THE
INA QUARTERLY

BRINGING HISTORY TO LIGHT THROUGH THE SCIENCE OF SHIPWRECKS

FOURNOI
ARCHIPELAGO SURVEY

EIGHT NEW SHIPWRECKS FOUND
IN THE AEGEAN SEA

2017 ANNUAL BOARD MEETING

HIGHLIGHTS FROM
MONTE CARLO

MASTER REMIGY DE HALUT'S GUNS

16TH-CENTURY
ARMADA CANNONS

FALL/WINTER 2017
VOLUME 44 NO. 3/4

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ON THE COVER: An amphora emptied of its contents after recovery during the Fournoi Underwater Survey (photo by Vasilis Mentogianis).

The Institute of Nautical Archaeology is a non-profit organization whose mission is to advance the search for the history of civilization by fostering excellence in underwater archaeology

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2018 FIELDWORK

INA's Archaeological Committee awards over $80,000 in support of 2018 projects

2018 PROJECTS

Adriatic Coast Shipwreck Survey
Albania | Dave Ruff (Texas A&M University)

Block 37 Schooner
Canada | Julia Herbst (Texas A&M University)

Fournoi Underwater Survey
Greece | Peter Campbell (British School at Rome) & George Koutsouflakis (Hellenic Ephorate)

Grande Passe 1 Roman Shipwreck
France | Alex Sabastia (Centre Camille Jullian)

Kaukana Harbor Project
Italy | Massimo Capulli (University of Udine)

Lechaion Harbor Project
Greece | Paul Scotton (California State University, Long Beach)

Marzamemi Maritime Heritage Project
Italy | Justin Leidwanger (Stanford University)

Ottoman Frigate *Ertuğrul* Research
Japan | Berta Lledó (INA) & Tufan Turanlı (INA)

Richelieu River Survey
Canada | Marijo Gauthier-Bérubé (Texas A&M University)

San Bartolome Survey
Spain | José Casabán (INA)

Sea Biscuit and Salted Beef
Bermuda | Grace Tsai (Texas A&M University)

Steamboat *Phoenix* Hull Documentation
Portugal | George Schwarz (INA)

Sudjuradj Shipwreck Excavation
Croatia | José Casabán (INA) & Irena Radič-Rossi (University of Zadar)

Venetian Shipwrecks Archival Research
Italy | Renard Gluzman (Tel-Aviv University)

Yukon Gold Rush Steamboat Survey
Canada | John Pollack (INA) & Robyn Woodward (INA)

ONGOING RESEARCH IN TURKEY

Burgaz Harbors Research Project
Elizabeth S. Greene (INA/Brock University)

Cape Gelidonya Metal Cargo Study
Nicolle Hirschfeld (INA/Trinity University)

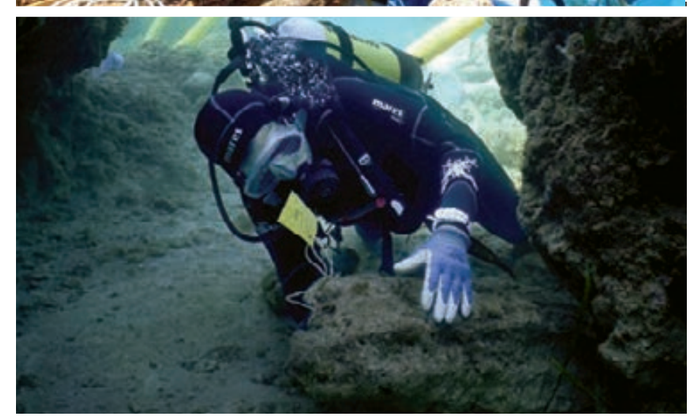
Kızılburun Late Hellenistic Shipwreck
Deborah Carlson (INA/Texas A&M University)

Ships of the Theodosian Harbor at Yenikapı, Istanbul
Cemal Pulak (INA/Texas A&M University) & Michael Jones (INA/Koç University)

Tektaş Burnu Classical Greek Shipwreck
Deborah Carlson (INA/Texas A&M University)

Uluburun Late Bronze Age Shipwreck
Cemal Pulak (INA/Texas A&M University)

Yassıada Byzantine Shipwreck
Fred van Doorninck (INA)



— 2018 —

CLAUDE DUTHUIT ARCHAEOLOGY GRANT RECIPIENT

In 2014, INA established the **Claude Duthuit Archaeology Grant**, a $25,000 award made annually to the underwater archaeological project that best captures the innovative, bold, and dedicated spirit of Claude Duthuit. An explorer, innovator, and pioneer of nautical archaeology, Claude was a loyal supporter of INA since its inception.

Justin Leidwanger, who earned his M.A. from Texas A&M University's Nautical Archaeology Program and his Ph.D. from the University of Pennsylvania, is the fifth recipient of this award. The awarded funds will support the excavation of the "church wreck," which carried prefabricated architectural elements for one or more Late Antique churches.

This season will usher in excavation of a new and complex part of the site, loaded with potential from large architectural marble down to tiny clues about the initial sinking of the ship. Meanwhile, continued conservation, artifact analysis, and 3D modeling will advance our understanding of the assemblage and socioeconomic context, while also serving the local Museum of the Sea. We are grateful and honored to have INA's support through the Claude Duthuit Grant, and we look forward to sharing the insights made possible through this generous grant.

-JUSTIN LEIDWANGER

www.nauticalarch.org/duthuit

NEWS & EVENTS

INA Project Updates, Award Recipients, NAP Alumni News

THINGS YOU CAN FIND INSIDE A PIRATE'S CANNON

Conservators in North Carolina recently recovered 16 paper scraps from inside a cannon chamber associated with Queen Anne's Revenge (QAR), the flagship of 18th-century pirate Blackbeard. The ship was discovered in 1996 and is in the process of being excavated and studied by the North Carolina Department of Natural and Cultural Resources. In a recent National Geographic interview, QAR conservator **Kimberly Kenyon**, who is also an INA Research Associate and graduate of the Nautical Archaeology Program (NAP), discussed the text, which proved to be a first edition of Captain Edward Cooke's *A Voyage to the South Sea*. With over 400,000 artifacts raised from the wreck, half of which remains to be excavated, we can expect more remarkable discoveries to come from Blackbeard's ship. The story was covered in National Geographic by **Kristin Romey**, another NAP alumna.

CONSERVING THE CAPE GELIDONYA CARGO

INA Affiliated Scholar **Nicolle Hirschfeld** (Trinity University) is among the first recipients of a grant from the Responsive Preservation Initiative for Cultural Heritage Resources, sponsored by the J.M. Kaplan Fund and the Council of American Overseas Research Centers (**CAORC**). The award will fund the conservation, documentation, and display of the metal cargo recovered from a Late Bronze Age shipwreck at Cape Gelidonya by INA Founder George Bass in 1960; that cargo is being conserved by staff at INA's Bodrum Research Center in Turkey including **Esra Altınanıt Biçer** and **Selen Özcan**.

