



CENTER FOR MARITIME ARCHAEOLOGY & CONSERVATION • NAUTICAL ARCHAEOLOGY PROGRAM

NEWS & REPORTS



CENTER FOR MARITIME ARCHAEOLOGY AND CONSERVATION

DIRECTOR

Kevin J. Crisman, Ph.D.

EDITOR

Chris Cartellone, M.A.

NAUTICAL ARCHAEOLOGY PROGRAM FACULTY

Donny L. Hamilton, Ph.D., George T. & Gladys H. Abell Chair of Nautical Archaeology; Yamini Family Chair of Liberal Arts

Kevin J. Crisman, Ph.D., Nautical Archaeology Faculty Fellowship

Shelley Wachsmann, Ph.D., Program Coordinator, Meadows Professor of Biblical Archaeology

Cemal M. Pulak, Ph.D., Frederick R. Mayer Professor I of Nautical Archaeology

C. Wayne Smith, Ph.D., INA Fellow in Nautical Archaeology

Luis Filipe Vieira de Castro, Ph.D., Frederic R. Mayer Professor II of Nautical Archaeology

Deborah N. Carlson, Ph.D., Sara W. and George O. Yamini Professor

STAFF

Helen Dewolf, Ph.D.

Peter Fix

Glenn Grieco, M.A.

John Hamilton

Jim Jobling, M.A.

LABORATORIES & DIRECTORS

Conservation Research Laboratory.....Donny L. Hamilton

Archaeological Preservation Research Laboratory.....C. Wayne Smith

Archaeo-Genomics Laboratory.....Peter Fix

J. Richard Steffy Ship Reconstruction Laboratory.....Luis Filipe Vieira de Castro

New World Laboratory.....Kevin J. Crisman

Old World Laboratory.....Cemal M. Pulak

Ship Model Laboratory.....Glenn Grieco

Wilder 3-Dimensional Imaging Laboratory.....C. Wayne Smith

AFFILIATE INSTITUTIONS

Institute of Nautical Archaeology

Department of Anthropology, Texas A&M University

Department of Oceanography, Texas A&M University

The Center for Maritime Archaeology and Conservation (CMAC) is based at Texas A&M University in College Station, Texas. Working in partnership with the Anthropology Department's Nautical Archaeology Program, the non-profit Institute for Nautical Archaeology, and other research institutions, CMAC strives to be in the forefront of maritime archaeological research around the world. The opinions expressed in CMAC News & Reports are those of the authors and do not necessarily reflect the views of CMAC or Texas A&M University.

Visit our website to download a **full color edition** and learn more about our team and our research, <http://nautarch.tamu.edu/>.

Please send correspondence to: Center for Maritime Archaeology & Conservation
Anthropology Building 107
Texas A&M University
College Station, TX 77843-4352
United States



Contents

NEWS

- 1 Faculty Profile — Donny Hamilton
- 2 Visiting Lecturers: Dr. Frederick Hocker and Captain Olof Pipping, The Vasa Museum
- 2 2011 Spring — Nautical Archaeology Program Theses & Dissertations
- 2 New Publications
- 5 Shipwreck Weekend

REPORTS

- 6 Nautical Archaeology Program Library – the Next Generation
M. Kofahl
- 7 Steaming Along: Research and Reconstruction of the Steamboat *Heroine*
K. Crisman
- 10 The Cargo of the Steamboat *Heroine* and the Army of the Frontier, Indian Territory, 1838
N. Chick
- 14 Challenges to Interpreting Life on Board the Steamboat *Heroine*
H. Jones
- 16 Health and Disease on the Dutch High Seas: Research at the Western Australia Maritime Museum Shipwreck Galleries
C. Eginton
- 18 Modeling the U.S. Brig *Jefferson*
G. Grieco
- 21 Sometimes Standard Recording Methods are not so Standard: Recording the Kızılburun Column Wreck's Hull Remains
J. Littlefield
- 24 Kings Mountain
A. Vance

On the Front Cover: Archaeologist Sara Hoskins recording a barrel from shipwreck *Heroine*, Red River, Oklahoma. See article on page 10.

On the Back Cover: Port stern quarter of *Jefferson* model. See article on page 18.

Faculty Profile: Donny L. Hamilton

Dr. Donny L. Hamilton is the only native Texan in the Nautical Archaeology Program (NAP), raised in Pecos, Texas, a fact he takes great pride in. He received a Bachelor of Arts degree in Anthropology from Texas Tech University in Lubbock in 1967 and a Doctorate in Anthropology from The University of Texas at Austin in 1975. Donny, as he is known by his friends, colleagues, and most of his students as well, is one of the first four professors who created the NAP at Texas A&M University between 1976-1978. The others were Dr. George Bass, Mr. Richard Steffy, and Dr.



Fred van Doorninck. As a NAP Professor and faculty member of the Anthropology Department, Donny holds the George T. & Gladys H. Abell Chair in Nautical Archaeology, and the Yamini Family Chair in Liberal Arts. He teaches courses in historical archaeology and artifact conservation. Now, he is the last of the “First Four” who established nautical archaeology at Texas A&M University. The NAP has since grown to include seven faculty making it the largest academic program in nautical archaeology in the world.

He is the former head of the Nautical Archaeology Program at Texas A&M University and also a past-president of the Institute of Nautical Archaeology which affiliated with Texas A&M University in 1976. He is a past editor of the Studies in Nautical Archaeology Series published by Texas A&M University Press. In recent years, Dr. Hamilton has taken on more administrative duties. From 2007 to May 2011, he served as the Head of the Department of Anthropology and is the past director and founder of the Center for Maritime Archaeology and Conservation.

When Donny arrived at Texas A&M University in 1978 he established the Conservation Research Laboratory (CRL), which he still directs. CRL is now one of the oldest conservation laboratories in the United States. In addition to conserving artifacts from university and Institute of Nautical Archaeology excavation projects, the lab also has an intensive contract program where artifacts are conserved for other reputable archaeology programs across the United States and the Caribbean. As the CRL director, Donny pioneered many of the techniques now used in the conservation of artifacts from marine sites and has an international reputation for his work in this field. Donny, along with his colleague, Dr. C. Wayne Smith, holds five patents on silicone oil conservation techniques developed in the CRL. The laboratory employs graduate students where they get valuable “hands on” experience in conservation, and a graduate assistant’s stipend.

Donny’s past and present research includes the conservation of artifacts recovered from the shipwrecks of the 1554 Spanish Fleet, excavated off the coast of Padre Island, Texas (in the

Gulf of Mexico), and the excavation and analysis of archaeological materials from Granado Cave near Guadalupe Peak in West Texas. He is best known for his excavations of the 17th-century sunken city of Port Royal, Jamaica and his research in artifact conservation. He is responsible for conserving the extensive collection of material recovered from the excavation of La Salle’s ship, the Belle, which sank in 1686 in Matagorda Bay, Texas. Currently, he is working with Dr. Deborah Carlson, current president of INA, on the excavation of a 1st century B.C. Roman shipwreck at Kizilburun, Turkey.

His published books include *Conservation of Metal Objects from Underwater Sites: A Study in Methods*, *Basic Methods of Conserving Underwater Archaeological Material Culture and Prehistory of the Rustler Hills: Granado Cave*. Most recently, he, along with two of the doctoral graduate students, Alexis Catsambis and Ben Ford, edited *The Oxford Handbook of Maritime Archaeology*, which was released in 2011 (see page 3).

In addition to nautical archaeology, conservation, and restoration, Donny continues to have an interest in North American historic and prehistoric archaeology. Other interests includes collecting scales and weights along with a variety of old things, and doing genealogical research. His current passion is the restoration of the 1891 two story, red sandstone Beard House, which he purchased in July 2010. It has not been lived in since 1943, so you can imagine its condition. If you ask him about the house be prepared to spend a lot of time listening to his enthusiastic descriptions of the Beard Family who built and lived in the house, as well as progress reports on cutting trees down, reroofing, and installing doors, windows, electrical outlets, and plumbing.

Donny has an affable personality, eclectic interests, an eclectic research program, and likes to work with his hands. Also, if the truth is told, he likes to be in control, but his colleagues agree that he is not overbearing. He has one rule, never ask anyone to do anything you are not willing to do yourself. On archaeological projects he is known for his scrounging skills and repairing or building things with nothing but scrap items. His philosophy is “keep it simple” and “you can do anything you want do” – this last advice was given to him by a stranger named Guy during a single 15-minute, chance meeting right after Donny graduated from high school 50 years ago. He took the advice as gospel. Never tell him you cannot do something because you do not know how. He will go out of his way to help anyone, especially students, as long as he knows they are willing to help themselves.

Learn more online about Dr. Hamilton and internet links to his research web pages at <http://anthropology.tamu.edu/faculty/hamilton/>.

2011 Nautical Archaeology Lecture Series

Two guest lectures spoke to the Nautical Archaeology Program and provided a half-day long workshop on ship rigging. Please see CMAC News & Reports Vol. 2 No. 1 for a detailed article describing a previous rigging class. The guests and lectures were as follows:

“The Ghost Ship: An Intact Dutch Merchantman from the 1640s”

Sailing and sinking a 17th century merchant ship.



Fred Hocker,
Director of Research,
The Vasa Museum.
Photo. C. Wayne Smith.

“Early 17th Century Sailing”

The rigging and sailing of an early 17th century ship, based on the current work with the warship *Vasa*.



Olof Pipping,
Research Associate,
The Vasa Museum.
Photo. C. Wayne Smith.

2011 Spring Nautical Archaeology Program Theses & Dissertations

Katie Custer Bojakowski, Ph.D., “Exploration and Empire: Iconographic Evidence of Iberian Ships of Discovery”

Carlos Cabrera Tejedor, M.A., “Re-Conservation of Wood from the Seventeenth-Century Swedish Warship the *Vasa* with Alkoxysilanes: A Re-treatment Study Applying Thermosetting Elastomers.”

