MARITIME ARCHAEOLOGICAL AND HISTORICAL SOCIETY

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Integrating Cultural Heritage into the Work of The Ocean Foundation

By Ole Varmer, with Mark J. Spalding, Matt Carter, Phillip Turner, and Alexandra Refosco

The Ocean Foundation (TOF) was launched in 2003 by underwater photographer and philanthropist Wolcott Henry, who served as the founding Chair of the Board of Directors. Mark Spalding became its President shortly thereafter. The Board of Directors include professionals in conservation and experienced in philanthropy. TOF is a 501(c)(3) nonprofit organization whose mission is to support, strengthen, and promote groups dedicated to conservation of the ocean and its resources. Each year TOF raises millions to promote healthy ocean resources and ecosystems. Our advisory board includes experts in science, conservation, education, policy, and law. I joined TOF a few years ago as a Senior Fellow, to assist in integrating Underwater Cultural Heritage (UCH) into the TOF work and mission.

Staghorn Coral, Acropora sp., and uninhabited island, Ailuk Atoll, Marshall Islands, Pacific. Image by The Ocean Foundation.

This article is based on presentations made earlier this year at the annual conference of the Society for Historical Archaeology (SHA). The talks included an overview by President Mark J. Spalding, and presentations by TOF members Alexandra Refosco (Seabed mining and UCH); Phillip J. Turner (Middle Passage); Dr. Matt Carter, archaeologist, President of the Major Projects Foundation and TOF Partner (potentially polluting wrecks); and yours truly on our work to increase the Ocean Literacy of UCH law and policy.

Seabed Mining and UCH

Seabed Mining (SBM) is an industrial practice where mineral deposits, including submerged rare earth metals, are extracted from the seafloor. Regulations on the industry have not yet been established and limited governance falls under International Seabed Authority (ISA) under authority conferred by the United Nations

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INSIDE THIS ISSUE:

Notes from the Prez – Steven Anthony

In the Winter 2020 Edition of *MAHSNEWS*, I described how the pandemic disrupted MAHS programs. I also reported the postponement of all of our congregative activities including our annual Field Schools, Pool Session, Board of Directors meetings, General Membership meetings and the various field trips normally scheduled as part of our Introductory Course in Underwater Archaeology. It has been a tough year for all of us.

Since then, the MAHS Board decided to convert our 2021 live course into a Zoom course which commenced on January 28, 2021. The Zoom course was successfully conducted and the students expressed their delight in being able to participate in the classes. Dr. John Seidel's presentations were especially popular and we are deeply indebted to him for helping us set up the new Zoom classes. In fact, we had so many students register for the course this year that we had to expand our review committee so we could grade all of the final exams.

Currently, the plan is to develop a trilateration exercise that the students can do at home to practice their skills. This will replace the Pool Session this year and help prepare them for our Field School when it becomes safe to dive again. At that time, we will all get back in the water so the students can complete their training and earn their full MAHS certification.

For the 2022 course year we plan to edit and refine the Zoom video presentations and assemble them on Dropbox so they are ready to go next January. We also plan to leverage social media marketing techniques as part of our campaign to attract more students to the course.

As our communities begin to open back up and folks start travelling again, MAHS will start planning our next Field School. Normally the Field School is conducted in the Florida Keys each year, but as we all know after September the Florida hurricane season really gets going and there is a greater risk of being washed out. The Board is continuing to assess the situation and the prospect of where and when to hold our next Field School.

On other fronts, Jim Smailes and Dennis Knepper continue to publish and distribute *MAHSNEWS*, and Tom Berkey continues to circulate MAHSmail reporting interesting maritime archaeology news items and relevant articles for our members. Dave Shaw keeps our Facebook site alive, and Dennis and I have been working to complete the Pamunkey River project reports and the Garlick's Landing National Register Nomination. I have also been actively involved with the Recreational Diver

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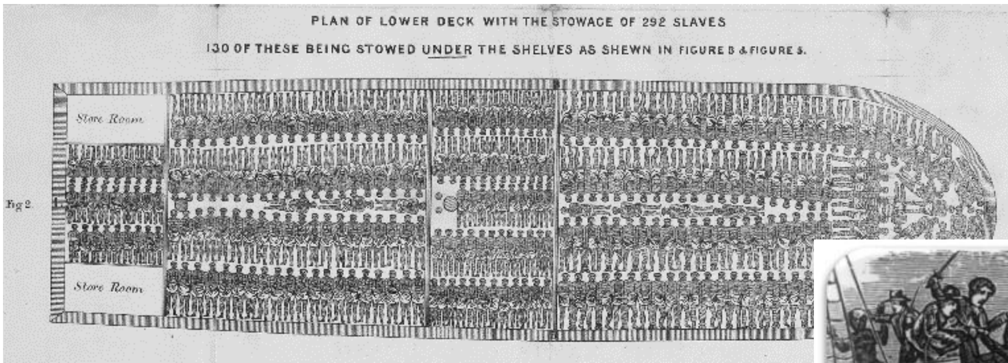
MAHSNEWS is the official publication of the Maritime Archaeological and Historical Society (MAHS), a non-profit, educational organization dedicated to preserving our global maritime heritage.

MAHSNEWS will consider articles and notices for publication which enhance public awareness and appreciation of maritime history, archaeology, and heritage preservation.

Convention of the Law of the Sea. The scraping of the ocean floor to extract the minerals could destroy deep-sea habitats of living marine species and cultural heritage in the area. New developments for seabed mining include the introduction of artificial intelligence (AI) used to identify minerals. AI has not yet learned to accurately identify sites of historic and cultural significance, however, which could lead to the destruction of UCH. This is particularly troubling considering the growing acknowledgment of UCH and sites related to the Middle Passage (see below), and the possibility that UCH sites may be destroyed before they are discovered. A precautionary approach to seabed mining is needed because we lack sufficient knowledge and related regulations to ensure seabed mining does no harm to important cultural heritage.



Stowage of the British slave ship Brookes *under the Regulated Slave Trade Act of 1788. Inset: Lithograph from The* Liberator, *the American abolitionist newspaper, 7 Jan. 1832 (vol. 11, p. 2). Both in public domain. Library of Congress.*

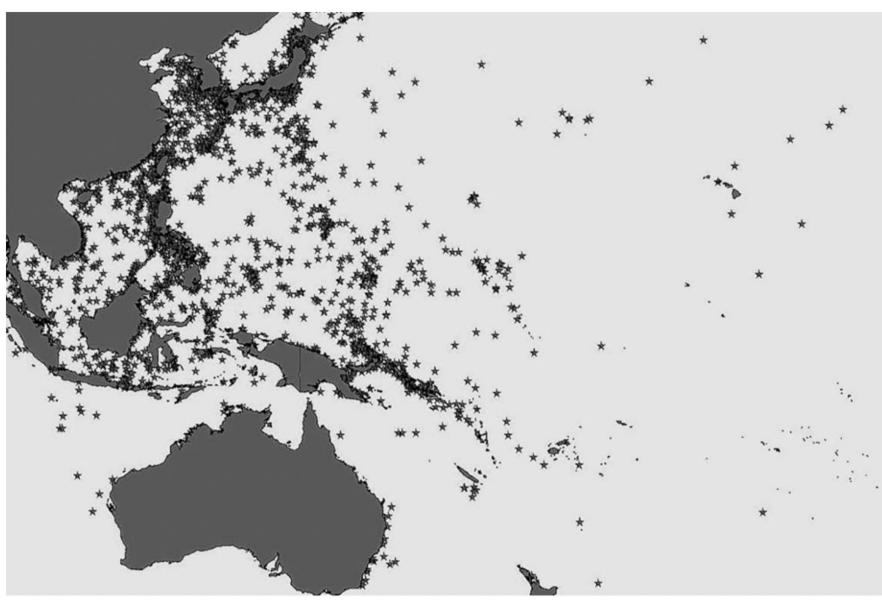
Memorializing the Middle Passage: Evidence on the Atlantic Seabed in the Area Beyond National Jurisdiction

More than 12.5 million Africans were held captive on 40,000+ voyages during the transatlantic slave trade. Many did not survive the voyage and the Atlantic seabed became their final resting place. Contemporary poetry, music, art and literature portray the meaning of the Atlantic seabed to descendants of those who were held captive. But this cultural heritage has yet to be formally recognized by the ISA, which governs mineral rights to the seabed in what are known as Areas Beyond National Jurisdiction. Member States of the ISA have a duty to protect underwater cultural heritage under international law. We encourage these States to consider ways in advance of mineral exploitation to memorialize those who lost their lives in the slave trade. We suggest that one or more virtual ribbons marking major slave-trade routes across the Atlantic should be depicted on ISA maps in memory of those who died during the Middle Passage.

We seek to encourage the ISA to recognize: 1) the loss of life in the transatlantic trade through a memorial; 2) the potential to find artifacts relating to the transatlantic slave trade, with the onus currently being placed on deep-sea mining contractors to recognize important artifacts and to respond accordingly; 3) the wider cultural significance of the Atlantic seabed as the final resting place for enslaved African people who died during the Middle Passage and the importance of considering these cultural values in decision making. We hope this work leads to a wider conversation at the ISA about how memorialization could take place.

Toxic Legacy: World War Two Shipwrecks in the Asia-Pacific Region

The Second World War in the Asia-Pacific Region has left an archaeological signature of over 3,800 ships and other wrecks on the ocean floor. Despite having been underwater for at least 75 years, these wrecks may



During World War II well over 3,000 ships were sunk in the Pacific. Map courtesy of Major Projects Foundation.

World War II wreck in Chuuk Lagoon.
Image by Steve Trewavas, Major Projects Foundation.

still contain millions of gallons of toxic oil carried as cargo and/or bunker fuel. Corrosion rate estimates demonstrate that these potentially polluting wrecks (PPW) are approaching structural collapse hastened by severe weather events associated with climate change. However, little is known about the current condition of these PPW or how their deterioration will impact fragile marine ecosystems and the communities that rely on them. The PPW of Chuuk Lagoon in the Federated States of Micronesia represent a case study describing a strategy aimed at prioritizing, managing, and mitigating the impacts of potential oil spills, as a means of safeguarding marine ecosystems and the cultures and livelihoods of coastal communities in the Pacific. A detailed discussion of this issue and work is available in the article by M. Carter referenced at the end of this article.

Ocean Literacy on the Law of Cultural Heritage

As indicated above, TOF's mission is to support, strengthen, and promote those organizations dedicated to reversing the trend of destruction of ocean environments around the world. The focus is on emerging threats in order to generate cutting edge solutions and better strategies for implementation. This includes facilitating the understanding of how humans influence of the oceans and how the oceans influence humans. For more information about TOF please visit our website referenced at the end of this article; it also includes an annotated bibliography on UCH law and policy.

In 2020, TOF sponsored my presentation on UNESCO's Report regarding its 2001 UCH Convention that emphasizes the need for integrating UCH into work on natural heritage and resources particularly the UN Decade of Ocean Science for Sustainable Development. TOF followed that up with an article about integrating UHC into the UN Decade of Ocean Science for Sustainable Development. I have been working with TOF on the Sargasso Sea initiative for several years and a chapter about that work will be published by Brill Publishers in a book entitled *Frontiers in International Environmental Law* that is dedicated to the work of Dr. David Freestone, the Executive Secretary of the Sargasso Sea Commission. The next step is to explore integrating UCH into the TOF work on the Sargasso Sea. We have had some preliminary discussion with James Delgado, who has done work on UCH off the coast of Bermuda, which is surrounded by the Sargasso Sea.

One of the projects we are working on is assisting in the development of a webpage on Cultural Heritage Law for the Nautical Archaeology Digital Library. This page currently provides a brief overview of international law regarding UCH, including the 2001 UCH Convention, the 1989 Salvage Convention, and the 1982 Law of the Sea Convention. The hope is to build out the website with domestic law and cases. The next step for me is to focus on United States federal UCH law based on an update of the UCH Law Study that I completed in 2014 with the support of Brian Jordan, of BOEM, and the assistance of an army of interns over a couple of years. After that, I am seeking assistance on summaries and links to the United States coastal states which will largely be an update of Carol L. Carnett's survey of state statutes, also referenced below.