WOMEN IN OCEAN SCIENCE

INA Research Associate and Nautical Archaeology Program (NAP) alumna **Rebecca Ingram** participated in the Girls in Ocean Science Conference at the **Ocean Institute** in Dana Point, California on February 24. The conference featured hands-on activities designed to inspire young girls to pursue a career in science; Rebecca's activity included plank reassembly and cataloging activity that generated great interaction with kids and adults about the importance of shipwrecks. Rebecca also serves as an Editorial Assistant for the *American Journal of Archaeology*, one of the most prestigious peer-reviewed journals in the world, and has authored or co-authored articles on her research at Yenikapı, Turkey in the *International Journal of Nautical Archaeology*.

Paper scrap from Blackbeard's ship; courtesy of N.C. Dept. of Natural and Cultural Resources

Rebecca Ingram's plank reassembly exercise at the Girls in Ocean Science Conference

Laurel Breece

Joseph Lehner

Megan Lickliter-Mundon (center)

TULSAMERICAN PROJECT DIRECTOR RECEIVES AWARD

INA congratulates **Megan Lickliter-Mundon**, Ph.D. student in the Nautical Archaeology Program, for being awarded the Defense POW /MIA Accounting Agency's Award for Superior Public Service as a result of her survey of the B-24 *Tulsamerican*, which crashed while attempting an emergency landing near Vis, Croatia during WWII. The resulting 3D map of the wreckage will be part of an exhibit at the Tulsa Air and Space Museum & Planetarium. Megan's study led to the recovery of three servicemen who died in the crash.

NEW INA SCHOLARS

We are pleased to welcome two new Affiliated Scholars to our ranks: **Laurel Breece** and **Joseph 'Seppi' Lehner**.

Laurel is a Professor of Anthropology and Archaeology at Long Beach City College in California, where she currently directs a terrestrial survey program designed to give students hands-on experience in mapping techniques. Laurel is also developing an underwater survey program in conjunction with the school's Underwater Robotics Program, which will teach students to build and pilot Remotely Operated Vehicles as a means of searching for submerged cultural resources.

Seppi, who is an Assistant Professor of Archaeology at the University of Central Florida, specializes in early complex societies in the Near East. He is adapting and developing new methods in materials science and geochemistry to analyze early economies, trade, technology, and metallurgy. In addition to projects in Oman, Seppi is co-directing the Cape Gelidonya Metal Cargo Project with Nicolle Hirschfeld to examine the physical and elemental characteristics of 1200 metal ingots and create 3D digital reconstructions of the artifacts.

A big welcome to these newest members of the INA family!

DRINK LIKE A SAILOR ON BOARD A TALL SHIP

Nautical Archaeology Program (NAP) Ph.D. student **Grace Tsai** is engaging the public to promote her **Ship Biscuit & Salted Beef Research Project**, which strives to learn more about the diet of 17th-century sailors. Aboard *Elissa*, the 1877 tall ship located in Galveston, Texas, guests attending the March 23 event will be treated to three tastings of a beer made from an English recipe dating back to 1577. The limited edition batch, brewed by Karbach Brewing Company, has been dubbed **NauticAle**.

INA

FOR MORE INFORMATION check out news and events updates on the INA website at **www.nauticalarch.org/news-events**

SHIPWRECK CAPITAL OF THE AEGEAN

The Fournoi Underwater Survey

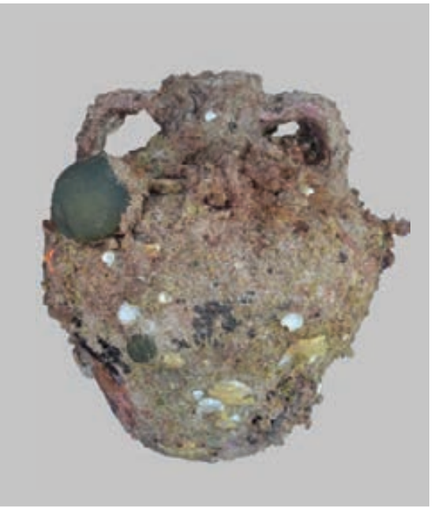
PETER B. CAMPBELL AND GEORGE KOUTSOUFLAKIS

The Aegean Sea is the cradle of the ancient Mediterranean, facilitating the growth of maritime cultures such as the Minoans, Mycenaeans, and Archaic Greeks. Spread around the Aegean are great maritime cities such as Athens, Miletus, and Rhodes. It is therefore surprising that the largest known concentration of shipwrecks in the Aegean lies in a rather obscure group of islands that was never home to a Greek city-state.

Lying a short distance to the south of the famous islands of Ikaria and Samos is a small collection of islands known as the Fournoi archipelago. Composed of 20 islands and islets in 17 square miles, the archipelago has passed largely unnoticed by historians. When Henry Tozer sailed past the islands on route to Patmos in the 19th century, he dismissively wrote, "we sailed between groups of islands unknown to fame." He is correct that the islands were never home to any settlements larger than small villages. Due to their size and lack of resources, the islands are rarely mentioned by ancient authors or modern researchers. The islands were known as *Korseai* or *Korrasiai* in the few ancient sources that mention them. Despite their ignominy, Fournoi is central to the navigational landscape of the Aegean.

PHOTO: V. MENTOGIANIS

Divers raise a Roman North African amphora for further study.



BACKGROUND

Since 2015, a collaborative team from the Hellenic Ephorate of Underwater Antiquities and RPM Nautical Foundation has been surveying the archipelago. 22 shipwrecks were located during the first season, 23 in 2016, and 8 more in 2017, for a total of 53. With approximately 50% of the coastline surveyed and the majority of the deep-water areas remaining to be searched, the number of sites is expected to continue to grow.

