed those outer planks first. They carved away over 70 percent of the original wood to sculpt the entire outer shell, without an interior framework."

Like weaving a basket upwards, the shipwrights joined the first carved plank to the keel using mortise cuttings linked with oak tenons spaced every 12 cm (4.7 in.). Pegs locked them together. It took nearly 4,000 mortise- and-tenon joints to attach all the pre-carved planks edge to edge over the whole 14 m (47 ft) length of the ship, fitting them so tightly that no caulking was needed. Only after eight or nine of the 13 planking rows were securely linked did the Greeks shape the first ribs to fit inside the shell. Driving pure copper spikes from outside through the ribs and clinching them down like staples, the builders locked the ribs in place to stiffen the ship. But the shell of planks was the ship's true strength.

Life on Board

Launched close to the year Alexander died, 323 BC, our merchantman must have moved tons of cargo through the eastern Mediterranean in the turbulent years when Alexander's surviving generals were carving his empire into kingdoms of their own.

Rhodes, the most prosperous island in the region, whose merchant the orator Lycurgus said, "sail the entire civilized world for trade," used her navy and diplomacy to remain independent of the generals. I believe our merchant captain could have homeported in one of her thriving harbors and that his name began with the letters EUR, which he scratched into the base of a plate designed for dipping tidbits of fish into a spicy sauce. He needed to be literate to keep his books and deal with harbor documents. We found his inkwell and perhaps a personalized wine amphora marked EU. Much of the ship's black glazed pottery lay in two distinct areas—the far bow and stern. A short deck in the bow carried a wooden anchor, its stock filled with poured lead as on the Tektaş Burnu ship (see page 69). Clusters of small folded lead weights tell us that one of two fishing nets was on this deck. In foul weather, the crew slept in the open space below, among seven amphorae from Samos filled with over 10,000 almonds.
Why Did She Sink?

"All those years of voyaging had taken their toll," Dick learned. "The Kyrenia ship was tired and weak." After many repairs, with a patched bow and years of teredo worm damage, she had been sheathed in lead as a last effort to keep her watertight. The golden planks Latius had seen was a recent repair. But under the millstones, years of bilge water had softened the old ship's backbone, and the lack of attachment between ribs and keel proved the ship's "Achilles heel."

Did the captain, knowing of the accumulated ravages from decades at sea, decide to give it all up and scuttle his ship to cover up some shady deal?

The riddle of her sinking, within sight of Kyrenia, remains unsolved. Violent storms drive down from the Taurus mountains of southern Turkey without warning, and Kyrenia's ancient harbor may have been dangerously exposed. Before the modern breakwater was built the locals always put to sea in the face of incoming storms. Perhaps our merchantman was attempting this maneuver when her old hull finally failed. With no natural hazards to wreck her, this seemed the best explanation until, years into studying the artifacts, we came upon unexpected finds.

"Spear! These are spearheads or maybe javelin tips, and there are eight of them. Look, four have lead sheathing, even scraps of wood attached, and one tip is bent. What were spears doing underneath the hull?" Michael had just saved apart small lumps of iron corrosion that had lain in our storeroom shelves since being found some years after the ship was raised. Then he cleared iron dust from inside the molds and made rubber casts of the rusty

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Loading Up

I picture our captain and crew at Rhodes loading for their last voyage. They already had the almond-filled Samian jars stowed bow and stern, along with the peripherals mentioned above, and a leftherover shipment of 29 heavy millstones fashioned on the nearby volcanic island of Nisyros. The odd number, and a lack of matching pairs, suggests that they were sold singly to replace baker's broken stones, meanwhile serving as ballast in three rows centered over the keel.

Now they filled the open hold with Rhodian amphorae, their conical shape handy for wedging in across the wide-bellied ship. Some jars were stowed on their handles with names of potters, magistrates, or traders, and all had been swirled inside with hot, black pine pitch to make them watertight. The wine they carried - mostly the popular table wine Rhodes exported north to the Black Sea and south to Egypt - took on the resin flavor that survives as "restica" in modern Greece.

Each amphora weighs 41 kg (90 lbs). We think a circular bronze strap and ring were the end of a hoist our crew used to lift each jar off the deck, swing it inside, and lower it into the rear stacking pattern we found. On Cyprus we made replica amphorae and practiced loading them with all 17 tons of cargo found on the original ship into a sailing replica named Kyrenia Liberty. Liberty is equipped with her own hoist, called a "mast derrick." Using pulleys and a hook just like one found in excavation, a crew of four could load a grain mill or offload a full amphora in just 20 seconds. At this rate the entire cargo could easily be loaded in a morning. All together over 300 amphorae in ten different shapes were aboard when the ship left harbor heading east to Cyprus. Just-harvested millet, grape seeds and almonds tell us the season was September or October, and coins and amphorae indicate the year was about 285 to 285 B.C.

The helmsman on the aft deck steered with two oars called "quadrant rudders." We found the blade of the starboard rudder being outside the collapsed stern. Through the hatch near his feet, the captain could drop down into the only closed cabin. Here was a cargo of nearly pure iron ingots; a spare sail, its many lead rings sewn in rows; spare rope and tackle; and a bow drill and other ship's tools. All were preserved inside a large concrescence that formed around the iron ingots. A tiny votive lamp, the captain's inkwell, an elegant bronze ladle ending in a duck's head, a fish hook, and many studded nails, possibly decorating a wooden box, were cemented in the mass. The captain's drinking cup and inscribed plate lay nearby.

Here, too, was a marble ceremonial basin resembling a modern birdbath. Such basins are found in sanctuaries and shipwrecks, reminding us of references to ceremonies asking and thanking Poseidon for safe passage. Perhaps our captain was prepared to give thanks for safe arrival in Kyrenia. Whether he ever entered the harbor we will never know.
personal possessions of our crew? Four sandal eyelets and two bronze beads were hardly the belongings of four men.

Another sinister surprise waited on the storeroom shelves. A folded lead sheet known as a "curse tablet" had been slipped inside a lead envelope and pierced with a copper spike. Its final spot suggests the spike was driven into the ship's main crow's nest, then clenched downward to hold the curse in place.

Similar tablets found throughout the Greek and Roman world were inscribed with moebiud spells naming the curse's enemies and beggym gods of the underworld to wreak misery upon them and their families, dragging their tortured souls down into hell. Tablets found uninscribed, like ours, are thought to be the work of illiterates. Inside our tablet were two pieces of white string, perhaps to bind the accused down. All materials for the tablet were on board...fish net string, lead sheathing, and the copper spike. Was a seaman disgruntled with the captain? Or had illiterate pirates inserted a spell to bind the sinking ship into the sea? If so, they succeeded...but only for 2,300 years. The old ship has risen to display again the masterful craftsmanship of her builders, and to honor the men who shared her life.

Originals - light javelin heads. Had the ship sunk on the site of a previous naval battle? Unlikely. But what if these javelins had been imbedded in our hull during a pirate attack? In a Greek vase painting a pirate ship appears ready to ram a merchantman in her starboard bow. In this area of our ship no wood survived, but our worm-tiddled bow would have offered little resistance. Possibly attackers drove javelins into the hull to pull their craft alongside for boarding. With the bow slowly taking water, there would have been time for pirates to snatch up valuable and take captive the four mariners, leaving the ship to sink. Slave markets prospered in Delos, Crete, Syria and the nearby south Turkish coast. But in a kinder scenario, captives could also be ransomed back to their families.

In Alexander's wake, his Macedonian general Antigonus, with his son Demetrius, were now at war with the Egyptian general Ptolemy I. Caught between were the islands of Cyprus and Rhodes. In 306 BC Demetrius captured Cyprus from Ptolemy, then turned his attention to independent Rhodes, sending ships to seize any merchants sailing to Egypt from Rhodes. When the Rhodians refused to yield, Demetrius besieged their island for a year, spreading the noose of his navy and pirates to intercept Rhodian shipping. With Ptolemy's aid the Rhodians broke the siege, preserving their sovereignty. But the seas of the eastern Mediterranean teemed with pirates for years to come.

Piracy would explain why certain things one might expect to find are missing from the wreck. Only seven bronze coins minted 306 to 294 BC were found. These were small change, not the high values needed for business. And how could a ship trade without several sizes of bronze balance scales and sets of weights? This most basic equipment found on other wrecks is absent in ours. What happened to the