Conclusion

TOF has taken a number of steps to conserve our ocean heritage (natural and cultural) including developing partnerships for projects involving ocean literacy and protection. We continue to seek partners for projects of mutual interest. Please feel free to contact us on our website if you have an interest in these projects or others that may be of mutual interest.

Ole Varmer is a Senior Fellow with The Ocean Foundation. He recently retired after more than 30 years at the Department of Commerce/National Oceanic and Atmospheric Administration working as an expert in maritime law.

Mark J. Spalding is an expert on international environmental policy and law, ocean policy and law, and coastal and marine philanthropy. He has been the President of The Ocean Foundation since 2003.

Alexandra Refosco is a Research Associate at The Ocean Foundation with an MA in U.S. Foreign Policy and National Security from American University and is interested in the intersection of international relations and ocean policy.

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A Brief Report on U.S. Legislation Pertaining to Ocean Management

compiled by Anne Gieseck

Each year, as an advocate for environmental and cultural resource matters related to the world's oceans, I study the work of the U.S. Congress, including bills that are introduced and legislation passed for potential impacts on ocean management. The United States Congress meets in two-year sessions, the terms coinciding with the terms of the elected members of the House of Representatives. The term that ended last December was the 116th Congress, which ran from 2019 through 2020. The current term is the 117th Congress, which runs until the end of 2022. Congress is currently considering over 230 bills and resolutions about ocean issues. This article lists the bills that became law during the 116th Congress.

116th Congress (2019-2020)

Hundreds of Bills pertaining to aspects of ocean management were introduced in the 116th Congress. The subject matter of the bills ranged from the operations of federal agencies such as the National Oceanic and Atmospheric Administration (NOAA), to the effects of and responses to climate change. A list of the general topics includes bills pertaining to specific geographic areas, such as the Great Lakes, West Coast, Florida, Chesapeake Bay, the Arctic; pollution and climate effects, such as fisheries management, threatened and endangered species, plastics, acidification, algal blooms, shore line protection, energy production, and the Green New Deal; federal agency operations including the U.S. Coast Guard and NOAA; NOAA programs including Sea Grant and Navigation Tools; the UN Convention on Biological Diversity's target of protecting 30 percent of the ocean by 2030, and the Law of the Sea Convention.

The following are the Bills that became Law:

Public Law No: 116-271 (12/31/2020)
Coordinated Ocean Observations and Research Act of 2020
This Act revises the Integrated Coastal and Ocean Observation System (IOOS), which is a network of federal and regional entities that provide information about the nation's coasts, oceans, and Great Lakes, as well as new tools and forecasts to improve safety, enhance the economy, and protect the environment. The Act reauthorizes the IOOS through FY2025.

Public Law No: 116-274 (12/31/2020)
Great Lakes Environmental Sensitivity Index Act of 2020
This Act requires the National Oceanic and Atmospheric Administration to update at least once every seven years its environmental sensitivity index products for each coastal area of the Great Lakes. An environmental sensitivity index product is a map or similar tool that is utilized to identify sensitive shoreline resources prior to an oil spill event.

Public Law No: 116-223 (12/18/2020)
Digital Coast Act
This Act requires NOAA to focus on filling data needs and gaps for critical coastal management issues and support continued improvement in existing efforts to coordinate the acquisition and integration of key data sets needed for coastal management.

Public Law No: 116-289 (01/05/2021)
Young Fishermen's Development Act
This Act directs the National Sea Grant Office in the National Oceanic and Atmospheric Administration to establish a Young Fishermen's Development Grant Program to provide training, education, outreach, and technical assistance initiatives for young fishermen.

Public Law No: 116-221 (12/18/2020)
National Sea Grant College Program Amendments Act of 2020
This revises the National Sea Grant College Program, through which the National Oceanic and Atmospheric Administration (NOAA) supports university-based programs that focus on studying, conserving, and effectively using U.S. coastal resources. The bill requires NOAA to award Dean John A. Knauss Marine Policy Fellowships. The fellowships support the placement of graduate students in fields related to ocean, coastal, and Great Lakes resources in positions with the executive and legislative branches. The Act reauthorizes other grants through FY2024.

Public Law No: 116-224 12/18/2020)
Save Our Seas 2.0 Act
This Act establishes requirements and incentives to reduce, recycle, and prevent marine debris (e.g., plastics), including requirements to establish a Marine Debris Response Trust Fund, a Marine Debris Foundation, a Genius Prize for Save Our Seas Innovations, a strategy to improve waste management and recycling infrastructure, a Waste Management Revolving Fund for states, and programs for a Waste Management Infrastructure Grant, a Drinking Water Infrastructure Grant, a Wastewater Infrastructure Grant, and a Trash-Free Water Grant.

Public Law No: 116-340 (01/13/2021)
Direct Enhancement of Snapper Conservation and the Economy through Novel Devices Act of 2020 or the DESCEND Act of 2020
This Act addresses the use of descending devices to release reef fish in the Gulf of Mexico. A descending device is an instrument that will release fish at a depth sufficient for the fish to be able to recover from the effects of barotrauma.

Dr. Giesecke is an archaeologist, diver, and ocean advocate who works with sport divers and the cultural resource community to monitor and influence state and federal legislation that affects cultural resources and the oceans. She has served as an archaeologist and regulator with the Department of Interior and environmental specialist with EPA. An archaeologist since the 1960s and a diver since the 1970s, she is a member of the Women Divers Hall of Fame and has served on the boards of the Advisory Council on Underwater Archaeology and the Society for Historical Archaeology. Anne is known for drafting the Abandoned Shipwreck Act of 1987 and guiding it through the legislative process.

Material for this article was taken from the public web site www.congress.gov ⚓

The Nineteenth-Century Medical Campaign to Reform Swabbing the Decks in the U.S. Navy

by Michael J. Crawford

In his 1849 novel *White-Jacket*, Herman Melville protests the inflexibility of the practice of cleaning the ship's spar deck every morning, whatever the weather, and criticizes the medical officers for failing to intervene against the practice:

> Is a ship a wooden platter, that it is to be scrubbed out every morning before breakfast, even if the thermometer be at zero, and every sailor goes barefooted through the flood with the chilblains? And all the while the ship carries a doctor, well aware of Boerhaave's great maxim "*keep the feet dry*." He has plenty of pills to give you when you are down with a fever, the consequences of these things; but enters no protest at the outset—as it is his duty to do—against the cause that induces the fever.

Melville's complaint against unnecessarily exposing seamen to cold and wet conditions reflected the established practices of the U.S. Navy in the age of sail and steam. But his criticism of the inaction of the navy's medical men was unfair, for those men campaigned through the whole of the nineteenth century to reform the practice.

A variety of sources soiled the decks of a warship in the age of sail and steam. To remove the filth the Navy instituted a routine of daily cleaning. Decks could be cleaned by sweeping, scraping, swabbing, and holystoning, by any one of these methods, or by any combination of them. Holystoning could be either dry or wet and could be done with or without sand. Swabbing the deck has been a practice common to navies from the age of wooden warships to the present day.

Swabbing Down." Drawing, charcoal on Paper, by Julian Levi, 1944. Gift of Abbott Laboratories, "Accession # 88-159-GI, Naval History and Heritage Command, Washington, D.C.

A Clean Ship or a Dry Ship?

Swabbing and holystoning ships' decks were rituals in the navy's religious devotion to cleanliness. This passion for cleanliness began in the British navy before the mid-eighteenth century. Under the influence of the prevailing belief that dirt was a source of disease, the movement to keep crews and ships clean was accentuated during the wars of the French Revolution and Napoleonic Era, during which it spread from the British navy to those of Scandinavia and the United States.

In *White-Jacket*, Melville observes that "of all men-of-war, the American ships are the most excessively neat, and have the greatest reputation for it." The commitment to the gospel of cleanliness by officers of the U.S. Navy may be attributed at least in part to the fact that the 1790s, when the navy was established, along with its standard practices and core cultural attitudes, was the very decade that cleanliness as a fashion of the British genteel classes arrived on the shores of North America. The devotion to cleanliness that grew to be an obsession of the American middle class by the latter nineteenth century began among the English gentry in the mid-eighteenth century, about the same time the Royal Navy embraced it. In the 1770s, Americans who aspired to gentility began imitating the British fashion of public baths and they began introducing private baths into their homes in the 1790s. By the beginning of the nineteenth century, genteel Americans were learning from childhood "that being dirty was disgraceful." It was not only fashion that drove the cleanliness movement, but also new medical teachings regarding the function of the skin in removing unhealthful bodily wastes and the resulting importance for good health of keeping the pores clear, which required both clean bodies and clean clothes. Morality accompanied fashion and health, with moralists teaching that cleanliness and morality were two sides of the same coin.

However important cleanliness was believed to be for the health of the crew, officers in the British and American navies embraced it as an essential component of good order and discipline. From the time that they were midshipmen, berthing in vicinity of the infrequently washed bodies of the common seamen, officers associated cleanliness with discipline and dirt with disorder, and in consequence adopted inflexible ideas of order, purity, and cleanliness. The social chasm separating naval officers from enlisted sailors influenced the officer's conviction that the men had to be kept busy if discipline were to be maintained. The absence of a system of long-term, career enlisted service increased the distrust between officers and men, leading, in some ships, to an oppressive atmosphere of antagonism between those in authority and those expected to obey.

The attitudes of naval officers toward cleanliness and its opposite mirrored the values of the American genteel classes to which they belonged. Requirements that the men appear at Sunday muster, washed and shaved, with combed hair and clean clothes paralleled the advice of the arbiters of manners in America. Historians of cleanliness in America have said, "by the middle of the nineteenth century, among the middle class anyway, personal cleanliness ranked as a mark of moral superiority and dirtiness as a sign of degradation. Cleanliness indicated control." Naval historians, in contrast, find that British and American naval officers made a direct connection between cleanliness and control as early as the eighteenth century. The U.S. Navy embraced the cleanliness doctrine well in advance of the American middle class.

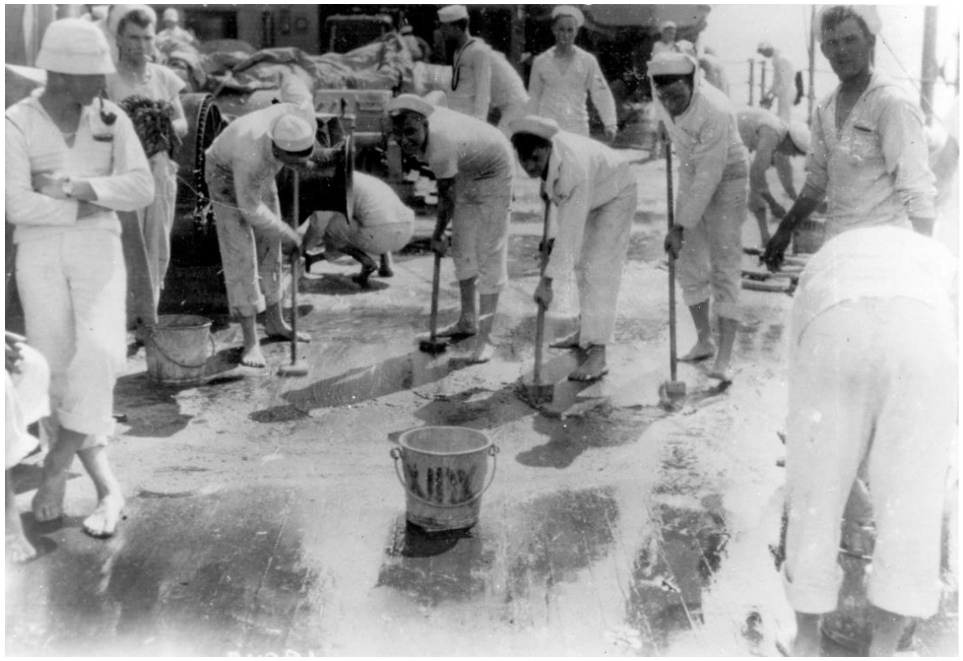
While line officers advocated frequent wet cleaning of the decks as a means to promote good health, naval physicians grounded their opposition on the opposite conviction, that the frequent wetting of the ship's decks created unhealthy conditions. Western medical theory in the eighteenth and much of the nineteenth century held that many diseases resulted from breathing bad air, which physicians called *miasma.* Foul smells indicated that the air carried miasmata, disease-causing filth that arose from the putrefaction of animal and vegetable matter. Frequent fumigations and applications of vinegar within the navy's warships were intended to purify the air of miasmata. Humidity increased the capacity of air to carry filth and therefore was bad for one's health, while dry air promoted good health.