NAVIGATIONAL LANDSCAPE

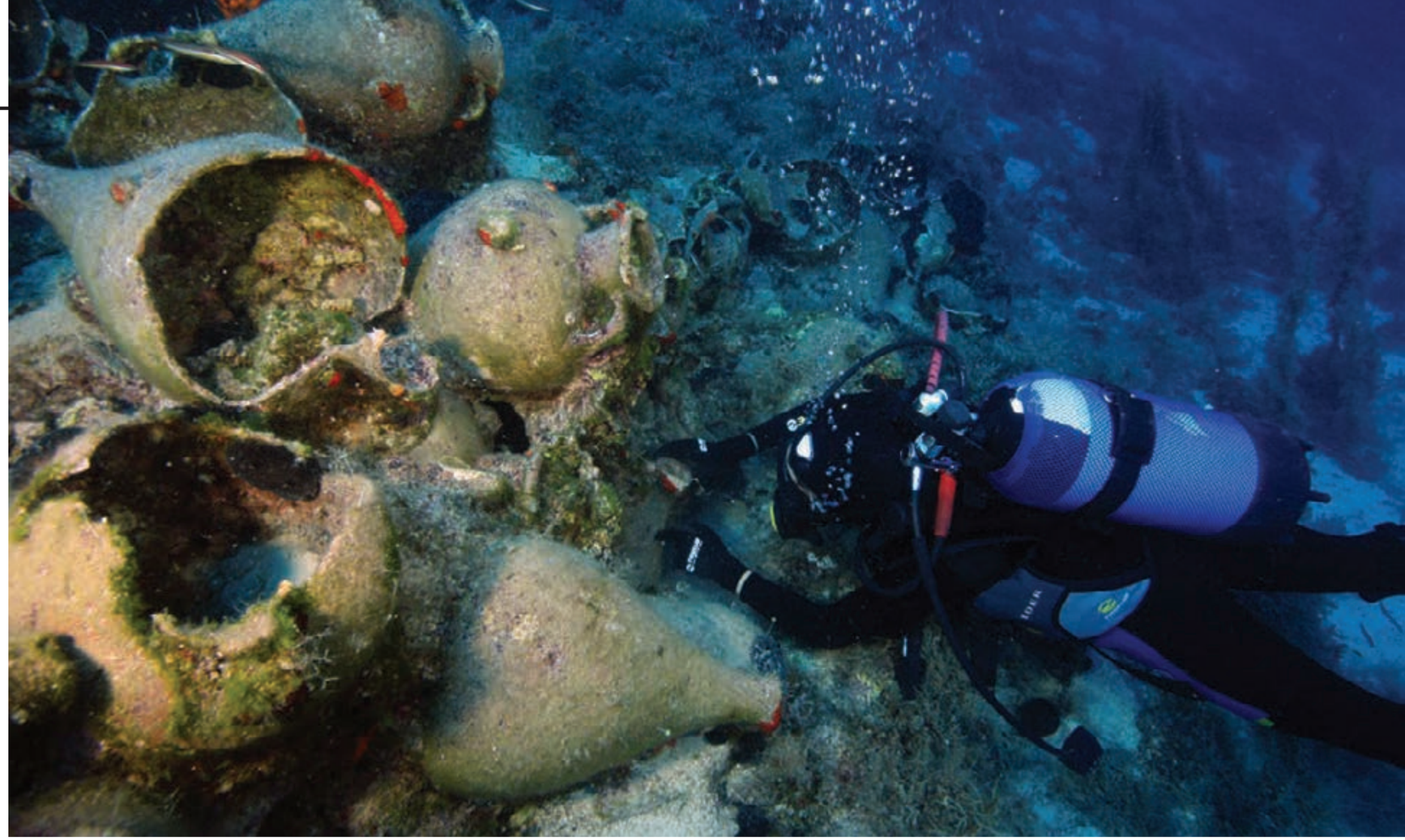
The key to understanding the number of shipwrecks at Fournoi lies in its significance within the navigational landscape. The islands are neither a ship graveyard, nor a ship trap. The ships sank fully laden with cargo, rather than stripped of anything of value and abandoned as one finds in ship graveyards. While Fournoi does have a few reefs, most sites are not found on ship traps like Yassıada, Turkey. To the contrary, Fournoi is full of deep, safe anchorages where mariners can find protection from any type of weather. According to French traveler Joseph Tournefort who visited the islands in the 17th century, the name "Fournoi" originates from the Greek word for "oven" and refers to the archipelago's many oven-shaped bays. Instead, the number of wrecks relates to the high volume of trade passing through the Fournoi Channel, that divides Samos and Ikaria. Over time, this high volume of ship traffic led to a great number of wrecks.

The large islands of Samos and Ikaria divide the eastern Aegean in two, creating a chokepoint that is most easily navigated through the Fournoi Channel. Significantly, Ikaria and the western coast of Samos are without safe anchorage; the geographer Strabo (64 B.C. - A.D. 23) refers to Ikaria as *alimenos*, or harborless. Fournoi is therefore strategically situated along the major north-south trade routes, but it also acts as a safe anchorage for vessels traveling west from Asia Minor to the Greek mainland. Fournoi lies in the area of major cities in Asia Minor such as Ephesus and Erythrae to the north and Priene, Heracleia, and Miletus to the south. In order to reach these cities, one was required to sail in the vicinity of Fournoi. Indeed, the *Stadiamus Maris Magni*, a sailing guide dating to the 3rd century A.D., describes two key crossing routes originating from Fournoi.

The high volume of trade passing by Fournoi is evidenced by the flourishing of piracy in the islands. Joseph Georgirenes, the Bishop of Samos and Ikaria, described Fournoi in 1678 as "three miles distant from the Island [Ikaria], on the southside towards Patmos, lye some small islands uninhabited; but know[n] by the name of Furny, and furnish'd with good harbours, capacious enough for all sorts of vessels. Here the Corsairs of Malta, and other Christians, us'd to lay in wait for ships that trade from Scio [Chios] to Rhodes." Piracy thrives on brisk commerce, which existed around Fournoi.

This page, from top: An early medieval amphora, 9-11th century A.D., before and after cleaning. **Opposite page:** A diver examines Archaic Greek amphoras.

PHOTOS, THIS PAGE: A. BEI; OPPOSITE PAGE: V. MENTOGIANIS



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COMMUNITY APPROACH

The Fournoi Underwater Survey was prompted by the project directors' conversations with sponge divers and fishermen. Sponge divers from Kalymnos reported spotting shipwrecks 30 years ago during the heyday of the sponge industry. Local free divers and fishermen reported clusters of broken ceramics on the seafloor. Using this ethnographic approach, the project directors located a number of sites, and followed with systematic diver-based survey. The project team continues to work closely with the local community to locate and docu-