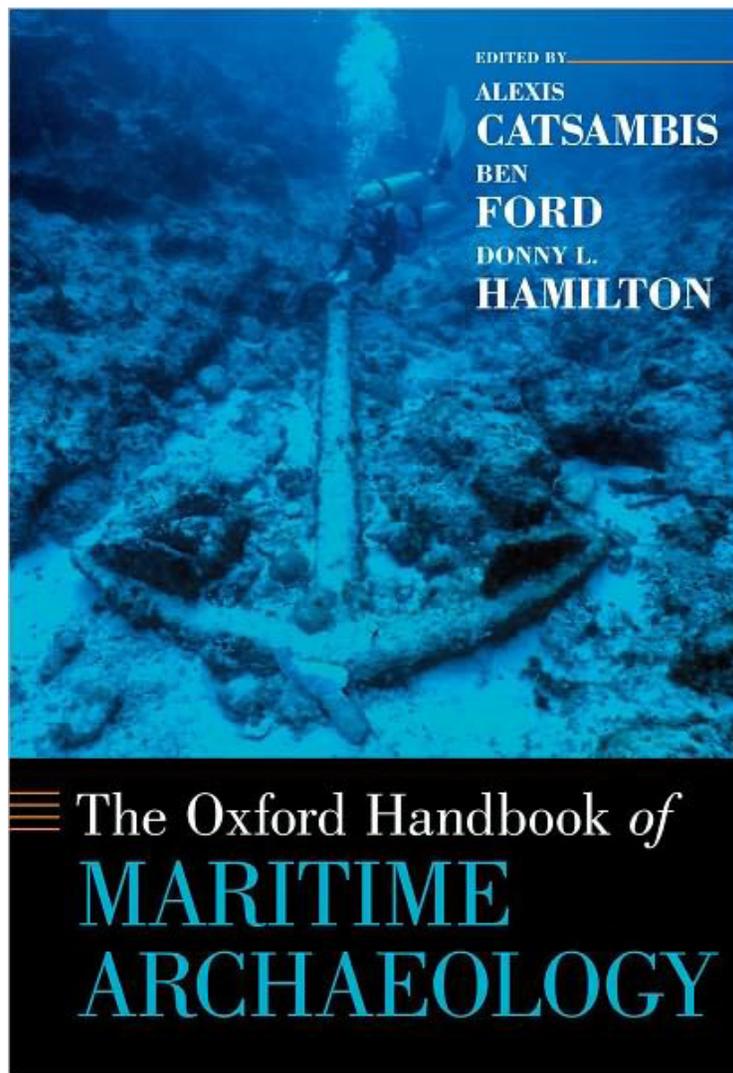
Lindsey Hall Thomas, M.A., “The A.J. Goddard: Reconstruction and Material Culture of a Klondike Gold Rush Sternwheeler.”

New Publications

Bojakowski, Piotr. “The Western Ledge Reef Wreck: Continuing Research on the Late 16th-Century Iberian Shipwreck from Bermuda.” *Post-Medieval Archaeology* 45:1 (2011): 15-37.

Bojakowski, Piotr, and Katie Custer Bojakowski. “The Warwick: Survey Results of the Early 17th-Century Virginia Company Ship.” *Post-Medieval Archaeology* 45:1 (2011): 38-50.

New Book



The Oxford Handbook of Maritime Archaeology

Edited by Alexis Catsambis, Ben Ford, Donny L. Hamilton.

Oxford University Press, 1240 pages.

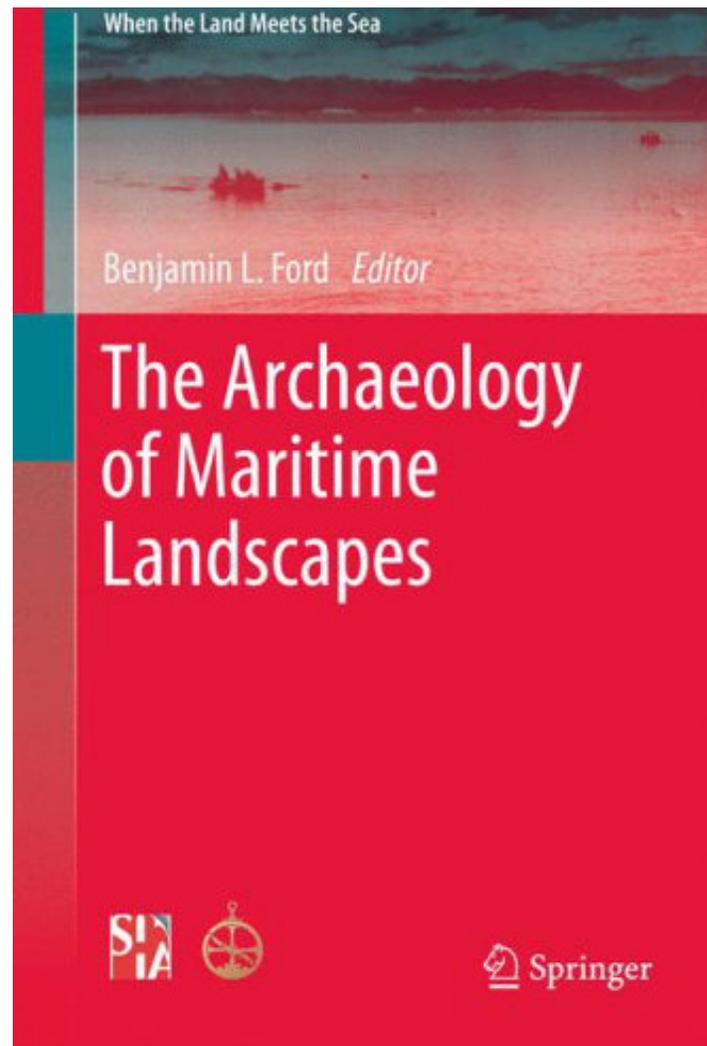
ISBN13: 978-0195375176

ISBN10: 0195375173

This comprehensive survey, with chapters from nearly fifty scholars, covers a wide range of topics within the discipline. The book has four main themes: the research process, ships and shipwrecks, maritime and nautical culture, and issues of preservation and management.

Alexis Catsambis is an Underwater Archaeologist with the Naval History & Heritage Command, Ben Ford is an Assistant Professor of Anthropology at Indiana University of Pennsylvania, and Donny L. Hamilton is a Professor in the Nautical Archaeology Program at Texas A&M University.

New Book



The Archaeology of Maritime Landscapes

Edited by Ben Ford.

Springer, 367 pages.

ISBN13: 978-1441982094

ISBN10: 1441982094

This book addresses the theoretical and methodological research questions surrounding maritime cultural landscapes, including terrestrial and submerged archaeological sites, prehistoric and historic sites, and an examination of diverse topics. The volume includes author contributions from the United States, the United Kingdom, Norway, and Australia.

Texas A&M University Nautical Archaeology Program alumnus Dr. Ben Ford is the editor and an Assistant Professor of Anthropology at Indiana University of Pennsylvania.

Texas A&M's Department of Anthropology, Center for Maritime Archaeology and Conservation, the Institute of Nautical Archaeology, and the Melbern G. Glasscock Center for Humanities Research present:

SHIPWRECK WEEKEND

In Images from 23 April 2011



Images courtesy of John Littlefield.

Nautical Archaeology Program Library: the Next Generation

Meko Kofahl

Nautical Archaeology Program, Texas A&M University

One of the jewels of the Nautical Archaeology Program is our specialty library, a repository of ten thousand volumes and several thousand offprint articles dedicated to nautical archaeology and related topics (fig. 1). The library was begun early in the program's history, when the program facilities were a considerable distance away from the main library. It lives on today as a highly-focused research library and study area where students can work and readily access relevant materials.

these archives for use by researchers, with the eventual goal of having an online collection of drawings, models, and research papers from our donors. Some of these materials are unpublished including a number of Professor Steffy's technical ship drawings. This project will make these materials widely available for the first time. The scanning process is slow and will certainly take a number of years to complete. My hope is that the dividends will long outlive the investment in time. This year the library invested in a high-speed document scanner



Figure 1: NAP Library. Photo: Chris Cartellone.

The library has been the recipient of a number of gifts over the years, many in the form of collections of books or archival papers. One such gift came from Professor J. Richard Steffy, one of the founders of the program; another came from Lillian Ray Martin. Martin, a former student who died tragically in a plane crash and whose family donated her papers to the library, had an extensive collection of personal research into Venetian ships and boats, including hundreds of reproduced archive photographs. In addition to donations such as these, smaller collections of papers and research are gifted by students to the library from time to time.

Through my assistantship as a NAP graduate student, I serve as the librarian. The focus of my tenure has been to digitize

which has hastened the process of digitization considerably.

The library benefits greatly from former students' and others' donations of site reports and other materials. Such materials--especially when not commercially published or widely available--are a great asset to the TAMU NAP community. Financial support is welcome, and could one day mean the creation of an endowed archival position dedicated to managing these unique resources and support the acquisition of new materials. I encourage anyone interested in supporting this effort to contact CMAC about a gift to the library, including the opportunity to purchase specific, desired books and materials for the library.

Steaming Along: Research and Reconstruction of the Steamboat *Heroine*

Kevin Crisman

New World Laboratory, Center for Maritime Archaeology & Conservation, Texas A&M University

One of the great strengths of nautical archaeology at Texas A&M University (TAMU) has been our ability to tackle really long-term shipwreck excavation and analysis projects. In this we are both unique and fortunate. The support of the university, the Center for Maritime Archaeology and Conservation (CMAC), and the affiliated Institute of Nautical Archaeology (INA), permits faculty and students to spend the time necessary to uncover, document, conserve, and fully analyze wrecks of particular significance. No other institution in the world is able to carry out this level of intensive research on so many different aspects and eras of the seafaring past.

A case in point is the *Heroine*, the earliest example of a Mississippi River or 'western river' steamboat yet found and scientifically studied. Archaeologists from the Oklahoma Historical Society (OHS) and INA first visited the wreck site in 1999; after three seasons of electronic-instrument surveys and test digs, full-scale excavation began in 2003 and continued until 2008. During this time a vast amount of data and artifacts were recovered from the vessel, a process that culminated in the helicopter-assisted recovery of well-preserved machinery elements (fig. 1).

What makes *Heroine* such a significant find? Well, first and foremost, it is a rare surviving example of a technology that completely transformed the social and environmental landscape of North America. *Heroine*, and the many hundreds of steamboats just like it, greatly accelerated the westward expansion of the United States in the first half of the 19th century. The changes they wrought cannot be overestimated. Despite their numbers and their contributions to national and world history, we know astoundingly little about the design, construction, and propulsion of the early steamboats. The first western river steamer was launched in 1811, but it is not until 1850 that we have a set of basic plans for one of them. Built in 1832, *Heroine* falls squarely between these two dates, at a time when these boats were still undergoing rapid modifications in their form and assembly.

Yet another significant aspect of *Heroine* is its apparent 'average-ness': the boat's 150-ton size places it in the median category of contemporary western steamers, and its career, reassembled from newspaper accounts, fits with the common 'transient' pattern of the era. Everything suggests that *Heroine* was entirely typical and therefore representative of many of its peers. Finally, the wreck of *Heroine* is noteworthy for being largely intact up to the level of the main deck, and much of its machinery has survived. Little guesswork has been required for the reconstruction of the lower hull and propulsion system.

Our experience with *Heroine* certainly confirms the truism that the real work in archaeology starts after you finish with the digging. With support from the OHS, TAMU, CMAC, and INA, a dedicated team of conservators, cataloguers, artists and photographers have been processing the many hundreds of finds from the wreck that were brought to CMAC's Conservation Research Laboratory between 2001 and 2008. While a few of the bulkier wooden items, such as the rudder, are still undergoing conservation, most of the artifacts have completed preservation treatment and have either been shipped to the OHS's Oklahoma History Center in Oklahoma City, or are currently undergoing study in CMAC's New World Laboratory. In 2009 CMAC purchased a 'Faro Arm' digital recorder, a device that has been used by Bradley Krueger and others to quickly produce highly-detailed records of the larger iron and wooden pieces (see CMAC News & Reports, Vol. 2 No. 2).

To facilitate our analyses the field data and artifacts from *Heroine* were separated into four very broad categories: 1) hull (everything relating to the boat's assembly including timbers, fasteners, and items such as the rudder); 2) steam propulsion system (boiler elements, flywheels, shafts, bearings, and side wheels); 3) cargo (barrels and their contents, boxes, as well as handcarts and other tools for lifting or moving cargo); and 4) crew- and passenger-related finds (shoes or clothing, food storage, preparation and consumption items, tools, and miscellaneous finds). Two of these categories have become the focus of thesis research by members of the cataloguing team: Nina Chick is carrying out an analysis of cargo-related finds and uncovering the story of *Heroine*'s final cargo, and Heather Jones is examining the personal finds of the crew and passengers, as well as broader aspects of steamboat work and life in the second quarter of the 19th century. Some of the results of their work may be seen in the following two articles.

The study of *Heroine*'s machinery has been spearheaded by CMAC research associate and model maker Glenn Grieco (with some contributory work by the author). Grieco began his work in 2004 by personally recording flywheel and paddle wheel assemblies on the wreck, and later supplementing his notes with additional data recorded in the field and -- once all the machinery elements were recovered -- in the laboratory. After reconstructing the machinery with the aid of a CAD program, he scratch-built a model of *Heroine*'s hull showing the 'as-built' arrangement of engine support timbers, the boat's single centerline-mounted piston, the crank or 'pitman', and the twin flywheels and side wheels (fig. 2). This model is now part of an exhibit on *Heroine* at the Oklahoma History



Figure 1: Helicopter recovering artifacts. Photos: Jeff Briley of the Oklahoma Historical Society.

Center. Work on the propulsion system continues with Grieco's recent CAD reassembly of the boilers, an arrangement based on recovered elements such as cast iron mountings, fire grates, bricks, sheet metal casing, and a feed-water pipe fitted with a one-way valve. Our knowledge of the fabrication and day-to-day operation of 1830s steam technology has vastly increased as a result of *Heroine's* bounty of information and Grieco's detailed analyses.

Reconstructing the *Heroine's* hull from keel to pilot house has been the author's pet project ever since 2002, when test pitting first hinted that the wreck was well preserved beneath the sand. Recovery of the entire vessel from the river was deemed too costly, and so detailed in situ recording of the structure was emphasized throughout the excavation. Thousands of individual measurements, hundreds of detailed timber drawings, and sixteen frame sections recorded by the dive team made it relatively easy – if time-consuming – to reconstruct the steamboat up to the level of the main deck. Lines drawings that show the hull's three-dimensional form were completed in 2009, and these have formed the basis for the most recent phase of the work, a reconstruction of *Heroine's* profile that includes the missing upper structure. The likely appearance of the steamboat's upperworks has been worked out from clues that survive on the wreck (the location of support posts, for example), contemporary paintings and written descriptions of steamboats, and the builder's contract for the 1831 steamboat *Yellowstone*. More drafting lies ahead, but the *Heroine's*



Figure 2: Glenn Grieco with model of *Heroine's* steam engine. Photo: C. Wayne Smith.

three-dimensional form, along with its propulsion system, its artifacts, and its history, are all taking shape nicely.

As the laboratory part of the *Heroine* study moves towards completion, the next phase is already steaming ahead. This is the vital step of sharing our discoveries, with other archaeologists and historians, and with the wider public whose support and interest make this research possible. Master's theses, popular and scholarly journal articles and books are all part of the publication plans. Sharing the finds more directly with the public is a priority for the OHS. The *Heroine* project has been featured in a display at the Oklahoma History Center since 2005, but over the past two years the OHS has been preparing a greatly expanded exhibit. This will include many more of the original artifacts from the wreck, a replicated section of the steamboat's main and upper decks, and new insights into North American steamboats and river transportation that have

been gained through our collaborative research efforts over the past decade.

In a very real sense exploring the wreck of the *Heroine* has been the equivalent of building a time-traveling machine. The construction of that machine started in 1999 when archaeologists began taking delivery on an incomplete jumble of parts accidentally deposited on the bottom of the Red River in 1838. Ever since then we have been working to put the whole thing back together one piece at a time, most of the time working without the benefit of clear assembly instructions. There are gaps and missing elements, of course, but the efforts are paying off. Little by little we can begin to see a time, a place, people, and long-ago events, once forgotten but now revealed to us through the pieces and the story of the steamboat *Heroine*.

The Cargo of the Steamboat *Heroine* and the Army of the Frontier, Indian Territory, 1838

Nina Chick

Nautical Archaeology Program, Texas A&M University

Seasons of diving into the muddy waters of Oklahoma's Red River on the 1838 wreck of the steamboat *Heroine* ended in 2008, but work on the project continues. Many hundreds of recovered objects are being conserved and studied, and researchers continue to piece together the story behind her sinking by diving into historical documents.

Excavation of the *Heroine* revealed a rare early example of a Western river steamboat, whose hull construction and single-piston engine have generated much interest among nautical archaeologists and others who study the history of American steamboat technology. In addition to the hull and the machinery, however, many smaller finds were recovered. These include tools and equipment used in the operation of the steamboat, handcarts and specialized hooks for handling cargo, and a variety of small personal possessions. In the hold, amidships on the port side, divers found barrels and barrel components: remnants of *Heroine's* last cargo (fig. 1).

They excavated about 170 staves, some as part of "barrel features," others scattered loose; thirteen complete heads representing at least ten barrels; and ten half-heads. There were hundreds of pieces of broken wooden hoops as well as fragments of staves and heads. An unknown number of barrels remain in a small unexcavated section of the hold. The presence of barrel heads marked USA—for United States Army—confirmed the identification of the wreck; research has revealed that *Heroine* was lost while carrying supplies to Fort Towson, Choctaw Nation (now Oklahoma).

In the 1830s Fort Towson was among the most remote of the frontier forts. Its mission was to guard the U.S. border with Mexico, and later the Republic of Texas, and to protect the Choctaws who had been removed to Indian Territory from east of the Mississippi. It would be difficult to overstate the challenges of supplying the post, due in large part to the perils of the Red River. In addition to the usual Western river hazards of narrow, shifting channels, submerged obstructions, powerful high-water currents and low-water shallows, there was the Great Raft. This enormous log jam obstructed some 160 miles (257 kilometers) of the river, allowing passage only to small vessels during periods of high water. Even after a passage through the Raft was opened by Henry Shreve and his innovative snag-removing technology in 1838, the river remained treacherous. Essential supplies for Fort Towson were frequently delayed, and in the spring of 1838, the annual provisions delivery was already overdue. The garrison was desperately short of edible rations; Lieutenant Colonel Josiah

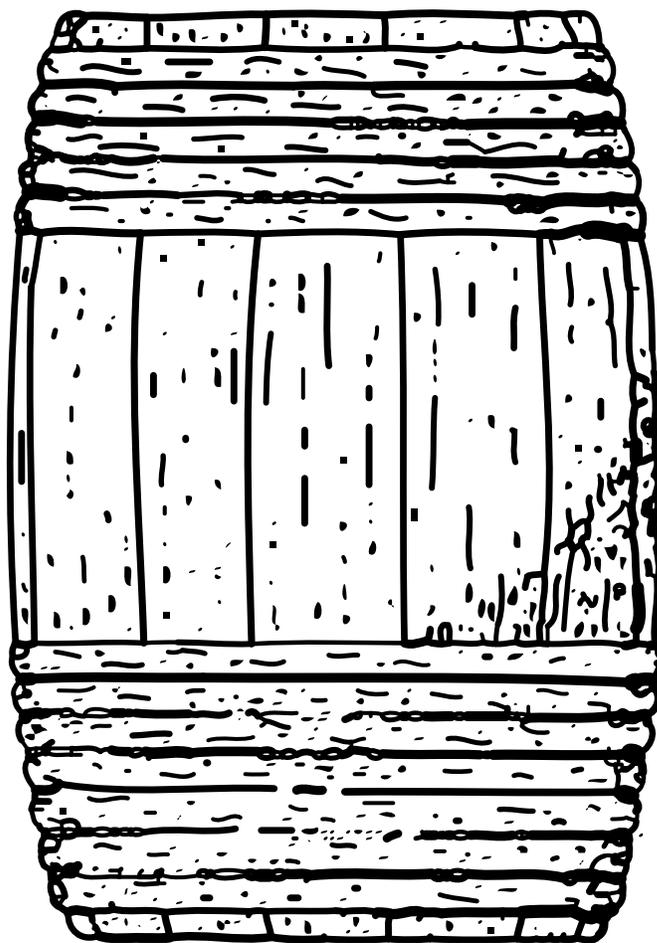


Figure 1: Reconstruction of a wooden-hooped barrel. Technically, a "barrel" is a cask of a certain size. However, as American usage designates most casks as barrels, this study uses the term "barrel" throughout. Conveniently for this study, all the "casks" in the assemblage are in fact barrel-size, so "barrel" is correct either way. After Danielle Jones.

H. Vose, commander at the time of *Heroine's* sinking, had to increase the pork ration by 50 percent to allow for rotten meat that his soldiers had to trim from each piece.

For most of the 19th century, feeding the army was the responsibility of the Commissariat of Subsistence. The



Figure 2: Where their ends overlapped, wooden hoops were tapered and notched, and secured to the barrel with small nails. Bark was generally not removed. Hoops often broke during handling, and barrel maintenance frequently included replacing broken ones.

correspondence of Commissary-General George Gibson and other records of the Subsistence Department have been most helpful in this study. The Commissariat (which was merged into the Quartermaster Corps in 1912) oversaw the purchase and distribution of army rations. A ration is the amount of food allowed for one man for one day. In 1837, it consisted of the following quantities:

Per man

- 1¼ lb. fresh or salt beef, or ¾ lb. pork or bacon
- 18 oz. bread or flour, or 12 oz. hard bread, or 1¼ lb. of corn meal

For every one hundred rations

- 8 qt. peas or beans
- 2 qt. salt
- 4 qt. vinegar
- 1½ lb. candles
- 4 lb. soap
- 4 lb. coffee and 8 lb. sugar.

This ration was to be supplemented with potatoes, onions and other produce from post gardens. Though not edibles, soap and candles had been part of the ration since Revolutionary War days. Assistant Commissaries at individual posts made some purchases, but the staples—salt pork, flour, beans, salt, vinegar, soap and candles—were delivered annually in bulk by civilian contractors.

Each summer, Calls for Proposals to deliver provisions to listed Army posts appeared in newspapers around the country. Bids included all costs, even transportation, and contractors bore total responsibility for the shipment until it had been delivered, inspected, and accepted at its destination. Though risky, especially for more remote posts, the contracts offered

entrepreneurs the opportunity to make good profits, and receive reliable payment. In the summer of 1837, Christopher Niswanger and William S. Sullivant of Columbus, Ohio decided to venture into the Army provisioning trade. Both were prominent entrepreneurs with interests in banking, transportation and other businesses. Sullivant's great wealth allowed him to follow his interest in natural sciences, and he later achieved renown as a botanist. Less is known about Niswanger, though he had served as Commissary-General for the Ohio militia and was sometimes addressed as General Niswanger on that account. He was the active partner in managing the Army contract. The men bid on contracts for several army posts, but won only the one for Fort Towson. Unfortunately, they seriously underestimated the costs of transportation. Even if most of the cargo had not been lost when *Heroine* sank, they would probably have barely covered their investment.

The Fort Towson contract required 240 barrels of pork, 500 barrels of flour, 220 bushels of white beans, 3,500 pounds of soap, 1,600 pounds of candles and 80 bushels of salt for some reason, vinegar was omitted from this contract; it was still part of the ration but was obtained outside the contract. By February, 1838, the cargo was all collected at Cincinnati, waiting only for the Ohio River to be cleared of ice before beginning its long journey to Fort Towson. The first mention of *Heroine* in the military documents is Niswanger's letter to Gibson informing him that, as of 29 March, the provisions were safe in Shreveport, Louisiana, aboard the steamboat *Heroine*, with J. R. Hord as Master.

In April, *Heroine* was one of the first vessels to pass safely through the Great Raft. Low water delayed her for two weeks at Jonesboro, Texas, only four miles (6.4 kilometers) from her destination. She finally headed upriver on 6 May, only to hit a snag and sink within two miles (3.2 kilometers) of the Fort Towson landing. Though damaged beyond repair, *Heroine* was not completely submerged. Soldiers sent by Vose from the Fort were able to salvage part of the cargo before rising water put an end to the operation.

Interpretation of the barrel finds has been greatly assisted by reference to historic documents. The contract signed by Niswanger and Sullivant stipulated that the pork, beans, flour and salt were to be delivered in "strong and secure barrels" and "the soap and candles in strong and secure boxes." The pork and flour barrels were to be of "seasoned heart of white oak," and the pork barrels "full hooped," it being understood that all the hoops would be wood, not iron (fig. 2). Though one complete iron hoop and some pieces were found in the wreck, none of the military cargo barrels appear to have been iron-hooped. The absence of boxes—beyond a few small scraps—among finds from *Heroine*'s hold is explained by a report from Vose to Gibson that "all the soap and candles were saved." The single intact "No. 1 Soap" box found in the wreck was in the stern compartment, evidently part of the crew's supplies. Vose reported the salvage of pork and flour barrels, but no reference

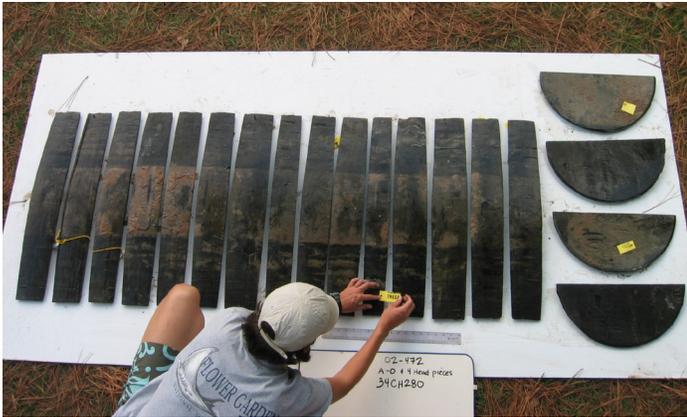


Figure 3: Barrel Feature 02-04 (02-472) was one of three pork barrels raised with contents intact. Note the dark ends of the staves showing impressions of a solid covering of wooden hoops, leaving only the bilge in the center uncovered.



Figure 4: This barrel (02-1035) probably held flour. Hoop impressions show only ten hoops in four widely spaced groups. Note the two staves on the right with remnants of hoops still attached.



Figure 5: This stave (02-700) is typical of the “bean barrels.” It is broad, thin and lightly hooped.

has been found to the salt.

This assemblage contains three types of barrels. Representative pork and flour barrels were identified by the markings on their heads, while the other barrel type is believed to have held beans. All the heads are 17 to 17½ inches in diameter. The highest quality are the “tight” barrels that contained 200 pounds of salted pork. Their staves are the longest at 29 to 30 inches, the thickest at one half to three quarters of an inch, and the most consistent in width, most of them four to five inches at the bilge. Wooden hoops completely covered the outer two thirds, leaving only the widest part of the barrel’s center, the bilge, free of hoops (fig. 3). Probably, more of these sturdy barrels could have been successfully salvaged and consumed had the river not risen.

Flour barrels held 196 pounds of superfine flour and fall into a “tight/slack” category of cooperage. Though less robust than pork barrels, they still had to be fairly tight-fitting to prevent the flour sifting out between the staves. These staves are about 27 inches long and about half an inch thick (fig. 4). These barrels were not full-hooped, having only ten hoops in two widely spaced bands on each end. Their width varies considerably from about two to four or more inches. Unfortunately for the soldiers and the contractors, much of the salvaged flour proved upon examination to have been water-damaged and did not pass inspection.

The last group of staves are quite thin, as slight as one-quarter inch. Though the same length as flour staves, their width varied even more—from two inches up to five and a half to six inches. In addition, the grooves around the inside of each end of the barrel into which the edges of the head are fitted. Their crozes were only one sixteenth of an inch deep compared to the one eighth-inch crozes on the staves of pork and flour barrels. They were not full-hooped. No head markings identified bean barrels. However, it is easy to imagine many of these relatively flimsy “slack” barrels breaking as cargo tumbled in the hold when *Heroine* jolted to a stop on the snag. Nor would intact barrels have protected their contents from the inrush of river water. Thus, it is not surprising that, as Vose reported, “all the beans were lost” (fig. 5).

Barrel heads provide clues to the origin of the cargo. Several show marks of individuals and firms known to have been operating in Cincinnati in the 1830s (fig. 6). W&R Phares and J. Phillip were flour merchants, A.S. Reeder dealt in salted pork, and Armstrong was an inspector of flour. Most heads are of two-piece construction, though a few have multiple pieces.

Three pork barrels were recovered with their contents more or less intact, and the bones have been studied by Juliet Brophy, a doctoral candidate in physical anthropology at Texas A&M University. Her research suggests that there was a lack of standardization in the number and parts of pigs in each barrel, but that the overall quality of the meat fulfilled the standards specified in the contract.

Vose was able to replace the lost provisions by dispatching an officer to New Orleans to make an emergency purchase.



Figure 6: This three-piece flour barrel head (02-684) is marked with the brands of the flour supplier W&R Phares, Cincinnati flour inspector Armstrong, and the United States Army (USA). It has a 1-inch bunghole. Incised straight lines, curved lines and circles are coopers' marks.

The real losers when *Heroine* was lost, however, were the contractors. They had no insurance on the cargo; Niswanger claimed that it could not be had on the Red River for any price. The Army paid only for provisions that were recovered

in acceptable condition, and Niswanger and Sullivant lost thousands of dollars on the contract. It was their first and last venture into Army provisioning.

Suggested Readings:

Croghan, George. *Army Life on the Western Frontier: Selections from the Official Reports Made Between 1826 and 1845 by Colonel George Croghan*, edited by Francis Paul Prucha. Norman: University of Oklahoma Press, 1958
Kilby, Kenneth. *The Cooper and His Trade*. London: J. Baker, 1971. Fresno: Linden Pub., 1989.
Shagena, Jack L. *An Illustrated History of the Barrel in America*. Self published, 2006.

Challenges to Interpreting Life on Board the Steamboat *Heroine*

Heather Jones

Nautical Archaeology Program, Texas A&M University

Steamboats are an American icon, idolized as massive three-layered carriers of entertainment and leisure. Unfortunately, this popular view does not accurately describe the majority of the commercial steamboat fleet on the Western rivers prior to the Civil War, which was composed predominantly of tramper steamboats. These small, independently-owned vessels were modest in design and took on any passengers and freight they could. Their absence from popular view is partially due to the fact that almost no steamboats from this early period have been archaeologically studied. The discovery and excavation of the steamboat *Heroine* in the Red River, Oklahoma, provides an opportunity to examine one of these early all purpose vessels.

The questions of who was on board and what life was like

for these individuals can be two of the most difficult questions to answer about any vessel. Telling the story of life on board *Heroine* may seem as simple as identifying where the more than 200 artifacts that represent daily life, including personal possessions, were located on the wreck. A shipwreck is usually considered a time capsule, capturing everything on board at the wrecking moment in stasis until an excavation occurs, but this idealized scenario rarely exists. It is important to consider any forces that might alter the story told by a wreck and its artifacts. This article aims to highlight the factors that are relevant to researching the personal possessions from *Heroine* and how they affect her story, beginning with her career history.

Heroine was built in 1832 for Jeremiah Diller, a cabinet maker from Louisville, and ran primarily on the Mississippi River as an all purpose freight and passenger carrier. During the winter months she often served as a cotton packet, transporting cotton bales from Southern plantations to New Orleans for shipment to distant mills. Diller sold *Heroine* in 1837. After briefly serving as a packet between Vicksburg and towns on the lower Red River, she was commissioned to deliver the yearly provisions for soldiers stationed on the frontier of the Oklahoma territory at Fort Towson in March 1838. It was on her trip up the Red River that she struck a snag and sank two miles (3.2 kilometers) short of her destination.

While only a summary, this brief history highlights two important considerations for research. First, at six years old *Heroine* was an old boat by the time of her sinking, since the average steamboat only survived four years before suffering a tragedy or being decommissioned. Second, *Heroine* served two separate careers. Her first career was from 1832 to 1837, carrying passengers and cargo on the Mississippi, Missouri and Ohio rivers. After being sold, her second career was working the lower Red River as a packet, before being exclusively dedicated to transport the Fort Towson provisions. The specialization of her final trip makes it likely that most items associated with passenger travel were removed prior to the voyage, leaving only remnants behind. The upper Red River was a dangerous passage, rarely traveled by steamboats at this time and sparsely settled. This combination made the voyage a high risk venture and without a passenger manifest, one can only speculate how many passengers risked the trip. As such, it is likely that artifacts recovered from the wreck of *Heroine* represent the crew and deckhands on her final trip or discarded items from previous voyages.

Heroine's history extends past her loss and to the salvage that occurred after she snagged. When news of her accident reached Fort Towson, soldiers were sent to retrieve the cargo.



Figure 1: Examples of the same location on *Heroine* during a high water excavation season (top) in 2004 and a low water season (bottom) in 2005.

While the hull was submerged underwater, it was still accessible with the upper works exposed well above the waterline, allowing for removal of anything not immediately lost to the river. Salvage was also undertaken by *Heroine's* owners in order to retrieve the engine and possibly other elements of her machinery and balers. Neither salvage attempt was aimed at recovering personal possessions but it is likely that loose items of value were recovered. The wreck remained visible for five years. During this time the Red River saw increased settlement and traffic and it is likely that unofficial salvage occurred until the wreck was completely buried by a flood in 1843. It should be noted that salvage not only removed material but would have led to artifacts being moved from their original location and even added new artifacts to the wreck, as salvagers lost or discarded items at the site.

Besides salvage, *Heroine* was subjected to a variety of natural site formation processes, which greatly impacted the wreck. The Red River carries a high level of sediments, has significant current, and experiences dramatic fluctuations in water levels (fig. 1). River sediments quickly buried the hull and artifacts in the lowest levels of the vessel, which then trapped logs, branches, and other materials carried by the current. The current also acted like a sandblaster on exposed areas of the wreck. When combined with human salvage effects, these forces played a huge role in carrying away loose artifacts and destroying the upper works, where any artifacts representing cabin passengers and officers would have been deposited. The 1843 burial of the wreck in the river bank sealed it from air, light, bacteria, and moisture changes, and would keep it in relatively good condition for a century and a half. When the hull was exposed by a new flood in 1990, it was again subjected to accelerated decay and damaging currents. Besides affecting the wreck site, these processes affected the excavation of *Heroine*. The current and shifting sediments created adverse conditions with low to no visibility, and made it difficult to obtain pin point accuracy while recording artifact provenience.

Awareness of the issues discussed above allows for a better

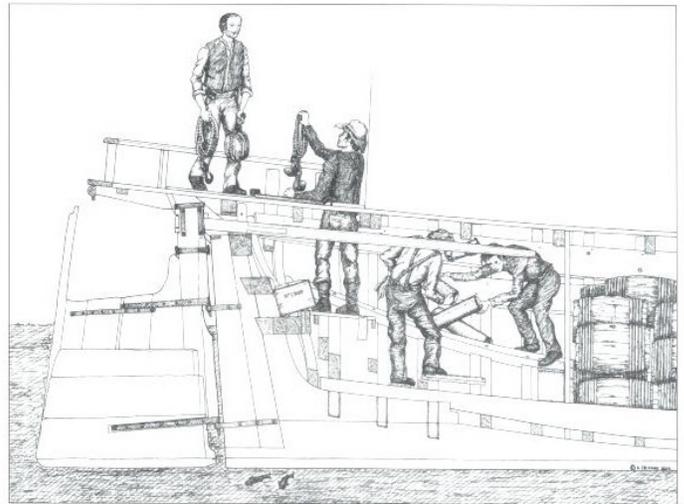


Figure 2: The stern compartment known as the “run” as it may have appeared on *Heroine*. An area primarily used by the crew for storage and one of the more secure areas of the wreck. Drawing: Dr. Kevin Crisman, 2005.

understanding of which artifacts best represent life on board *Heroine*. Damage caused by the river is most prevalent in the forward and after holds. The stern and bow compartments, on the other hand, were relatively secure against the current and do not appear to have trapped intrusive materials due to their quick burial in sediment. There is a possibility, however, that they were affected by between 1838 and 1843 salvage attempts. Artifacts recovered from these two compartments are likely to be original *Heroine* artifacts, unlike some artifacts excavated from the main hold (fig. 2). Precise identification of artifacts through comparative research is another step to ruling out invasive material. It is only through understanding the history of *Heroine*, the forces acting on the site, and the artifacts themselves that the most accurate conclusions can be reached with regard to what life might have been like on board this 19th century steamboat.

Suggested Readings

Brown, H. and K. Crisman. “News from the Red River: A Mid-Season Update on the Steamboat *Heroine*.” *INA Quarterly* 32:4 (2005): 3-6.

Crisman, K. “The *Heroine* of the Red River.” *INA Quarterly* 32:2 (2005): 3-10.

_____. “Easy as One-Two-Three: Completing the Steamboat *Heroine* Excavation.” *INA Quarterly* 34:2 (2007): 3-12.

Crisman, K. and W. Lees. “Beneath the Red River’s Waters: The Oklahoma Steamboat Project, Part I.” *INA Quarterly* 30:2 (2003): 3-8.

Hunter, L. *Steamboats on Western Rivers*. New York: Dover Publications, Inc., 1993.

Health and Disease on the Dutch High Seas: Research at the Western Australia Maritime Museum Shipwreck Galleries

Coral Eginton

Nautical Archaeology Program, Texas A&M University

By the beginning of the 17th century, Dutch seafarers had risen from being opportunistic fisherman of the Baltic to become masters of the high seas. They reached out with a ruthless hand to grasp the exotic trade routes and ports of the east that had once belonged to the Portuguese. The Dutch East India Company (VOC) was more concerned with turning a profit in the spice trade than establishing overseas colonies and often employees spent more time at sea than on land. A single voyage from Amsterdam to the eastern hub of Batavia could take longer than six months with the return route being even longer and more arduous. Life aboard these vessels had the same health issues experienced on land though they were aggravated by shipboard living conditions. Vessels were crowded with men who were virtually unable to maintain personal sanitation and who spent most of their time either soaked by seaspray or huddled in poorly ventilated quarters. In addition to these personal hygiene issues, environmental factors affected the health of men aboard as well. Ships bound for the Indies sailed through tumultuous storms and were often becalmed in the sweltering heat of the tropical climate. Lastly, making landfall at any point along the way could expose the crew to foreign diseases and exotic fevers.

As a trade-driven company, the VOC's leadership recognized early that the success of its endeavors relied upon keeping its employees alive and well enough to man the ships transporting commodities. Since its inception in 1602, the Company required surgeons on every trading vessel, a practice that did not change even into its dwindling years. During the two centuries that the VOC operated, some ten-thousand surgeons were employed to care for nearly one-million sailors and soldiers who ventured to the Indies in the service of the Company.¹

Being the only medical personnel available to the crew on such trying voyages forced surgeons to adapt and take up new roles they were less accustomed to performing on land. In this environment, the parameters separating the professions of barber, surgeon and apothecary dissolved and sea surgeons became a truly unique class of healer. In an attempt to illuminate both the personal and professional lives of surgeons practicing aboard VOC vessels, the author conducted research this past fall at the Western Australia Maritime Museum Shipwreck Galleries (fig. 1). Under the direction of Dr. Wendy Van Duivenvoorde, nearly two-hundred artifacts from the wrecks of *Batavia* (1625) and *Vergule Draeck* (1656) were pulled from storage and re-assessed. The goal of this research was to further analyze those artifacts previously identified as belonging to the



Figure 1: Coral Eginton conducting research at the Western Australia Museum Shipwreck Galleries. Photo: Wendy Van Duivenvoorde.

surgeon's equipment, and to identify any artifacts related to shipboard medicine that are less easily recognized.

The purely surgical duties of a shipboard surgeon included dressing minor injuries, contusions, fractures and broken bones, the removal of gunshot and in rarer cases trepanation and amputation. The instruments used in these procedures such as pincers, trocars, scalpels, bistouries, forceps, directors, trephines, cautery irons and needles for suturing wounds were all composed either completely of metal or of a metal tool portion and wooden handle. In the 17th century, such tools were often made of iron or crude forms of steel; both of which do not survive well in the marine environment. Therefore, much of the research at the Shipwreck Galleries revolved around examining the morphology of unidentified wooden handles whose provenience and associated finds suggested they might be part of the surgeon's equipment. Illustrations from contemporary medical treatises served as a basis for comparison of handle forms and the instruments to which they originally belonged. A number of more delicate and ornately turned wooden handles recovered from *Batavia* have morphological parallels in the works of famous surgeons such as Ambrose Paré and Paul Barbette (fig. 2).

Barbering and surgery were once two aspects of a single guild before the professions separated in the 17th century. Though it was considered an infringement upon the business of local barbers, many surgeons were not afraid to offer their customers a shave and a haircut for extra profit. Onboard ships of the VOC, the task of barbering fell to the third surgeon or surgeon's mate. Visiting the barber on a ship was not simply

a luxury for the crew but rather an integral component of attempting to maintain sanitation. Long hair and beards were difficult to keep clean, especially in an environment where bathing existed only in the crudest form, if at all. Excess hair created the perfect hiding place and breeding ground for lice and other bodily vermin which could spread viruses and infections.

Among the barbering equipment recovered from *Batavia* were two complete brass basins with a distinctive recess along their rims. Such bowls were specifically formed to be placed against the throat of a customer receiving a shave so as to catch the waste of lather and hair. These bowls were also positioned at the crook of a patient's elbow during the process of bleeding which was thought to balance the humors and bring harmony to the internal workings of the body. Additional artifacts from both ships that may also be categorized as barbering equipment include razors for shaving, combs for grooming and removing lice, and scissors for trimming hair. However, the abundance, provenience, and general uniformity of the above items suggest that the razors and scissors were more likely part of the ship's cargo and that the few combs were personal possessions of the crew members.

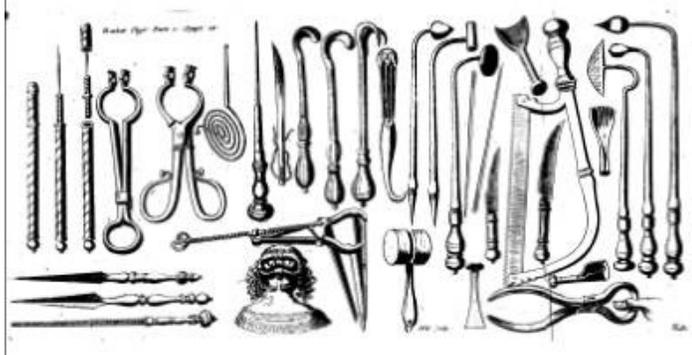


Figure 2: Surgical instruments illustrated in Ambroise Paré's *The Method of Treating Wounds...* (1651) Wellcome Library, London (top). Surgical instruments illustrated in Paul Barbette's *Thesaurus Chirurgiae* (1687) (bottom).

The role of the ship's surgeon as an apothecary was perhaps the most challenging to him since, on land, the Collegium Medicum restricted surgeons to the practice of external medicine. What knowledge they had of internal medicine often came from optional extracurricular lectures attended at the universities for an additional cost. Onboard the ship however, the surgeon treated all manner of commonly known ailments and attempted to combat mysterious tropical maladies that even educated physicians had not encountered. Part of the surgeon's daily duties, as outlined in the Order of Instruction from 1695, included consultation with the crew and the administration of medicines in the morning and in the evening.

The ingredients used by the surgeon's prescriptions were



Figure 3: An albarello from *Batavia* (left) and contemporary parallels from the paintings of David Teniers (middle) and Gabriel Metsu (right).

purchased by the Company in bulk from apothecaries in Holland then redistributed for shipboard use by the Company pharmacist in Amsterdam. They were stored in tall, narrow-waisted, Majolica albarelli jars and smaller earthenware zalfpotten which were secured in a surgeon's chest (fig. 3). The surgeon's stores on *Batavia* included a minimum of thirty-two albarelli and thirty-one zalfpotten. Both types of storage vessels were capable of containing liquids. The zalfpotten were coated internally with a lead-based glaze and that the albarelli were painted inside and out with a white, tin glaze. The albarelli were decorated with geometric designs of brown, yellow, blue and green but there is no evidence of any labels denoting their contents. Ceramic analysis of these vessels is ongoing to determine whether or not these apothecary jars compose part of a family, created together and purchased in bulk by the VOC.

Investigations into the daily duties of the shipboard surgeon and the instruments with which he administered his trade help to illuminate the living conditions experienced by the sailors of the Dutch East India Company. Furthermore, analyzing the way in which the Company approached the hiring and supplying of

sea surgeons, both in bulk, confirms that these matters were handled little differently than any other. Shipboard healers acted as a sort of insurance policy for the Company with their

function among the crew being seen as yet another safeguard to keep the engines of commerce running smoothly.

Note / Reference

¹ I. Briujn, *Ship's Surgeons of the Dutch East India Company: Commerce and the Progress of Medicine in the 18th Century*. (Leiden, 2009), 17.

Modeling the U.S. Brig *Jefferson*

Glenn Grieco

Ship Model Laboratory,

Center for Maritime Archaeology and Conservation,
Texas A&M University

During the War of 1812, the presence of British naval forces in the Great Lakes created a need for capable American warships in the area. Under the direction of well-known shipbuilders such as Henry Eckford and the brothers Adam and Noah Brown, shipyards were established in the wilderness along the shores of the lakes. The need for larger, faster, and more heavily-armed vessels would lead to many innovations in shipbuilding technology and construction. At the forefront of the innovation, Eckford was commissioned to build several vessels at Sackets Harbor on the shores of Lake Ontario. One of those vessels was the 20-gun brig *Jefferson*. Opting for speed to outrun and outmaneuver its British opponents, the 123-foot (37.49 meters) brig was designed with a shallow draft, sharp hull, and extra sail (fig. 1). *Jefferson* was also outfitted with some of the heaviest guns available at the time. Originally intended to carry 32-pound carronades, she was ultimately equipped with sixteen 42-pound carronades and four 24-pound long guns. Her design also called for an 18-pound pivot gun on the forecastle, but this was removed early in her career to improve her sailing capabilities.

At the close of the war, *Jefferson* was mothballed and eventually abandoned to deteriorate along the shore of Sackets Harbor. In 1984 the remains of the hull were relocated, and between 1984 and 1988 the hull was excavated and recorded under the direction of Kevin Crisman and Arthur Cohn of the Lake Champlain Maritime Museum. Although only about 40 percent of the hull survived, it has provided a window into some of the innovations occurring in the shipbuilding industry at the beginning of the nineteenth century. Subsequent research and reconstruction of the vessel by Crisman has provided one of the most complete pictures of an early American brig and



Figure 1: Port stern quarter view of *Jefferson* showing shallow hull and comparatively tall rig. Photo: C. Wayne Smith.



Figure 2: Stern of model showing exposed frames and deck beams on the starboard side of the vessel and completed bulwarks with guns on the port side. Photo: C. Wayne Smith.

the associated innovations that were occurring in the early 19th century.

In May of 2002 it was determined that Crisman's reconstruction would provide an excellent foundation for a model reconstruction of *Jefferson*. Built by the author over a period of seven years, the 1:36 scale model represents the vessel as she probably would have looked at the end of the war. The model was constructed of Castello Boxwood, a wood that approximates the appearance and mechanical qualities of oak at this scale, and blackened brass to represent fasteners, cannons, and any other objects made of iron on the original vessel.

The starboard side of the model has been left unplanked in order to show internal details that were recorded from the original vessel (fig. 2). Characteristic of warships of this period, *Jefferson's* frames were very tightly spaced, providing almost a solid wall of timber underneath her hull planking. The exposed deck framing on the starboard side of the vessel exhibits the lack of both lodging and hanging knees aboard the vessel. Normally considered essential for securing the deck beams to the sides, the construction of these knees were labor-intensive and required the use of appropriately curved compass timber. Eckford eliminated the need for knees by sandwiching the ends of the deck beams between heavy deck clamp and waterway timbers. These were strongly supported from below by ten pairs of diagonal riders that not only supported the clamp and deck but also diagonally tied the frames together to greatly strengthen the hull.

Early in the life of the vessel, her main mast was moved aft to improve her sailing qualities. The original mast step was extended aft to accommodate the new placement of the mast. This explains the unusual double mast step that can be seen in the model constructed exactly as the original. Other structures of interest visible in the model are the copper-lined magazine

just forward of the captain's quarters, officers' quarters and staterooms. The port side of the vessel has been planked and fitted out to represent what the vessel probably looked like at launch (fig. 3).



Figure 3: Construction of *Jefferson's* lower decks. Note the diagonal riders, elongated mast step and coppered magazine. Photo: C. Wayne Smith.

Over ten thousand scale nails were used to replicate the fastener pattern that was used to fasten *Jefferson's* planking to her frames. To expedite construction, only iron fasteners were used in the original vessel. Precise recording of the locations of ringbolts and eyebolts inside the bulwarks by Crisman has provided information for the proper arrangement of *Jefferson's* sixteen carronades and four long guns. An unusual break in the pattern of these fittings only around four gunports near midships hints at the probable location for the four long guns. Another interesting feature of the guns' rigging are the heavy breach tackles that were used to limit the recoil of the cannons. Typically fastened to ringbolts inside the bulwarks, the breach tackles on *Jefferson* are fastened through lead lined holes in the bulwarks on either side of the gunports. With the introduction of 32- and 42-pound carronades, the ringbolts were no longer sufficient to check the recoil of these powerful guns and occasionally pulled through the bulwarks.

Unfortunately, nothing remains of *Jefferson's* deck, deck furniture, and fittings in the archaeological remains. The deck structure and hatches, capstan, wheel, and other details were constructed according to Crisman's reconstruction. There are also no remains of the hammock rails and netting along the top of the caprail, although these structures almost certainly would have been used. The starboard side of the model shows the bulwarks as excavated and the port side shows the bulwarks with hammock netting as reconstructed (fig. 4).



Figure 4: Port side of completed *Jefferson* Model. Photo: C. Wayne Smith.

Very little archaeological evidence for *Jefferson*'s spars and rigging has survived. Fortunately, the remains of five rigging channels and a few associated deadeyes and chainplates and an opening through the bulwarks for the fore sheet sheave were recorded on the port side of the vessel. These features provided important information about the rigging to the lower masts. Additional evidence for Crisman's reconstruction of the rig of the vessel came from historical sources and drawings of other vessels built by Eckford. All the rigging for the model was hand

laid of linen bookbinder's thread according to specifications in contemporary ropemaking tables.

Additional photos of the construction and finished model of *Jefferson* can be seen at <http://nautarch.tamu.edu/model/report3/> as well as photos of other models that have been constructed in the CMAC Ship Model Laboratory. Streaming video of the reconstruction of a rowed galley from the Yenikapi site in Istanbul, currently in progress in the CMAC Ship Model Laboratory, can also be found on the website.

Sometimes Standard Recording Methods are not so Standard: Recording the Kızılburun Column Wreck's Hull Remains

John Littlefield

Nautical Archaeology Program, Texas A&M University

J Richard Steffy penned an article entitled *Maximum Results from Minimum Remains*, in which he emphasized the need to closely study even the most scant ship remains where large questions loom over construction techniques or general ships features. Large questions certainly loom over the construction of ancient stone carriers. Iconographical evidence of stone carriers from antiquity is unknown and the literary evidence is extremely limited. Many stone cargoes were lost at sea. At least 64 architectural stone cargoes have been discovered in the waters of the Mediterranean, but few have been examined thoroughly, mostly due to the paucity of hull remains.

The thesis of Steffy's article has become a sort of mantra during the recording and interpretation of the scant hull remains of the Hellenistic period marble carrier excavated at Kızılburun, Turkey from 2005 to 2009; a project under the auspices of the Institute of Nautical Archaeology (INA) and Texas A&M University with Donny L. Hamilton serving as Project Director and Deborah Carlson as archaeological director.

The labile wooden remains of the ship are not only scant, but heavily fragmented, discontinuous, and particularly friable. By employing adaptations to standard set-up and recording methods, as set forth by Steffy in his book *Wooden Ship Building and the Interpretation of Shipwrecks*, and using indirect evidence offered by in situ fasteners and 3-D models, a better, yet still incomplete understanding of the construction of the vessel is being developed. Steffy's methodology involves tracing each face of a timber on acetate, either placed directly on the timber or placed on sheet glass raised slightly above the timber.

Steffy's method works sufficiently on complete or near complete timbers, even when they are broken. However, the Kızılburun remains are less than solid and required some creative adaptations to standard methodologies in order to obtain acceptable results, as timbers could not be simply turned to record each individual face.

Often, recording the Kızılburun ship's timber fragments is only feasible in two dimensions and not always in the same two dimensions, further complicating the interpretation of a constructional puzzle with most of the pieces missing. Several hundred, mostly tiny, wooden fragments have been individually recorded from the ship. Each fragment, regardless of size, is examined, described, and drawn in 1:1 scale. Many of these fragments are stand alone bits, as they do not have

adjoining pieces. However, in some cases, especially with the nearly three meter long keel portion and a number of framing elements, fragments can be temporarily reassembled into more substantial timbers by utilizing diver's notes, sketches and in situ photographs. The process of gathering these data for a single timber's reconstruction often takes days to locate, collect and evaluate before attempting to reassemble a timber section for recording. In some cases, even with the best of notes and photographs, reassembly is impossible due to the fragmented and discontinuous nature of the remains.

In instances where elements such as framing or planking are contiguous, they are still disjointed and individual pieces, which are seldom more than 20 cm in length. In order to facilitate the correct 3-D reassembly of these fragments, a long, shallow container filled with tiny marble chips was used to support and align the timber fragments such that they could be drawn as a unit (fig. 1). This was a minor, albeit essential adaptation that allowed accurate drawings to be produced.

In the case of recording the vessel's keel, even with this adaptive measure employed, results were less than satisfactory. Several attempts were made, but after recording one face and moving to another, timber fragments were not stable and resulted in non-matching drawings. The keel did, however, have a relatively well-preserved, flat inner face. Consequently, recording set-up methods were creatively adapted once more by placing the timber's inner face down on the glass to give the best alignment of the fragments in all three dimensions. This



Figure 1: Timber fragments supported by marble chips. Photo: John D. Littlefield.



Figure 2: Recording an unstable timber section. Photo: Kimberly Rash.

modification necessitated lying on the floor and recording the timber from below (fig. 2), while the molded face was recorded by using an additional plate of glass mounted to 90° shelving brackets (fig. 3). In this manner the timber fragments were not as susceptible to movement or misalignment and resulted in a much more satisfactory drawing.

The recording of the fragmented keel's profile also presented unique problems in that the original edges of the timber did not survive. The rabbet was partially preserved on both sides of the keel, but at no single point does the rabbet survive on both sides at once, making a keel profile very difficult to obtain. In the end, 21 profiles were taken from the three meter keel section and a composite profile was produced. This composite was used to create a 3-D model of the timber in Rhinoceros 4.0 software that has proven to be very useful in the overall understanding of the timber (fig. 4).

Little of the hull's planking survives and almost all of the extant planking has been compressed by the concentrated weight of the stone cargo to

the point that thickness measurements are skewed or invalid. Therefore, it is necessary to utilize indirect evidence. The cataloging of over 1000 cupreous fastener fragments proved to be valuable in determining the planking thickness. During the cataloging process, a pattern of nail breakage was discerned on fragments that retained the heads, suggesting a common weak point. Of the 1007 fragments, 39 percent retained their heads and were broken between 3.9 and 5.1 cm length. In checking diver's notes and sketches, it was found that many were found head down with no artifactual material below them, suggesting they are plank-to-frame fasteners. It has been deduced that there

must be a correlation between this nail breakage pattern and planking thickness that was later supported in examining a planking fragment retaining an uncompressed knot and by the width of the back rabbet of the keel, showing a thickness



Figure 3: Recording the keel's molded face. Photo: Kimberly Rash.

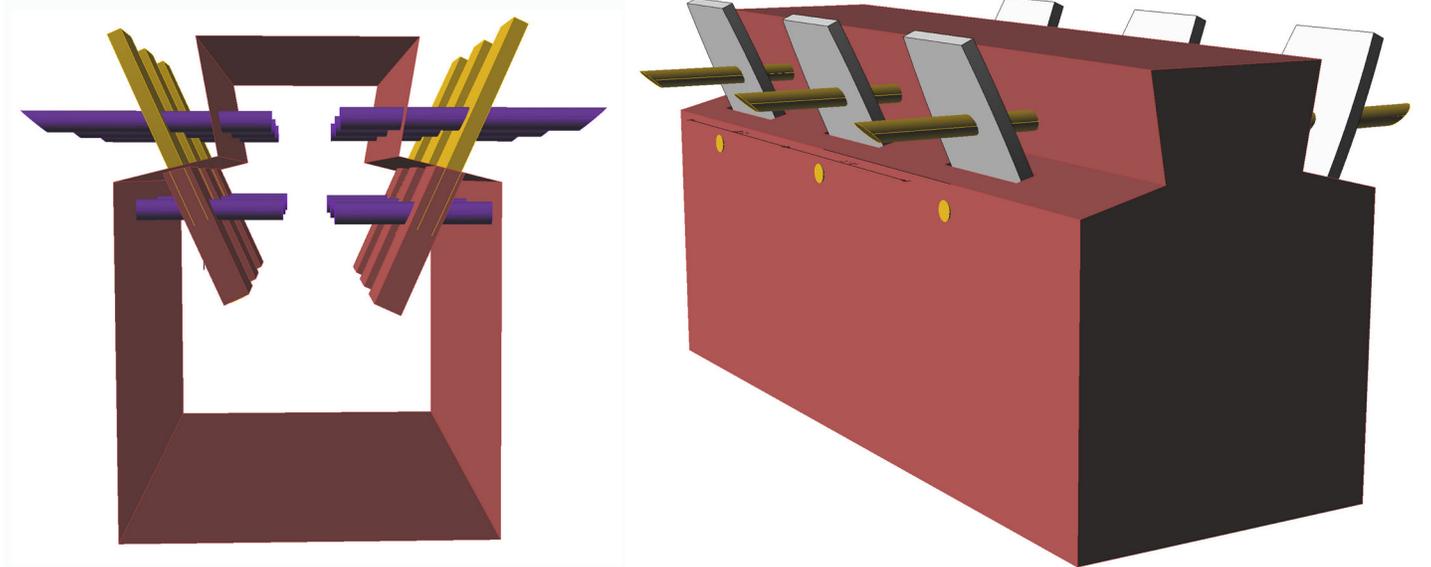


Figure 4: Three-dimensional reconstruction of the keel's profile. Image: Sheila Matthews and John D. Littlefield.

between 4.1 and 4.5 cm.

Many of the above mentioned fasteners were found in rows, stretching transversely across the site. There were eight rows of nails found directly upslope of the column drums and similar patterns found in two other nonadjacent areas. From these patterns of fasteners, frame spacing is determined at an average center-to-center distance of 25 cm. Again, this dimension is supported in the examination of a section of planking fragments where impressions of two framing elements exist.

The paucity and level of preservation of the wooden remains of the Kızılburun ship present countless enigmatic questions, many that remain unanswered. However, by examining the extant wood remains with the Steffy philosophy in mind, and using adaptive modifications to methodologies and recording set-ups, indirect evidence provided by the ships fasteners, artifact positioning and 3-D modeling, a better understanding of the construction of the Kızılburun marble carrier has been and continues to be achieved.

Acknowledgements

The author would like to thank the Institute of Nautical Archaeology for financial assistance. Particular gratitude is expressed to the staff of the Bodrum Research Center for all their help and support. Additional gratitude must be given to Sheila Matthews and Orkan Köyağastioğlu for sharing their knowledge and experience in recording hull remains.

Suggested Readings

- Carlson, D.N. "A Monumental Cargo: The Roman Column Wreck at Kızılburun, Turkey." *INA Quarterly* 33:1 (2006): 3-10.
- Carlson, D.N. "An Uplifting Summer: The 2006 Excavation Season at Kızılburun, Turkey." *INA Quarterly* 34:1 (2007): 3-10.
- Carlson, D.N. "Excavation of a Shipwrecked Marble Column." *CMAC News and Reports* 2:1 (2010): 4-5.
- Carlson, D.N., and C.E. Atkins. "Leaving No Stone Unturned: The 2007 Excavation Season at Kızılburun, Turkey." *INA Annual 2007* (2008): 22-8.
- Carlson, D.N., and W. Aylward. "The Kızılburun Shipwreck and the Temple of Apollo at Claros." *American Journal of Archaeology* 114:1 (2010): 145-59.
- Carlson, D.N., and D.L. Hamilton. "Kızılburun 2008. Shipwreck Research at the Bodrum Center." *INA Annual 2008* (2009): 11-4.
- Rash, K. "Casting the Assemblage of Iron Artifacts from Kızılburun." *CMAC News and Reports* 2:2 (2010): 31-3.
- Steffy, J.R. "Maximum Results from Minimum Remains." In *Beneath the Waters of Time: The Proceedings of the Ninth Conference on Underwater Archaeology*, edited by J. B. Arnold. Austin: Texas Antiquities Committee, 1978.

Conservation of Artifacts from Kings Mountain National Military Park, South Carolina

Amanda Vance

Nautical Archaeology Program & Conservation Research Laboratory, Texas A&M University

Kings Mountain National Military Park in South Carolina was the site of an American Revolutionary War battle that took place on October 7th, 1780. This battle was unique in two ways: it was one of the few battles fought without any British soldiers--fought between patriots and loyalists--and it was one of the first major patriot victories in the South after the British invaded Charleston, SC in May 1780. Currently, the site is managed by the National Park Service (NPS), which also cares for artifacts associated with the site and the area. In 2008, NPS contracted the Conservation Research Laboratory (CRL) at Texas A&M University to conserve some of this collection and I was fortunate to be the student chosen to do the laboratory work.

The conservation of these artifacts has been both challenging and rewarding. None of the artifacts were waterlogged, but there was a wide range of materials. The most prominent piece in the collection is an oil painting, which took three months of individual attention to conserve (fig. 1). This required me to learn art conservation techniques which I then applied to an archaeological conservation method. Other highlights of the collection are three traveling trunks which I will be writing about for my doctorate degree. The trunks were a challenge because although they are similar, none were exactly alike. Working on the trunks has been especially educational because of all of the materials involved: leather or raw hide, textile, paper, cupreous metal, iron, tinned iron, wood, and ink or chalk. Not only did the trunks allow me the experience of



Figure 1: Working image of the re-stretching of the painting.

working with so many different materials, I was also allowed to do some experimentation with leather treatment and artifact restoration.

Although not as large and showy as the previously mentioned pieces, the rest of the Kings Mountain collection contained several interesting metal, horn, ceramic, leather and combination wood and metal pieces. Of these some of the most challenging, and thus the best for gaining experience, were the few pieces that were made of wood and iron. There were two pieces: an auger and a heckle--also known as a hatchel, it was a tool used to card flax fibers. Unlike some other composite artifacts, I could not dismantle either of these, nor could the wood and metal be treated by the same process which can be done with composite artifacts that are made of two different kinds of metal, for example.

For both pieces I conserved the wood first and then wrapped the wood to protect it while the metal was being treated. The auger was able to undergo electrolytic reduction (ER), throughout which the wood had to be constantly monitored and the protective cover changed regularly. The heckle was more difficult to treat because the form of the artifact made ER impossible; it is a rectangular piece of wood wrapped in a metal sheeting with nails that go completely through the sheeting and wood to act as the teeth, thus there was no way to wrap the wood that could have prevented contact with the sodium hydroxide solution used in ER. Instead, the metal of the heckle was treated with a combination of mechanical and chemical methods (fig. 2).



Figure 2: Working image of the mechanical cleaning of the heckle.



Figure 3: Final image of the horn cup.

Some other noteworthy artifacts from this collection were a horn cup, a ceramic bowl, a bayonet, an iron stirrup, and a leather cartridge box. Although this grouping may seem strange to some, each of these pieces were particularly special to me because in most cases they were my introduction to the conservation of that particular kind of material and its treatment. On the horn cup I learned the silicone oil process, which is a unique process not widely used in the field of conservation (fig. 3). The ceramic bowl was also a first for me; it required desalination and consolidation treatments (fig. 4). My ceramic experience was then later reinforced and augmented in the Conservation I class. This spurred my interest and led me to do a field school in Italy for ceramic conservation this past summer.

The bayonet, although not the first metal object I had treated, allowed me the opportunity to learn how to use an x-ray and to learn about the different markings associated with military weaponry. The stirrup also was not the first metal piece I



Figure 4: Final image of the ceramic pot.

conserved, but it was the first piece I had to cast, which was very useful as I have had to cast several artifacts since then. Casting is an important part of conservation done frequently at the lab on metals in very poor condition. A mold is made using the artifact, the artifact is removed, the mold is filled with epoxy resin, and then the epoxy cast is worked to look like the original artifact. Lastly, the leather cartridge box was both the first leather piece I conserved and my first experience with restoration. The seams had come undone in some sections of the box and I had to sew it back together. These experiences later helped me in conserving the trunks.

One of the best things about working on this project was that the education and experience I am getting is immediately apparent. In a classroom setting, treatments are learned and tested but once the class is over that experience is filed away for later use. Working out at the lab I am constantly using the knowledge I have gained from working on previous artifacts to treat others.

Acknowledgments

For all of their help and support for this project I would like to thank Jim Jobling, Helen Dewolf, Wayne Smith, and Catherine Sincich. I would also like to thank the National Park Service, specifically from the Kings Mountain National Park.

Suggested Reading

<http://www.nps.gov/kimo/index.htm>

Need artifacts conserved from any archaeological site - on land or underwater?

CMAC does Contract Conservation

CMAC's Conservation Research Laboratory (CRL), Archaeological Preservation Research Laboratory (APRL) and Wilder 3-Dimensional Imaging Laboratory offer contract services for the conservation and documentation of artifacts. The Conservation Research Laboratory is one of the oldest continuously operated conservation laboratories that deals primarily with archaeological material from shipwrecks and other underwater sites. CRL works with academic institutions, museums, historical societies, and government offices, as well as with the private conservator. Our goal is to create viable conservation strategies of the highest standard that can be accomplished at minimal cost.

Research conducted at the Archaeological Preservation Research Laboratory has contributed to the development of new processes for the stabilization and conservation of organic artifacts. In conjunction with Dow Corning Corporation, research at APRL focuses on the development of organo-silicone chemistry and polymers as well as their application in conserving organic archaeological artifacts.

The Wilder 3-Dimensional Imaging Laboratory offers services for three-dimensional scanning and recording of archaeological sites and single artifact recording. Once site data and artifact imaging is complete, it is possible to make facsimile copies of sites and single artifacts for teaching and display purposes. Often, artifact replications are created in larger-than-life sizes for use in classrooms.

Services

Industrial radiography, electrolytic, and chemical cleaning.

North America's largest wood-treatment facility.

Artifact casting and restoration.

New polymer-processing technologies.

State-of-the-art equipment for training, analysis, and research.



Contact us to learn how we can help you.

Attn: Jim Jobling
Conservation Research Laboratory
Center for Maritime Archaeology & Conservation
Texas A&M University - 4352
College Station, Texas 77843-4352

Phone: 979-862-7791
FAX: 979-862-7792
E-mail: crl@tamu.edu



Master's student Brennan Bajdek conserving Arch Cape, Oregon Carronades Project at the CMAC Conservation Research Laboratory.



<http://nautarch.tamu.edu/>

Over the past two decades Texas A&M University (TAMU), through its affiliation with the Institute of Nautical Archaeology (INA), the joint excavations of significant shipwrecks with INA, and the establishment of the Nautical Archaeology Program (NAP) in the Department of Anthropology, has become recognized as having one of the best nautical archaeology academic and research programs in the world. Over this same period, the conservation laboratories that are part of NAP have become very innovative and are acknowledged as being leaders in this field of conservation. In order to capitalize and build on this recognition, a Center for Maritime Archaeology and Conservation (CMAC) was created by the Texas A&M University Board of Regents in May 2005 as the best means by which the goals and mission of nautical archaeology at TAMU can be realized.

The mission of CMAC is simple. CMAC, as a research center at TAMU, and through its affiliation with INA and the Department of Oceanography, will continue to keep TAMU in the forefront of nautical, maritime, and underwater archaeology research. It will continue to build on our expertise in artifact conservation, advance underwater mapping technology, and build on the reputation it now has in these research areas. More simply put, CMAC's mission is to form research alliances such as the one we have with the INA in order to continue to be in the forefront of maritime archaeology research and be an active partner in one of the best academic programs in nautical archaeology in the world. To accomplish these ideals, CMAC has incorporated several varied laboratories specializing in various research areas and aspects of nautical archaeology.

By concentrating on these objectives, CMAC will accomplish this multifaceted mission, but we need your support. Contact us today to learn how you can contribute to our research efforts in exploring, documenting, conserving, and studying underwater archaeological sites, and educating the next generation of maritime archaeologists.

Attn: Kevin Crisman
Center for Maritime Archaeology & Conservation
Anthropology Building 107
Texas A&M University
College Station, TX 77843-4352
United States