The navy regulations established by President John Adams in 1798 and every subsequent iteration of rules governing the U.S. Navy over the next seventy-two years incorporated directives derived from the medical theory of miasma. Every new issuance of navy regulations from 1818 through 1870 repeated a close approximation of the phrase, "as cleanliness, dryness, and pure air are essentially conducive to health, he [the commanding officer] is to use his utmost endeavors to insure them to the ship's company." Cleanliness, dryness, and pure air constituted the holy trinity of health, since filth contaminated the air, humidity increased the capacity of air to carry filth, and contaminated air caused disease. Throughout the navy's first eight decades the first two elements of this triad of factors competed for priority because the medical officers privileged dryness while the non-medical officers privileged cleanliness.

From Sail to Steam

The year 1808 witnessed the publication of the first major work on naval medicine by a U.S. Navy surgeon, Edward Cutbush's *Observations on the Means of Preserving the Health of Soldiers and Sailors.* Cutbush stated that "even washing the decks," although necessary for cleanliness's sake, "ought to be limited." His use of the word *even* implies that the idea of limiting the practice would come as a surprise to, and meet resistance from, the reader. In place of wetting the decks, Cutbush proposes dry scrubbing in damp weather.

As introduction of coal-powered steam as motive power for warships increased the surgeons' concerns with shipboard humidity it simultaneously increased the difficulty of keeping warships clean, causing line officers to be even more reluctant to cut back on the frequency of the washing of the decks.



USS Oklahoma *(BB-37). Holystoning the quarterdeck, while steaming near Guantanamo Bay, Cuba, circa 1919.*
NH 44425, Naval History and Heritage Command, Washington, D.C.

The U.S. Naval Surgeons' Campaign against Scrubbing the Deck at Its Zenith

Melville's 1849 protest had no effect on the navy's practice of swabbing the decks of their ships. The navy's surgeons continued their campaign to reform that practice and by the early 1870s were clamoring for changes. Their protests had only slightly more effect than Melville's.

Not ignoring the value of cleanliness, U.S. naval medical reports published in the 1870s focus on two of the three traditional disease-preventing precautions, increasing the volume of fresh air and increasing the air's dryness.

In a book on naval hygiene published in 1871 and republished in 1873 in a compilation of medical essays, Medical Inspector Albert L. Gihon, USN, included a section on humidity. In it he decries the widespread practices of wetting or holystoning the spar deck as well as swabbing the berth-deck every morning, both of which he views as ancient customs not justified by modern medical science. The spar deck, he says, needs to be cleaned only when soiled by the washing of clothes and hammocks or particularly dirty work, such as weighing anchor, coaling, and provisioning. The berth deck and covered gun decks need not be cleaned more than once or twice a month, and when they are, everyone not involved should be sent onto the spar deck with his bag and ditty box until the decks have been thoroughly dried, which should be accomplished as quickly as possible using drying stoves, wind sails, and ventilators. Observing how difficult it was to keep water from natural causes out of a ship, Gihon finds "singular" the "universal habit of deluging it above and below," artificially increasing the humidity.

The naval medical officers who wrote the Navy's medical reports for 1873-74 called for scientific studies of the relationship between humidity and disease, and the relationship between washing of the decks and humidity. But contrasting to the cautiousness of the 1873-74 reports stands the frank boldness of Medical Inspector Thomas J. Turner, who, in reports published in 1879, passionately condemns the frequent washing of the decks and directly calls for reform of the practice. In his reports on the medical conditions in USS *Tennessee* in 1875 and 1876 Turner asserts, "a damp ship is an unhealthy ship" and "*Tennessee* is a damp ship," implying the conclusion that therefore *Tennessee* is an unhealthy ship. In 1876, when the wooden screw frigate served as flagship of the Asiatic Squadron, *Tennessee*'s gun-deck was wet down 301 times and the berth-deck 233 times plus several dozen partial wettings. The gun and berth decks were washed down or holystoned every thirty-one hours on average. "The result," Turner concludes, "is apparent now in the acute and chronic rheumatisms, adynamias, acute and chronic bronchitis, catarrhs, abscesses, and boils." "There is no necessity," the medical inspector rails, "for this excessive use of water." Turner recommends new regulations limiting wetting of any deck below the spar-deck to once a week and ordering the lacquering of the berth decks of all warships, making it easier to keep them clean without washing them down. "Cleanliness," Turner declares, "can be preserved without the eternal morning order to 'wash down decks.'"

Impure air, overcrowding, and humidity, Turner asserts, are the three main culprits accounting for the great sick rates and shortened lifespans of U.S. Navy sailors. Rather than calling for further tests of the relationships among swabbing the decks, humidity, and disease, Turner states categorically, “the excessive humidity of the air on the lower decks has its origin almost entirely in the daily water-soaking routine which exists in the service, and to which the decks are subjected.” “There is but one remedy for this excessive humidity of the air on decks,” he proclaims, “—dryness.” Not daily, but “once a month would be sufficient for all such cleaning purposes as are now suggested to keep alive this abomination.” Turner departs from the scientific justification of his position to make an appeal to humanitarianism. “If this routine washing, holy-stoning, wiping, clamping, scrubbing, &c., is meant for cleanliness,” he writes, it is defeating its purpose by promoting filth—since humid air carries more filth than dry air. He continues, “If it is not meant for cleanliness, then in the light of modern scientific research, *it is the ruthless and barbarous wielding of a potent disease-producing weapon against the lives of the unoffending and powerless* [emphasis added].”

At the same time Turner was pushing the reform of swabbing the decks in his published reports, in equally or even more pungent terms Gihon pushed the reform through the medium of speech, first in a paper read at the annual meeting of the American Public Health Association on 5 October 1876, and next by an address following a similar outline before the United States Naval Institute on 8 February 1877. Gihon recognized that conditions of shipboard life had improved in the navy in recent years—“Better food, better water, better clothing, better treatment”— but insisted that much remained to be done, for “the worst enemies of the sailor still remain to be subdued.” And what were the worst enemies of the sailor?

> Foul air and the vapor of water, are the direst foes which menace the sea-farer. Leagued together they are greatly more to be feared by him that the atmosphere of the most sickly climate, or than the boundless waters, which environ him; and the object that I have had in coming before you to-night will be fully accomplished if I succeed in giving any of you an impression of the terrible power for evil of these allied princes of darkness.

Gihon asserted that it was a moral duty for all in authority in the navy to do whatever lay in their power to reduce preventable deaths and that those who failed at this were criminally responsible for those deaths.

The Fate of the Movement

The reluctance of line officers in the U.S. Navy to take the advice of medical officers and modify established shipboard practices stemmed from an antagonistic relationship deriving from a contest for authority whose virulence reached an apex in the 1870s. From the Antebellum Era on, staff officers—naval constructors, paymasters, engineers, and surgeons—agitated for greater recognition, privileges, and authority, and officers of the line resisted, understanding any such advance of the status of staff officers as a proportional diminution of their own. This contest for authority continued through the century until Congress resolved it by amalgamating line and staff in 1899. In the meantime, as one historian puts it, “every warship was a battleground for Staff and Line.”

Not all humanitarian reform movements were successful, the movement to change the navy’s practices of swabbing its decks being a case in point. We cannot understand why some reforms succeed if all we study are the successes: We need to know why some do not. Kwame A. Appiah argues that practices that were once accepted as unexceptionable can be terminated in short order when they come to be viewed by their practitioners as morally repugnant and shameful. He demonstrates how shifts in conceptions of honor among relevant groups brought the end of the slave trade in the British Empire, foot binding in China, and dueling among English gentlemen. The movement to reform the U.S. Navy’s practice of frequently swabbing the decks met with so little success in large part because, given the commonly accepted maxim that *cleanliness is next to godliness*, it was difficult to paint this practice, unlike other naval practices such as the grog ration and flogging that were the objects of successful reform movements, as dishonorable and evil. Medical officers found it impossible to convince line officers, with their unshakeable faith in the virtue of cleanliness, that frequent washing of the decks was inhumane and immoral. In a contest between cleanliness and dryness, cleanliness won out.

Two major developments put an end to the movement to curtail swabbing of the decks of the U.S. Navy’s warships: a revolution in medical science and a revolution in warship construction.

The abandonment of the miasmatic theory in favor of the germ theory of disease causation undercut the scientific basis of the reform. Into the 1880s the miasmatic theory of the etiology of disease held its sway over the germ theory, but, little by little over the course of the latter half of the nineteenth century as experiments demonstrated that bacteria caused the diseases previously attributed to bad air, the germ theory gained acceptance. Between 1877 and 1903, biologists identified the micro-organisms that caused most common diseases.

The second major development that spelled an end to the movement to limit swabbing the decks of the

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Calvi I: The Reconstruction of a Late-16th Century Galleon

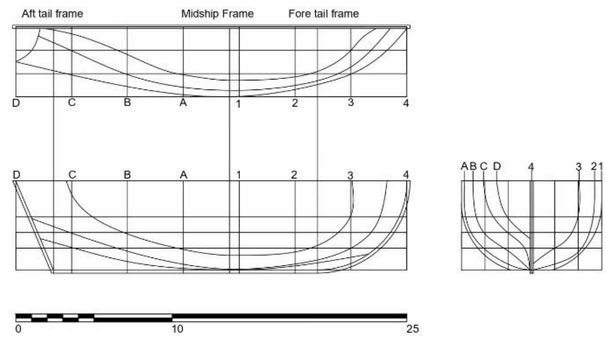
by Raul O. Palomino Berrocal

Three-dimensional or photogrammetric technology has improved considerably in the last decades, and its use and reach can be found in almost every discipline. Archaeology is not an exception since new analytical methods are being employed to obtain information that regular studies could not previously offer. Photogrammetry and laser scanning are some of the most common ways to acquire and reconstruct real life objects in a virtual space. Ceramic pottery, bone material, and even complete architectural structures can be scanned to obtain reliable 3-D recreations. Spatial, physical, and even conservation analysis can be performed with these 3-D "copies" of real objects in ways that would be impossible otherwise. The present article centers around the 3-D reconstruction of the "Calvi I", a galleon found off the coast of Corsica. The purpose of this 3-D reconstruction is for hydrostatic and physical resistance analysis. The goal is to test the performance of the Calvi I ship as a seagoing vessel through the use of modern software, and to propose this methodology as a new tool for nautical archaeological research.

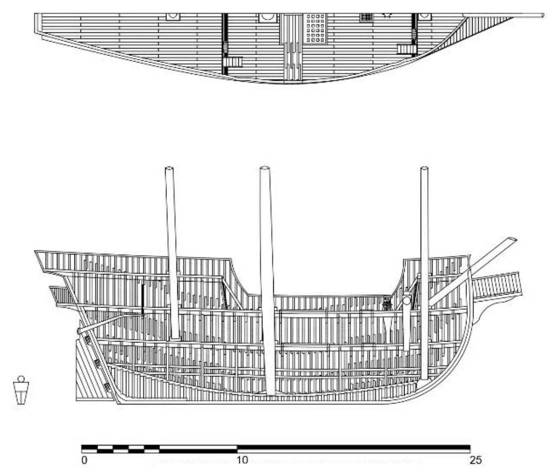
The port of Calvi is located on the island of Corsica, southeast of the French mainland. It was for several centuries a center for maritime activity in the middle of the Mediterranean Sea. Naturally, this constant maritime traffic resulted in accidents and wrecks in the area. One of these shipwrecks was found in 1979 by French submariner Antoine Roucayrol and, due to the lack of identification, it was named "Calvi I". The remains are located 50 m from a busy ferry dock at a depth of 8 m. They lie under the route used by the ferries, whose activity has damaged the site.