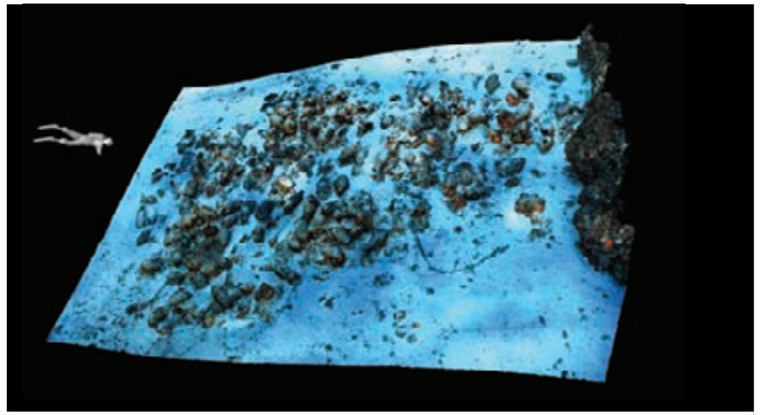
PHOTOS: V. MENTOGIANIS; SITE PLANS: K. YAMAFUNE

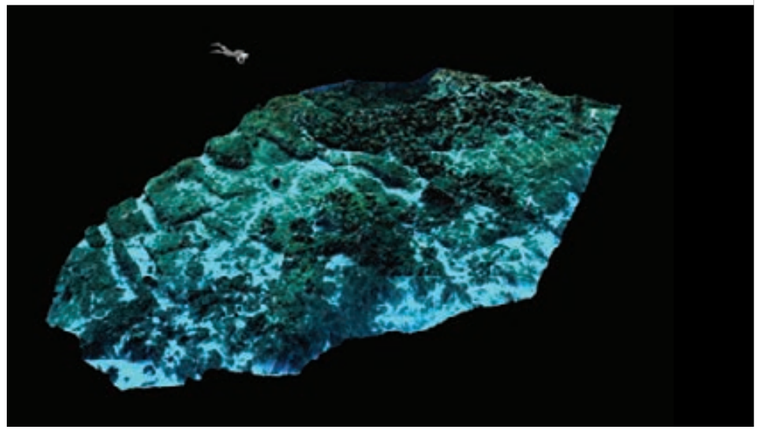
ment shipwrecks. This community-based approach increases protection of the underwater cultural heritage, as it is not possible to monitor this remote location through any other means than reliance upon the local community.

FINDINGS

The 53 shipwrecks discovered during the survey represent a significant new dataset. The earliest shipwrecks date from the Archaic period (6th century B.C.). One was carrying amphoras from Samos, another amphoras from Miletos, while the third was transporting an unidentified Aegean amphora type. One of the more complete sites is a cargo of Hellenistic amphoras from Kos, which are still stacked neatly in rows, though the site has been disturbed by fishing nets. Of particular interest are three Roman-era cargoes of Black Sea amphoras, the first examples from this region known in the Aegean. One Late Roman ship was transporting a cargo of decorated tableware. While many of the cargoes originated in the eastern Mediterranean, one of the

While many of the cargoes originated in the eastern Mediterranean, one of the largest and best-preserved was comprised of North African and Iberian amphoras.





From left: An archaeologist systematically photographs a wreck to create a 3D site plan; 3D site plans of wreck 15 (top) and wreck 4 (bottom); Roman North African amphoras in rows almost completely buried by sediment.

PHOTOS: V. MENTOGIANIS

largest and best-preserved was comprised of North African and Iberian amphoras. Dating to the Late Roman period, it is the deepest shipwreck (65 m) found at Fournoi and one of the most intriguing.

The survey has also documented anchors dating from the Archaic through medieval periods and the submerged foundations of an early Christian village. Several Archaic stone stocks, two of which are nearly 2 m in length, are among the oldest objects our team has discovered.

The 2017 season lasted three weeks in June. While the two previous seasons had been focused on identification of sites, the aim of the 2017 season shifted toward documentation. The team used the latest methods such as orthographic photomosaics and 3D photogrammetry to map the sites, while additional artifacts were raised as samples for analysis and study.

The team continued to survey large sections of the coastline, locating eight new shipwrecks. One of the most interesting was transporting a cargo of amphoras from Chios dating to the Classical period. Deep-water survey was carried out from RPM Nautical Foundation's research vessel *Hercules* by using its remote sensing equipment and ROV to recover amphoras from the deep-water site. The current dataset of 53 shipwrecks may continue to grow as new areas are surveyed.

CONCLUSION

The small islands of the Fournoi archipelago did not have large settlements, but they do tell the story of maritime connectivity in antiquity. The islands served as anchorages and navigational points for ships navigating the eastern Mediterranean. The quantity of shipwrecks at Fournoi is, therefore, more a reflection of a high volume of trade than it is a reflection of Fournoi's role as a trade destination or navigational hazard.

An Ottoman map attributed to Piri Reis depicts a fleet passing through the Fournoi Channel, suggesting that this was the preferred route between Samos and Ikaria. The map also shows the large islands of Fournoi and Thymina, as well as Agios Menas, where the main concentration of shipwrecks has been located. Two sailing vessels are shown at anchor in locations that still correspond to safe anchorages identified in the modern *Mediterranean Pilot*. Even today, Fournoi serves as a safe anchorage for ships in bad weather.

The Fournoi Underwater Survey is revealing the importance of eastern Mediterranean trade networks in every time period. These networks connected the Black Sea and Aegean to Cyprus, the Levant, and Egypt. Some of the shipwrecks identified at Fournoi originated even farther afield, with cargoes from Italy, North Africa, and Portugal. How many shipwrecks remain to be found in the archipelago is anyone's guess, but the current data are already contributing to our understanding of the past.

Clockwise: Directors Peter Campbell and George Koutsouflakis discuss the research plan with diver Anastasis Agathos; A Late Roman amphora on the seafloor; The head conservator cleans a cooking pot.

ACKNOWLEDGEMENTS

The authors would like to thank Angeliki Simosi, the director of the Ephorate of Underwater Antiquities, for her continued support. The season would not have been possible without the support of the Institute of Nautical Archaeology. The Hellenic Ephorate of Underwater Antiquities and RPM Nautical Foundation provide personnel and equipment, without which the project could not happen. The local community in Fournoi, especially the mayor, business association, and local collaborators, have been critical to the success of the project. Finally, the authors would like to acknowledge the hard work of the archaeologists, divers, conservators, and surface support that compose the Fournoi team.

FOR MORE INFORMATION about the survey, check the project pages at https://nauticalarch.org/projects/Fournoi-underwater-survey/, https://rpmnautical.org/ and http://www.korseai.com/EN/.

SUGGESTED READING

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INSTITUTE OF NAUTICAL ARCHAEOLOGY

JOIN OR SUPPORT INA TODAY!

Bringing History To Light Through The Science Of Shipwrecks

The Institute of Nautical Archaeology (INA) is a non-profit international research organization committed to locating, excavating, recording, preserving, and publishing shipwrecks and other archaeological sites of maritime significance. INA was founded over 40 years ago by **Dr. George Bass**, who in the 1960s pioneered the science of archaeological excavation under water. INA is devoted to the archaeological study of ships as major vehicles of exploration, colonization, innovation, and cultural exchange. Based in College Station, Texas and affiliated with **Texas A&M University**, INA conducts work around the globe on shipwrecks and submerged sites.

Today there is greater need than ever before to support the work done by INA. The world's submerged archaeological sites are threatened not just by the ravages of time, but also by the destructive activities of dredging and commercial fishing. With funding for archaeological fieldwork and research always in short supply, INA depends on friends like you to help us protect threatened sites and promote scholarship by supporting survey, excavation, conservation, preservation, and education. INA members are institutions, professionals, enthusiasts, and students united in their passion for discovering the untold stories that lie hidden beneath the sea. **Join INA today and become a patron of discovery!**

Some Noteworthy INA Excavations

For more than 40 years, INA archaeologists have been directing or participating in shipwreck excavations around the world. These archaeological projects, which represent all historical periods and geographic regions, are how INA brings history to light through the science of shipwrecks.

14th-century BC Bronze Age shipwreck at **Uluburun, Turkey**
13th-century BC Bronze Age shipwreck at **Cape Gelidonya, Turkey**
7th-century BC Phoenician shipwreck at **Bajo de la Campana, Spain**
6th-century BC Archaic Greek shipwreck at **Pabuç Burnu, Turkey**
5th-century BC Classical Greek shipwreck at **Tektaş Burnu, Turkey**
3rd-century BC Hellenistic shipwreck at **Serçe Limanı, Turkey**
1st-century BC Hellenistic column wreck at **Kızılburun, Turkey**
4th-10th century shipwrecks at **Tantura Lagoon, Israel**
4th / 5th-century Late Roman shipwreck at **Yassıada, Turkey**
7th-10th century shipwrecks at **Yenikapı, Turkey**
7th-century Byzantine Shipwreck at **Yassıada, Turkey**
9th-century Byzantine shipwreck at **Bozburun, Turkey**
11th-century medieval glass wreck at **Serçe Limanı, Turkey**
16th-century shipwreck at **Molasses Reef, Turks and Caicos**
16th-century Ottoman shipwreck at **Yassıada, Turkey**
17th-century pipe wreck at **Monte Cristi, Dominican Republic**
17th-century *Nossa Senhora dos Mártires* in **Lisbon, Portugal**
17th-century *Santo Antonio de Tanna* at **Mombasa, Kenya**
17th-century sunken city of **Port Royal, Jamaica**
18th-century shipwreck at **Sadana Island, Egypt**
1830s side-wheel steamboat *Heroine* in **Red River, Oklahoma**
1860s Civil-War blockade runner *Denbigh* in **Galveston, Texas**
19th-century horse-powered ferry in **Burlington Bay, Vermont**
19th-century Gold Rush steamboat survey in **Yukon, Canada**

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Diver ($40)- Join at this level and receive the benefits of INA membership, as well as a gift featuring the INA logo and a color photo from an INA excavation

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Institutional ($100)- Libraries, museums, and educational organizations receive all the benefits of Diver membership and an acknowledgment in the *INA Quarterly* as a supporting institution

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MASTER REMIGY'S GUNS

16th-century Spanish Armada cannons found on *La Trinidad Valencera*

BY COLIN MARTIN

It has been 50 years since the first shipwrecks from Spain's ill-fated Armada against England in 1588 were found and investigated using modern archaeological techniques. Defeated as much by bad planning and unseasonable weather as by the English fleet, the 130-strong Armada, having failed to escort a Spanish invasion force to a landing beach in England, made for home somewhere north of the British Isles. The autumn gales of that year – the Winds of God, as their Protestant adversaries called them – blew early and with unusual ferocity, leaving many of the returning Spanish ships wrecked on the wild Atlantic coasts of Scotland and Ireland.

Though some were salvaged shortly afterwards, most remained undiscovered. In 1967 the Belgian underwater explorer Robert Sténuit found the wreck of the galleass *Girona*, lost close to the Giant's Causeway in Northern Ireland. Nothing remains of the ship at this exposed and shallow site, but rock gullies had preserved many heavier objects. These fall into two main categories. The most widely publicized is a remarkable collection of Renaissance jewelery, now displayed in Belfast's Ulster Museum. Many on board had been wealthy aristocrats and their heavy coins and ornaments gravitated into the deepest crevasses. With them were a large number of cannon balls. Paradoxically, although the jewelery is the more striking discovery, the cannon balls are historically more diagnostic, for

This page: Colin Martin and a colleague measuring the 1587 Remigy gun 400 years later in 1987. **Opposite page:** Philip II's royal escutcheon on the Remigy guns.

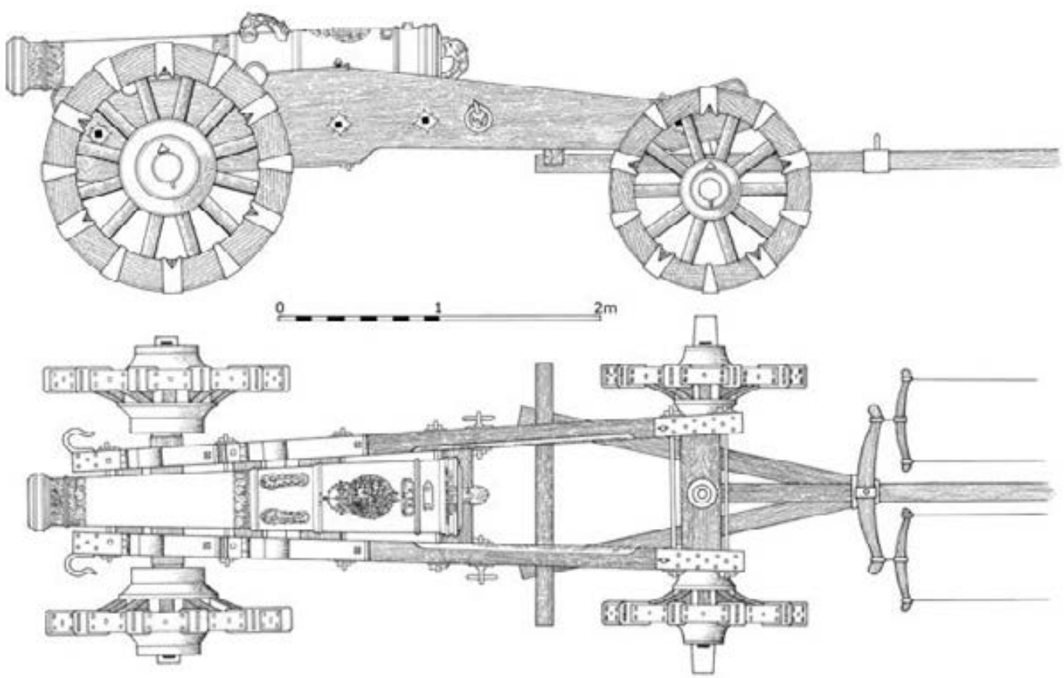
PHOTOS, THIS PAGE: C. MARTIN; OPPOSITE PAGE: R. SUTCLIFFE

historians believed they should not have been there at all.

