ShipLAB
Research Portfolio 2013

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Nautical Archaeology Program
Center for Maritime Archaeology and Conservation
ShipLAB Mission

The ShipLab was created by J. Richard Steffy in 1976 and today is one of the laboratories of the Centre for Maritime Archaeology and Conservation of the Anthropology Department at Texas A&M University. Our mission is to acquire and disseminate knowledge about shipbuilding through time. As a classroom our main objective is to provide an effective learning environment. As a research laboratory our objective is to facilitate investigation, seek public and private research funds, and recruit and retain quality students for our projects. As an outreach institution we aim at providing information, education, and guidance on the discipline of nautical archaeology and the importance of the world's submerged cultural heritage, perhaps more than ever threatened by treasure hunting.

Gnalić Project, dir. Irena Radic Rossi, started in 2011, the excavation of a large merchantmen lost off the Croatian coast in 1583 with a large cargo bound for Constantinople.

Stella 1 Shipwreck, dir. Massimo Capulli, started in 2011, is part of a wider study of the life along the Stella River, Italy, over a period of two millennia.

Battle of Itaparica, dir. Rodrigo Torres, studies the 1648 battle of Itaparica and its Portuguese and Dutch Shipwrecks.

Finisterre Project, dir. Miguel San Claudio and José Luis Casaban, is a study and inventory of shipwrecks along in Galician waters.

Ship Modeling

With Nuno Fonseca from IST’s SAEN, and Texas A&M VizLAB, we are developing methods to compare hull shapes, performances and capacities.

NADL

With Richard Furura, director of the Texas A&M Center for the Study of Digital Libraries, we are using computers and computer science to develop a better understanding of what it means to be an archaeologist in the digital era.

Vasa

Using 3D computer software, Kelby Rose is studying and reconstructing the hull of the warship Vasa, lost in 1628 on its first voyage.

Saveiros da Bahia

With Denise Gomes Dias, from University of the State of Bahia (UBED), we are recording whole molding techniques that survived for centuries in the Baía de Todos os Santos region, in Brazil.
Introduction

Featured Projects

Submerged Cultural Heritage: a Future for the Past

Rodrigo Torres (PhD) Stranded Shipwrecks of Southern Brazil.
Samila Ferreira (PhD) Policies of Memory, Politics of Forgetting.
São Lourenço do Sul, Brazil.
Samuel Cuellar (PhD) A History of Ship Bells.
The Gnalić Project, Croatia.
Stella 1 Shipwreck, Italy.
The Nautical Archaeology of Puerto Rico.
Lagos Project, Portugal.
Oeiras Guns, Portugal.

Ship Modeling and Visualization Sciences

The Textual Excavation of a India Nau.
Sailing the Pepper Wreck.
Modeling the Pepper Wreck.
A Parametric Model of the India Naus.
Kelby Rose (PhD) A Tridimensional Study of Vasa.
José Casaban (PhD) Nuestra Señora del Juncal, México
Kotaro Yamafune (PhD) A Reconstruction of the Pepper Wreck.

Computer Science

The Nautical Archaeology Digital Library
Photogrammetry and Timber Recording

Iberian Seafaring

Astrolabes Database
Iberian Ships Database
Pepper Wreck Project, Portugal.
Arade 1 Project, Portugal.
Cais do Sodré Project, Portugal.
Cape Finisterre Project, Spain.
Nicholas Budsberg (PhD) Ships of Discovery and the Renaissance.
Saveiros da Baía, Brazil.
Battle of Itaparica, Brazil.
Playa Damas Shipwreck, Panama.

Italian Seafaring

Asian Seafaring

Randal Sasaki (PhD) Bach Tang Excavation, Vietnam
Kublai Khan and the 1279 Attempted Invasion of Japan
Namban Screens and the Portuguese in Japan
Ancient Ships of Japan
Current Students

Eight students are currently working towards their PhD in the ShipLAB, doing their dissertation research while they prepare themselves to become competent scholars and dedicated professionals with practical skills that will allow them to compete for the best jobs on the market.

**Nicholas Budsberg**

Nicholas Budsberg is a doctoral student in the Nautical Archaeology Program where he is studying the maritime impacts of the European expansion. His research focuses on the Spanish and Portuguese vessels that first charted and explored the African coast and the New World, and that would later be the first to circumnavigate the globe. Nicholas’s current focus is the re-investigation of possibly the earliest European shipwreck site in the New World located off of the coast of Highborne Cay in the Exumas, Bahamas. In addition, he is currently finishing the conservation and analyses of a 17th century Portuguese Astrolabe, after this rare example of the instrument was brought to the attention of the Conservation Research Lab at Texas A&M. Nicholas received his Bachelor of Arts in Anthropology with an Archaeology Concentration from Western Washington University in 2010. His field work and experience has been mostly accumulated in the Balearic Islands, Spain, and in the Aucilla River, Florida, while during the academic year he is an officer with the Archaeology Dive Club, and the Nautical Archaeology Student Association. He is an L.T. Jordan International Fellow, holds a Graduate Assistant - Teaching position, and is the recipient of several other internal and external grants and scholarships. He is currently finishing his coursework in College Station, Texas, while he will be working with the Bahamian government on shipwreck, conservation and cultural heritage projects.

**José Luis Casaban**

José Luis Casaban completed his B.A in Prehistory and Archaeology at the University of Valencia (Spain) in 1998 and his M.A. in Post-Excavation Skills (GIS applications in Archaeology) at the School of Archaeology and Ancient History at the University of Leicester (UK) in 2000. Since then Jose has worked as a field archaeologist for different CRM firms in Spain and Ireland. He worked as an archaeological surveyor in Ireland for 2 years, and has directed several archaeological projects, both on land and underwater, in Spain. In addition, he was also part of the archaeological team (as an archaeologist and photogrammetry technician) working on INA’s Bajo de la Campana Phoenician Wreck project in Spain (2008-2010). Always interested in underwater archaeology, Jose started his PhD in Nautical Archaeology at Texas A&M in 2010. Since then he has taken part in the Mazotos project, a 4th century BC shipwreck located off the coast in Cyprus. Jose is currently one the project directors of the INA Finisterre Project in Spain. This project is focused on the study of 16th and 17th Iberian seafaring shipbuilding technology, which encompasses his main doctoral research interest.
Samuel Cuellar

Sam Cuellar completed his BA in Anthropology at Texas A&M University in Spring of 2011 and began his graduate studies at Texas A&M’s Nautical Archaeology Program (NAP) in Fall of 2011. Sam’s dissertation work focuses on the first study undertaken of the origins, history, and uses of early ship bells dating up until the beginning of the 18th century. Fieldwork for his dissertation will take place in Europe over the Summer of 2014, and involve the examination of numerous ship’s bells in private collections and museums, as well as additional archival research. Sam’s current fieldwork includes assisting in the excavation of the Gnalic shipwreck off the coast of Croatia. During his graduate career, Sam has developed interest in the relationship between underwater archaeologists and offshore oil and gas drilling in the Gulf of Mexico through work with Texas Nautical Archaeologist Amy Borgens. He plans to develop ways to enhance the relationship between the academic and business sides of underwater archaeology to increase information sharing and cooperation.

Samila Ferreira

Samila Ferreira is a Doctorate Student at the Cultural Anthropology Program. She graduated with a B.A. in History from the Federal University of Rio Grande, Brazil in 2008, and with a M.A. in Social Memory and Cultural Heritage from The Federal University of Pelotas, Brazil in 2010. Her Master's thesis discusses concepts of cultural heritage, social memory, public policy, and the invention of traditions. During her career she has been focusing her research efforts primarily on studying the relation between social memories, cultural heritage and the effects of public policies on the representation/oblivion of social groups in heritage preservation projects. Her empirical work has been carried out in the historical port town of São Lourenço do Sul, southern Brazil. Her doctoral research proposal will undertake a comparative study of this theme in Brazil and in the US.
Kelby Rose

Reverse Naval Architecture of Vasa, a 17th-Century Swedish Warship

Kelby Rose is a PhD candidate in the Nautical Archaeology Program. While in the program, Kelby has served as a member on underwater archaeological expeditions in Turkey and Italy, a conservation technician at the Center for Maritime Archaeology and Conservation Research Laboratory, and as graduate instructor of record for two undergraduate anthropology courses. His dissertation research is a pioneering investigation into the naval architecture of the Swedish warship Vasa, sunk on its maiden voyage in 1628. During his graduate career, Kelby has developed a particular interest in the archaeological and educational application of visualization technologies. Using advanced digital 3D modeling software, he is virtually deconstructing the hull of Vasa to recover and analyze the methods used to design the ship. Kelby believes strongly in the power of existing and emerging technologies to bridge the gap between the important work of nautical archaeologists and the interested public.

http://www.kelbyrose.com/

Randall Sasaki

Randall J. Sasaki was born and raised in Japan, but moved to U.S. to complete his B.A. in Anthropology (specializing in Indian Ocean Seafaring in the Bronze Age) at Southwest Missouri State University (currently Missouri State University). After working as a field supervisor at several CRM companies, he decided to pursue an academic career in Nautical Archaeology with a focus on East Asian Seafaring. After entering the Nautical Archaeology Program at Texas A&M University, he was involved with a number of maritime archaeological projects in Japan. He completed his MA in 2008. His MA thesis focused on the reconstruction of the ill-fated Mongol fleet that was destroyed by "the divine wind" at the battle of Koan in 1288. He is currently conducting field work in Vietnam, aiming to find another ill-fated Mongol fleet in that country. He is the author of the books The World History Based on Shipwrecks (Media Factory/New Book Series. Tokyo, Japan, 2011), The Archaeology of Kamikaze: Revealing the Secret of Mongolian Navy (Texas A&M Press, in final review).

He is currently working as a city archaeologist at Fukuoka Japan while completing his PhD Dissertation.
**Rodrigo Torres**

Rodrigo Torres is a Brazilian Oceanographer and Archaeologist. In the last 12 years he specialized in applied oceanography and nautical archaeology, with acquired skills in the fields of shipwreck archaeology, site formation processes, digital cartography (G.I.S.), museology and scientific diving. He is currently enrolled as a PhD student in the Nautical Archaeology Program at Texas A&M University, sponsored by the Brazilian Ministry of Education and the Fulbright Commission. His PhD research focuses on nineteenth-century Atlantic maritime culture and its influence on the modernization of Brazilian port cities after 1808. He conducted fieldwork on the archaeological investigation of stranded shipwrecks found along the southernmost Brazilian shore, aimed at understanding cultural and natural formation processes which affect the distribution of shipwrecks along the coast. More recently he begun the assessment of a number of shipwreck sites from the Colonial period in Brazil, salvaged by treasure hunters in the 1980’s. Realizing that even salvaged and heavily looted shipwrecks can still yield enormous amounts of information if properly studied, this project aims at reviewing the history behind these ships and their explorations, and assess the potential for future research.