It was in the 1980s that the shipwreck was finally excavated archaeologically by Pierre Villié. In his research project, Villié recovered various artifacts, especially ceramic pots. Thanks to this pottery, Villié could conclude that the ship dated to the late 16th century. Villié focused excavation on the structural elements of the ship in order to understand the construction process and structural features. As part of this goal, the excavation team documented a section of the stern that showed various elements including the keel, floors, futtocks, clamps, stringers, and the keelson.

The remains consisted of 22 surviving frames in total, every other one fastened to the keel. The frames are 11.7 cm both sided and molded, and the first and second futtocks have 11 x 11 cm sections. The floors and first futtocks are joined by dovetail scarfs and one iron nail. Likewise, the hull planks are between 20 and



Calvi I: Two-dimensional reconstruction of the hull lines.



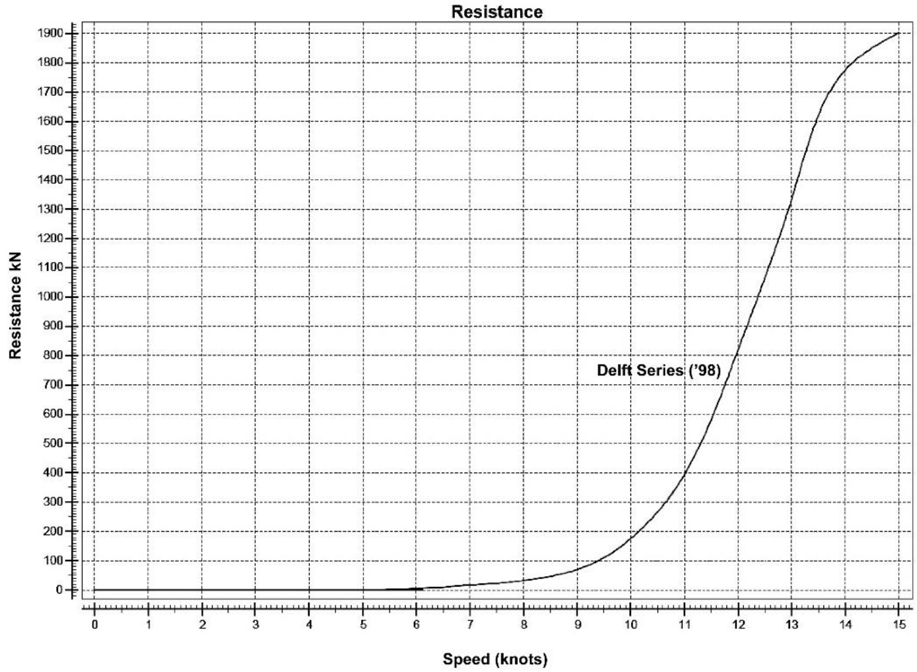
Two-dimensional reconstruction of the inner framing. All figures and images courtesy of the Nautical Archaeology Program, Texas A&M University.

30 cm wide and 5 to 6.5 cm thick. These elements are fastened to the frames with two iron nails per frame. Another structural element relevant to the research was the stern panel, which was found preserved in fair condition. The panel was designed as a solid wall with radial planking, possibly a common practice in contemporary ships of its era. The keel ends in a stern heel and a stern knee, which were also preserved in good condition. The sternpost overlaps the upper arm of the stern knee while the lower arm is prolonged with a filling timber. Moreover, the stern knee is tabbed to receive the floors.

With the information recovered from several field seasons, the research team drew a set of lines to reproduce the shape of the hull. Furthermore, a tentative reconstruction was intended using the historical naval treaties of Pre Teodoro (mid-16th century), Oliveira (late

16th century), and Furttenbach (early 17th century) as a basis. The researchers proposed two different alternative reconstructions: one with two decks and another with three. Nevertheless, the reconstructions were just intended to show a general idea of the shape of the hull with no specific details.

A completely new reconstruction was proposed by researchers at Texas A&M University. Using the measurements and drawings originally obtained from the excavations by Villié, the reconstruction described in this article was developed. The first part of the process was to draw the lines that define the shape of the hull. Based on the physical remains, the researchers proposed that the length in the weather deck was 25 m, the depth in hold 5.71 m, and the maximum beam 8.96 m. With the main parameters set, the lines were traced based on similar vessels. With the hull determined, the second step was to reconstruct the internal framing of the Calvi I. For this section, the field records were essential since they illustrated the structural elements and dimensions clearly. A feature that stands out is the distribution of the framing: the frames had more space between them and were also thinner in comparison with the floors and futtocks of contemporary galleons. Given this characteristic, we believe that the Calvi I ship must have had only two decks. Due to its short length, the proposed depth, and the relatively weaker framing, adding an extra deck would have made the vessel unbalanced.



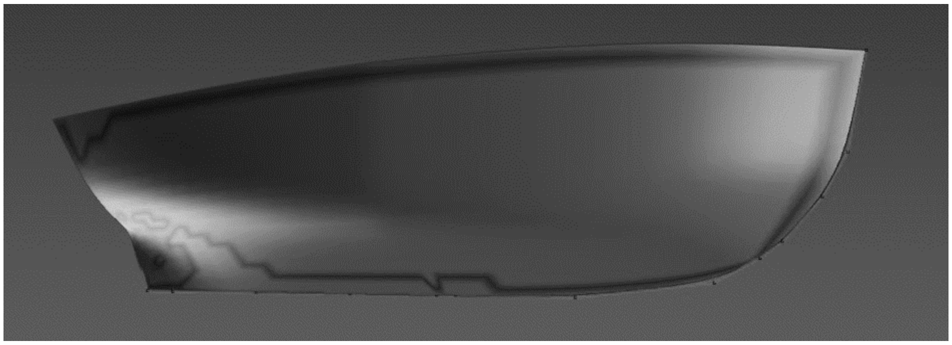
Graph of resistance properties of the Calvi vessel showing a consistent transition in resistance as speed increases.

Once the two-dimensional drawings were completed, the next step was to translate the hull's lines into a three-dimensional space. For this task, the DELFTship program was employed. DELFTship is an application software developed for hydrostatic analysis of naval structures, assessing their stability in water. Two-dimensional lines were imported and recreated within the three-dimensional space in order to have a more realistic visualization of the hull.

When the re-arrangement of the lines was completed, the hydrostatics and resistance analysis were run. The information obtained consisted of the volume, waterplane, and midship properties. By contrasting these sets of data, the ship was shown to be well-balanced. However, the results also indicated that while loaded the ship would require extra weight in the bow to keep the trim adequate for effective seafaring. Furthermore, the sectional areas show that near the stern the shape of the hull is slightly concave, but, in general, the transition from the stern to the bow is smooth.

Finally, the resistance results indicate the forces that the vessel would face while navigating at specific speeds and the energy required to overcome it. In the chart above, the Y axis indicates the resistance that the ship will encounter, and the X axis indicates the speed. The Delft Series ('98) resistance calculation is a statistical method obtained from several years of testing in the towing tank of the Delft University of Technology. The method was the result of testing with fin-keeled models, but it can be applied to different types of ship as well. The results shown by the Delft Series (98) method indicate a consistent transition in the speed/resistance relationship that is comparable to resistance curves of similar vessels. For a 15-knot speed, a resistance of 1900 kN would be expected in a galleon of such measures as the Calvi I; thus, the resistance calculation obtained from the Delft Series (98) suggests a fair performance as a seagoing craft for the Calvi I.

On the other hand, the software also indicates what sections of the hull as proposed could cause tension in the structure. In the 3-D reconstruction (next page), light gray sections indicate areas that would be more difficult to build because they are more complex surfaces and also would create drag or tension. Darker gray sections show the parts of the ship where the hull runs smoother with no complex surfaces. The analysis thus suggests the galleon would experience more tension along the upper edges of the ship and especially on the bottom along the keel. This characteristic in the lower section would have



In a three-dimensional model of the hull, light gray areas indicate more complex surfaces which would create more tension.

been detrimental since it is a structural shortcoming that could have endangered the vessel while at sea, possibly leading to its sinking. A similar weakness was also found while analyzing our reconstruction of the hull of the *San Giacomo di Galizia*, a Spanish galleon built in Naples in the late-16th century as part of the Anglo-Hispanic War. Both galleons being built in the Mediterranean Sea around the same period and showing the same structural deficiency could indicate a common characteristic of this type of vessel. We cannot, however, exclude the possibility that this problem stems from our reconstruction decisions, and further research is still required to reach a more confident conclusion.

The analysis of the Calvi I ship showed it to have been a well-balanced seagoing vessel, adequate for transporting goods in the Mediterranean Sea. Nonetheless, there is one major structural flaw found in the lower section of the hull that could be either a consequence of the Mediterranean shipbuilding tradition or a reconstruction bias from our 3-D and hydrostatic analyses.

The results obtained from this methodology were mostly positive. However, more testing with different vessels from different periods and geographical locations is needed to determine the full extent that 3-D technology can offer in the nautical archaeology discipline.

Raul Palomino Berrocal is in the PhD program at Texas A&M University. His interests include Iberian seafaring during the colonial period in the Americas. ⚓

Civil War Rubber: Historic Gaskets from USS *Monitor*

by Hannah Fleming, Lesley Haines, Laurie King, and Molly McGath

In 1987 The Mariners' Museum and Park partnered with the National Oceanic and Atmospheric Administration (NOAA) to be the official repository of artifacts raised from USS *Monitor*. *Monitor* is a Civil War era ironclad ship, known for its revolving gun turret and its part in the Battle of Hampton Roads, March 8-9, 1862. The ship sank later that same year off the coast of Cape Hatteras, North Carolina and was not rediscovered until 1973. Starting in the late 1990s, archaeologists from NOAA in partnership with the US Navy, began a major effort to recover the most significant parts of USS *Monitor*, including portions of the aft engineering section and gun turret. The final major recovery expedition was completed in 2002, with the arrival of *Monitor's* turret at the Mariners' Museum and Park in Newport News, Virginia. A total of 210 tons of archaeological material was excavated and is undergoing conservation at the Museum's Batten Conservation Complex.

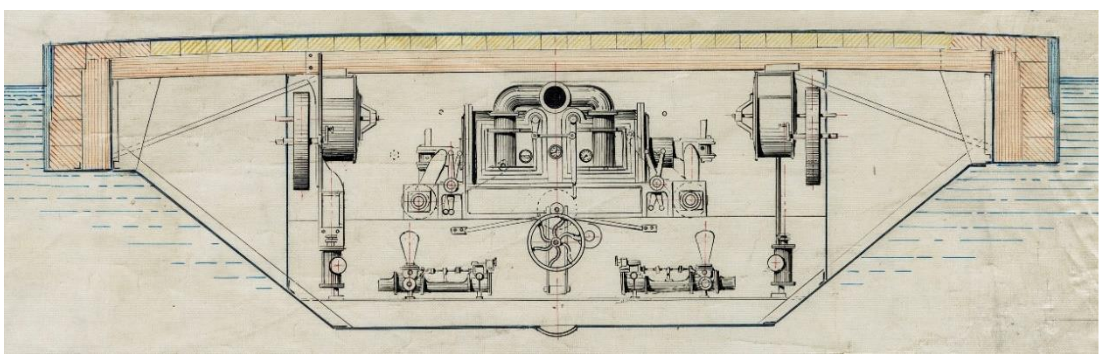


Image detail of the engine room from the "Rowland plan" of USS Monitor *(MS0376/03.01-02.01#47). All images courtesy of The Mariners' Museum and Park.*

While the majority of materials recovered from the ship are metal (namely iron and copper alloy), a number of organic objects were recovered. Wooden tool handles, leather boots, and rubber gaskets are a few examples. Rubber gaskets were used throughout the engine plant to

Examples of variety of gasket degradation:
A) iron staining; B) minimal degradation; C) delamination; D) embrittlement.