For various reasons many had concluded that the Armada failed because it ran out of shot. The English (they believed) did not, so it was only when the Spanish guns fell silent that Queen Elizabeth's warships were able to come in close and drive the Armada into the North Sea. It was also thought that the Spanish had the heaviest guns, including 7¼-inch-bore bronze monsters which threw a 40-pound shot. These, said the historians, were short-range ship-smashers, which should have given the Spanish the upper hand in close combat against the English, who favored a lighter armament that emphasized the long-range types. Only when the Spanish had fired all their shot, the argument concluded, could the English deploy their lighter guns with impunity and win the day.

The *Girona* finds suggested otherwise. But had the Spanish perhaps just run out of *heavy* shot? No. A year after *Girona* was discovered, Sydney Wignall's team (of which I was a member) found the remains of another Armada ship in Blasket Sound off southwest Ireland. The *Santa María de la Rosa* was an important fighting vessel, vice-flagship of the Armada's Guipuzcoan squadron. What we found was her lower hull, pinned down by stone ballast. The upper part, including the ship's guns and most of its contents, had broken off and drifted away with the tide. It has never been located. But a large cache of ammunition had been stowed in the bow, atop the ballast, and there we found many hundreds of pieces of shot, of all calibers up to and including 40-pounders. So why hadn't they been used to smash the English ships?

The critical finds are three matching 2½-ton bronze guns, with identical 7¼-inch bores...They are described as *cañones de batir* [battery cannons] with carriages and limbers for transport on land.



DRAWINGS AND PHOTO: C. MARTIN

The answer emerged in 1971, when members of the City of Derry Sub-Aqua Club found the remains of *La Trinidad Valencera* on a sandy seabed in Kinnagoe Bay, Ireland. At 1,100 tons she had been the fourth largest ship in the Armada. I was lucky enough to be asked to direct the excavation of the site, bringing our newly-founded Institute of Maritime Archaeology at the University of St Andrews in Scotland to work in collaboration with the Club in what became a long-term and extremely productive project. It continued into the 1980s, and the finds are now displayed in the innovative Armada Museum of what is now Londonderry.

The critical finds are three matching 2½-ton bronze guns, with identical 7¼-inch bores. We know exactly what they are, for lists of equipment loaded onto the ship in 1587 are preserved in Spain's Royal Archives at Simancas. They are described as *cañones de batir* [battery cannons] with carriages and limbers for transport on land. They were not ship guns at all, but siege artillery intended to support the Spanish army's march on London when the Armada landed the invasion force on English soil. On the voyage they were stowed in the hold, along with their heavy carriages and ammunition. The 40-pound shot carried by the Armada was there to batter Queen Elizabeth's castles, not her ships.

The three *cañones*, all dated 1556, are marked individually with their weights in Spanish *libras* of 460 grams – 5186, 5260, and 5316. These match exactly the weights recorded in the Armada documents, which describe the guns in detail. They bear the arms of Philip II, joined with those of Mary I of England, whom he married in 1554. He was therefore King Consort of England until she died in 1558. The documents tell us that the arms were highlighted in the royal colors, though no trace of paint survives. Their breech-rings carry the name of Juan de Acuña Vela, Philip's Captain-General of Artillery at the time, and – in larger letters since in Hollywood terms he was the bigger star – that of Remigy de Halut, the king's Gunfounder Royal at Malines near Antwerp. Malines had been renowned as a bronze-founding center for many years: even before the advent of cast metal artillery in the later 15th century, fine bells had been produced there.

This page: One of the Remigy *cañones de batir* being brought ashore for conservation. **Opposite page:** Reconstruction of a Remigy battery cannon and its carriage limbered for transport.

SUGGESTED READING

Martin, C. 1988. A Sixteenth Century Siege Train: the Battery Ordnance of the Spanish Armada. *International Journal of Nautical Archaeology* 23.3: 383-99.

Martin, C. 2011. "Stowed or Mounted: the Spanish Armada of 1588 and the strategic logistics of guns at sea." In *Ships and Guns in Venice and Europe between the 15th and 17th* Centuries, edited by Carlo Beltrame and Renato Gianni Ridella, 85-97. Oxford.

Martin, C. and G. Parker, 1988. *The Spanish Armada*. London and New York.

Remigy de Halut proved to be as skilled a gunfounder as his predecessor and, ably partnered by Hedwige, continued to produce fine guns of all types and calibers.

The most famous of the Malines master-founders was Hans Poppenruyter, who began making high-quality bronze ordnance in the 1480s and who, in the first two decades of the 16th century, cast more than 144 guns for Henry VIII of England. During these years Henry amassed, in the words of the Venetian Ambassador, 'cannon enough to conquer Hell.' Work for England was suspended at Malines in 1526 because Henry, always short of money, proved a bad payer. In the meantime, however, Poppenruyter secured an even more lucrative contract. In 1520 Charles V, who that year became ruler of both Spain and the Holy Roman Empire, bestowed on Malines the profitable honor of making it his Royal Gunfoundry. Poppenruyter was granted the title of Founder Royal. Under the patronage of Charles V, and helped by the wars then prevailing throughout Europe, the Malines foundry prospered.

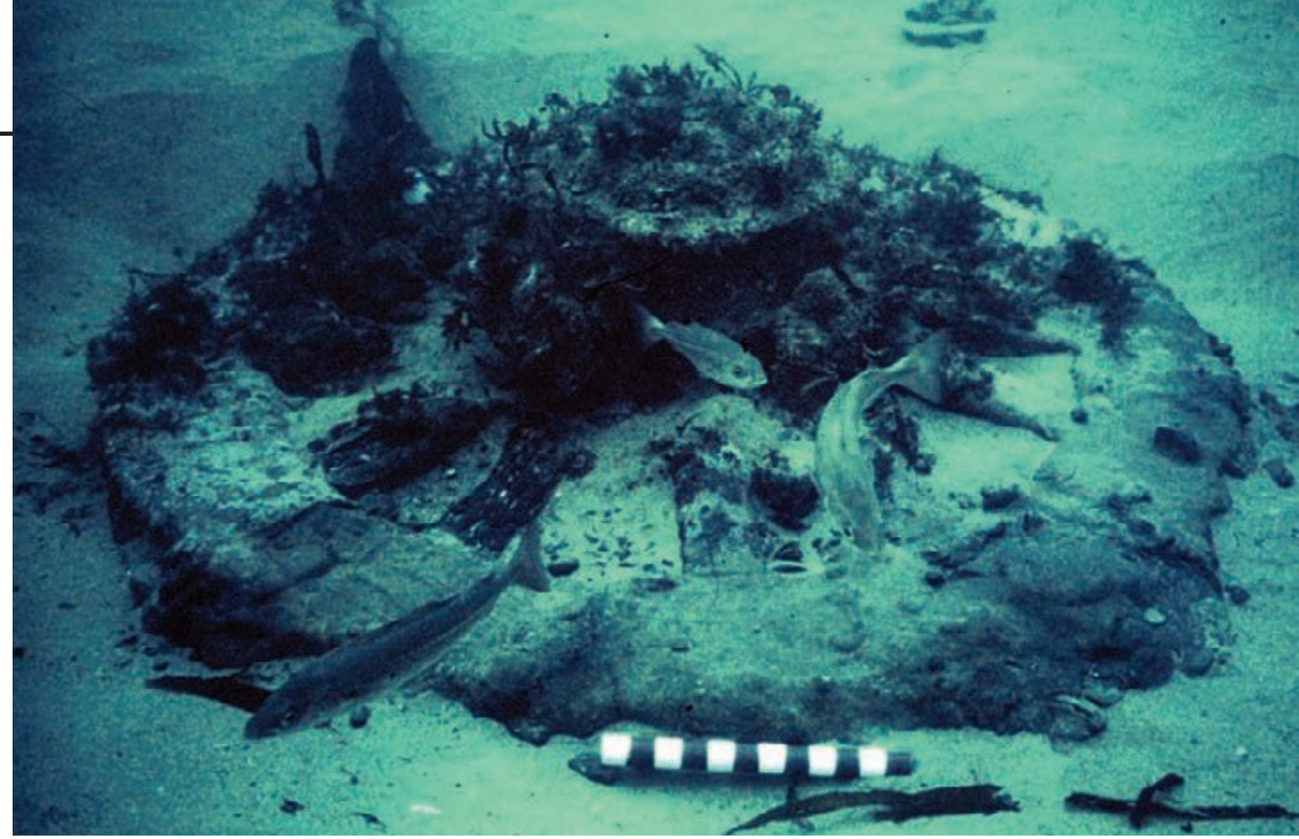
In 1526 Poppenruyter married Hedwige van den Nieuwenhuysen. She was evidently a lady of spirit and character for she took on much of the foundry's administration. Poppenruyter died in 1534, leaving no heir, and for two years the formidable Hedwige ran the business on her own. It was tough work, and she began looking around for a suitable partner – a man she might contract to be co-director of the foundry and, secondarily, her husband. The job went to Remigy de Halut. In due course Charles V confirmed Remigy's appointment as Founder Royal in succession to Hans Poppenruyter. Had 21st-century moral codes applied, he might just as well have awarded it to Hedwige.

Nonetheless Remigy de Halut proved to be as skilled a gunfounder as his predecessor and, ably partnered by Hedwige, continued to produce fine guns of all types and calibers. In 1550 Charles V established a center for his field artillery service at Malines, and by the following year a great arsenal and munitions depot had grown up around the foundry. Two important reforms were introduced. The first was a standardization of gun types by laying down strict formulas by which caliber, length, weight, and proportions were calculated. Our three guns confirm that this was achieved. The second was the introduction of proof-firing. Each gun, before being passed for service, was fired three times with a powder charge equal to the weight of its shot – about twice the normal load. The foundry stood near the old Brussels Gate just inside the city walls. Part of the original building survived into the 19th century as an orphans' home until it was demolished in 1837.

La Trinidad Valencera's manifest confirms that each of the three Remigy guns was provided with two sets of field carriages and limbers. Parts have been identified on the wreck. They include massive spoked wooden wheels heavily reinforced with iron. The larger type, 1.5 m (5 ft) in diameter, has 12 spokes, while a smaller version 1.3 m (4½ ft) in diameter has ten spokes. Wooden axles, likewise strengthened with iron, were also found. These came in two lengths, the longer intended for the smaller wheels, the shorter for the big twelve-spokers. The big wheels on short axles would have supported the main carriage assemblies, with two side-pieces linked to form a long trail, flaring towards the end. No evidence of side-pieces was found, but the proportions of the guns, and a contemporary drawing preserved at Simancas, allow the carriages to be reconstructed.

For transportation, the gun and carriage assemblies required articulated two-wheeled limbers which could be hitched under the trail. These explain the ten-spoke wheels, which needed a longer axle to accommodate the turning arc. The limbers would have been linked by wooden swingletrees to traces for paired horses or oxen, perhaps nine pairs in all. Ready for the road, the full combination (excluding draft animals) would weigh about five tons, and extend as much as 30 m (100 ft). We can see why transport by water was the preferred option.

Evidence of supporting equipment

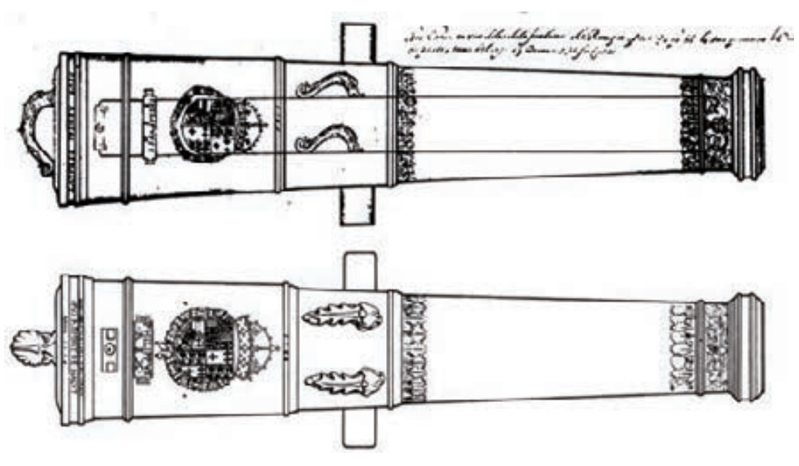


Opposite page, clockwise from top: One of the larger-type, 12-spoked guncarriage wheels; An archaeologist prepares a guncarriage wheel to be raised to the surface; A wooden axle found alongside its iron reinforcements.

PHOTOS: C. MARTIN

The Armada generated a wealth of documentation about its composition and strategy, now meticulously preserved in the Simancas archives. No major event in Early Modern European history is so richly endowed with written sources.

TWO DRAWINGS, FOUR CENTURIES APART



One of the three Remigy guns from the Trinidad Valencera was drawn to scale in 1587 by Philip II's Captain-General of Artillery, Juan de Acuña Vela, in a technical memorandum sent to the king. It is identified by the 5186 libra weight mark, which he carefully included in his drawing. I measured and drew the same piece in 1987, unaware that someone had beaten me to it by four centuries. When Acuña Vela's version turned up in the archives and we compared it with mine we found that the proportions and details recorded independently across the centuries matched almost exactly. To find that Don Juan and I had used similar conventions for our drawings sent a shiver down my spine. I've never felt so close to a real person from the past.

ARTWORK (TOP): COURTESY OF THE AUTHOR'S COLLECTION; DRAWINGS (TOP): ARCHIVO GENERAL DE SIMANCAS; (BOTTOM): C. MARTIN; PHOTOS: C. MARTIN

required for the artillery train when operating ashore has also been recognized. It includes shovels, baskets, esparto matting, wooden levers, tents (for the ammunition, not the men), and part of a tripod hoist incorporating a windlass for mounting and dismounting the guns. Wooden planks were available to build platforms when the guns were in position, together with gabions (basketwork cylinders that could be filled with earth) to protect them. Fir saplings with their branches trimmed to leave short spikes were the 16th-century equivalent of barbed wire. Had all of this been landed on English soil in 1588 history might have turned out very differently.

The Armada generated a wealth of documentation about its composition and strategy, now meticulously preserved in the Simancas archives. No major event in early modern European history is so richly endowed with written sources. Yet it has taken archaeology – read in conjunction with documents – to understand what the Armada's biggest guns were really for. Archaeology does not begin at any particular date; it is relevant whenever it adds fresh understanding to any topic or period. And it works particularly well when it can be combined with contemporary records.

This page, from top: The gun's sprightly lifting dolphins; Credit lines showing the founder, Remigy de Halut; The weight mark 5186, replicated in *La Trinidad Valencera* documents and in Juan de Acuña Vela's 1587 drawing. **Opposite page:** The old foundry at Malines, demolished in 1837 showing the remains of a furnace at bottom left.

AUTHOR

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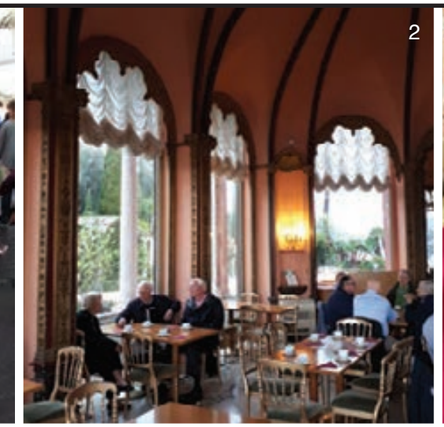
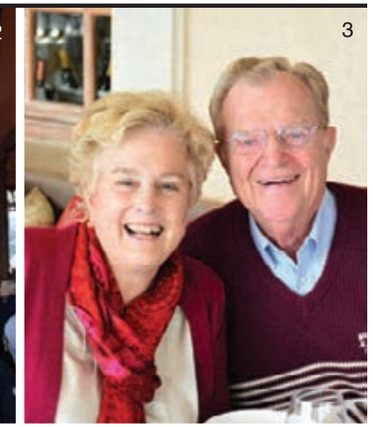
2017 INA BOARD MEETING

Directors and Officers gather in Monte Carlo to celebrate another outstanding year

Every autumn, INA's Board of Directors comes together to discuss the results of ongoing INA surveys, excavations, research, and publications. The 2017 meeting took place in breathtaking Monte Carlo, Monaco, at the generous invitation of longtime INA Director Danielle Feeney. Highlights of the five-day itinerary included the Villa Ephrussi de Rothschild, the Villa Kerylos, the Oceanographic Museum of Monaco, the Matisse Museum, the flower market of Nice, the Fragonard Museum of Grasse, and the enchanting medieval hill town of Saint Paul de Vence. Our sincere thanks to our hostess Danielle and all attendees, but especially to the INA Board for their continued support of our superb organization!





1. View of the harbor of Monte Carlo 2. Afternoon tea at the Villa Ephrussi de Rothschild 3. Robyn Woodward and Bob Walker 4. Jenny Arkhipov and Dana McGinnis 5. Dinner at the iconic Cafe de Paris in Monte Carlo

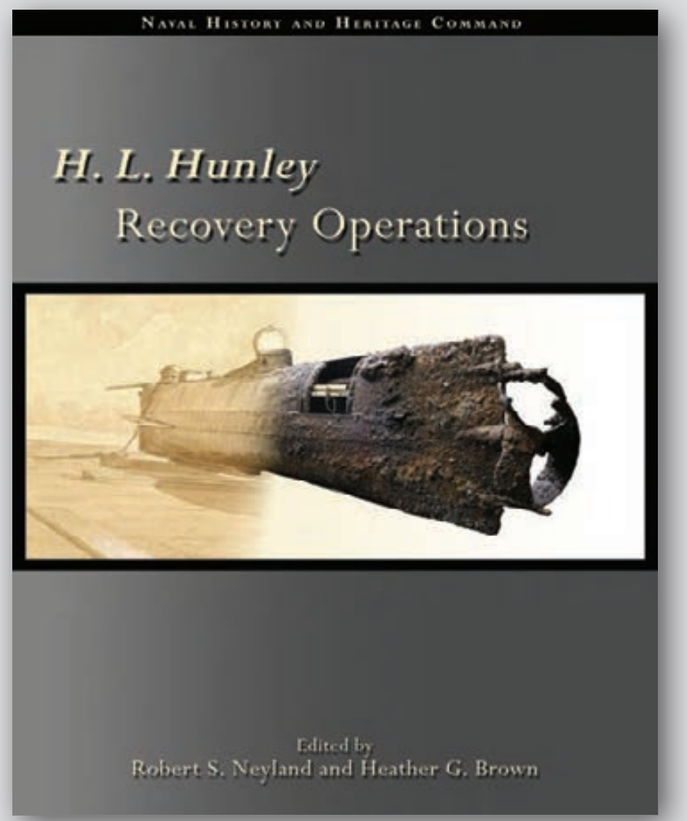
6. John Cassils and Cemal Pulak 7. Luncheon at La Reserve in Nice 8. Past INA President Donny Hamilton with daughter Amy Hamilton-Foster 9. John DeLapa, Bob Walker, and Ned Boshell 10. Clockwise from left: Roger Williamson, Ginny Klein, Judy Sturgis, and Lucy Darden 11. Danielle Feeney and Debbie Carlson at the Armistice Day ceremony in Nice

12. Tuba Ekmekçi and Kenan Yılmaz 13. Danielle Feeney with a 1:32 scale model of INA's new research vessel *Virazon II* 14. Lucija Aydemir and Oğuz Aydemir 15. Touring the Fragonard Museum in Grasse

REVIEW

H. L. HUNLEY RECOVERY OPERATIONS

Edited by Robert S. Neyland and Heather G. Brown



NAVAL HISTORY AND HERITAGE COMMAND
ISBN 978-0-94527-491-9
REVIEWED BY RICHARD HENDREN

Shortly after the loss, with all hands, of the Argentine submarine ARA *San Juan*, I was asked to review this book about *H. L. Hunley*. Having spent a large part of my 30-year navy career in submarines, every time I hear of the loss of a submarine, and the crew that gave her life, I cannot help but think 'There, but for the grace of God, go I'. This sentiment is common among most submariners, yet, except for a few navies, submarine duty is strictly voluntary. The *H. L. Hunley* story makes one realize the amazing determination and bravery of the men who crewed her. