

INA NEWSLETTER

VOL 12 NO 4



February 1986

1985 ANNUAL REPORT

Customarily, in the final issue of each volume series of the *Newsletter* we present a review of INA projects conducted during the preceding year; issue Number 4 is our annual report from project directors to Institute supporters. While that tradition forms the basis of this *Newsletter* edition, we discover that the range of projects and activities that engaged INA associates during 1985 was so vast that only a small sampling can be included.

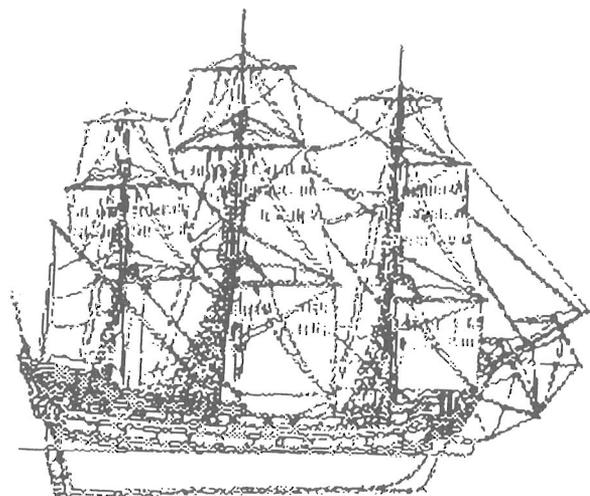
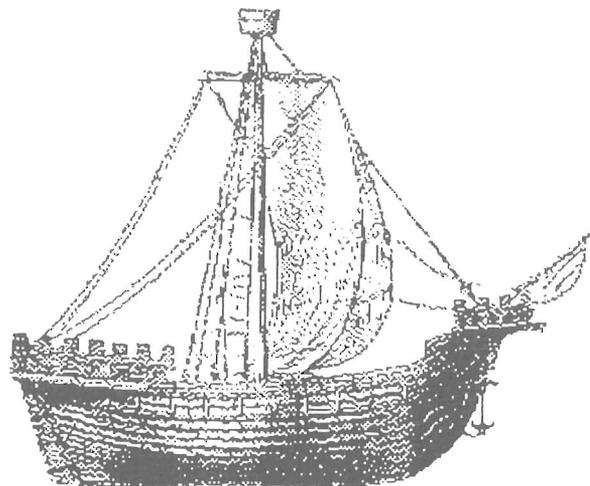
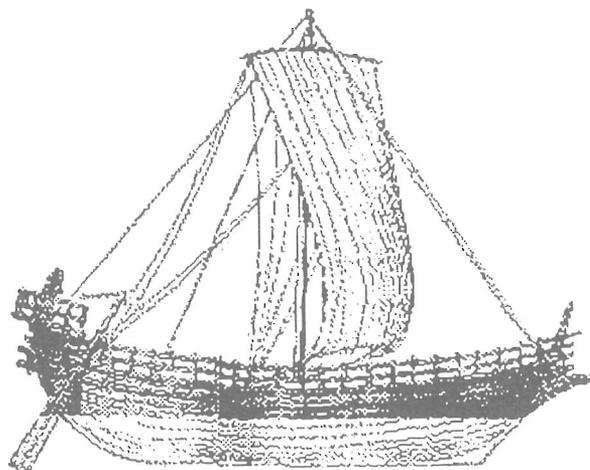
Not only has the scope of research fostered by the Institute expanded in global and temporal dimensions, but the number of individuals conducting scholarly study of seafaring history also has increased. In Turkey, for example, aspects of research on at least five shipwrecks are in progress, engaging the attention of no fewer than ten INA associates throughout the year and many more during summer field work. In the Western Hemisphere, shipwreck sites in seven Caribbean locations alone are under consideration or active study, involving full- and part-time efforts by another dozen individuals. Many of these participants are INA staff members, but many also are graduates and students of the nautical archaeology specialization at Texas A&M University.

Signs of INA's growth, flowering for several years but in full bloom in 1985, are evident in many ways: in the greater numbers of members, employees, and directors; in the volume of publications and presentations generated about Institute research; in dollar values of support from private and public sources; and in the range of technological adaptations and field activities, to name a few. Indeed, a few years ago, one *Newsletter* issue of only four pages could fully encompass the work on a single project—the single project—while now, an issue three times that size can include only a smattering of the news about INA research endeavors.

This growth is good. As noted by INA Ship Reconstructor J. Richard Steffy, recipient of a 1985 MacArthur Fellowship and the subject of our feature article, it indicates a vitality and new understanding in the discipline as a whole. It also reflects the fact that a new generation of nautical archaeologists has emerged, without whom the pioneering efforts of their mentors could not continue.

KC Smith

Page 1 ship illustrations after Landström; prepared with a Macintosh ThunderScan™ by Roger C. Smith



Fellowship Moves Steffy Closer To Life-Long Goals

Among the highest honors ever bestowed on an INA associate was the award last June of a MacArthur Foundation Fellowship to Ship Reconstructor J. Richard Steffy. In the words of the Foundation, the five-year, tax-free annual grant which entails no obligations except those self-imposed by a recipient is presented "to individuals who show exceptional promise, dedication and capacity for self-direction" in their respective fields. The grant is given to free such individuals from support-earning constraints so they can "pursue whatever they believe is important and relevant."

For years, Steffy has been teaching that reconstruction of a shipwreck hull is relevant; that the hull is the most important artifact a site can yield if we wish to understand the technological capacity of a previous culture. He has strived to prove this point, and has done so successfully, on nearly ten different projects, in the classroom with protégés, and in publications noted worldwide. His students revere him and admire his wisdom-widened visage; he is among the most energetic of the Institute's staff members, yet he also is among the most humble and sincere. And now, he is the only person in Texas ever to be recognized for his professional endeavors by the august Foundation. Steffy describes his feelings and perceptions about the award, and his views about his sub-discipline, in the following interview.

It was funny how I learned about the award. I was in Bodrum at the time, and I received a message that there was an emergency call from the States. All sorts of things raced through my mind, since [wife] Lucille was in Pennsylvania and planned to return to College Station via Chicago around that time. Because the call was from Chicago, where the MacArthur Foundation is located, all I could figure was that Lucille was in trouble in Chicago. So I called the number I'd been given.

I reached the director of the Foundation—I got him out of bed because it was the middle of the night in the States—and he told me I'd won the Fellowship. It was a poor phone connection, and at first I thought he was asking me about someone else who had been nominated for the award. And then, when he finally got the message through, we were cut off. I was sure it was a mistake, but I couldn't get back to him, and I couldn't reach Lucille; and it was not until a week later, when I went to Athens and was able to talk to both of them that I really confirmed it. I was amused by the fact that I was the second to the last person among our group of 25 recipients to be notified. The last person was a fellow researching in a jungle area who was more inaccessible than I was.

Aside from being very surprised, how did you feel about receiving the MacArthur Fellowship?

I have to admit, at first I had mixed feelings about the award. For one thing, we were launching the Kyrenia ship replica at the same time, and I was completely involved in that. A big media affair had been planned, and hundreds of people were there; but we didn't know how the ship would behave. So I couldn't really think about the MacArthur award until the launching was over.

And then how did I feel? Well, it was a bit overwhelming, actually. I mean, some of the recipients on the list are awesome in my opinion; and while it is a wonderful honor to receive, sometimes I wonder whether I'm really qualified to be on that same list. The other thing I wonder is whether I can live up to the award. I find myself saying, "Well, now that I've received this, I'm really going to work the hardest I've ever worked for the next five years just to earn this right."

But the reason you were selected for the award is because you already have excelled in your field, isn't that correct?

Well, I suppose that's the general opinion. The thing about the award is that it's given in the spirit that, despite what you already have done, you now will go forward and do more things. The funding is meant to free you from institutional duties and report-writing so you can concentrate on your research. In my case, of course, I haven't exactly been able to do that, simply because there's no one right now to teach my courses. But I have changed my schedule and later on I hope to spend a lot more time devoted strictly to MacArthur research.

Outside of the fact that it has made me busier, I wouldn't say the Fellowship has changed my life greatly. I tend to work harder now because I feel I must do some type of special research even though I still have a full teaching schedule and other commitments that I must fulfill. So I've just tacked the MacArthur research onto my regular work day, which already was too long.

You have alluded to your "MacArthur research." What special study does this encompass?

Aside from the previous commitments I already had, I've made an extra time slot in my work day for the writing of a book about my sub-discipline. There really is no definitive text written yet on ship reconstruction, and somebody has to do it, and I feel it has to be me and it has to be now, so that's some of what I'm working on in the context of the MacArthur award.

Beyond that, however, a thorough history of shipbuilding technology needs to be written, and it is for that that I actually will use the MacArthur award. This has been my life-long research. For years, I've wanted to study ship construction in various archives and museums but I've never had the time or the funding to do so. I'm interested in tying together the



INA Ship Reconstructor J. Richard Steffy, recipient of a 1985 MacArthur Foundation Fellowship, and Lucille Steffy. (Photo: KC Smith)

archival results with the practical research we have done on shipwreck materials. Now if I can find the time, at least I will have the funding to do these studies.

You've been chiseling away for many years to carve a well-founded understanding of ship reconstruction. How did you become involved in the study?

I was always interested in ships, and I built a lot of models and studied ship construction to the extent that it was possible. I became fascinated by shipwrecks in the early 1950s when Cousteau published some of his accounts, and about that time the Cheops ship was discovered in Egypt. You see, I had this idea that one could combine graphic shapes, drafting and models to determine ship lines and other details, but it was just an untested suspicion back then.

Then in the early 1960s, George Bass published a report about the Yassi Ada seventh-century ship, and I was very impressed with what he and Fred van Doorninck were doing with these remains, which were fairly meager. So I wrote to George, and he invited me to Philadelphia. I had been working on a research model of an Egyptian ship, and I remember dragging that along for him to look at. I must have sounded like a crackpot, but George has always been open-minded about new ideas and he was willing to try out my hypothesis. He introduced me to Fred, and things got going from there.

Because I was in business as an electrical contractor, ship reconstruction remained a sideline, just a hobby. I worked off and on with Fred and a few museums for several years, but I found it was taking a greater and greater part of my time. Then in 1971, when I had the opportunity to work with Michael Katzev on the Kyrenia reconstruction—and that was a project I really wanted to do—I realized that it couldn't be just a hobby. So I left the business and became a professional ship reconstructor.

From those beginnings has proceeded an array of important reconstruction projects—among them, the Cornwallis Cave Wreck, the Brown's Ferry Wreck, the Charon, the Athlit Ram, and now the Glass Wreck. Ahead is the Bronze Age Ship, and the prospect of reconstructing that vessel must be exciting to you.

Yes, but actually I don't believe I should be the one who does the reconstruction of the Kaş Wreck. I think it's time for others to take over INA projects. We have all these bright former students who are professionals now and who have far more knowledge

than I did when I started the Kyrenia Wreck. It's time to give them their chance, and that's essentially what we are doing on the Serçe Liman Wreck; they are reconstructing the ship and I'm just overseeing the whole thing. Similarly, I will happily advise on the Kaş Wreck—maybe I'll look over their shoulders and cluck a little—but I want my former students to do the actual reconstruction.

I'm impressed with the people who are former students. They are working all over the world, dealing with foreign governments, and doing some fine archaeology. We don't have to worry about there being ships that can't be reconstructed for lack of capable and experienced people, and I'm quite pleased with that.

The emergence of a new wave of ship reconstructors is only one recent byproduct of your work and that of colleagues. What other changes have you seen in the discipline?

There's a nice thing happening in nautical archaeology, and that is a better recognition, a better understanding, of the worth of the ship itself in relation to the whole shipwreck. When I first got involved in this sort of thing, the ship was not a highly regarded artifact. Many archaeologists considered it to be just so much rotten wood.

But certainly that has changed. The ship now has a major status among the artifacts. Almost every excavation has its ship report, and the terminology used is more accurate and complete. People refer to "frames" instead of "ribs," and the frames are broken down into "futtocks" and "floor timbers." And when you attend conferences, you find a higher caliber of report being given, or find that entire sessions are being devoted to ships and other maritime topics. All of this reflects a better understanding of ship construction. Partly this is a result of better archaeological techniques—we can study the wood more carefully, and we have a clearer idea about how to conserve it; so it represents improvement in the field in general. But primarily it is a better recognition for the ships.

I think our program has helped to bring about these changes. Many of the people currently doing nautical archaeology are Texas A&M graduates or they have been associated with INA in some way. I believe our influence is spreading and that collectively we are helping to make the discipline far more professional in its approach and far more productive in its work. I'm glad to be a part of it.

KC Smith

As One Ship Is Unearthed, Another Is Reassembled

Kaş Wreck Continues To Share Secrets Of Bronze Age Trade

By Cemal Pulak

The second season on the oldest shipwreck excavated by archaeologists, the Ulu Burun Bronze Age shipwreck at Kaş, Turkey, continued to yield hitherto unknown facts about Late Bronze Age commerce in the eastern Mediterranean. The ship's 3,400-year-old cargo consists primarily of tin and copper ingots, mainly in the "ox-hide" shape; glass ingots; bronze tools and weapons; gold, silver, and amber and faience jewelry; Canaanite amphoras; ivory and pottery.

The objective of the season was to complete excavation of areas begun in 1984; however, the wealth of finds and heavy encrustation around delicate material prevented the realization of our goal. A region previously mapped as bedrock proved to be a totally encrusted assemblage of unique artifacts, and the meticulous dissection of the matrix with hammers and chisels was slow but rewarding. Many large tin ingot fragments, deliberately cut into quadrants, still retained their shapes, which we reconstructed into ox-hide forms.

This discovery came as no surprise. Egyptian tomb paintings and reliefs depict many ingots of ox-hide form. When painted red or pink, the ingots represent copper, while colors like blue, white and grey symbolize other raw metals, including silver and lead. That the grey-colored ingots also might represent tin was suggested by George Bass nearly twenty years ago.

Because organic materials survive under water when buried by sediment, the sand decanted from over fifty Canaanite amphoras raised during the first season was sieved for possible remains of the jars' contents. While studying this, Cheryl Haldane observed that nearly all vessels recovered during both seasons showed traces of a honey-colored resin; one amphora yielded a lump of the material weighing more than a kilogram. Samples have been analyzed with infrared spectroscopy by Curt W. Beck of Vassar College, and the spectra strongly suggest a family of resins that includes frankincense and myrrh, substances used ritually by the ancients. Indeed, the Egyptians imported incense-bearing trees from Arabian and Somali coasts to establish groves of their own.

Over a dozen disc-shaped glass ingots were found in 1984, and six ingots recovered this season have been analyzed by Robert H. Brill of the Corning Museum of Glass. The results indicate that the glass owes its rich blue color to cobalt, although the source of the cobalt is not known. The chemical analyses also revealed that the Ulu Burun ingots are identical in composition to glass objects from Mycenae and Egypt. At present, the source for our glass can only be guessed.

When completely excavated, the Ulu Burun site probably will yield the largest and most complete set of balance-pan weights from the Late Bronze Age; numerous bronze, hematite and stone weights of two types already have been recovered. Of greater interest is a remarkable group of six bronze zoomorphic weights including two frogs, a bull or cow, a duck, a sphinx, and a lead-filled bronze disc adorned with figurines of a shepherd and two sheep. Similar weights have been found in Cyprus, the Near East and Egypt.

Weapons also continued to surface. Among the more spectacular discoveries in 1985 were two extremely well-preserved bronze swords, one of which is typically Near Eastern and the other apparently of Aegean origin.

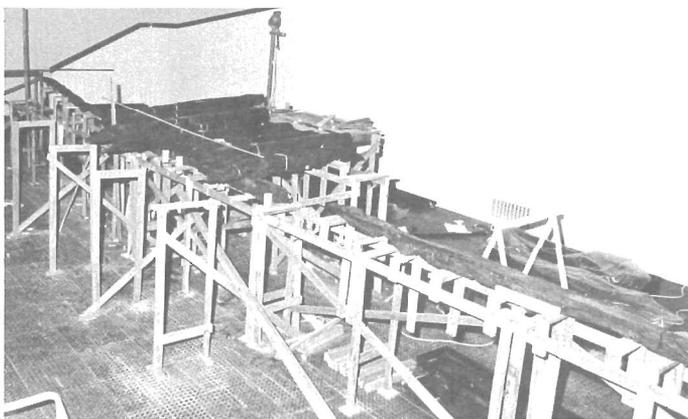
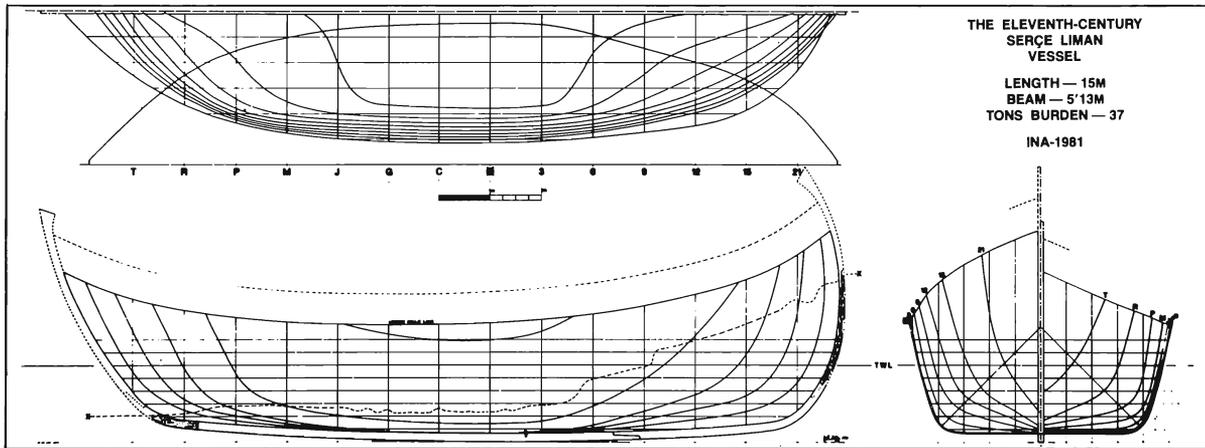
It is still too soon to determine the exact date and origin of the ship. Ceramic evidence suggests a 14th-century B.C. date. The nature of the cargo reminds us of contemporaneous cuneiform tablets found at Amarna, Egypt, relating the exchange of such gifts as copper ingots, ivory, gold and silver jewelry, bronze weapons and even myrrh between the Kings of Alasia and Egypt.

The Canaanite amphoras filled with Somalian or Arabian frankincense or myrrh almost certainly were loaded at a port on the Syrian coast, perhaps at Ugarit; glass ingots and ivory probably originated from the same general region. The source of tin remains enigmatic, but texts point to sources farther east. Recent discoveries of tin in Afghanistan, and evidence of its mining during the Bronze Age, are most exciting. The copper probably originated from and was taken on at Cyprus, along with a large quantity of Cypriot pottery.

The ship was surely sailing from east to west before its demise, its cargo destined perhaps for Rhodes, the Anatolian coast, Crete or the Greek mainland. Otherwise, the vessel's origin is difficult to ascertain. Along with Near Eastern Pottery, Mycenaean wares also were found, although Near Eastern sites often yield such pottery, a popular import item at the time. Other Mycenaean elements included a merchant's seal found in 1984 and the sword mentioned above. Several chisels also may have come from the Aegean area.

New Egyptian elements included several daggers of a type found on Palestinian sites. A bone scarab in a gold frame and a steatite plaque, each carved with Egyptian hieroglyphs, could be of Syro-Palestinian manufacture. A section of a gold signet ring with Egyptian devices on the bezel, deliberately cut into two pieces with a chisel, was undoubtedly scrap. Several boat-shaped mortising chisels of varied size find their closest parallels in Egypt.

Such a mixed assemblage of Syro-Palestinian, Cypriot, Egyptian and Aegean artifacts presents certain problems of interpretation. While we may never fully unravel the mysterious details of the ship's origin and destination, the Ulu Burun site will rank as one of the most significant finds of the Mediterranean Bronze Age.



Ship Reconstructions Span The Globe And 21 Centuries

By J. Richard Steffy

The ship research laboratory shared by INA and Texas A&M was the scene of an interesting variety of projects during 1985.

Research and documentation of the Athlit ram, a half-ton bronze ramming sheath attached to the bow of a classical warship dating to the 3rd or 4th century B.C. was completed in February. A few bow timbers of the ship survived within the ram, giving us the first physical evidence for the construction of these highly touted vessels. Research on the metallurgy, iconography, and other features of this discovery are being conducted by others, and it is hoped that a major publication will soon evolve from these combined efforts.

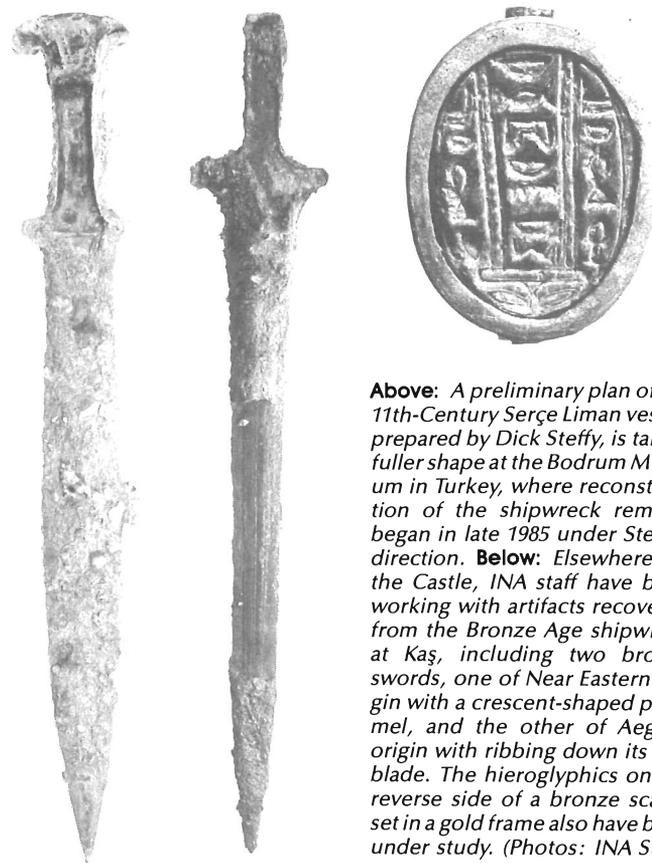
Final work for the rigging, sails, steering gear, and topside construction of the Kyrenia replica also was completed during these early months, and the information and sketches were sent to the shipyard in Perama, Greece, where the little vessel was launched on June 22. A future issue of the *Newsletter* will feature additional information about this interesting project.

Jay Rosloff, a former lab assistant, completed his research on the Ronson Ship, an early 18th-century merchantman found in the excavations for an office building in lower Manhattan. Jay had built a large model of the bow of that vessel as an aid to determining its construction; the model is now exhibited at Mariner's Museum in Newport News, Virginia, where the bow timbers of the Ronson Ship will be assembled and displayed as soon as their conservation process is completed.

During the summer Tom Oertling, another former lab assistant, began his investigation of the remains of the Molasses Reef Wreck, an early 16th-century shipwreck excavated in the Turks & Caicos Islands. Oertling has begun to clean, draw, and conduct preliminary analyses of the scant wood fragments, which have been undergoing desalinization treatment since they were brought to the MRW Conservation Lab.

Cemal Pulak, currently assistant director of INA's Bronze Age excavation at Kaş, Turkey, is reconstructing the remains of a 16th-century wreck excavated earlier at Yassi Ada, Turkey. Both of these projects probably will be completed next year. Fred Hocker, our current laboratory assistant, is doing preparatory research for his reconstruction of a 16th-century *beurtschip* laden with eggs and pewter, and Aleydis van de Moortel, who has worked on INA projects in Turkey during the past two years, has initiated her investigations of two late medieval ships. Both

Continued on Page 6



Above: A preliminary plan of the 11th-Century Serçe Liman vessel, prepared by Dick Steffy, is taking fuller shape at the Bodrum Museum in Turkey, where reconstruction of the shipwreck remains began in late 1985 under Steffy's direction. **Below:** Elsewhere in the Castle, INA staff have been working with artifacts recovered from the Bronze Age shipwreck at Kaş, including two bronze swords, one of Near Eastern origin with a crescent-shaped pommel, and the other of Aegean origin with ribbing down its fine blade. The hieroglyphics on the reverse side of a bronze scarab set in a gold frame also have been under study. (Photos: INA Staff)



Robin Piercy and Fred van Doorninck clean polyethylene glycol from wood fragments of the Serçe Liman vessel during an initial cosmetizing process. (Photo: INA staff)

MRW Reco Amid Cape

By Donald H. Keith

While there was no field season for the Molasses Reef Wreck Project in 1985, its artifact collection was enhanced by the discovery of another *verso*, or swivel gun. Dennis Denton, photographer for the project and now a manager with Research Submersibles Ltd., found the gun during a site surveillance check in July. We had not discovered it during our excavation because someone had carried it off the site and hidden it on the bottom before we started work in 1982. Denton contacted me and I flew down to bring the *verso* back to the conservation laboratory. I was delighted to see that it was a particularly fine specimen, completely intact except for one side of the swivel, which had been damaged by the would-be salvors. Unlike most of the other *versos* we had found, this one was loaded and ready for use.

Before leaving the islands I managed to spend a few days on West Caicos, an uninhabited island near Molasses Reef, which could have been reached by the wreck's survivors. Denton and two other friends, Wayne Kafcsak and Peggy Leshikar, helped me locate "Maravedie Cove," a sheltered niche in the ironshore where an early Spanish "Santo Domingo Series" copper coin was found in 1980. Two small lead shot of diameters matching those found on the Molasses Reef Wreck were discovered in the same vicinity four years later by Terry Richardson, Provo resident and friend of the Project, who sent them to us for analysis. Although we discovered no other early European artifacts, it was apparent that the site contained features making it particularly attractive to occupation: natural rain water collection basins, a good view of Caicos Pass, shade, and a place to land a boat. Previous visitors had carved their names and dates on the rocks around the pools. The earliest date we saw was 1867, but on the high ground above the ironshore Leshikar discovered sherds of a type of coarse shell-tempered pottery which may constitute evidence of a much earlier, pre-Columbian occupation by Lucayan Arawaks.

In Miami I was joined by my old friend Gary Adkison, who four years ago helped me rout a band of gun-wielding treasure-hunters off the Molasses Reef Wreck, and together we spent more than a week prowling the Miami riverfront looking for artifacts stolen from the site before INA began scientific excavation of the wreck. An anonymous tip-off led us to a yard once used by "Caribbean Ventures," the now defunct treasure-hunting company which quietly removed the artifacts from the Turks and Caicos Islands nine years ago. There we located three of the missing artifacts, a *verso*, *bombardeta* breech chamber, and a type of light cannon called a *cerbatana*. But the individuals currently in possession of these artifacts would not allow them to be reunited with the rest of the collection. Under cover of darkness the treasure-hunters spirited the heavy artifacts away to a new hiding place only hours before U.S. Customs agents arrived to investigate.

Ship Reconstruction Projects

Continued from Page 5

Hocker and van de Moortel will be conducting field work on these vessels in the polders of The Netherlands next summer.

The major INA ship project in 1985 was the commencement of the Serçe Liman reconstruction, an elaborate effort taking place in locations 8,000 miles apart. Late in 1984 the Turkish government completed a new ship museum within the Castle in Bodrum, which will house the reassembled remains along with anchors, rigging, and other ship-related artifacts. A sectional replica will be loaded and displayed with original cargo, and a highly detailed model will illustrate the appearance of the vessel before it sank.

Once the museum gallery was ready, scaffolding and other preparatory work for reassembling the original hull fragments began. Because the bottom of the ship had rested on soft sediments except the stern, which was propped on a rock, there was a suspicion that the remains had acquired an irregular shape. Therefore, it was necessary initially to assemble pieces with a view that changes might be required.

By mid-summer one-third of the hull had been temporarily assembled and evaluated for distortion, shrinkage, variations from the projected design, and other factors common to such reconstructions. This information was forwarded to our lab in Texas, where research models and drawings are being used to assess the work and to plan the next steps of scaffolding, permanent reassembly of fragments, and final supporting mediums. We now are at the stage where final erection of the hull has begun.

Sheila Matthews, our resident reconstructor in Bodrum, has been doing an excellent job in recording the fragments and assembling them on the scaffolds. Assisted by two local people in the cleaning and cosmetizing of fragments, and on occasion aided by visiting graduate students and archaeologists, Matthews forwards reports on field progress at regular intervals. That information is converted into graphic and model forms in the lab with the assistance of Hocker, who will spend time on the project next year. Rosloff, who has helped with this project here and in Turkey since its inception, will soon be arriving in Bodrum to assist Matthews with the phases of reassembly to follow. The project is scheduled for completion in 1987.

Construction Continues Versos And Conservation

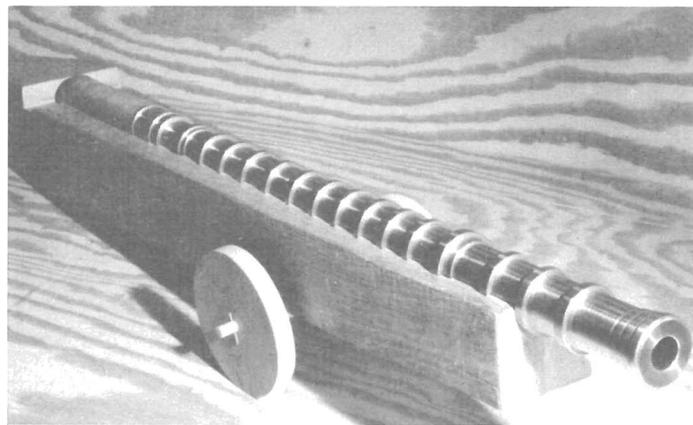
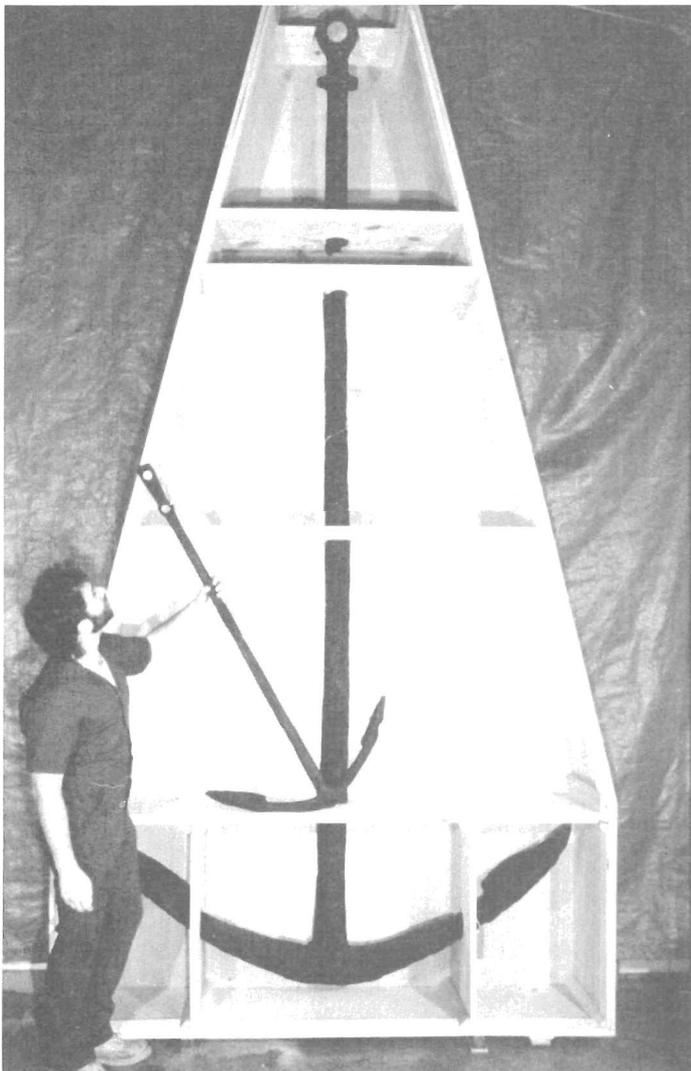
We discovered another *verso* for sale in a Miami curio shop. The shop proprietor's description of the man who had brought the gun in matched one of the treasure-hunters involved with Caribbean Ventures, leading us to conclude that this *verso*, too, had come from the Molasses Reef Wreck. I declined to buy the piece on ethical grounds, but the proprietor permitted Gary and I to draw and photograph it. We were sorry to observe that this once-splendid *verso*, one of the oldest European artifacts ever found in the Western Hemisphere, had

never received any conservation treatment, and was now in the final stages of total disintegration.

On the way back to Texas I picked up a pair of *versos* salvaged twenty years ago from the Highborn Cay Wreck in the Bahamas. The date and identity of this wreck were never determined but, like the Molasses Reef Wreck, it is one of the earliest shipwrecks ever found in the New World. The *versos* were entrusted to us for additional conservation treatment and analysis by Mr. Bob Wilke, one of the original discoverers of the site, who hoped that they would provide us with the opportunity to compare directly ordnance from the two sites to determine if they share a connection.

Upon my arrival back in College Station I was pleased to see that the enormous project of cleaning, analyzing and conserving the rest of the artifacts from the site was beginning to produce visible results. The first object to finish the process of electrolytic reduction was the ship's sheet anchor—the largest artifact in the collection. Since then, artifacts have been coming out of treatment at the rate of two dozen a week.

We are planning to return to the Turks and Caicos Islands during the months of April and May to continue our work at the Molasses Reef site. This field season will represent the final excavation of this interesting and enigmatic shipwreck.



Left: Among the first MRW artifacts to complete treatment were the large sheet anchor found on the site and a small boat anchor, recovered near the site and believed to be part of the assemblage because of constructional similarities. **Right:** While ordnance abounded, none of the carriages on which the guns rested—each being unique to a gun—survived. Thus, an experiment was undertaken to derive the proportions of one of the missing artifacts. A mild steel model of one of the site's bombardetas was fabricated, for which Jay Rosloff constructed an oak gun carriage. (Photos: Harding Polk)

The Cadiz Project

Joint Effort Leads To Finds
In Archives And The Bay

By Denise Lakey

When an invitation to jointly conduct an underwater archaeological survey of the coast of Spain was extended to INA in 1983, Dr. George Bass cast about for persons interested in working in that area of the world. Because of our long interest and involvement in wrecks from the Spanish colonial period, Joe Simmons and I felt the experience of working in the “mother country” would be worthwhile, so we packed up and moved to Spain in the summer of 1984.

The project, conducted with Sr. Manuel Martin-Bueno, who was then subdirector of archaeology, began with a survey of the Bay of Cadiz, chosen for its long maritime history, predating even its legendary founding by the Phoenicians in the 12th century B.C. Certainly we “New World types” had a strong interest in the area because of the significant role the port played in the earliest years of exploration and discovery, and because of its importance as a terminus for the Indies’ trade throughout the Spanish colonial period.

We spent the first nine months of the project gathering data to enable us to zero in on the best areas in which to work. We found a great deal of information in the *Museo Naval*’s excellent research library in Madrid. From there we moved to Sevilla for work in the famous *Archivo de Indias*. We were soon joined in our research by two young Spanish women, who proved to be invaluable to the project. They also became our good friends and helped us comprehend some of the subtleties of Spanish culture, although we never learned how to get a chicken cut up the “proper” way.

Armed with historical information from the archives, results of interviews with local divers and fishermen, and all the requisite nautical charts and tide tables, we moved our operation to one of the many naval bases on the Bay of Cadiz and “set up our camp” in a high-rise apartment overlooking the Atlantic Ocean. It’s a rare INA project where participants use an elevator to get to and from work.

Despite the typical field season problems that plague any project to one degree or another—equipment failure, customs delays, weather cancellations, and atypical problems like the fueling hoses at the fisherman’s dock being too short to reach our little research vessel when the tide was low—we located several wrecks near the entrance to the Bay of Cadiz.

Most of them were too modern—that is, wood-hulled, 20th-century trawlers—to be of any interest to us, but we buoyed them for the Comandante of the Spanish Navy’s diving



group so that he would have something on which his men could practice some of their skills. It was the least we could do to repay him for his assistance and support in allowing us to operate from his facilities.

The most interesting site located during the season was a portion of a vessel containing five large cannons and an anchor. Because of the single pearlware chamber pot sherd found deeply buried between hull frames, we were able to date the wreck to the late 18th or early 19th century. The site corresponds to one of the locations of the *Bucentaure*, the French flagship which sank while limping back into Cadiz harbor after being badly damaged at the decisive Battle of Trafalgar. However, since local informants cite at least three distinct locations as that of the *Bucentaure*’s remains and given the local populace’s proclivity for attributing every ship, anchor, and cannon as being from the Battle of Trafalgar, we dubbed the site “The Copper Scupper” Wreck.

Certainly the season’s work was only a drop in the ocean compared to the work that can be done in the Bay of Cadiz alone, not to mention the many interesting areas nearby such as the mouth of the Guadalquivir. However, the successes achieved during the course of the project were encouraging: we established good cooperation between team members and participating institutions—INA, the Ministerio de Cultura, the Armada Espanola, and the Instituto Espanol de Oceanografia. By season’s end, we had gained the Spanish navy divers’ confidence and they were telling us the locations of other wrecks. We began a preliminary, documented list of more than 385 wrecks in the Gulf of Cadiz, a list which, when placed in final form, will be quite useful in future research. We determined that the area we called the “Inner Bay” offers excellent archaeological possibilities and is worthy of a future project itself.

In the overall picture, the opportunities to learn about the Spanish culture first hand, to conduct fruitful research, and to become acquainted with other research avenues in Spain and the people who are pursuing those directions of study have already proved beneficial.

We wish to thank the institutions already mentioned, and the people too numerous to list here for their cooperation and support. We especially wish to thank the Joint Spanish-American Committee for Cultural and Educational Cooperation, our funding source, without which this project could not have been conducted.



Artillery in Focus

15th- And 16th-C. Ordnance
The Object Of In-Depth Study

By Joe Simmons

In order to gather firsthand information on the often poorly documented surviving examples of wrought-iron artillery from the 15th and 16th centuries, I conducted a one-person survey of European artillery collections from Portugal to Denmark during the months of January and February 1985. Precipitated by the study of wrought-iron guns recovered from the Molasses Reef Wreck (MRW), my research trip was made possible by the generous contributions by INA members J. D. Tobin of Portland, Oregon, and Richard McClelland of Miami. INA also made funds available for additional travel expenses.

I drew and completely measured more than seventy pieces of 15th- and 16th-century artillery and shoulder weapons in more than twenty museums and collections. Some of the best pieces—that is, the closest to the types we have found on the MRW and on a number of other period shipwrecks currently being investigated in the Caribbean—were found in the village of Hasselt, Holland, and in Madrid, London and Copenhagen. In situations where I was unable to physically inspect the pieces due to their being mounted on walls, placed behind glass or otherwise unavailable, I was able to secure photocopies of curators' measurement files, materials from museum libraries, and in some cases personal correspondence of the curators and conservators. I accumulated more than one-hundred pages of photocopies of pertinent data and excellent additional references.

I shot nearly seventy-five rolls of film of pieces of artillery and associated subjects before all of my camera equipment was heartlessly stolen in Madrid at the end of February. I was not harmed and I did manage to get my back-pack with all of my notes and drawings away from one of the *banditos*. That was an experience that I cannot recommend, however.

I was not able to visit all of the locations to which I originally planned to go. However, I was informed along the way about

other obscure but important collections, which I visited, and about still others which need to be examined during trips sometime in the future. In all, I visited seventeen of thirty-five intended stops and added three stops en route; a total of twenty facilities were thoroughly investigated in two months of travel, or an average of three days per facility. As it was, I felt severely rushed at times and I certainly tried to see too many places. Weather was a factor in some of my travels and affected the relative accessibility of certain institutions or specific collections.

This relatively small-scale research trip was an unqualified success. I was able to examine and to fully document many different kinds of artillery—primarily of wrought-iron but also of cast-iron and bronze—of various sizes, styles and dates. I located the very important collection of fourteen small swivel guns, or *haquebuts*, in Hasselt. At least two of these are nearly identical to the octagonal-barreled pieces recovered from the Molasses Reef Wreck. A *bombardeta* very similar to the matching pair from the MRW was located in Madrid. Decorative motifs on a surprisingly large number of wrought-iron pieces of various types were noted, which might help to identify more accurately the origin and date of specific pieces. Among the wrought-iron guns examined, a number of interesting constructional variations were documented.

Preliminary findings can aid in the immediate diagnosis of wrought-iron artillery pieces encountered on wrecksites of vessels from the period of exploration and discovery, which is the focus of our efforts in the Caribbean. Data subsequently gained through detailed analysis of the drawings, photographs, and sources obtained on this investigative journey will further add to the body of knowledge about these increasingly historically important weapons. This includes everything from the technical to the tactical aspects of the major weapons systems upon which the discoverers and explorers of the New World were heavily dependent.

Left: The well-preserved portion of a ship's hull, recovered from the inner area of the Bay of Cadiz more than twenty years ago, is studied by the joint INA-Spanish archaeological team. **Right:** Among the ordnance examined by Joe Simmons was the extensive outdoor collection of iron and bronze artillery pieces, seen here lightly covered with snow, at the Museum of Artillery in the Rotunda at Woolwich, England. Woolwich was one of twenty locations which Simmons visited. (Photos: Joe Simmons)

Computer Lessens Duress Of Site Recording, Mapping

By Fred Hocker

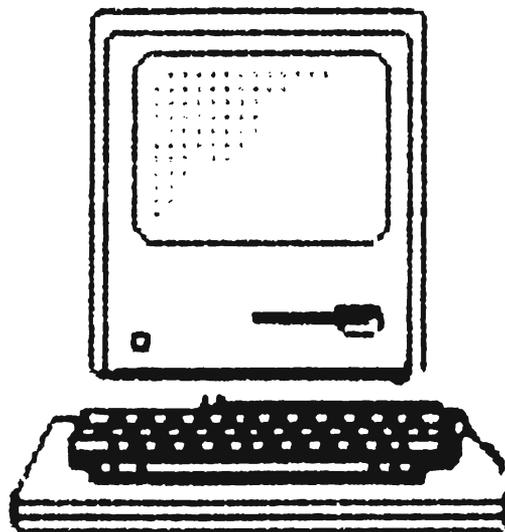
Green glass liquor bottles and kaolin clay tobacco pipes emerge from the black muck beneath the waters of Kingston Harbor. In some areas, isolated sherds appear; in others, thousands of shattered bottle and pipe fragments, the last remains of a thriving 17th-century port, are revealed by the dredge during our excavation of the sunken remains of Port Royal, devastated by an earthquake in 1692.

Three hours of excavation by a single diver easily can produce over thirty pounds of glass and clay fragments and a large number of bent, encrusted nails and spikes. In some areas, the bottom is nearly paved with chopped-up beef, pork, goat, turtle and chicken bones. Excavating such items is tedious, but cataloging and mapping them can be maddening. Aside from the occasional pewter plate, brass scale weight, or wooden doorsill, these seemingly countless and mundane items make up the bulk of the artifacts recovered at Port Royal during each summer field school season sponsored by Texas A&M, INA and the Government of Jamaica.

Curiously, the commonplace objects are potentially more informative than glamorous artifacts like pewter plates or musket barrels. Many of the pipes are marked with manufacturers' stamps, and often we find them lying in groups where their original shipping barrels came to rest on the seabed. Hundreds of bottles survived the earthquake that destroyed most of the city; corks and brass wires which sealed them often are still in place. By analyzing the quantities of different types of pipes and bottles, we learn something of the commercial practices of the merchant who purchased and stored thousands of these items in the spring or summer of 1692. By examining the distribution of different types of artifacts in the building in which we are excavating, we begin to understand the purpose for which the building was built and its relationship to nearby structures.

Previously, this type of research was performed by hand, with project participants laboriously collating data recorded in artifact catalogs, dive notebooks and on carefully-drawn site maps. Indeed, when the Port Royal Project resumed this past summer under the direction of Dr. D. L. Hamilton, the methods used for the most part were techniques developed during the previous four seasons. For the first time, however, the power of a microcomputer was applied to the tasks of cataloging and mapping in the field.

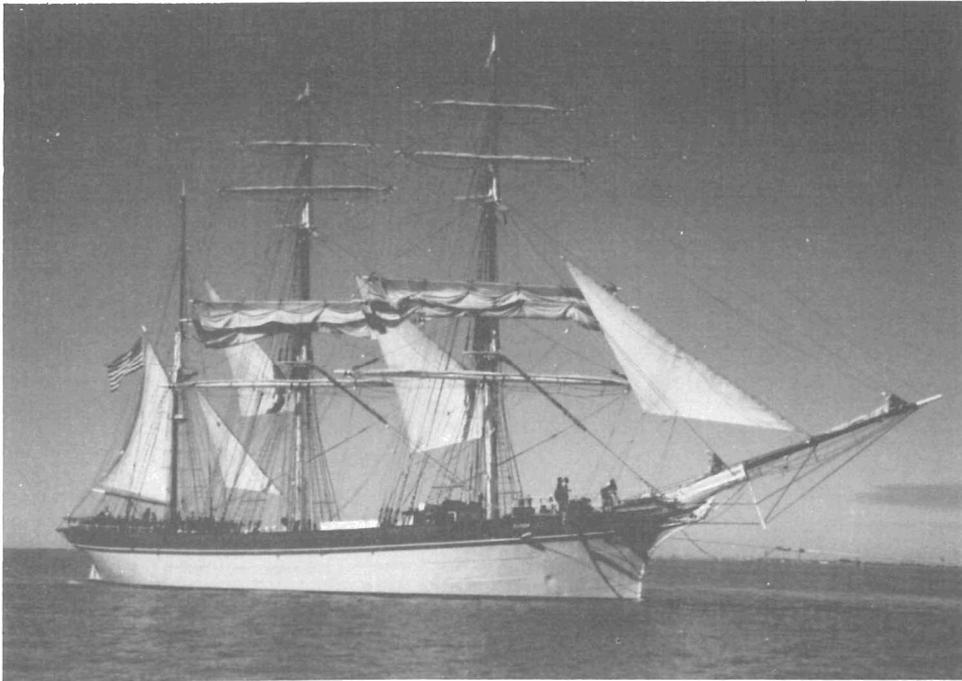
Computers have been used by INA at its College Station headquarters for word processing, accounting and record-keeping, but this year marked the Institute's first extensive field use of computers. The excavation team working on the Bronze Age shipwreck in Turkey applied them to field operations and also began testing a highly sophisticated, computerized underwater mapping system developed by INA Board Member Martin Wilcox.



Dr. Hamilton selected a Texas Instruments Portable Professional Computer for our use at Port Royal, equipped with word processing, database, and Computer Aided Design (CAD) software. Aside from a minor keyboard problem which the manufacturer cheerfully solved, the machine performed flawlessly, despite an erratic electrical supply and other adverse conditions.

Machines, however, are useless without skilled operators. From among the participants in our graduate-level field school in archaeology a wide variety of skills usually are present, and this year we were especially fortunate to have a pair of talented computer programmers, Michael Hulett and Gene Sekera. I also had worked extensively with the CAD software. Thus, with direction from Dr. Hamilton, Hulett and Sekera developed a comprehensive database that allowed us to organize artifacts as they were cataloged and even to perform some gross analysis in the field. I was able to draw the site plan and several survey maps very quickly using the CAD software, and Hulett and I wrote a program to map artifacts on the site plan automatically as they were cataloged.

Plans now call for the computerization of data from previous seasons at Port Royal, and expanded archaeological applications of the computer at INA. Dr. George Bass has speculated on the possibility of using computers to tackle the enormous amount of data from the Serçe Liman Glass Wreck, and Professor Richard Steffy has been developing a database for cataloging and analyzing wooden hull remains. Another graduate student, Aleydis van de Moortel, and I have been working on integrating CAD technology with ship reconstruction. Computers, especially small, sturdy portables, have opened up new avenues of research and should facilitate the attainment of ever higher standards of excavation and more comprehensive analysis strategies.



Elissa under sail, approaching Corpus Christi. (Photo: Sarita Bullard)

Saga Of Elissa: Cruise To Corpus

By Tom Oertling

I was having great apprehension about crewing aboard a 108-year-old sailing ship with a crew comprised mostly of amateur sailors. I was having the same emotions, I suppose, as the poor souls who found themselves impressed or shanghaied into sea service. Visions of storms, fire and shipwreck filled my mind. I contemplated the one-thousand-and-one things that might go wrong. Being a nautical archaeologist has its drawbacks at times; I'd seen too many shipwrecks on the seabed.

It took a while for these fears to pass, but after the daily routine had been established and we had gone through several emergency drills, I began to look around me and enjoy where I was. There is a certain sense of freedom on a sailing ship that one finds nowhere else. Having broken contact with land, we had none of land's constraints upon us: no deadlines, no appointments, no parking signs.

Darkness adds its own eerie dimension. I had thought that when the sun went down I would be left in pitch blackness, and I was surprised how much light is cast by the stars—indeed, enough to make out shapes and forms. Just a quarter-moon allows one to see color. I was very appreciative of this the first time I went aloft at night. Being in the rig while underway in daytime is an experience in itself, but to be there at night turned me cold. However, I could see my hand in front of my face, and that was all the consolation this nautical archaeologist needed. As I climbed the ratlines, timing my steps to the roll of the ship, I realized I remembered where everything was. When I stepped onto the footrope of the t'gallant yard, I held on extra tightly—leaving my fingerprints on the metalwork, I am sure—and made sure my safety line was attached. Meanwhile, despite my fear and caution, the moon had turned the water and yards and sails to silver.

Colors are different at sea. The water can be anything from deep blue to muddy green; the sky from bright blue to cloudy gray. The sunsets are red and orange, and the sunrises are pastel

pinks and reds—not so much brilliant colors as pure. There are no leaf or grass greens, nor the bright colors of flowers.

During the day there was always some activity, and the watch on deck was either washing or scrubbing something down. When off duty, one could either pitch in and help, which most of us did, or spend the time as we chose—sleeping, relaxing or singing.

When the last morning broke, we were standing in toward shore. Oil rigs were in sight and soon shore structures became visible. We passed the buoys marking the channel to Port Aransas. It was all coming to an end, though the most exciting part lay before us. As we approached Aransas Pass, boats of all sizes, types and shapes came out to meet us. Crowds lined the jetties and docks as we entered Port Aransas. We did not take up the tow from our tug as had been planned, but with the help of a favorable easterly wind, we sailed the entire eighteen miles across the bay. As the ship approached Corpus Christi, a fleet of sailboats followed us. Cars were bumper to bumper along the waterfront street. As the bowsprit crossed under the bridge, a cannon sounded a welcome and cheers went up from everyone.

I was feeling intense pride and joy. Despite my earlier apprehensions, we had done it! For the first time in sixty years, *Elissa* had travelled from one port to another under sail. I was thrilled to see that this ship was appreciated for what she is: a relic of the past, but still alive, still able to spread her sails and glide across the water.



INSTITUTE OF NAUTICAL ARCHAEOLOGY

P.O. Drawer AU, College Station, TX 77840

409/845-6694

OFFICERS—ADMINISTRATION

Donald A. Frey, President
George F. Bass, Archaeological Director

Michael L. Katzev, Vice-President

BOARD OF DIRECTORS

John H. Baird
George F. Bass
Duncan Boeckman
John C. Calhoun, Jr.
Charles Collins
Mrs. John Brown Cook
Frank Darden
Michael J. Davidson
Claude Duthuit
Donald G. Geddes, III

Nixon Griffis
Harry C. Kahn, II
Michael L. Katzev
Jack W. Kelley
David C. Langworthy
Robert E. Lorton
Frederick R. Mayer, Chairman
Melvin M. Payne
Clinton A. Phillips

Ray H. Siegfried, II, Vice-Chairman
Williams T. Sturgis
Frank E. Vandiver
Robert L. Walker
Lew O. Ward
Peter M. Way
Garry A. Weber
Martin A. Wilcox
George O. Yamini

STAFF

Sheila Matthews
Mark D. Myers
Netia Piercy
Robin C. M. Piercy
Sema Pulak

KC Smith
J. Richard Steffy
Murat Tilev
Tufan Turanli
Frederick H. van Doorninck, Jr., Ph.D.

ADJUNCT PROFESSORS

Edwin Doran, Jr., Ph.D.
Cynthia J. Eiseman, Ph.D.
John Gifford, Ph.D.
D. L. Hamilton, Ph.D.

Carolyn Koehler, Ph.D.
David I. Owen, Ph.D.
David C. Switzer, Ph.D.
Gordon P. Watts, Jr., M.A.

RESEARCH ASSOCIATES

Jeremy Green
Donald H. Keith, M.A.
Denise Lakey, M.A.

Cemal Pulak, M.S.
Donald Rosencrantz
Roger C. Smith, M.A.

SUPPORTING INSTITUTIONS

Australian Institute of Maritime Archaeology
Boston University
Brown University
Bryn Mawr College
University of California, Berkeley
University of Cincinnati
Cornell University
Corning Museum of Glass

Departamento de Arqueología Subacuática de la I.N.A.H., Mexico
Kittery Historical and Naval Museum
Maine Maritime Academy
University of Maryland, Baltimore County
Massachusetts Institute of Technology
University of New Hampshire
New York University, Institute of Fine Arts

University of North Carolina, Chapel Hill
Partners for Livable Places
University Museum, University of Pennsylvania
Shell of Turkey, Ltd.
Texas A&M Research Foundation
Texas A&M University
University of Texas, Austin