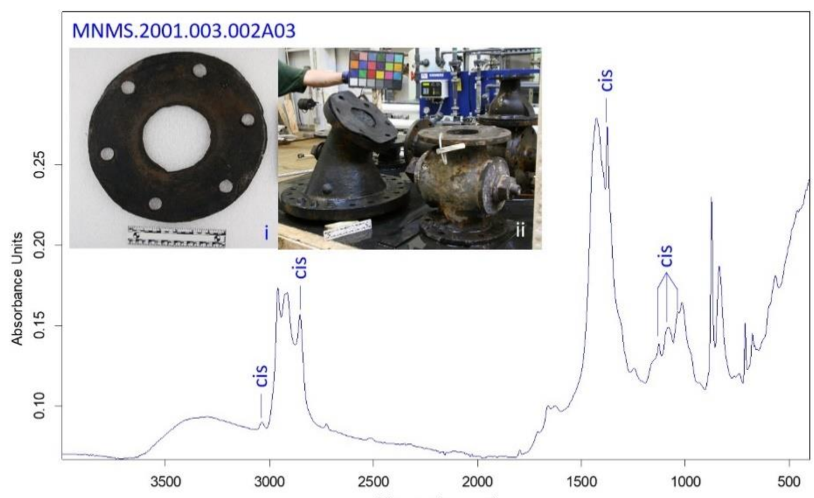
make steam and water-tight seals at connections. There are over 40 gaskets in the collection, with great variation in condition and composition. The gaskets are layers of woven textile and rubber. Some appear newly made, others are covered heavily in iron staining and marine growth. Some are brittle along the edges, others have lost much of their structural integrity and are highly distorted. Therefore, we decided to turn to both analytical research and historical documentation to discover more about the gaskets' material composition.

We use analytical techniques that are non-destructive and non-sampling to get a better understanding of the chemical make-up of the objects. A process known as attenuated total reflectance-Fourier transform infrared spectroscopy (ATR-FTIR) allows us to investigate historical objects from our collections, using reflected infrared light to identify the chemical fingerprints of many organic materials, like rubber, textiles, oils, and certain paints. With this technique we have been working to better understand rubber objects from USS *Monitor*.

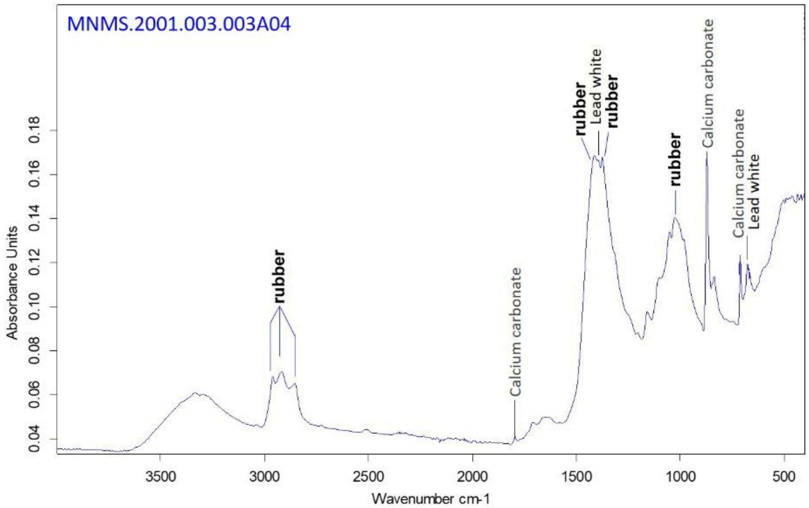
Rubber objects are some of the earliest plastics in museum collections. They were typically made using tree sap from a variety of trees in Asia, Africa, and Central/South America. This sap was prized for its polymeric properties which, as a natural plastic material, could be dried and molded into many different forms that were water-repellant, air tight and flexible. After processing, the rubber could be used in a variety of ways. The popularity and versatility of rubber is illustrated by the different items recovered from USS *Monitor*, including the gaskets, but also buttons, a comb and rubberized cloth. ATR-FTIR is used to characterize the type of polymer in the rubber. Rubber has two major, naturally occurring isomers: 1,4-*cis*-polyisoprene and 1,4-*trans*-polyisoprene. The former is primarily sourced from the *Hevea brasiliensis*, a new world tree located in the South and Central Americas. The latter is found more globally, and is sourced from predominantly Asian, African, and some equatorial American trees.

Gaskets in the *Monitor* collection were recovered from at least nine different artifact assemblies. To date, 39 gaskets have been tested with ATR-FTIR. Of these, 26 were identified as 1,4-*cis*-polyisoprene (graph below), and thus were likely from *Hevea brasiliensis* or Central/South American rubber. The origin of the rubber for 13 objects is undetermined--while they have strong indicator peaks for 1,4-*cis*-polyisoprene, there are additional peaks that may come from a mixture of 1,4-*trans*-polyisoprene (graph next page). This may be a result of mixing the two rubbers, or lamination of the two isomers.

Additionally, ATR-FTIR is useful in identifying some inorganic compounds on the gaskets, like lead white, and this has confirmed historical sailor's accounts of using lead compounds in association with rubber. George Geer, a Yeoman Engineer onboard *Monitor* from February 1862 until the ship sank on December 31 1862, references use and production of rubber gaskets in his



ATR-FTIR spectrum of a rubber gasket that shows very clear peaks of 1,4-cis-polyisoprene characteristic of Hevea brasiliensis, *a new world tree (inset image i: after treatment); (inset image ii: during disassembly).*

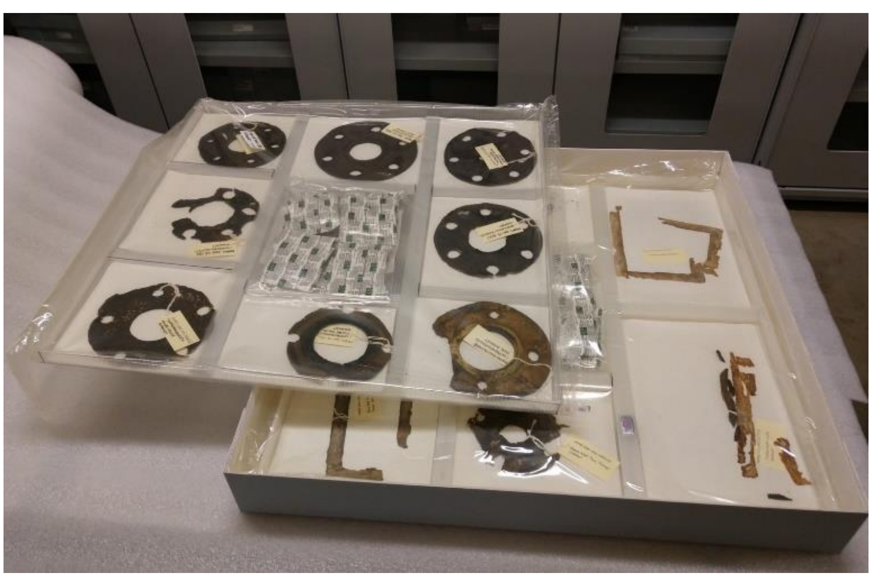


ATR-FTIR spectrum that shows peaks for lead white and calcium carbonate in addition to peaks of rubber in a spectrum collected from rubber gasket.

writings, and on multiple occasions mentions the acquisition and use of lead white. One such passage reads:

> I was told by Mer Green the first Left and the Chief Engineer to put the hatches on and if poseable [*sic*] get them tight. I put them on with Read Lead putty and for the Port Holes I made Rubber Gaskets one inch thick and in fact had everything about the ship in the way of an opening water tight.

This is the only known reference to use and production of rubber gaskets onboard *Monitor*. It suggests that, in at least some cases, rubber was being procured and brought on board the ship where the crew were cutting and shaping gaskets to fit a variety of components. This means that at least some rubber components on the ship were replaceable.



Gaskets in anoxic storage after treatment.

Similarly, the ship's surviving log book, which covers actions from January to September 1862, makes reference to the purchase of "8 kegs of white lead 1 of red...". Lead white and red lead putty were used as primers and sealants for gasketed components. While only mentioned by name, stores for the ship were replenished on at least 18 other occasions between January and September. Regardless, restocking shows that the ship was re-sealing and priming surfaces and component parts for continued service.

Scientific analysis has greatly expanded our understanding of the use of rubber, at least for gaskets, on USS *Monitor.* At least 67 percent of the tested gaskets are made solely from Central or South American rubber, highlighting the rubber trade to the Union during the Civil War. It also leaves researchers with more questions to ask and answer, however. Further research into cost, quality, transportation, and processing of American, Asian, and African rubber variants during this tumultuous period could help determine if *Monitor*'s use of a particular variant was out of convenience or necessity. Similarly, testing of other rubber objects from *Monitor*'s collection, such as rubber combs and buttons, could determine if rubber formulations were preferable for differing objects.

While our research into USS *Monitor* rubber is not complete, we are using established protocols for artifact conservation and storage. Proper storage is important as soon as the rubber is excavated or removed from an object. All marine archaeological artifacts are stored wet before treatment; if waterlogged objects are dried before conservation, irreversible damage can occur. In addition to wet storage, when we disassemble machinery and remove gaskets, they are immediately sandwiched between plastic sheeting to prevent warping and curling. Often the release of the seal between the pipes causes the rubber to "spring back" from its compressed state. Securing the gaskets with cable ties between two boards of corrugated plastic helps preserve the object's flat shape. It's best to store wet organics, including rubber, in cold, dark conditions to reduce biological growth. USS *Monitor* organics are stored in a walk-in fridge at 43 degrees Fahrenheit until treatment. Unfortunately, while lower temperatures protect the rubber from biological growth, it can also cause the rubber to contract, making the use of supports doubly important. It is also critical to avoid freezing rubber objects during

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Sands of Time: Bathymetric History of the Emanuel Point Shipwreck Area, 1857-1899

by Rikki Young

Eleven Spanish ships sailed into Pensacola Bay on August 14, 1559. The expedition, led by Governor Tristán de Luna, anchored offshore from the area presently known as Emanuel Point with the intent to establish a settlement. The colonists worked to construct shelter and food storage, meanwhile leaving most of the provisions aboard the ships anchored in the bay. This strategy proved no match for the hurricane that emerged from the Gulf of Mexico only five weeks after their arrival. Seven vessels and a substantial amount of the colony's supplies were lost to the waters of Pensacola Bay. The settlement continued to struggle and was abandoned in 1561.

Pensacola remained uninhabited by Europeans until Spain’s return in 1698. The natural characteristics of Pensacola Bay undeniably influenced the populations that inhabited its shores in the following centuries. The people in turn altered various characteristics of the waterway to fit their evolving needs. The sunken ships bore witness to the maritime activities occurring overhead, including those that altered the bathymetry, or subsurface topography, of the area containing these submerged cultural resources. To date, three of the ships associated with the 1559 Luna expedition, collectively known as the Emanuel Point (EP) Shipwrecks, have been located.

Constructing a bathymetric history of the EP Shipwreck area provides insight into the development of the physical environment encompassing the archaeological sites. Pairing this information with an examination of Pensacola’s maritime cultural landscape provides a timeline while contextualizing the maritime activities that have altered the bathymetry of the study area. This article uses resources outlined by Christer Whesterdahl to evaluate Pensacola’s maritime cultural landscape: natural topography, tradition of usage (mental maps), land remains of maritime activities, and shipwrecks. The study from which this article is derived examined the entirety of Pensacola’s historic period. Here we focus on the latter half of the nineteenth century is examined here.