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**Kotaro Yamafune**

Kotaro Yamafune completed his B.A in History at Hosei University (Japan) in 2006 and started his MA in the Nautical Archaeology Program at Texas A&M University in 2009. His research interests are Portuguese shipbuilding and seafaring in the 16th and the 17th centuries, and the reconstruction of the Medieval and Post Medieval shipwrecks. His thesis focused on late 16th and early 17th century Japanese Namban art, which displays the first European activity in Japan. He completed his MA in 2012 and is currently enrolled as a PhD student in the Nautical Archaeology Program. His dissertation focuses on the 3D reconstruction of Portuguese India trading ships of the 16th and 17th centuries. During his study at Texas A&M University, he participated in the WWII Cultural Heritage Project in Saipan in 2010 (conducted by Flinders University) and is currently an active member of the Anxum Project in Italy (Texas A&M University and University of Udine), the Gnalić Project in Croatia (Texas A&M University and University of Zadar), and the Project of the Battle of the Itaparica in Brazil (Texas A&M University, Netherlands Cultural Heritage Agency and University of Bahia).

Kotaro Yamafune also specializes in the reconstruction of ship and shipwreck sites using 3D software, such as Autodesk MAYA© and Rhinoceros©. A sample of Yamafune’s work on 3D reconstruction and modeling can be seen at:

[http://www.youtube.com/user/kotaro0321](http://www.youtube.com/user/kotaro0321)
Graduated

Since 2001 twenty students completed their graduate work and are currently studying or on the job market.

Katie Custer (MA 2004)
Wrought Iron Hand Tools from the Underwater Archaeological Excavations of Colonial Port Royal, Jamaica, C. 1692.

Gustavo Garcia (MA 2005)
The Rincón Astrolabe Shipwreck.

Timothy Kane (MA 2006)
Influence and Evolution: The Development of the Batten Lug Sail.

Hiroaki Miyashita (MA 2006)
Ancient Ships of Japan.

Alex Hazlett (PhD 2007)
The Nao of the Livro Nautico: Reconstructing a Sixteenth Century Indiaman from Texts.

Tiago Fraga (MA 2007)
Santo António de Tanna: Story and Reconstruction.

Sarah Kampbell (MA 2007)
The Pantano Longarini Shipwreck: A Reanalysis.

Erika Laanela (MA 2008)
Instrucción Náutica (1587) by Diego García de Palacio: an Early Nautical Handbook from Mexico.

Blanca Rodriguez (MA 2008)
Standardization of Spanish Shipbuilding: Ordenanzas para la Fabrica de Navios de Guerra y Mercante - 1607, 1613, 1618.

George Schwarz (MA 2008)
The History and Development of Caravels.
Randall Sasaki (MA 2008)
*The Origin of the Lost Fleet of the Mongol Empire.*

Vincent Valenti (MA 2009)
*Transitions in Medieval Mediterranean Shipbuilding: A Reconstruction of the Nave Quadra of the Michael of Rhodes Manuscript.*

John Eastlund (MA 2010)
No thesis option.

Paul Creasman (PhD 2010)
*Extracting Cultural Information from Ship Timbers.*

Lilia Campana (MA 2010)
*Vettor Fausto (1490-1546), Professor of Greek and Naval Architect: a New Light on the 16th-Century Manuscript Misure Di Vascelli Etc. di...Proto Dell’Arsenale di Venetia.*

Courtney Higgins (MA 2012)
*The Venetian Galley of Flanders: from Medieval 2-Dimensional Treatises to 21st Century 3-Dimensional Model.*

Kota Yamafune (MA 2012)
*The Portuguese Century in Japan and the Nanban Screens.*

Bry Dubard (MA 2013)
*The Key to All the Indies: Defense of the Isthmus of Panama*

Laura Gongaware (MA 2013)
*Treasure Hunting: Three Case Studies.*

Coral Eginton (MA 2013)
*Dutch ship pharmacies.*
The ShipLAB cooperates with scholars from different universities and research institutions in several continents, trying to create opportunities for our students to travel, network and become acquainted with the field.

Massimo Capulli  
Università degli Studi di Udine, Italy

Tânia Casimiro  
Instituto de Arqueologia e Paleociências, Universidade Nova de Lisboa, Portugal

Miguel San Claudio  
Arqueonauta SL, Spain

Denise Gomes Dias  
Universidade do Estado da Bahia, Brazil

Marta Domínguez  
Nederlands Centrum voor Dendrochronologie, Netherlands

Francisco Contente Domingues  
Universidade de Lisboa

Pierre Drap  
Images and Models team (I&M), Laboratory of Sciences of Information and Systems, UMR CNRS 7296, Marseilles, France

Nuno Fonseca  
Instituto Superior Técnico, Technical University of Lisbon, Portugal

Rosa Varela Gomes  
Instituto de Arqueologia e Paleociências, Universidade Nova de Lisboa

Roberto Junco  
Instituto Nacional de Antropologia e Historia, Mexico

Jorge Semedo de Matos  
Escola Naval de Lisboa

Paulo Monteiro  
Instituto de Arqueologia e Paleociências, Universidade Nova de Lisboa, Portugal

Irena Radic Rossi  
Department of Archaeology, University of Zadar, Croatia

Flor Trejo  
Instituto Nacional de Antropologia e Historia, Mexico
Submerged Cultural Heritage

Featured Projects
The ShipLAB condemns the destruction of the underwater cultural heritage by looters and treasure hunters. We believe that treasure hunters and archaeologists cannot work together because our activities have different objectives. The goal of treasure hunting is profit. It is understandable that its investors expect the best return for their investments. A for-profit company that allocates time to carefully excavate an archaeological site, or spends money to preserve artifacts without market value, will be replaced by any company with a more efficient focus on the extraction and sale of artifacts that possess market value.

**Mentions of our Work**


**Books**


**Keynote Addresses, Invited Talks, Panels, and Workshops**


Castro, F., 2010 *Summer Season in the Upper Adriatic Region*, Brown Bag Talks, Anthropology Department at Texas A&M University, October 2011.


collateral effects on the businesses of marine construction, salvage, oil and gas and the real impact on shipwreck exploration and archaeology. UI Shipwreck Track, New Orleans, 9-11 February, 2010.


Communications at International Meetings


Publications


Reports


Alves, F., Castro, F., *Relatório da missão de verificação de um achado fortuito de um canhão na praia das Avenças (Cascais), IPA/CNANS, 1997.*

Graduate Work


Newsletter Articles


Popular Articles


Castro, F., “Caçadores de tesouros: proposta de uma taxonomia” in *História e...


Druett, J., Run Afoul, New York :
In fact, the nineteenth-century was an interesting period of opportunities for the nations situated along the margins of the Atlantic rim. New political conditions and the liberalization of seaborne commerce early in that century provided conditions for Brazilian port cities to engage Atlantic trading networks. By this time, the Atlantic Ocean was already a well-established commercial and cultural venue, where merchant vessels from various parts of the world intertwined goods, peoples and ideas along with the development of modern economics. In the southern Brazil, the small port city of Rio Grande would hence flourish as an important commercial center of Atlantic South America.

The main goal of this research is therefore to study late modern Atlantic mercantile maritime culture through the archaeological investigation of stranded shipwrecks found in the intertidal zones of the Rio Grande do Sul seashore, southern Brazil. The studied shipwrecks are found partially buried in the wet and dry portions of the beach. It is observed in these areas of the beach profile an alternation of cyclical (seasonal) and non-cyclical (meteorological) events of natural flooding, burial and exposure, with significant implications for the preservation of the materials studied, as well as for the distribution of wreck remains and the interpretation of archaeological data (Torres, 2012). The methodological approach will concentrate in understanding cultural and natural formation processes behind the occurrence and distribution of shipwrecks.

Stranded shipwreck sites often occur in highly dynamic sedimentary environments, posing major challenges in terms of preservation and coherence of the archaeological data. Beach environments are among the most energetic and complex depositional systems in the world’s oceans (King, 1972; Zenkovich, 1967), where multi-directional wind, waves and currents affect sediment transportation and depositional patterns, as much as it does with artifacts distribution in the wreck site. These sites typically consist of widely scattered materials.
located either in the intertidal zone or above the high-tide line. The specialized literature has referred to those as ‘scattered’ or ‘scrambled’ sites (see Delgado, 1984, 1985, 1997; McNinch et al., 2006; O’Shea, 2002; Russel, 2002; Muckleroy, 1975).

Concerns with understanding the particularities of wreck sites formation have followed the field of shipwreck archaeology since its origins in the 1960’s (Dumas, 1962; Bass, 1966). It initially developed around issues of defining wreck sites typologies and discussing the coherence of archaeological record in relation to the physical characteristics of the underwater environment (Dumas, 1962, 1972; Frost, 1962; Muckelroy, 1977).

Due to the privileged nature of incredibly rich wreck sites off the Mediterranean coast, where the ‘microcosms’ of ancient people have been investigated since the 1960’s, the sub-discipline of nautical archaeology had its beginnings associated with the excavation of well-preserved, near-pristine shipwreck sites (see Bass, 1972; 1983). Early publications thus have somewhat disregarded the significance of shallow and scattered ship remains, due to their presumed little coherent information content (Dumas, 1962, 1972; Frost, 1962).

The proposed approach to the problem of interpretation of shore stranded shipwrecks in southern Brazil will be delimited by three analytical instances, or contexts: 1) the coherence of structures and artifacts at individual sites; 2) their distribution in the extent of Rio Grande do Sul seashore, thus understood as a regional shipwreck province with occurrences along time and space; and 3) the southwest Atlantic Ocean as a space for the circulation of maritime culture, where the merchant ship and its material culture are intertwined in a macro-regional sphere of circulation of goods, people and ideas during the late Modern period.

Together with a team of archaeologists and geomorphologists from the Federal University of Rio Grande in Brazil, we started in 2011 a field experiment in site formation processes, designed to provide a base for long term monitoring of the archaeological remains in relation to environmental variability in these exceptionally dynamic wreck sites. A pilot site was thus chosen and benchmarks were installed in a convenient position near the wreck. Hull features were tagged with five permanent control points each and surveyed with the aid of a digital topographic instrument (Total Station).
Samila Ferreira
Policies of Memory, Politics of Forgetting. São Lourenço do Sul, Brazil
2013 - Co-Chair: Tom Green

Samila Ferreira’s research focuses on heritage policies, the enhancement of social memory and its effects on the representation/oblivion of social groups in multicultural/multiethnic contexts. In her work she analyzes public policies in view of their effects towards constructing and promoting narratives of the past. Language, power, and politics make our past, and public policies, monuments and legislation are the tools with which the narratives are created by every generation.

The city of São Lourenço do Sul in Brazil is located on the west shore of the Patos Lagoon. The city began to receive free laborers in 1858 with the arrival of immigrants from different parts of Europe, especially Germany and the extinct Pomerania, occupying and cultivating agricultural properties in southern Brazil. Early on this colonial enterprise came to depend on water transportation for the transport of crops from and supplies to the farms. This transport was done with sailing schooners, regionally known as iates, thereby integrating the colonial region with other navigation lanes into the Patos Lagoon. Over the years, the demand for schooners in this trade attracted many iates to São Lourenço do Sul city, whose operation expertise and seamanship was mostly Portuguese.

Since 2005, the municipal administration has officially developed public-private collaborations in order to disseminate and promote the German-Pomeranian immigrant culture in the towns and region. This initiative, mainly linked to tourism, has emerged as an economical alternative for the descendants of immigrants living in the rural area. The area experienced frequent economic swings as production declined and a colonial monoculture, especially tobacco, was established, impoverishing the local population. Since the 1970’s a rural exodus of many young people is taking place, who seek for opportunities outside of the rural context.

In this study the interaction of at least two ethnic groups with the Portuguese is highlighted. According to Llorenç Prats all expressions of cultural identity are ideological in the sense that they are based on narratives, ideas, values and prejudices. Collective memories in any single community are frequently different for different social and cultural groups, and the state sponsorship of any particular narrative risks the establishment of a collective memory that silences important voices or historical events.

This dissertation will discuss the problems related with the estab-
lishment of official narratives, collective memories and collective amnesia, and their relations with the social, cultural, economical and political factors at play.

As Foucault suggested, individual and collective identities are the result of our experience and most people accept the reality that the media and the existing institutions present them. In this sense, all collective memories silence important parts of the past and represent a version of the powerful that serves a specific purpose. Morality, truth and meaning depend on knowledge and experience, and these are embedded in culture, with its consensus and collective narratives of the past and the relations between the different cultural and social groups interacting on any given community.

This dissertation will frame the question of collective memory and collective amnesia in São Lourenço do Sul in the cultural, social and economical context of this multi-cultural community and analyze the construction of collective memories and consciousness in the social context of the different powers at play between the dominant and subordinate groups.

**Publications**


Clockwise: (1) Aboard in the late Jaguarão; the man wearing the white clothes is the late’s master, at the helm is a sailor, the boy in the background holding the rope is the apprentice, and the man sitting in the background is the renowned photographer of that time, Bruno Pruské. Undated, author’s personal collection. (2) Personal tools of sailor Mr. Lourenço Martins. From left to the right: thimble, fid and small knife for cutting up points. Recorded by the author on 01/04/2010. (3) Roveré Shipyard workers in São Lourenço do Sul. Undated. Mrs. Iolane Roveré Montezuma Personal archive. (4) Roveré Shipyard workers repairing the late Federal. Undated. Mrs. Iolane Roveré Montezuma Personal archive.
The goal of this study is to determine when, where, and why bells appeared aboard ships in Europe, sometime prior to the mid-to-late 15th century.

Both archaeological and historically known bells will be used to analyze religious, practical, and decorative functionality in relation to shipboard life and as compared to known land-based bells in churches and elsewhere.

By defining these factors, a better understanding of the circumstances leading up to their placement aboard ships can be realized. In addition, a survey of all known and accessible extant archaeological bells will be done to determine if certain characteristics can provide an accurate designation of date and country of origin. These will include size and weight, physical markings, inscriptions, decorative elements, metal composition, and shape and construction method.

A handful of ship bells are known historically and archaeologically from the period dating before AD 1705. To make better sense of the centuries represented, they have been sorted by date below with known information.

The early use of bells on ships may be related to the necessity of signaling a vessel’s presence in the fog. However, only a handful of ship bells are known historically and archaeologically from the period dating before AD 1705. To make better sense of the centuries represented, they have been sorted by date below with known information.

Bell allegedly recovered by sport divers from a shipwreck site near Figueira da Foz, Portugal, possibly the Spanish ship San Salvador, lost in that area in 1555 (Courtesy CNANS).

Possible fragment of a bell from São Julião da Barra, Portugal (Courtesy CNANS).

Fragment of a bell from Cabo Raso, Portugal, from the site of the 1696 shipwreck of an Italian ship named Grande Principessa di Toscana (Courtesy CNANS).
revealed. Another goal of this database is to provide quick and easy access to information for researchers. By providing a centralized location of known ship bell data, identification of a shipwreck’s time period and country of origin may prove expedited through the use of the bell, if found.

The successful creation and completion this database depends on the accessibility and accurate reporting of ship bell data. In several examined archaeological reports, data provided is either incomplete or missing in its entirety, other than a passing mention a ship bell was recovered. Likewise, bells have been recovered by local fishermen, treasure hunters, and sports divers and rest in private collections or housed in museums where they sit unstudied. Bringing these sources to light is essential to an accurate picture of ship bells prior to 1750.

At this stage of the research we are collecting data from archaeological publications, historical accounts, and iconographical evidence.

We hope to gather enough information to reconstruct the history of ship’s bells in the North Atlantic and the Mediterranean.
2011 Field Season

The Gnalić shipwreck is a little over three nautical miles distant from Biograd na Moru, Croatia. It was discovered by sport divers in the early 1960s, lying at a depth between 25 and 29 meters, near the Gnalić Island, at the entrance of the Pašman channel. Several archaeological interventions under the direction of Ksenija Radulić, in the late 1960s and early 1970s, and under the direction of Zdenko Brusić in 1990s, exposed the archaeological remains of a large ship dated to the late 16th century. The extension of the site and the amazing preservation of the ship remains and its cargo make it one of the most interesting early modern shipwrecks known.

The ship’s preserved cargo consists of a rich assortment of glass vessels, mirrors, window panes, brass chandeliers, silk, cotton shirts, shaving razors, pins, needles, candle snuffers, brass bells, spectacles, and raw materials, such as cinnabar, lead carbonate, mercury, antimony, sulfur, brass wire, and brass sheet. Determining the provenience and destiny of all these items will shed light on the nature of commerce routes in the eastern Mediterranean world of the late 16th century.

2012 Field Season

In the summer of 2013 we will revisit the site and try to excavate a trench to assess the extension and preservation of the ship’s hull.

Invited Talks


Publications


Stella 1 Shipwreck

Italy

2011-

The Anaxum project is a collaboration with the Dipartimento di Storia e Tutela dei Beni Culturali dell’Università di Udine and the Soprintendenza per i Beni Archeologici del Friuli Venezia Giulia. The project’s mission is the multidisciplinary study of the River Stella, in Northern Italy, throughout time. In the summer of 2011, a team from ProMare, Texas A&M’s Nautical Archaeology Program, and the Institute of Nautical Archaeology was invited to participate in the excavation of a Roman barge: the Stella 1 shipwreck. The work was directed by Massimo Capulli from the University of Udine and Filipe Castro from Texas A&M University, under the scientific supervision of Luigi Fozzati of the Italian Ministry of Heritage and Cultural Activities. The excavation was made possible thanks to the generous support of ProMare, the Center for Maritime Archaeology and Conservation (CMAC), and Dr. Peter and Nancy Amaral, Texas A&M Alumni and long time supporters of the Ship Reconstruction Laboratory / CMAC.

Reports


Newsletter Articles


Communications at International Meetings


Castro, F., Luigi Fozzati, Massimo Capulli, Ayse Atauz, Dante Bartoli, Kelby Rose, Lindsey Thomas, Kotaro Yamafune, Peter Holt, The Stella 1 Shipwreck, 44th Annual Meeting of the Society for Historical Archaeology Annual Conference, Austin, Texas, January 2012.

The Stella 1 laced Roman barge as it was found in situ, with a piece of the mortise and tenon wooden structure, possibly from the embankment, lying nearby at a slightly
Puerto Rico is located on the northeast corner of the Caribbean Basin. Archaeological evidence suggests that the island's first inhabitants arrived between the years 7,000 and 4,000 BCE. Spanish colonization of Puerto Rico began in 1509, under the direction of lieutenant Juan Ponce de León. The strategic location of Puerto Rico was admired since the early 16th century by both friends and enemies of Spain. This project aims at understanding the country's maritime history and vocation through its shipwrecks. In 2008, in cooperation with the Instituto de Investigaciones Costaneras (IIC), a team from Texas A&M University surveyed the coast between the municipalities of Loíza and San Juan. In 2010 we relocated the site of the Rincón shipwreck in cooperation with the Consejo para la Conservación y Estudio de Sitios y Recursos Arqueológicos Subacuáticos, the University of Puerto Rico, and the Historic Preservation Office.

Publications

Reports

Graduate Work

Newsletter Articles

In the nexus of the North Atlantic and the Mediterranean worlds, the Portuguese coast has a rich submerged cultural heritage. The ShipLAB organized a summer school in Lagos, Portugal, during the month of June of 2006, with the support of the municipality. Lagos has a long seafaring tradition and is the place where Prince Henry the Navigator lived and planned the first effective steps of the Portuguese expansion overseas, which lead to the discovery of a maritime route to India.

The 2006 Field Season was an exploratory mission designed to introduce the landscape, the culture and the history of Algarve to a team of ShipLAB graduate students, and plan a long-term project of inventory, study, and publication of the region’s maritime cultural heritage.

Part of the student’s time was spent recording artifacts raised by fishermen and sport divers, part diving on known shipwreck sites, and part visiting museums and archaeological sites.

An inventory of recorded shipwrecks was started together with another of underwater sites with archaeological interest.

Stone anchors raised from a fishing site off Praia do Carvoeiro (Fiipe Castro, 2006).

Recording an old anchor found near the city door on the ancient medieval beach.


Newsletter Articles
The Site

This site has been known to fishermen since long and its shallow location suggests that most of the shipwreck was salvaged over the years.

In the 1980s one gun presumed to come from this site was raised and placed in front of a house located nearby, but it has since rotten away.

Sport diver Paulo Pimentel showed the team an adjacent area where in the winter, when the sediment blade is thinner, he found spikes and other small artifacts lodged in the crevices between the bolders that form the rocky bottom. The erosion on these artifacts, most from cooper alloys, suggests a long exposure to the currents and running sediments. Most of the shipwreck area lies now under the jetty.

Report

Castro, F., Relatório dos trabalhos de salvamento de 5 bocas de fogo em ferro encontradas na zona de implatação da Marina de Oeiras, on file in IPA/CNANS' library, 2001.
Ship Modeling and Visualization Sciences

Featured Projects
During the last four decades computers have continuously changed the way archaeologists work. The ShipLAB works with the Department of Visualization, Texas A&M University and the Centre for Marine Technology and Engineering of Instituto Superior Técnico, to maximize our research capacity and to profit from the important input of these two excellent institutions.

About our Work

Papers

Keynote Addresses, Invited Talks, Panels and Workshops

Communications at International Meetings
T. Santos, N. Fonseca, T. Vacas, and Castro, F. Numerical Simulations of Indian Route Voyages by the Late 16th Century Portuguese Indiaman, 43rd Annual Meeting of the Society for Historical Archaeology Annual Conference, Austin, Texas, 2008.
January 2011.

Fonseca, N. and Castro, F. Experimental Archaeology with a Portuguese Indiaman Scaled Model, 43rd Annual Meeting of the Society for Historical Archaeology Annual Conference, Austin, Texas, January 2011.


Fonseca, N., Vacas, T. and Castro, F. Análise das características náuticas de embarcações latinas

Cargo Distribution aboard the Pepper Wreck at departure from India (Audrey Wells).

¹ Paper Published

**Graduate Work**

Audrey Wells, Virtual Reconstruction of a 17th-Century Portuguese Nau (MA 2004-2008 – Chair: Frederick Parke, Department of Visualization, Texas A&M University).

Kelby Rose, A Three-Dimension Study and Reconstruction of Vasa (PhD 2008- ).

Charles Justus Cook, A Parametric Model of the Portuguese Nau. (MA 2010-2011 – Chair: Frederick Parke, Department of Visualization, Texas A&M University).

Kotaro Yamafune, Tridimensional Reconstruction of a 17th Century Merchantman (PhD 2012- ).

**Newsletter Articles**

Alexander Hazlett

The Textual Excavation of an India Nau

2001-2007

Alexander's work is focused mainly upon the “textual excavation” of a nau of the Carreira da India (the “India Route”), describing the construction of the vessel timber by timber, following the methods of 16th-century shipbuilders and the dimensions and measurements specified in contracts and treatises. Using Rhinoceros 3 software to model the ship, he built the model directly from a list of timbers described in the anonymous manuscript Livro náutico ou meio pratico de construção de navios e galeis antigas - Ms. F464 from the National Library, Lisbon, dated to 1580-1590 - which he translated and interpreted.

Although the primary source for this reconstruction was the regimenio “Medidas pera fazer huma Nao di Seiscentas Tonilladas, e os paos que hâ de levar de Sovoro e Pinho” from the Livro Nautico, Alexander used Fernando Oliveira’s treatise Livro da Fabrica das Naus (c. 1580) extensively, and looked at numerous other original texts when it was necessary to understand a criptic passage or term in the Livro Nautico. Another text used was written around a decade later, was João Baptista Lavanha’s treatise Livro Primeiro de Arquitectura Naval.

Data derived from these sources was compared to those found in other treatises, iconography, and the archaeological record. The reconstruction was based on a hypothesized construction sequence, mainly based on the order in which the timbers are presented in the Livro Nautico document. Neither the treatise of Oliveira nor that of Lavanha contradict this sequence of building operations.

Where they were missing, the scantlings of each type of component were estimated based on data from the archaeological record.

Shapes were defined using the geometrical formulas and other data contained in the ship treatises of the period, or found in the archaeological record.

The model was defined using Rhinoceros 3 three-dimensional modeling software. The end result of this project is an annotated model, illustrated by a 3-D model, presented on the next page.

Written around 25 years later than the vessel described in the Livro Nautico, and showing a larger vessel, the treatise of Manoel Fernandez - Livro de Traças de Carpintaria, 1616 - was very important to help decoding the meaning of certain timber names. Fernandez’ drawings and scantling gages are a tremendous primary source for the understanding of Portuguese shipbuilding in the period.

One last source utilized was the Spanish treatise by Diego Garcia de Palacio, Instrucion Nautica Intrvccion nathtica para el bien vso, y regimiento de las Naos, su traça, y gouierno conforme à la altura de Mexico, dated to 1587.
Each timber of the *Livro náutico ou meio pratico de construcao de navios e galês antigas regimen* “Medidas pera fazer huma Nao di Seiscentas Tonilladas, e os paos que há de levar de Sovoro e Pinho” was detailed, designed in 3D and assembled following the traditional methods, as prescribed in the coeval shipbuilding treatises.

Because this text contains the number of timbers of each kind that are necessary to build a 600-ton nau, Alexander was capable of achieving an impressive level of detail, for instance in what pertains to the spaces between frames or deck beams.

These values were then compared to the available data from shipwrecks and other texts which greatly improved the plausibility of his reconstruction.

Alexander’s model was later expanded and fine-tuned by Nuno Fonseca, Tomás Vacas, and Tiago Santos, the team from the *Centre for Marine Technology and Engineering*, *Instituto Superior Técnico* that tested the Pepper Wreck reconstruction with numerical and physical models, in order to evaluate its intact stability and its performance under sail.
Based on the information retrieved from the Pepper Wreck archaeological remains, compounded with the knowledge obtained from almost 100 years of studies on iconography and contemporary written sources, both literary and technical, the main objectives of this project were:

a) To obtain a plausible configuration for the hull, masts, spars, rigging and sail plan of an India nau;

b) To try to understand the complexities of the construction sequence and structural details of these ships and determine their fundamental characteristics in terms of total weight, weight distribution, displacement and trim;

c) To assess their sailing abilities under different weather conditions, in terms of stability, propulsion force, resistance, performance, and maneuverability; and

d) To assess the ship's structural strength to extreme and fatigue loads.

To achieve these goals we established thirteen tasks:

**T1 - Development of a set of hull lines, sail plan and rigging plan**

This task entailed an analysis and fine tuning of the existing lines drawings, and the development of the masts and spars plan, sail plan, and rigging plan. Several models were developed and discussed.

**T2 - Design of the ship's structure, including space divisions and internal bulwarks**

A three-dimensional model of the ship's structure was created based on the model developed by Alex Hazlett, as well as a theoretical internal subdivision of the spaces. The weights and centers of gravity of each timber piece were entered, using the different specific densities of the various kinds of timbers used. A definition of the interior spaces was developed to allow the estimation of the cargo capacity, weight, and distribution of the cargo and ballast for each loading configuration.

**T3 - Stability analysis**

This task comprised the assessment of the floatability and stability of the ship for several loading conditions.

Firstly the intact stability was investigated by modern computational methods, including small-angle and large-angle stability. The results were then
compared to current stability criteria for large sailing vessels, allowing an estimation of the actual safety of the ship. We plan to investigate the stability during and after flooding (damaged stability), and to discuss the effectiveness of the crew countermeasures described in contemporary documents.

**T4 - Hydrodynamic model tests in towing and seakeeping tanks**

This task entailed the construction of a 1/10 model for:

a) resistance tests, where the model was towed in still water at several speeds to measure the resistance to the advance;  

b) sea-keeping tests, where the model will be towed in regular and irregular waves to measure the induced motions and added resistance to the advance due to the waves; and  

c) maneuvering tests where forced horizontal motions are imposed on the model to obtain the hull maneuvering characteristics.

**T5 - Aerodynamic tests in wind tunnel with sail model**

A model of the hull’s upper works and rigging was built and will be tested in a wind-tunnel, with different wind conditions such as various wind directions.

These tests will be carried out considering only the sails (in several configurations) as well as the sails together with the hull’s upper works, since it is known that the size of the fore and stern castles of these ships influenced their performance under sail.

**T6 - Calibration of the theoretical models for ship dynamics**

CMTE has developed and implemented software based on several theoretical models that calculate the dynamic behavior of ships at sea: resistance to advance, seakeeping in waves, maneuvering and sailing performance.

However, these models are at present adequate for modern conventional ships and vessels. Those modern models will be calibrated and validated to represent the dynamics of the Pepper Wreck, by systematic comparison of results with tank and wind tunnel data.
T7 - Calculation of the Polar Diagram of Speeds

This task will consist of the calculation of the polar diagram of speeds, a graphic that indicates the speed attainable for each direction and wind force combination. In addition to the sailing speed and direction, UETN software will find the heeling, drift and rudder angles, while sailing in equilibrium for each situation of wind intensity and direction and sail configuration.

A critical analysis will be performed in order to assess if the route chosen by the Portuguese pilots was in fact the best possible solution given the ship's characteristics and the calendar restrictions imposed upon the trips - a complex set of restrictions that were related with the harvest and cure of the peppercorns in India, the prevalent winds of each monsoon, and the pathway of the cash flows that fuelled the commerce.

T8 - Assessment of the India Route various paths

Considering the patterns of wind and currents for the Atlantic and Indian Oceans during the periods in which these ships sailed from Europe to the Indian Subcontinent and back, an attempt will be made to simulate a full round voyage and determine the speeds and times traveled during each leg.

Fatigue will also be analyzed since these ships were subjected to violent and repetitive stresses during long periods of time—frequently over one month—during their six to nine month's trip. One of the most interesting aspects of this study will be to assess the influence of heterogeneity of the timber, as a construction material, in the final strength of the ship.

A computer model based on Alex Hazlett’s was developed by CMTE student Tomás Vacas (Rhinoceros®).

T9 - Assessment of the ship's structural strength

The model built in tasks 1 and 2 will be used to study the structural strength of these ships. Almost nothing is known about this subject other than that the scarcity of suitable timber for shipbuilding that characterized this period made these ships very interesting subjects of study from the optimization-engineering point of view.

Structural loads imposed by severe weather, transmitted to the hull structure by both large waves and by the rigging will be analyzed and compared with the structural strength expected for the model, given the timber sections utilized, the types of connections, scarves, and fastening patterns.

T10 - Creation of a virtual reality model

A three-dimensional virtual model was designed by Texas A&M VizLAB student Audrey Wells (Autodesk Maya®) to provide both the investigators and the target public a better understanding of the interior space distribution, living conditions, sailing performance and maneuvering.

This model allows the representation of spaces and environments of indubitable interest, both for the scientist's under-
standing of the ship under study, and for the public targeted in the dissemination of the study's results.

**T11 - Virtual Reality Simulations**

We expect to develop this model further and use it together with the mathematical models to recreate a series of typical situations routinely encountered by an India nau, such as: maneuvering, including reaching, beating, changing tack, stopping; the dynamics of the ship under several different sailing conditions; the inflow of water which might result in sinking, including the measures taken by the crew; simulation of the construction process; the operation of launching; simulation of the careening of the ship.

**T12 - Construction of a scale model**

This task consists on the construction of a wooden scale model of an India nau. These models permit a better understanding of the ship shape and structure, based on the restrictions of the building materials. Models allow scientists to understand the real possibilities of the timber utilized, the most important aspect being the simulation of bending directions of the wales, stringers, planking strakes, and the influence of this practical knowledge - today completely lost - on the conception and design of these ships. Each construction phase is being documented in video and digital photography.

**T13 - Dissemination of the results**

The objective is the dissemination of the results to two main target publics: the scientific community and high school teachers and students.

This project has created numerous opportunities to develop a better understanding of the design and construction of the ships that opened the Asian markets to Europe.

**Publications**

A complete list of our publications is presented on pages 58-62, included in the Pepper Wreck Project.
In Audrey’s own words: “Modeling is a very powerful tool, which can allow viewers to progress from what is observable, archaeological data and theory, to concepts of what is unobservable, the past.”

Quoting Gary Lock’s Using Computers in Archaeology: Towards Virtual Pasts (London: Routledge, 2003), Audrey continues: “‘Moving from data to explanation through theory and interpretation has always been the endeavor of archaeology.’

Lock also presents the use of computer modeling in archaeology as a *hermeneutic spiral*, or process of interpretation, in which the data model and theoretical model are derived from the archaeological record through interpretation. Digital computer models, informed by the data and theory, add an additional layer of interpretation.

Based on the models, interpretive statements about the past are made. These interpretations constantly inform and reform our understanding of the past. (…) This is useful because the subject of study is generally from partial remains. Models, and the process to create them, can have a significant influence on archaeological interpretations. Gary Lock asserts: ‘Because the past is complex, often unknowable and unverifiable, working through models is the only way of approaching explanation and experimenting with the meaning of observed data.’”

Audrey’s model is the basis for further work.
Testing the model at Frederick Park’s C.A.V.E.

Crew and passengers were modeled after Italian 16th Century painter Luca Cambiaso, whose stylized figures revealed themselves extremely economic in term of computer memory allocated per person.

The cargo was object of careful study and all clues to standardization retrieved from coeval documents were used.

Asian pots, common in shipwrecks from this period.

Audrey’s work was further developed by Kotaro Yamafune, who focused on the rigging and the immense task of inserting the crew and passengers.

The Pepper Wreck reconstructed and loaded, at departure from Cochin, India, to Lisbon, Portugal.

Reconstruction of the mainmast top, stay, shrouds, and lifts.

Barrels turned up to be very difficult to model, at least in what pertains to their standardized sizes. We have their capacities, but not their main dimensions.
This interdisciplinary project combined the disciplines of nautical archaeology and computer visualization in order to create an interactive virtual reconstruction of a Portuguese nau. Information about the shipbuilding process was gathered from 16th and 17th century treatises by Fernando Oliveira and João Batista Lavanha. Eight registered tonnage formulas from the 16th and 17th centuries were used to estimate the cargo capacity of the reconstructed hulls. Using this information Justus Cook developed an algorithm that creates a parametric computer model of a hull and calculates its registered tonnage. This parametric model allows the user to choose between the Oliveira and Lavanha conception recipes, adjust the basic dimensions of a ship’s hull (e.g. keel length, beam, depth of hold) to fine-tune the hull shape further, and save the information about the hull shape for future editing. The eight registered tonnage estimates are compared to the volume of the parametric hull model below a generic waterline.

Ship shapes are relatively easy to define through a small number of more or less complex curves:

1. The curve defined by the sternpost, keel and stem post;
2. The turn of the bilge curve;
3. The lower whale curve;
4. The sheer line.

In a significant paper entitled “Shape Creation in Civil and Naval Architecture” (Nowaki and Lefèvre, eds., Creating Shapes in Civil and Naval Architecture. Leiden: Brill, 2009: 3-45) Horst Nowaki argues that the evolution of ship shape can be analyzed along three axis:

1. The time axis;
2. The geometric complexity axis;
3. The axis of tools and methods of shape creation.

In this particular study Justus was asked to take in consideration only the axis of geometric complexity. For the relatively short period under analysis the tools and methods used by shipwrights to generate shapes were limited and common to the entire region considered (Europe).

The shapes under study – the lower hulls of merchant and warships of the sixteenth and early seventeenth centuries – are relatively easy to model using differential geometry, namely applying the concept of Gaussian curvature.

One day we expect to use Paul de Casteljau / Piêrre Bezier’s algorithms / curves and explore this subject further, but at this
time we focused on a more immediate problem: to identify and map the knowledge gaps encountered when we try to model three basic hull types: caravels, galleons and naus, namely in what pertains to the ranges of variations in length, beam, and depth of hold within each type, and within a period of around 150 years (1500-1650).

Understanding rated capacity and displacement becomes the first step in such a project. Different countries rated their vessels in terms of capacity based on different units and methods. After 1530 several formulas were adopted to determine a ship’s freight capacity.

There are few studies relating different units, formulas, and functions, in a way that allows meaningful comparisons between, for example, a ship of 300 tons in England, circa 1550, and a nao of 300 toneladas in Spain, in the same year.

We have, however, a rather extensive list of basic dimensions of European oceangoing ships from this period that would be very interesting to compare.

Based on these data, this project followed the steps indicated on the fluxogram below and tried to understand the ranges of values expected for a number of parameters, such as hull coefficients, displacements, and designated capacities for a small sample of ships for which we have building contracts or other documents mentioning basic dimensions.

The results obtained suggest a fairly predictive set of variations in shape and size throughout the period under study, but only further research will allow us to draw definitive conclusions.

![Fluxogram](image)

**Fluxogram:**

1. **Input the type of recipe:**
   - Oliveira
   - Lavanha
   - Fernandez, etc.

2. **Enter keel length (m)**

3. **Vary one of the diagnostic dimensions (m)**

4. **Vary another diagnostic dimension (m)**

5. **We compare and analyze the results.**

**Computer:**

- a) Calculates a list of diagnostic dimensions of the selected recipe;
- b) Develops a 3D model;
- c) Measures the model’s volume below the load waterline;
- d) Calculates the Block Coefficient; and
- e) Calculates the registered tonnage according to a number of different contemporary formulas.
On August 10th, 1628 the Swedish warship Vasa set its sails for the first time, in Stockholm harbor. Its construction was personally commissioned by King of Sweden Gustav II Adolf and with its full complement of 64 cannon, the ship was the most powerful weapon in the world. After sailing less than one nautical mile, however, Vasa heeled precariously to port, plunging its lowest open gunports underwater. The massive warship filled with water and sank rapidly.

Kelby Rose
The Reverse Naval Architecture of Vasa, a 17th-Century Swedish Warship
2008-

Research

Vasa remained on the bottom of Stockholm harbor for 333 years, until it was raised nearly intact in 1961. It remains the oldest intact vessel ever recovered. After more than two decades of conservation treatment, Vasa went on display in a purpose-built museum in 1990. The hull and its associated artifacts have been the focus of intense archaeological investigations since the time of its raising, yet many fundamental questions remain unanswered about the ship. Kelby Rose’s dissertation project seeks to answer one of these questions:

How was the hull of Vasa was designed?

In the early 17th century, the Dutch were famed as the premier shipbuilders in Europe and employed in several countries outside of the Dutch Republic. Two Dutch master shipwrights, Henrik Hybertsson and Henrik Jacobsson, oversaw the design and construction of Vasa’s hull. Construction features of the hull confirm that the ship was built according to 17th-century Northern Dutch methods of naval architecture. This is particularly significant as Dutch shipwrights did not design their vessels on paper prior to construction – instead they designed their vessels by eye. It is certain, however, that a deliberate mental design method was used, just not committed to paper. Literary and archaeological sources indicate that these methods were guided by a small set of rules of thumb. These rules, however, were frequently broken and do not account for every aspect of a ship’s design. The experience and judgment of the shipwright filled in these gaps and allowed for complete design realization. Vasa presents archaeologists with an unprecedented opportunity to examine this process for an intact 17th-century vessel.

Using advanced digital 3D modeling technology, this dissertat-
This project is an important methodological step forward for the practice of nautical archaeology. Using SolidWorks 3D modeling software, Kelby Rose is constructing precise models of the principal components of Vasa’s hull. Due to concerns about its structural integrity, the actual hull of Vasa cannot be fully disassembled. The digital models however can be fully manipulated and therefore enable a level of analysis and interpretation that is not possible with their physical counterparts. These models will serve as the basis for a detailed 3-dimensional examination of the naval architectural principles of Vasa and recovery of its design method. This process of recovering the design concept from the intact structure is termed “reverse naval architecture”. The highly visual nature of digital 3D models means that both the procedure and results of this project will be documented and disseminated in unparalleled clarity and detail.

The results of this dissertation project will not only answer fundamental questions about Vasa and the influential Dutch shipbuilding tradition during the birth of the Scientific Revolution, it will also contribute significantly to the array of analytical and visualization tools available to nautical archaeologists in the 21st century.
Nuestra Señora del Juncal was built in 1622 at Fuenterrabía (Guipúzcoa, Spain) following the 1618 Ordenanzas (shipbuilding ordinances), which were issued during the reign of Phillip III to regulate and standardize naval construction. The ship was probably designed as a merchant galleon since it was privately built. Once completed, it travelled as a merchant vessel to Veracruz, Mexico, as part of the New Spain Fleet in 1625. After the return voyage it remained docked at Cádiz until it was confiscated in 1629 to serve as capitana (flagship) of the 1630 fleet of New Spain (Mexico).

During its second voyage the ship stayed in Veracruz until October, 1631, when it departed for Havana as the fleet almiranta (vice-flagship). During the journey to Havana, the galleon was caught in a storm and badly damaged. The situation was so dramatic after one week that the main mast had to be cut to keep the ship’s stability. Moreover, artillery (the ship was carrying 24 cannons that weighed almost 33 tons), chests, old rigging and other objects were jettisoned in a desperate attempt to keep the ship afloat. Notwithstanding, on the night of the 31st of October, 1631, the ship rolled to its starboard side and pitched from the bow, raising the stern and sinking very quickly. Three hundred and eleven people were lost, as well as the ship's cargo. Only thirty-nine people survived.

The reconstruction of Nuestra Señora del Juncal combines the original measurements of the galleon, provided by contemporary documents, and the 1618 Ordenanzas in order to produce a reasonable scantling list as well as the masts and yards dimensions. However, the Juncal was also modified and repaired several times before and after being designated as the capitana of the New Spain Fleet. In 1625, its hull was doubled (embonado) in Veracruz, probably to correct some stability deficiencies of the original ship’s design. Contemporary documents also mention other modifications intended to reinforce the hull of the ship, both to carry artillery and to improve the ship’s seaworthiness and cargo capacity.

The aim of this project is to attempt the reconstruction of the Spanish galleon Nuestra Señora del Juncal based on primary written sources, archaeological data, and iconographic evidence, and gain a better understanding of 17th century Spanish galleons’ design, construction, displacement, hydrodynamic properties, and outfitting.
In order to understand and incorporate these modifications in the reconstruction, contemporary Iberian shipbuilding treatises and contracts are being examined. The dimensional data provided by the scantling lists is combined with the design methods of the 17th century using a CAD software package to produce the line drawings of the galleon. A full three-dimensional model with the hull components and the complete sail plan of the galleon is also being constructed. Finally, the cargo, crew, passengers, gear, rigging, anchors, ordnance, and ballast will be added to the model.

Once the three dimensional model was created, its displacement will be calculated and correlated with the sixteenth and seventeenth century tonnage formulas. The volume of the galleon’s scantlings will be multiplied by the weight of the different types of wood used to in their construction, which are usually specified in the construction contracts. The combined weight of fastenings and fittings will also be included in the previous number. Then, the weight of the cargo, gear, rig, anchors, ballast, stores, ordnance, passengers, and crew will be incorporated to the model to calculate the total displacement of the galleon. Finally, the proportions and hydrodynamic properties of the galleon will be calculated, including the ship’s principal dimensions (lengths, breadths, and depths), length/beam ratio, waterplane area and coefficient, midship, block and prismatic coefficients.

The results of the calculations may be used then to perform an accurate comparison between the silver galleons and similar types of ships built during the same period by other European maritime powers. This analysis will help to introduce some objectivity to this type of comparisons, often based on nationalistic essays supported by erroneous or partial hypothesis.

The final objective of the reconstruction is to become a dynamic model which can be implemented with the data provided by new studies and archaeological projects. In the same way, the model intends to provide a reasonable representation of Nuestra Señora del Juncal based on archaeological and historical research.
The aim of this dissertation is to reconstruct a 3D model of a 17th century Portuguese Merchantman based on both the archaeological data and historical documents, such as contemporary shipwright treatises, journals, and iconography. During the last decade, the quality and availability of 3D software has opened up new avenues of research in nautical archaeology. Commercial and over the counter software allows researchers to model and test their hypotheses about the complex spaces that form the interior of a Three-D software permits a quick and relatively easy implementation of changes, corrections, as well as the testing of hypothesis generated from unclear written sources, both textual and iconographic. Moreover, high-end reconstructions of archaeological ships are effective tools to discuss and improve knowledge about shipbuilding, both at scholarly and popular levels.

In my dissertation I will attempt a full scholarly reconstruction of a large oceangoing ship based on the research developed in the Ship Reconstruction Laboratory around the data retrieved from the Pepper Wreck, an early 17th century Portuguese Indiaman lost near Lisbon on its return voyage from India It has been tentatively identified as Nossa Senhora dos Mártires, lost in 1606. Although its authors admit that theirs is just a conjectural reconstruction, based on scarce archaeological remains, I have chosen this shipwreck because of the amount of data available about its conception, construction sequence, hull structure, rigging arrangement, crew, passengers, victuals, and cargo.

The goal of this dissertation is to create a visualized anatomy of a late 16th or early 17th century Portuguese merchantman for both scholars and the general public, using archaeological and historical data. To achieve this goal my reconstruction of the ship shall be composed of the ship hull, rigging, cargo, and aspects of life on board, such as the space appropriation by crew and passengers.
The cooperation between the Nautical Archaeology Program and the Department of Visualization (Vizlab) dates back to the mid-1990s, when the computer animation students developed models of the War of 1812 brig Eagle, reconstructed by Dr. Kevin Crisman, and the Dutch inland vessel Oost Flevoland B 71, dating to c. 1600 and reconstructed by Dr. Fred Hocker. During the last decade the ShipLAB collaborated on another two projects with the Vizlab. The first consisted of a reconstruction of the interior volume of the Pepper Wreck (Audrey Wells) and the arrangement of the cargo and victuals, while the second explored the relations between the registered capacity and displacement in a 16th century Iberian merchantmen (Justus Cook). Both projects were oriented by Dr. Frederick Parke and Dr. Filipe Castro, and both have successfully demonstrated the enormous potential of the cooperation between the Vizlab and the Ship Reconstruction Laboratory.

A third project, Kelby Rose’s reconstruction of Vasa, is now in progress and I intend to frame my dissertation project within the same theoretical lines using 3D software to develop a model of the Pepper Wreck that synthesizes all the present knowledge about this ship, summarizes the most important remaining questions regarding its reconstruction, and presents the data in a clear and easy to use way to both the scholarly and the general public.

Yet another project using computer graphics as a tool to better understand the conception and construction of a ship is being developed by José Luis Casaban, and is a study of the Spanish almiranta Nuestra Senora del Juncal, lost off the coast of Mexico in 1631.
Computer modeling and 3D reconstructions allows us to establish a methodology to reconstruct and interpret shipwreck remains more accurately, and share our reasoning and primary data with our peers.
Our cooperation with the Center for the Study of Digital Libraries, a leader in the digital humanities field worldwide, has extraordinarily widened the ShipLAB research capacity and created opportunities for our students to dream about subjects such as the future of maritime archaeology and the data it generates, but above all, to think about what it means to be a maritime archaeologist in the digital age.

Publications


Monroy, C., Furuta, R., and Castro F., Poster: "Ancient


Communications at International Meetings


Graduate Work


Newsletter Articles


Screen of the nautical Archaeology Digital Library (Carlos Monroy).
The objective of this project was to design, implement, and evaluate a framework that would a) efficiently catalog, store, and manage artifacts and ship remains along with its associated data and information produced by an underwater archaeological excavation; b) integrate heterogeneous data sources from different media to facilitate research work; c) incorporate historic sources to help with the study of current artifacts, d) develop visualization tools to help researchers manipulate, observe, study, and analyze artifacts and their relationships; and e) develop algorithm and visualization based mechanisms for ship reconstruction, i.e. to determine where recovered pieces and fragments fit in a whole. Our objective was to make the findings and information acquired available over the Internet to scholars as well as to the general public. The project focused on a specific excavation site; the Pepper Wreck.

From the Computer Science viewpoint, the major impact areas of this project were within the specialty area of Digital Libraries and included:

a) A flexible cross-linking of heterogeneous content in a dynamically-growing collection;
b) A flexible use of annotations to enhance community access while respecting individual information rights;
c) A focus on incorporating uncertain data;
d) Advances in the digital library replication and synchronization; and
e) General applications of visualizations based on 2D grids.

From the Nautical Archaeology viewpoint, the major impacts of the project were:
a) Developing a model for mapping an underwater archaeological excavation site:
b) Establishing a protocol for storing, managing, and organizing information related to a shipwreck:
c) Creating a framework to enable the integration of heterogeneous data sources and media:
d) Developing new ways for structuring and accessing ancient shipbuilding treatises; and
e) Providing computational assistance for the identification and placement of ship fragments to allow ship reconstruction.

Publications
See pages 48-49.
Ship Ontology

Throughout the ages countless shipwrecks have left behind a rich historical and technological legacy. Nautical archaeologists study the remains of boats and ships, and the cultures that created and used them. Ship reconstruction can be seen as an incomplete jigsaw reconstruction puzzle. In this project Carlos Monroy hypothesized that a computational approach based on digital libraries can enhance the reconstruction of a composite object (ship) from fragmented, incomplete, and damaged pieces (timbers and ship remains).

The main archaeological sources used in this project were data generated from a 17th-century Portuguese ship, the Pepper Wreck, complemented with information obtained from other documented and studied shipwrecks. Shipbuilding treatises spanning from the late 16th - to the 19th-centuries provided textual sources along with various illustrations. Additional visual materials came from a repository of photographs and drawings documenting numerous underwater excavations and surveys.

An ontology was developed, based on a rich database of archaeological information compiled by the late J. Richard Steffy, creator of the ShipLAB and one of the founders of the Nautical Archaeology Program. The original database was analyzed and transformed into an ontological representation in RDF-OWL (??). Its creation followed an iterative methodology which included numerous revisions by nautical archaeologists. Although this ontology does not pretend to be a final version, it provides a robust conceptualization.

An important component of the architecture of this project was an ontology for describing wooden ships, called ontoShipDS. This ontology is contained in an RDF-OWL formatted file. It was created using Protégé [Protégé 2000], an open source ontology editor.

Navigation through the ontology is possible with a web-based ontology browser. This browser is open source software provided in collaboration between the Universities of Manchester and Stanford [Ontology Browser 2009].
Underwater archaeology as a research discipline is a nexus between the soft and hard sciences. The problem of recording underwater sites is at the center of every project. Digging is time consuming, expensive, and a sometimes dangerous and destructive process. Archaeologists typically destroy the archaeological sites they dig; therefore accurate and comprehensive recording is the most important task of archaeologists.

Archaeologists must know what to measure and measure it as accurately as possible, but their responsibility does not end here. They must store and share their data with their peers, and make sure it is accessible to other scholars in the future.

Ensuring that knowledge and accuracy are the foundations of any recording process, Pierre Drap, a world renowned computer scientist, developed software that automatically acquires archaeological information from photogrammetric images, and creates an extremely accurate cloud of points with color metadata that represents an excavated surface chosen by the archaeologists at any given moment.

Together with the ShipLAB and other institutions, the Images and Models team (I&M) from the Laboratory of Sciences of Information and Systems at Marseilles (LSIS), UMR CNRS 7296, is developing a new technology to automate the process of volume recognition. In other words, to try to automate the process from Figure 1, to Figure 2, to Figure 3. To identify the structural components of a shipwreck is not a trivial endeavor. We are developing this project along two lines of research, namely the relations between measurement/knowledge and photogrammetry/ontology, within the context of naval archaeology, where measures are often incomplete, as well as in underwater archaeology, where the aim is to develop sophisticated pattern recognition 3D/2D, which then proposes or validates typological assumptions from very precise measurements.

The survey of the current state of this shipwreck will be achieved through an automated process, departing from the recognition and localization of amphorae and other manufactured objects visible on the surface layer.

A complete and detailed ontology, already initiated at Texas A&M University, will describe the structural elements of the vessel and propose a generalization of the relation measurement/knowledge which is proposed in the context of naval archaeology.
Portuguese and Spanish ships of the 15th and 16th centuries were among the best in the world during this Iberian golden age. Building upon the work developed by the Institute of Nautical Archaeology in the late 1980s and early 1990s, the ShipLAB has continued to collect data and study these ships, their voyages, and the peoples that built and manned them.

Books


Papers


Graduate Work


José Luis Casaban, The Reconstruction of a 17th Century Spanish Silver Galleon (PhD 2010-).

Nicholas Budsgen, 15th Century Europe and the Ships of Discovery. (PhD 2012-).

Communications at International Meetings


Iberian ships have some particular characteristics that seem to be regional, appearing in the Atlantic and perhaps spilling into the Baltic Sea as well (Filipe Castro).
The ShipLAB is collecting information on nautical astrolabes in collaboration with Alan Stimson and as of May 2013 we have an inventory of 99 nautical astrolabes.

Astrolabes chronologically organized and sorted out according to their typologies. We have subdivided Stimson’s typology to differentiate between the different kinds of ballast, post tops, and thrones (Filipe Castro).

Publications

Garcia, G., “Nautical astrolabes,” in Custer, K., eds., Edge of Empire. Proceedings of the Symposium held at the 2006 Society for Historical Archaeology Annual Meeting, Sacramento, California, Lis-

We kept Stimson’s taxonomy and subdivided his types according to the decoration trends observed through time in each production center. The result is a very consistent model, which predicts the possible shapes within certain time intervals (e.g. triangular ballasts only appear between 1530 and 1570.

Graduate Work


Astrolabe database: we are still gathering data on many of the specimen located on the internet and in auction catalogues (Filipe Castro).
At the ShipLAB we are collecting data on Iberian shipwrecks and building a database with basic information, bibliography, iconography, and publications.

It is often difficult to establish dimensional relations between basic ship parts, their registered tonnage, and the sections of their structural timbers. We are interested in the variations around the relations between a ship’s basic dimensions, the size of its crew, its cargo capacity, routes, and the trends observed all over Europe, while varying from place to place and through time. Ships are single artifacts produced by different maritime landscapes depending on the access to the necessary materials, taste, money, and technology available, but always in a cosmopolitan background, in which ideas travelled, adapted, and evolved, crystallized, or died.

Ole Crumlin-Pedersen and Eric Rieth remind us that some construction particularities are local and parochial, and travel only small distances in centuries. On the other hand, we know that some rigging types diffused rather fast and over great distances, as for example the carvel construction, adopted all over Europe by the first quarter of the 16th century.

Portion of our shipwreck spreadsheet, which presently has around 80 columns and over 200 shipwrecks.
Building upon J. Richard Steffy’s shipbuilding database, we are trying to make sense of patterns and trends in the conception and construction of ships and boats, and trying to trace their spread and evolution geographically and through time. We then connect these trends and patterns with larger social and economic movements.

We are also working on a model to track the evolution and spread of shipbuilding memes. At this stage we are developing morphological matrixes and ship taxonomies to shape our research model.

**Publications**


Iconography database developed at the ShipLAB, containing late medieval and early modern representations of ships and boats.

One aspect of some shipwreck positions on Google Earth.
The Pepper Wreck - presumed to be the Portuguese Indiaman Nossa Senhora dos Mártires, lost in 1606 - was found on the Tagus River mouth, Lisbon, Portugal, in 1993, during an archaeological survey promoted by the Museu Nacional de Arqueologia, directed by Francisco Alves. From 1996 to 1998 it was excavated by the Instituto Português de Arqueologia / Centro Nacional de Arqueologia Náutica e Subaquática, as part of the program of the Portuguese pavilion at the 1998 world exhibition EXPO’98. In 1999 and 2000 the remains of its hull were excavated by the Centro Nacional de Arqueologia Náutica e Subaquática, with the support of the Institute of Nautical Archaeology / Texas A&M University. The study of its hull remains - which include a portion of the keel, eleven frames, and some of the planking - in cooperation with the Centre for Marine Technology and Engineering from Instituto Superior Técnico, yielded interesting results and a first glance at the largely unknown Portuguese naus da India.

Books


Also edited in Spanish and English.


Also edited in Spanish and English.

Reviews of Books


Special Lectures


**Keynote Addresses and Invited Talks**


Castro, F., The Pepper Wreck, at the 32nd Annual Meeting of the Society for Historical Archaeology Annual Conference, Québec City, Canada, Invited by CNANS, the Portuguese state agency for nautical archaeology. January 2000.


Castro, F., A 17th-Century Wreck at the Mouth of the Tagus River.

Shipwreck Weekend, Texas A&M University 1999.


Papers


**Communications at International Meetings**

Castro, F., Nossa Senhora dos Mártires, an early 17th-Century
Indiaman lost at the mouth of the Tagus River, Portugal, First Centre for Portuguese Nautical Studies Maritime Archaeology Conference. Paper read by Mr. Tiago Fraga. Eastern Cape, South Africa, 7 to 9 August 2004.


Reports


Popular Books and Booklets


Lisbon’s Naval Museum has a window dedicated to the Pepper Wreck.
Graduate Work


Newsletter Articles and Popular Publications


In the Media


First found during dredging operations in 1970, the Arade 1 shipwreck was photographed and inspected by amateur archaeologists in subsequent summers. Since there were very few artefacts, this wreck was eventually forgotten and abandoned. During the following decade the Arade 1 hull decayed, broke flat, and was covered by sediments. In the summer of 2001 Centro Nacional de Arqueologia Náutica e Subaquática (CNANS), the Portuguese agency for nautical archaeology, relocated the site and secured an agreement with the local municipality and museum for a long-term project of excavation, conservation and study of the Arade River underwater cultural heritage. In 2002 a team of students from the ShipLAB was invited to participate on the excavation of this shipwreck.

**Publications**


**Communications at International Meetings**


**Invited Talks**


**Reports**


Further Work by Other Teams


Academic Work

The Cais do Sodré shipwreck was found in April 1995, during the excavation works for the construction of a new subway station near downtown Lisbon, which is now the terminus of the Caravela line; named after this find. Dated to the 16th Century, these hull remains are an interesting example of a ship conceived with the whole molding method. The shape of the hull and the relation between its scantlings and its size are still a puzzle to researchers.

Publications


Communications at International Meetings


Reports


Newsletter Articles
Cape Finisterre extends from the Iberian mainland into the North Atlantic and lies along one of the most important maritime routes in the region. With its rocky coastline and reefs, brutal winter storms, dangerous currents, and dense fogs this dangerous coastline is known in Spain as La Costa de la Muerte (Coast of Death) and has become the final resting place for many ships, along with their passengers and crew.

One of the worst maritime disasters to occur in this area took place on the night of October 28, 1596, when a storm took an armed Spanish fleet by surprise off Cape Finisterre.

In the last decades of the 20th century the remains of what seemed to be one of the 1596 shipwrecks were discovered by seafood harvesters at Punta Restelos. In 2007, looting of this shipwreck was detected and communicated to the authorities. The Regional Government of Galicia supported a preliminary archaeological survey of the Punta Restelos shipwreck to document the archaeological remains. The survey was conducted by the Spanish archaeologist Miguel San Claudio and his Cultural Resource Management (CRM) firm Archeonauta S.L. During the surveys, six more shipwrecks, which are thought to be part of the fleet of 1596, were located together with shipwrecks from later periods.

Communications at International Meetings


Newsletter Articles


Since 2011 the ShipLAB is cooperating with Spanish archaeologist Miguel San Claudio in several projects in Galicia, aiming at inventorying, studying and publishing the region’s impressive underwater cultural heritage. We are also collaborating on several research topics related to the Spanish maritime world of the 16th and 17th centuries, when Spain built and sailed some of the best ships in the world.
Nicholas Budsberg

Renaissance and the Ships of Discovery

The Iberian discoveries are part of the Renaissance cultural revolution, and its ships and boats cannot be studied outside this context. Connected by the sea, during the 15th and 16th centuries the world as seen by the Europeans never stopped growing. Although the ships of exploration do not seem to have gathered much attention from the intellectual elites until later in the 16th century, it is likely that the desire for learning and discovering that framed this period impacted their conception and construction.

The economic advantages of the newly opened maritime trade routes were obvious. Although sailing around the African continent was a long and dangerous endeavor, a small ship with 150 tons of capacity could carry the cargo of 1500 camels and stay away from most thieves, warlords, tolls and taxes.

During these two centuries the conception and construction of ocean-going ships evolved and blended along the Atlantic coasts of the Iberian Peninsula, a region situated on the nexus of two diverse seafaring worlds: the Mediterranean and the North Atlantic and Baltic.

What emerged from this ‘Atlantic Tradition’ was a flush-laid, skeleton-built, two or three-masted vessel that paired new arrangements of square and lateen sails for its rig. Construction details and phases, or transitions in development, are still largely unknown, and the answers to these questions and others can only be found through archaeological research.

This project proposes to gather and research the available archaeological data pertaining to 15th and early 16th century ships and interpret and evaluate it in the context of the cultural, economic and political history of Europe.

Modern nautical archaeology has contributed much to Iberian maritime studies since the field’s inception in the 1960’s. Initial research into early European shipwrecks in the New World began in the 1980’s and continued into the 1990’s with students from Texas A&M, although historical research into this time period dates back to the late 19th century with the coming 400th anniversary of 1492. The public’s interest with Christopher Columbus,
the *Nina*, *Pinta*, and the *Santa Maria*, and other contemporary explorers and their ships has not dwindled over the years, as many recent studies and reconstructions have been done regarding these vessels and others, although not enough is known about the caravels and naos of the exploration period to accurately reproduce one.

This dissertation will focus on the shipwrecks that are currently known but have yet to be thoroughly investigated. In the New World the Highbourne Cay wreck has been partially excavated, the Bahia Mujeres shipwreck surveyed, and the Playa Damas shipwreck salvaged. Only one early 16th century shipwreck has been excavated so far – the Molasses Reef wreck in the Turks and Caicos – and the timber remains were scarce and partially destroyed by treasure hunters before the excavation. In Europe a handful of shipwrecks from this period has been excavated but not entirely published.

We intend to inventory the information available and try to make sense of it in the context of the history of the Renaissance, as these were among most complex objects built in their time. Their study will teach us about our technological history and ingenuity, and will help us understand the first step in the history of globalization.
Swift, agile, elegant with their bright sails and colorful hulls, the *saveiros* were the blood that supplied Baía de Todos os Santos and distributed its manufactured goods throughout the cities and villages surrounding the industrial center. Sugar, manioc, pottery, coconuts, palm oil and spices were transported raw and processed, to and from the city of Bahia, since times long forgotten.

Anthropologist Pedro Agostinho (2011) made the case for the evolution of the colonial caravels through “the slower rhythm of cultural change, [which] may have preserved until today many archaic structures, forms and techniques.” His seminal work was later re-edited with a set of magnificent images and established a history and a typology of these vessels.

Another brilliant scholar, John Patrick Sarsfield, traced a hypothetical evolutionary line that explains the introduction of the present gaff sails through Dutch influence and the name change from *caravela* or *caravelão* to *saveiro*. In the 1980s Sarsfield brought these boats to Anglo-Saxon attention with three papers, and eventually had a “caravel” built by one of the shipwrights that used a version of the whole molding method.

**Communications at International Meetings**


Gomes, D., *Os segredos da arte. Um olhar etnolinguístico sobre os carpinteiros navais do Baixo*


Dias, D. G. “Memories from the sea: linguistic and ethnographic sources for Bahia’s nautical history.” *XVth International Reunion for the History of Nautical Science*. Ferrol, 4-6 November, 2010.

Dias, D. G. “No que viajam sobre a água: remanescentes da cultura náutica brasileira documentada em relatos de viagem do século XVI.” *Do Brasil a Macau: narrativas de viagem e espaços de diáspora*. Lisboa, 10 a 14 de setembro, 2008.
The Dutch ship *Utrecht* sunk off Itaparica Island, in the waters of the state of Bahia, northeast Brazil, after an engagement with the Portuguese vessels *Nossa Senhora do Rosário* (32 guns) and *São Bartolomeu* (32 guns) in the later period of the Dutch West India Company presence in Brazil. Incorporated in 1621, the West India Company was inspired by the success of the East India Company (1602-1798) and aimed at supporting the Dutch colonization and related commercial activities, which included privateering actions, in the Atlantic and Pacific Oceans.

The battle that followed the ships *Utrecht* (32 guns) and *Nossa Senhora do Rosário* (32 guns) lasted from 1624 to 1654 and constitutes a rich period for the investigation of early modern geopolitics in the Atlantic.

In Brazil, the Company’s business developed around sugar production and a highly profitable slave trade. The Dutch occupation of northeast Brazil lasted from 1624 to 1654 and constitutes a rich period for the investigation of early modern geopolitics in the Atlantic.

On September 28, 1648, a Dutch fleet of seven sails under the command of Admiral Witte Corneliszoon de With was patrolling an area off All Saints Bay, Salvador, Bahia, when it encountered two Portuguese sails coming in from the sea, around noon. The Portuguese ships were *Nossa Senhora do Rosário* and *São Bartolomeu*, whose mission was to patrol the entrance of the bay. During the battle that followed the ships *Utrecht* (32 guns) and *Nossa Senhora do Rosário* (32 guns) sank. Their remains lie on the seabed, roughly 200 meters apart, at a depth of 18 to 20 meters, and have been heavily looted, although the archaeological information contained in their *tumuli* justifies further research.

**Reports**

**Youtube Videos**
http://www.youtube.com/watch?v=kCyFIRhOu4g
http://www.youtube.com/watch?v=3Tj6utJzbGs
Playa Damas Shipwreck
Panama
2003 - 2005

*Found by sport divers in the 1990s, this shipwreck was mistakenly identified as Columbus’ Vizcaina, a small 50 ton caravel lost near Nombre de Dios during his fourth voyage in 1503. In July 2003 Texas A&M University was invited to consider the complete excavation of the shipwreck at Playa Damas, located near Nombre de Dios, on the Atlantic coast of Panama. Unfortunately, this shipwreck was salvaged by a for-profit company between 2004 and 2006.*

**About our Work**


**Invited Talks**


*The Playa Damas Shipwreck*, III Jornadas de Universitárias de Arqueología Subacuática, Universidad de Huelva, Huelva, Spain. Invited by the University of Huelva. 27 to 30 November 2006.

**Publications**


**Reports**


**Documentaries**

*Spiegel TV - Kolumbus’ letzte Reise*

**Popular Publications**

Italian Seafaring

Featured

Projects
After the collapse of the Roman Empire and following the barbaric invasions, the political unity of the Italian Peninsula was fragmented. Reunification was not achieved until 1870, after the Third Civil War and the conquest of Rome. In this context the study of Italian Seafaring during the Middle Ages and the following periods must count with a complex and contingent historical reality, in which the local shipbuilding traditions were enriched by external influences, such as Arab and Byzantine, originating in a different cultural diversity in each geographical area. As Braudel pointed out, Italy has always been the middle axis of the Mediterranean, and always divided between an Italy that is turned to the West, and another that looks to de Levant. With the advent of the 12th century the Italian Peninsula witnessed a diverse and prolonged phenomenon: its maritime cities developed autonomously and expanded their interests throughout the Mediterranean and beyond. The objective of this theme is the study of the Italian ships and the contribution that its shipwrights brought to the development of shipbuilding.

**Papers**


**Communications at International Meetings**


**Graduate Work**


Lilia Campana, *Vettor Fausto (1490-1546), Professor of Greek and a Naval Architect: a New Light on the 16th-Century Manuscript Misure di Vascelli etc. di...Proto dell’Arsenale di Venezia* (MA 2006-2010).

Modeling a Flanders Galley (Courtney Higgins).
Asian Seafaring

Featured Projects
Asian Seafaring
2002 -

From the beginning of the Tang dynasty to the end of the Ming dynasty (618-1644 C.E.) China ruled the South China Sea and was the world’s greatest maritime empire. As a center of maritime trade China connected the East Asian continent with large portions of the Pacific and Indian Oceans. The study of the diversity, quality, and evolution of its ships and boats is a growing subfield of maritime archaeology and the ShipLAB is participating in its development.

Graduate Work
Timothy Kane, Influence and Evolution: The Development of the Batten Lug Sail. (MA 2002-2006).

From Randall Sasaki’s thesis: Asian shipwreck types. a. Flat bottom, b. round bottom, c. v-shaped, and d. traditional Korean type.
Looking at a history of any particular nation, there will always be a few historically significant events that shaped the ethos of the nation and its people. One such event, for Vietnamese history, is the battle of Bach Dang River fought in 1288 C.E.

In this battle the country of Dai Viet (today's Northern Vietnam) successfully defended the nation from the invading Mongol Empire. It is said that the Vietnamese set up a trap by planting numerous wooden stakes along the Bach Dang River and waited for the enemy's fleet to arrive. By luring the enemy to the field of stakes at the changing of the tide, Vietnamese were able to immobilize the fleet and successfully crush the invading enemy. In the 1950s and 1960s, a large number of wooden stakes were discovered at the town of Yen Hung in Quang Ninh Province (location believed to be the battle site) and Vietnamese archaeologists determined that the stakes were indeed from the battle of Bach Dang River.

However, no artifacts from the battle - other than the wooden stakes - were found. In fact, there are still numerous questioned to be answered. Did the battle really took place at the site? Where did the ships disappear? What was the main battle strategies and why were the stakes placed where they are? In 2008, initiated by Randall Sasaki, a member of the Institute of Nautical Archaeology, the Maritime Archaeology Program at Flinders University, and the Institute of Archaeology at Hanoi created an international research team to answer these questions. A series of surveys and excavations have been conducted, supported by various organizations including the National Geographic Society.

Despite the fact that no shipwreck has been located as of yet, the project revealed many aspects of the Vietnamese battle strategies and led to the discovery of new "stake-fields" which are now registered as national historic sites. The project has gained national attention in Vietnam, initiating other nautical and underwater archaeology related projects in the country.

Publications


Lê Thị Liên et al. “Understanding the Bach Dang Battlefield from recent research results.” Asia-Pacific Regional Conference on Underwater Cultural Heritage Proceedings,

"Reconstructing the Ships from the Mongol Invasion (Japanese)” Kikan Kokogaku (Archaeology Quarterly).
In 1279 C.E., under the rule of Kublai Khan, the Mongols sent a fleet of more than 4000 vessels to subjugate the island nation of Japan, when a powerful typhoon crushed the invading fleet into pieces. The great wind, called kamikaze, or divine wind, thus saved the nation from foreign rule.

Historical sources suggest there were three main types of vessels involved in this event: V-shaped cargo ships for transporting provisions to the front, constructed in the Fukien province in China; miscellaneous flat and rounded bottom vessels made in various areas along the Yangtze River; and flat bottomed landing crafts from Korea.

In the recent past the remains of the fleet were discovered at the Takashima underwater site in western Japan, unveiling numerous artifacts including weaponries, ship board items, and hull sections. The site consists of the ship remains built in China and Korea. The interpretation of the artifacts is thus extremely complex. In order to determine the origin of the vessels, a logical framework was necessary. The author created a timber category database, analyzed joineries, and studied the philosophy of shipbuilding to ascertain the origin and types of vessels.

**Publications**


Namban screens are a well-known Japanese art form that was produced between the end of the 16th century and throughout the 17th century. More than 90 of these screens survive today. They possess substantial historical value because they display scenes of the first European activities in Japan. Among the subjects depicted on Namban screens, some of the most intriguing include ships: the European ships of the Age of Discovery.

Namban screens were created by skillful Japanese traditional painters who had the utmost respect for detail, and yet the European ships they depicted are often strangely anachronistic.

On maps of the Age of Discovery, the author discovered representations of ships that are remarkably similar to the ships represented on the Namban screens. Considering the hypothesis that ships of some of the Namban screens are copies of ships represented on contemporary European cartography, the author realized that one particular historical event connecting Europe and Japan may be the source of these representations. This event was the first visit of the Japanese Christian embassy, the Tensho Embassy, to Rome, in 1582. Its journey to Europe and its following visit to the Taiko, or first effective leader of Japan, Hideyoshi Toyotomi, may have been a trigger for the production of one of the most well-known Japanese artworks, the Namban screens.
Hiroaki Myashita

Ancient Ships of Japan

2004-2006

Ancient ships of Japan are little known outside of the country. They were the object of this study, presented based on the studies of past researchers, together with a comprehensive analysis of their archaeological remains. The process of development from logboats to extended logboats and finally to assembled craft was traced. This study covered evidence from the Early Jomon period (4000 – 3000 B.C.E.) through the Kofun period (300 – 700 C.E.). A large number of logboat remains date to the Jomon period, and it is these logboats which become the foundation of later Japanese ships. The number of ship remains from the Yayoi period diminishes. Therefore, iconographic evidence, mainly clay ship figures and drawings, was used in order to reconstruct the ships from that time.

Japan is an island country from where it is impossible to cross over to the continent without ships. This has been taken for granted and therefore, until the mid-twentieth century, little attention has been focused on ships and their history.

However, the concern with nautical history has been growing, and a considerable number of studies have been conducted on this subject, and have brought about substantial results.

Logboats have been broadly used since the prehistoric times and are generally the same from Europe to China. The earliest example of a logboat was found near Pesse in the Netherlands, and dated to about 6300 B.C.E.

Although it seems that most complex ships developed from logboats, the process of development from the primitive stage to a more sophisticated form is different in different areas. Ships in Northern Europe or in the Mediterranean developed first into shell-first or plank-built ships, then to skeleton-first or frame-first ships. Meanwhile, ships in China seem to have developed from logboats to extended logboats, and after that to junks, which were characterized by their structural bulkheads.

Ships in Japan developed differently from those in other countries. Abundant archaeological evidence has been found from ancient times, unlike the medieval period (1167 – 1568 C.E.) and later, for which there is no evidence as yet. Studies of ancient ships in Japan have been earnestly undertaken by Japanese archaeologists, historians, and folklorists since the second quarter of the twentieth century. The development process of Japanese ships has been roughly explained.

It is generally said that ships in Japan evolved in the following order: logboat, extended logboat and assembled craft. In this project a typology of the early Japanese watercraft was presented, based on both archaeological and ethnographic evidence.
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