Pensacola’s Maritime Cultural Landscape

Pensacola Bay is the westernmost harbor in the state of Florida and is the only natural deep-water port on the Gulf Coast, averaging 32 feet in depth. The bay measures approximately 12.5 miles long by 2.5 miles wide. It is joined to the north by Escambia Bay and to the east by East Bay, both ranging in depth from 7 to 12 feet with rivers extending into the hinterland. Three additional waterways, Bayou Chico, Bayou Texar, and Bayou Grande, connect to Pensacola Bay, which is protected from the Gulf of Mexico by a barrier island. The coastal area is surrounded by vast tracts of land, lending access to profitable resources. These natural features rendered the harbor a valuable asset to various maritime enterprises and played a key role in the development of Pensacola’s maritime industries.

E.E. Saunders & C. Fish & Ice, Palafox Wharf, 1885. (UWF Historic Trust Archives, Catalogue # W.83.85.604.1).

Like many port cities, Pensacola’s tradition-of-usage changed as the needs of the population evolved. During the Civil War, Pensacola’s naval yard served as a supply center for the military. An increase in military traffic on the bay mirrored the fort-studded shoreline. At the close of the Civil War, the naval yard fell into disrepair. Meanwhile, the city of Pensacola began to grow.

The industries that led to Pensacola’s economic success and development in the late nineteenth century were based on two natural resources: lumber and fish. The port city was responsible for 53 percent of the state’s lumber exports by the late 1860s and was also known as the Red Snapper Capital of the World at the time. Moreover, Pensacola played an active role in the importation and distribution of goods from the West Indies and South American markets. By 1887, 361 of the 518 vessels entering Pensacola Bay originated from foreign ports.

The rise in Pensacola’s maritime activities is reflected in the construction of the bay’s waterfront. Before the Civil War, two docks were present in the main port, but by the early 1880s, over 16 wharves extended into the bay. Fish houses were built on the waterfront in response to the fishing industry. Similarly, mill sites were constructed, including two, which operated at Muscogee Wharf, that were each responsible for the production of 260,000 square feet of lumber a day. To increase access to the area, dredging from the bay's main channel to Muscogee Wharf began in the 1890s.

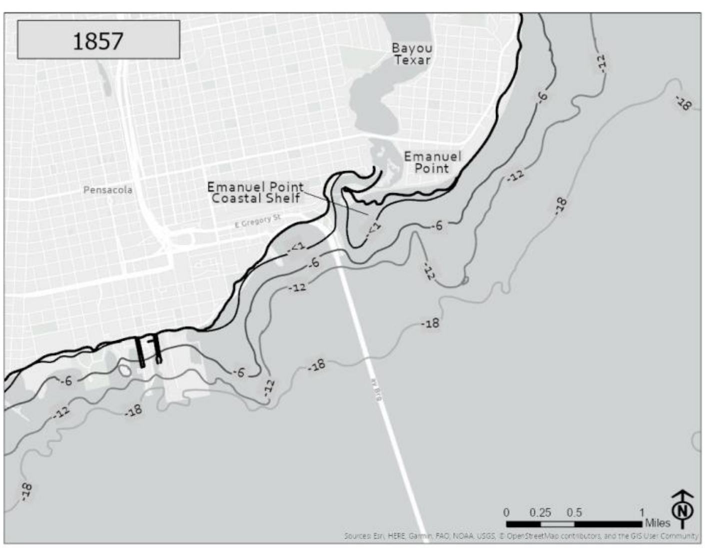
Short tracks of rail were constructed in Pensacola prior to the Civil War. In the decades that followed, additional railways connected Pensacola's waterfront to main rail lines, including the CSX railroad, which runs along Emanuel Point's shoreline and over Bayou Texar. To support the exportation of goods, the port city gained connection to the Mobile & Montgomery line in 1870, providing direct transportation to the north. Development of the waterfront continued throughout the remainder of the century and resulted in the filling of nearly 3,000 square feet from the original shoreline.

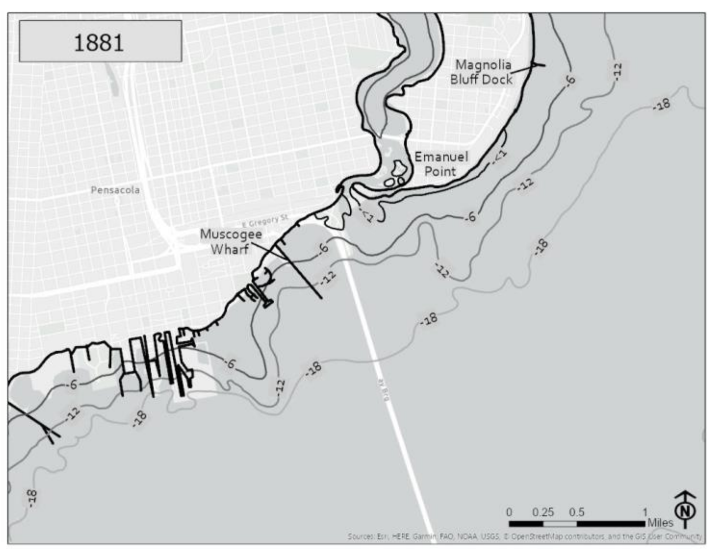
The coastal community's ability to construct a waterfront that fit their changing needs resulted in the growth of both the economy and the population. At the close of the Civil War, Pensacola's population was estimated to be a mere 1,200. By 1880, this number increased to 6,845 and reached nearly 18,000 by the end of the century. The population trend directly reflects the increase in the industrial and maritime enterprise. Similarly, the prominent role of foreign trade brought immigrants of various nationalities to Pensacola, creating a diverse population. The growing community worked to urbanize Pensacola through the implementation of common public institutions. This included the development of the school system, the construction of the Post Office and Custom's House, the establishment or re-growth of religious congregations, and the rise of recreational entertainment. While the overall livelihood of Pensacola grew, so did yellow fever. The first major post-war epidemic hit Pensacola in 1867 and the disease continued to resurface until 1905.

Not only did this time in Pensacola's history have a lasting impact on the community, but its maritime focus is also reflected in the cultural resources submerged in the surrounding waters. In 1991 the Florida Bureau of Archaeological Research (FBAR) in the Division of Historical Resources performed phase one of the Pensacola Shipwreck Survey. Of the 162 possible targets identified, 33 were successfully located and documented. Of these, 29 are estimated to fall in the latter half of the nineteenth century, the period of this study. Eleven of the sites are wooden barges and four are lumber schooners. The other sites represent varying vessel types, including a possible transoceanic merchant vessel, the steel battleship USS *Massachusetts*, a steam tug, and a section of drydock. The overwhelming representation of late nineteenth and early twentieth-century sites located in FBAR's survey lends credence to the heightened activity of this time. Additionally, the type of vessels that make up the majority of the sites discovered, wooden barges and lumber schooners, indicate the presence and impact of the lumber industry in the region.

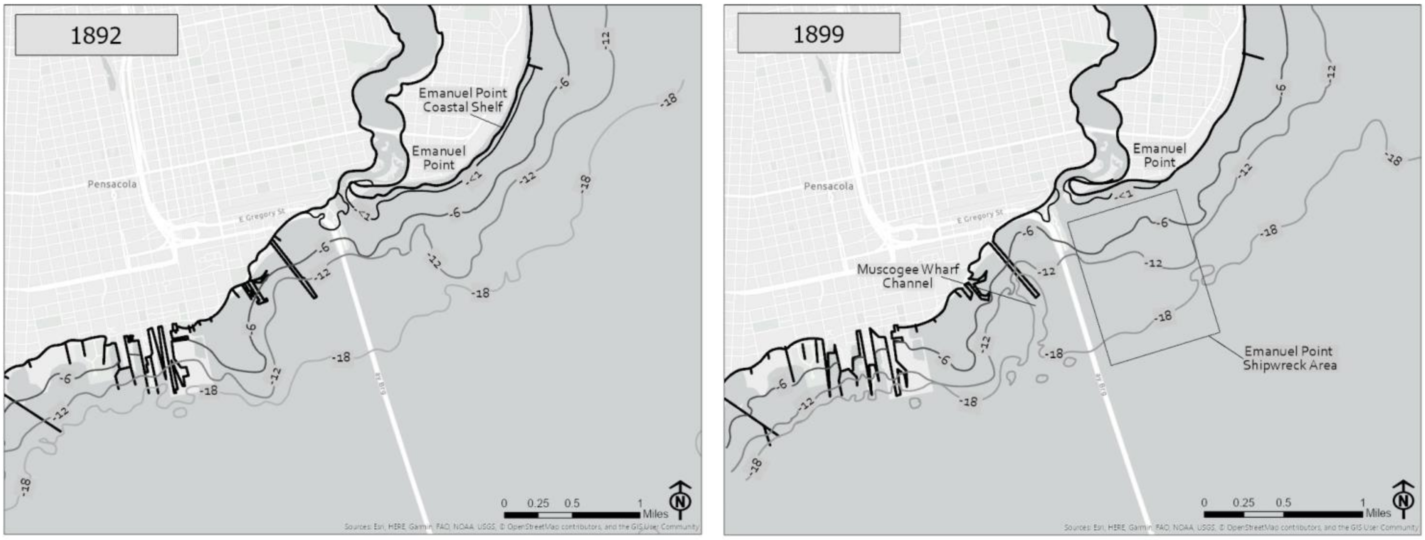
Bathymetric History of the Emanuel Point Shipwreck Area

To evaluate the bathymetric history of the area encompassing the EP Shipwrecks, a series of four bathymetric layouts were created using data derived from navigational charts. The sounding measurements and contour lines depicted in each chart were





Maps by the author. Left: bathymetric data from "Preliminary Chart of The Entrance to Pensacola Bay, Florida." 1857. US Serial Set Map. UWF's Libraries Database. Right: bathymetric data from "Choctawhatchee Inlet to Pensacola Entrance, West Florida." 1881. United States Coast & Geodetic Survey. NOAA.



Maps by the author. Left: bathymetric data from "Entrance to Pensacola Bay, Florida." 1892. United States Coast & Geodetic Survey. NOAA. Right: bathymetric data from "Entrance to Pensacola Bay, Florida." 1899. United States Coast & Geodetic Survey. NOAA.

georeferenced and recorded with the Geographic Information System software, ArcGIS. The layouts portray the bathymetric history of the study area from 1857 to 1899, allowing for the visual interpretation of the bathymetric changes which occurred during this time.

Most notably, the 1881 layout displays extensive construction of Pensacola's waterfront in comparison to 1857, as dozens of structures extend into Pensacola Bay, including Muscogee Wharf and Magnolia Bluff Dock. Examination of the contour lines reveals further impacts. In 1857, the Emanuel Point coastal shelf pointed south from Bayou Texar. By 1892, this protrusion had retracted while the coastal shelf extended north to Magnolia Bluff Dock. The coastal shelf receded by 1899, at which time the development of a deep-water channel to Muscogee Wharf appeared.

The exact locations of the EP Shipwrecks have been removed from the bathymetric layouts for the protection of the sites. However, it is important to note the changes that occurred at the archaeological sites whose general area is highlighted on the 1899 bathymetric layout. In conjunction with the recession of the Emanuel Point coastal shelf, the contour lines in the highlighted region shifted south. In 1892, the 18-ft contour was located 778-ft south of the EP I shipwreck site. The 18-ft contour shifted to a distance of 1,479-ft south of EP I in 1899. The 12-ft contour in 1892 was located 413-ft north of the EP I Shipwreck and 418-ft north of the EP II Shipwreck. In 1899, both EP I and EP II were positioned on the 12-ft contour. Similarly, in 1892 the 6-ft contour was located 110-ft north of the EP III shipwreck. The 6-ft contour shifted south beyond the site to a distance of 405-ft south of EP III in 1899. The southward repositioning of the 6-ft, 12-ft, and 18-ft contours reflect the decrease in depth of the EP shipwreck sites between 1892 and 1899: the depth of EP I's site decreased from 17-ft to 12-ft, EP II from 15-ft to 12-ft, and EP III from 7-ft to 3-ft.

Discussion

Upon the close of the Civil War, the town of Pensacola thrived on a rejuvenated economy. The natural resources available were capitalized upon by the population, propelling the community's development into a maritime industrial center. As the ship tonnage entering the port of Pensacola continued to multiply, the waterfront and waterways of Pensacola were constructed and altered to meet rising demands in docking area, storage and processing facilities, and the bulk transportation of goods. This facet of Pensacola's maritime history is apparent in the bathymetric timeline developed in this study, as just a few wharves appear south of downtown Pensacola in 1857. By 1881, dozens of piers, docks, and wharves emerged from Pensacola's shore, and by 1899 a deep-water channel to Muscogee Wharf was developed.

The most dynamic bathymetric alteration noted is a result of the 1888 construction of the CSX railroad segment that traces the Emanuel Point shoreline, connecting the Magnolia Bluff Dock to the main port. The bluff that was constructed to support the CSX railroad added sediment to the adjacent waterway. As a result, the coastal shelf that was confined to the southern

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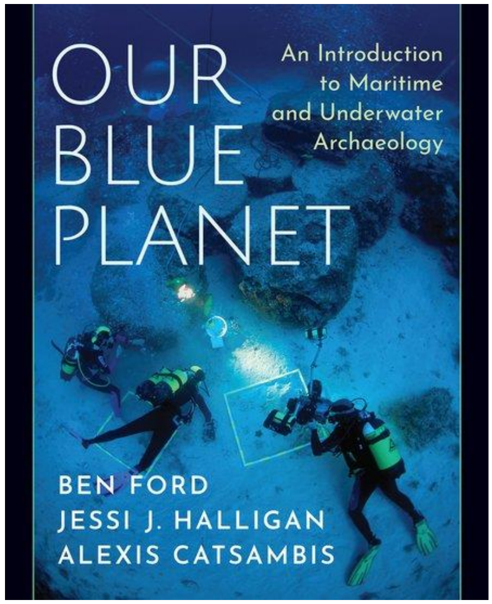
Our Blue Planet: An Introduction to Maritime and Underwater Archaeology

by Ben Ford, Jessi Halligan, and Alexis Catsambis (Oxford University Press 2020)

reviewed by Dennis Knepper

Ten years ago, Oxford University Press published a large edited volume entitled *The Oxford Handbook of Maritime Archaeology*. Coming in at about 1,200 pages, it contained articles by more than 50 experts and was aimed primarily at a scholars and professionals. The press has recently brought out a new book on the subject, *Our Blue Planet: An Introduction to Maritime and Underwater Archaeology*, by Ben Ford, Jessi Halligan, and Alexis Catsambis (two of whom, Ford and Catsambis, were editors of the *Handbook*). As its subtitle indicates, *Our Blue Planet* is an introductory text geared toward a wider audience of interested newcomers and professionals alike. It succeeds for readers at both levels.



The work contains fourteen chapters organized into four parts, including an introductory section that describes what the discipline is and what we can learn from it; how the archaeological work is conducted (methods or procedures); the various interpretive or anthropological perspectives of the research; and the value and management of maritime cultural heritage.

While a self-described textbook, *Our Blue Planet* does not always follow the same format as previous textbooks devoted to the subject. In the early 1970s, Keith Muckleroy's *Maritime Archaeology* began presenting processual archaeology to maritime studies. While not a comprehensive textbook, Muckleroy's work brought a focus on site formation processes, introducing terms such as extracting filters and scrambling devices, and the use of scientific methods and statistical techniques to help identify patterns in shipwreck data resulting in insights into human behavior. Later, textbooks like the Nautical Archaeology Society's *Guide to Principles and Practice* or Jeremy Green's *Maritime Archaeology*, if not as deeply analytical, were still technical in nature, concentrating on practical matters of field and laboratory techniques and practice.

In contrast, *Our Blue Planet* takes a somewhat broader approach aimed as much at the general interest reader as the aspiring professional or academician. This is not to say that it is "maritime archaeology lite." The book capably answers the question of how of maritime archaeology is done. But it also considers the question of why we should be interested, something that other, more technically oriented texts often seem to take for granted. The book covers all aspects of the field, but with an explicit assessment of how and why the study is important.

The authors use clear language that is free of unnecessary jargon. The text can easily be read by those new to the subject, but it is also a well-organized and well-presented review of where the discipline currently stands, how it got there, and what may come next. Readers of all backgrounds will come away with a greater appreciation of the conduct of the science of maritime archaeology.

Each of the authors is a maritime heritage professional, Ford and Halligan serving on university faculties (Indiana University of Pennsylvania and Florida State University, respectively), and Catsambis working as a heritage manager with the U.S. Naval History & Heritage Command, in Washington, D.C.

In classic textbook fashion, each chapter opens with a series of focus questions to introduce the reader to the ideas that will be presented and closes with discussion questions for further consideration, along with short lists of further readings (not always from the expected or traditional list of sources).

The general organization of the text follows some but not all of the main steps employed in conducting a research project. The first half of the book considers the environmental context of the maritime world (the character of the oceans and of near-shore landscapes), and the physical techniques involved in finding and recovering data from archaeological sites, these latter including dive physiology, remote sensing, mapping, photo-documentation and photogrammetry, and artifact recovery and conservation. Missing from the list of project phases is the important step of archival research. The authors also give relatively little emphasis to research design and planning, as well as to the form and dissemination of reporting. Likewise disappointing is that ethical matters are only briefly mentioned until the final chapter of the book.

The second half of *Our Blue Planet* emulates data interpretation, although it is aimed more at presenting some of the findings of maritime archaeological research in general rather than ways of interpreting a particular wreck site.

The book's promotional literature characterizes this part of the text as a switch to a thematic approach. A section entitled Human Adaptations to Watery Worlds, contains the thematic approach, with chapters on environmental impacts of human interactions with the sea, the study and types of inland coastal sites, the ethnography of sailing, ship types and their construction, exploration and commerce, and maritime warfare.

The final 50 pages of the book discuss the role of heritage management and insights into future trends. The treatment of heritage management includes a consideration of the value of underwater cultural heritage in general, the components of a management plan, the function and responsibilities of artifact curation and collections management, and the value of public outreach. Embedded in these discussions are considerations of ethical matters, including a short description of the UNESCO Convention and thoughts on the difficulty balancing preservation and stakeholder needs.

Each chapter of *Our Blue Planet* is accompanied by one or more sidebars contributed by a variety of maritime archaeologists. These color commentaries, some of which extend more than a page in length, add additional insight or context to the narrative. The contributors represent a geographic range spanning South America, South Africa, India, Australia, as well as Europe, and North America. Many of the commentaries are personal in nature, describing what the writers consider to have been their own most important contribution to underwater archaeology. While adding information, the general character of these short pieces is to highlight the excitement of maritime archaeology, going beyond the romance portrayed in popular culture to demonstrate how the contributors' research has inspired them.

The supplementary pieces range from descriptions of careers to comments on methodologies. George Bass writes of his early introduction to underwater archaeology and some of the difficulties he met in getting the discipline accepted by mainstream academia. Pilar Luna Erreguerena describes being inspired by Bass and having similar problems with academic recognition in Mexico. Others write of their own early experience and major projects: Dolores Elkin (Argentina) working on HMS *Swift* off the coast of Patagonia; Bruno Werz (South Africa) and work ranging from the *Mary Rose* to Early Stone Age artifacts off Cape Town; and Stella Demesticha (Cyprus) and the 4^{th}-century BCE Mazotos wreck off the island's southern coast. Dan Davis describes the development of deepwater archaeology resulting from advances in remote sensing technology. Johan Rönnby writes about behavioral insights from looking into the crew cabin of an exceptionally well-preserved 17^{th}-century wreck at 130 m in the Baltic Sea. Michael Faught examines work on inundated prehistoric landscapes in the Gulf of Mexico. The value of collaboration with informants is highlighted by Marc-André Bernier (avocational volunteers in St. Lawrence Bay, Canada) and Maddy Fowler and Rigney Lester-Irabinna (indigenous groups in Australia), and Randall Sasaki marvels at insights made from small discoveries in the lab while analyzing wood fragments from Khublai Khan's 13^{th}-century Mongol fleet that invaded Japan.

Approximately 200 illustrations in the text include grayscale photographs reproduced in good resolution, with examples from a wide variety of site types and geographic areas, along with site maps, line drawings, schematics ranging from the familiar Venn diagram of overlapping research areas associated with maritime, nautical, and underwater archaeology to clearly portrayed graphic timelines. Also highlighted are historical illustrations, from maps to an anatomical painting of the unsavory effects of scurvy. Like a modern textbook, the amount of information on the pages of the book can occasionally feel busy, but overall, the design is pleasing and the text is easy to use.

The main text runs to almost 400 pages and is succeeded by a short glossary. References are handled with end notes, which are followed by a general index. *Our Blue Planet* is a significant addition to the body of instructional literature in maritime archaeology suitable to all readers, in a text that balances technical detail with a narrative that aptly conveys the excitement of maritime archaeology. ⚓

Be sure to keep your MAHS Membership current. If you aren't a member, become one and join us in supporting maritime historic preservation.

Varmer, continued from page 4

Matt Carter is a marine archaeologist and holds a PhD, MA and BA in archaeology. He is the Research Director for the Major Projects Foundation where he works to protect marine ecosystems threatened by legacy shipwrecks in the Pacific Ocean.

Phillip Turner is a marine policy advisor in the UK and holds a PhD in Marine Science and Conservation from Duke University, USA. This work formed part of his PhD dissertation.

For further reading, the authors suggest:

M. Carter et al. Ticking ecological time bombs: Risk Characterisation and Management of Oil Polluting World War II Shipwrecks in the Pacific Ocean. Marine Pollution Bulletin *164 (2021) 112087.*

P. J. Turner et al. Memorializing the Middle Passage on the Atlantic seabed in Areas Beyond National Jurisdiction. Marine Policy *122* (2020) 104254

UNESCO's Report on its 2001 UCH Convention http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CLT/images/INF9_Evaluation_EN_01.pdf

O. Varmer, M.J. Spalding, and A. Refosco. Integrating Underwater Cultural Heritage into the UN Decade of Ocean Science for Sustainable Development. ACUA Underwater Archaeology Proceedings 2020*, edited by V. Mastone and C. Mires, pp. 5-13.*

O. Varmer. Underwater Cultural Heritage Law Study, 2014. http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CLT/pdf/UCH_Law_Study_OLE.pdf

C.L. Carnett. A Survey of State Statutes Protecting Archaeological Resources, National Park Service and the National Trust, 1994. http://npshistory.com/publications/archeology/state-statutes.pdf

The Ocean Foundation website includes a page on Underwater Cultural Heritage with an annotated bibliography on UCH law and policy. https://oceanfdn.org/underwater-cultural-heritage/ ⚓

Crawford, continued from page 9

navy's ships was the technological revolution that produced the New Navy. The new steel ships were much more watertight than the ships of wood and iron of the Old Navy. Bilge water was minimized or eliminated. The linoleum floors of some of the covered decks in the steel ships required less water to clean than did the wooden decks of the ships of the Old Navy and proved an improvement over oil cloth and varnish. In addition, the moving of the elimination of body wastes from the ship's head to flush toilets and urinals, the greater use of soap, and the introduction of disinfectants rendered the air below deck more salubrious.

By the 1890s the navy's culture of cleanliness remained as strong as ever, but technological developments had made the ideal much easier to achieve. Electrical lighting, internal plumbing, running hot and cold water, and refrigeration held the promise of a more healthful existence for those aboard ship.

With all the technological developments that transformed the U.S. Navy between the antebellum navy and the navy at the turn of the twentieth century, one thing remained unchanged: the navy's devotion to cleanliness. An experienced bluejacket with the Great White Fleet during its circumnavigation of the globe from 1907 to 1909, observed, in words reminiscent of Melville's:

> Man-o'-war cleanliness is different from any other that I know. I distinguish it from all other kinds because it is the most searching and far reaching thing of the kind in the world. . . . All must be immaculately clean, and this habit is so thoroughly ingrained in the men that to maintain it they will even commit crime.

In the aftermath of the reform movement, daily swabbing of the decks of U.S. Navy ships continued a universal practice. Roam the decks of a U.S. Navy warship tomorrow morning and you will encounter enlisted sailors with swabs in hand.

Until his retirement in 2018, Dr. Michael Crawford was Senior Historian, Naval History and Heritage Command, after a career of 36 years as a Navy historian.

This article is a much abbreviated version of Crawford's "Avast Swabbing! The Medical Campaign to Reform Swabbing the Decks in the U.S. Navy" The Journal of Military History *83 (2019): 127–56.*

For further reading the author recommends:

Richard L. Bushman and Claudia L. Bushman, "The Early History of Cleanliness in America," *Journal of American History* 74 (1988)," 1213–1238.

Arthur N. Gilbert, "Crime as Disorder: Criminality and the Symbolic Universe of the 18th Century British Naval Officer," in Robert W. Love, Jr., ed., *Changing Interpretations and New Sources in Naval History: Papers from the Third United States Naval Academy History Symposium* (New York and London: Garland Publishing, 1980): 110–22.

David Boyd Haycock and Sally Archer, eds., *Health and Medicine at Sea, 1700–1900* (Woodbridge, England: The Boydell Press, 2009.

Suellen Hoy, *Chasing Dirt: The American Pursuit of Cleanliness* (New York: Oxford University Press, 1995).

Herman Melville, *White-Jacket: or The World in a Man-of-War* (1850; reprint ed., edited by Harrison Hayford, Herschel Parker, and G. Thomas Tanselle (Evanston, Ill.: Northwestern Univ. Press, 1970, 2000).

N.A.M. Rodger, *The Wooden World: An Anatomy of the Georgian Navy* (Naval Institute Press, Annapolis 1986). ⚓

Fleming, continued from page 14:

storage. While this is beneficial for other organics, it impacts the elasticity of rubber objects and may cause irreparable damage. Treatment for the gaskets involves removing iron staining, salts and marine growth.

After treatment, the gaskets are dried in a controlled system in order to prevent distortion and maintain flexibility and to allow for ease of storage and research. The Museum uses a system designed over 10 years ago by conservator Susan Grieve that stores the rubber in a dark, anoxic environment to reduce oxidation, which can cause further degradation and brittleness in the material. The system uses Mitsubishi RPK® non-desiccating oxygen scavenger packets, which are designed to remove oxygen but not remove humidity from an enclosed space. The object is placed on a tray with the correct number of sachets, a blue humidity indicator card, and oxygen indicator tablets. The tray is then encapsulated by an Escal® barrier bag (ceramic coated polyvinyl alcohol transparent film). The bag is heat sealed and further sealed with foil tape. Multiple bagged trays are stored in a box made of museum board.
This storage system is initially expensive and does restrict handling, but it can prolong the life of a collection. Visual inspections can still occur, but every time a bag is opened, the sachets need to be replaced. If the bag is not opened, the sachets can maintain an oxygen-free environment for years. Periodic inspection of the oxygen indicator in the bag is necessary, however, as a precaution. At minimum, rubber should be stored in dark, cool (but not cold) conditions at mid-range relative humidity (45-55% RH). UV film barriers for cases or gallery windows are recommended if rubber or other organics are on display.

Modern materials, like rubber, are being recovered more frequently during archaeological excavations as we examine 19th and 20th century sites. The conservation, analysis, and storage of these newer material types evolves as objects enter collections. Conservation and storage are important steps that must be considered during the planning process. Analysis using scientific techniques and examination of historical records allows us to learn about these objects' origins and use lives. However, most scientific analytical techniques require contact with or samples of the original objects. This means that providing access to and conducting analysis and research of these objects should also be considered early in the planning process, because of the competing requirements of analysis and proper storage. Research into the conservation, analysis and storage of rubber objects from USS *Monitor* at The Mariners' Museum and Park began when the first objects arrived at the Museum. There is still much to understand and we will continue to study the degradation of 19th century archaeological rubber, its manufacture, and the best methods of preservation.

The authors work at The Mariners' Museum and Park. Hannah Fleming is an archaeologist; Lesley Haines and Laurie King are archaeological conservators, and Dr. Molly McGath is an associate research scientist.

For further reading the authors recommend:

Grieve, Susanne. The Excavation, Conservation, Storage and Display of Rubber Artifacts Recovered from the USS Monitor (1862). Journal of the American Institute for Conservation *47(2):139-148. 2008.*

Haider, Katharina Sophia. Rubber Soul: the Investigation of Rubber by Vibrational Spectroscopy*. Master's thesis, Freie Universitat Berlin, Humboldt Universitat zu Berlin, Technische Universitat Berlin, and Universitat Potsdam, Germany. 2012.*

McGath, M., L. King, L. Haines, and H. Fleming. Polymeric Treasure: Evaluating the Composition of Civil War Era Rubber Objects from the USS Monitor. In Postprints from the 48th American Institute for Conservation Annual Meeting, Research and Technical Studies Specialty Group*, pp. 54-56. 2020.*

George Geer's papers are housed in the The Mariners' Museum Library and Archives. ⚓

Young, continued from page 17:

portion of the Emanuel Point shoreline in 1881 extended north to Magnolia Bluff Dock in 1892. The sediment from the bluff was constrained to the immediate area before the forces of the bay worked to retain the waterway's natural characteristics. By 1899, the coastal shelf receded south as the sediment that composed the northern portion of the coastal shelf eroded away. The sediment was ultimately redistributed in the region south of Emanuel Point and resulted in the decrease of the shipwreck sites' depth by 3-ft to 5-ft between the years of 1892 and 1899.

Between the years 1857 and 1899, Pensacola's maritime activities had clear impacts on the bathymetry of the EP Shipwreck area. The bathymetric timeline created here allows for the visual interpretation of the physical characteristics of the area encompassing the archaeological sites over time and the sedimentological changes that occurred. Meanwhile, the determination of what caused bathymetric alterations and why requires an analysis of Pensacola's maritime cultural landscape. Information highlighted by this approach can be further applied to future preservation efforts. Armed with the knowledge of how activities such as waterfront construction and dredging may alter the active preservation of valuable historic resources, researchers and historic preservationists alike can advocate for alternative solutions to activities that may result in harmful impacts.

Rikki Young is a Master's student in the Historical Archaeology program at the University of West Florida. Her research interests include historical ecology, cultural landscapes, and documentation of impacts on submerged archaeological sites.

President's column, continued from page 2:

Heritage Committee of the Advisory Council for Underwater Archaeology.

I would like to remind our readers that the year 2021 marks the beginning of the "Decade of Ocean Science for Sustainable Development." This event is sponsored by the United Nations and is scheduled to continue through the end of the year 2030. The objective is to achieve the 2030 Agenda for Sustainable Development. As relevant programs are announced, MAHS will notify our members through MAHSmail.

The rate of vaccination continues to rise and we look forward to the day when we can return to a healthy and thriving community. It will be great to get back to diving safely again and pursuing our shared passion for exploring and preserving our nation's historic shipwrecks.

See you on the water,

Steven Anthony

The Maritime Archaeological and Historical Society: Committed to enhancing public awareness and appreciation of historic shipwreck preservation and the science of maritime archaeology.

MARITIME ARCHAEOLOGICAL AND HISTORICAL SOCIETY

Statement of Ethics

The Maritime Archaeological and Historical Society is organized for the purpose of enhancing public awareness and appreciation of the significance of submerged cultural resources and the science of maritime archaeology. In pursuit of this mandate, members may come into contact with unique information and cultural material associated with terrestrial and underwater sites containing evidence of the history of humankind. To protect these sites from destruction by commercial salvors and amateur souvenir hunters, the Society seeks to encourage its members to abide by the highest ethical standards. Therefore, as a condition of membership and pursuant to Article 2, Section 1 (A) of the bylaws, the undersigned executes this statement of ethics acknowledging adherence to the standards and policies of the Society, and further agrees as follows:

1. To regard all archaeological sites, artifacts and related information as potentially significant resources in accordance with federal, state, and international law and the principles and standards of contemporary archaeological science.
2. To maintain the confidentiality of the location of archaeological sites.
3. To excavate or otherwise disturb an archaeological site solely for the purpose of scientific research conducted under the supervision of a qualified archaeologist operating in accordance with the rules and regulations of federal or foreign governments. Artifacts shall not be removed until their context and provenience have been recorded and only when the artifact and related data have been designated for research, public display or otherwise for the common good.
4. To conduct oneself in a manner that protects the ethical integrity of the member, the archaeological site and theSociety and prevents involvement in criminal violations of applicable vandalism statutes.
5. To observe these standards and aid in securing observance of these standards by fellow members and non-members.
6. To recognize that any member who violates the standards and policies of the Society shall be subject to sanctions and possible expulsion in accordance with Article 2, Section 4 of the bylaws.

Signature ______________________________ Date ________________

MARITIME ARCHAEOLOGICAL AND HISTORICAL SOCIETY
PO Box 44382, L'Enfant Plaza, Washington, D.C. 20026

Application for Membership

Membership in the Maritime Archaeological and Historical Society is open to all persons interested in maritime history or archaeology whether or not they are divers. Members of MAHS have first preference for enrollment in all courses and other activities and projects of the Society. To join MAHS, please sign the Standards of Ethics above and send it to MAHS along with your check and this application form. You may also submit dues via our website at http://www.mahsnet.org/membership.php.

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Skills (circle): research/dive/video/communications/writing/first aid/other:

____

General membership meetings of the Maritime Archaeological and Historical Society are held on a bi-monthly basis, the second Tuesday of each month. Meetings are held at 7:30 p.m. at McLean High School, in McLean, Virginia, except in August and December. Meetings in August and December are held at other locations for special events and holiday parties

Please join us and bring a friend. The school is located on Davidson Road, just inside the Capital Beltway (I-495) – use Exit 45, coming from Maryland, or Exit 46, coming from Virginia.

Check the website www.MAHSNet.org for advisories about any schedule changes.

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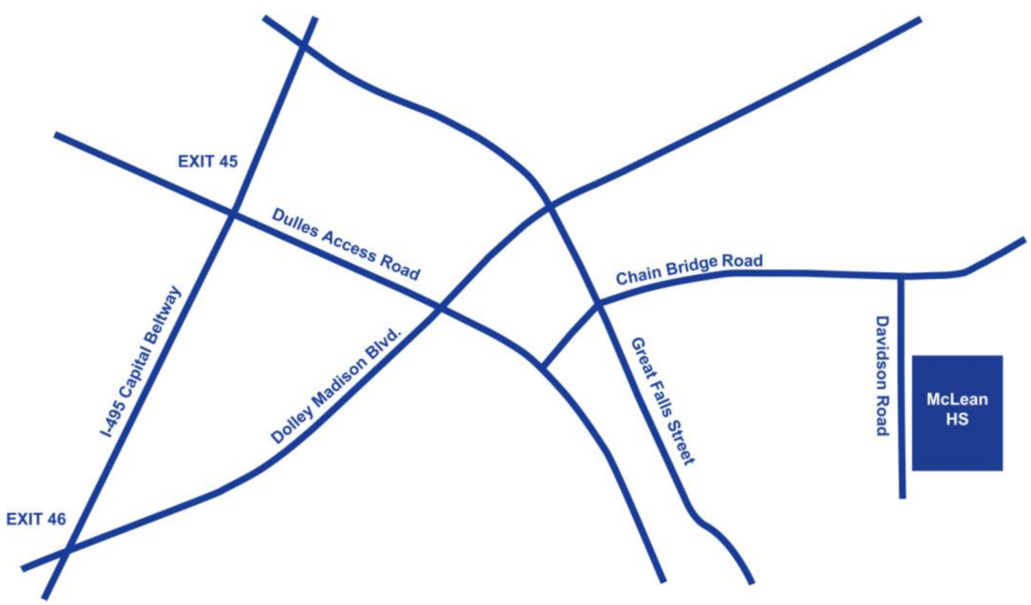
It's time to renew your membership in MAHS. It's easy. Just complete the application form on the inside back cover and sign the Ethics Statement, enclose a check for your dues, and mail! Thank you!



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PO BOX 44382, L'Enfant Plaza
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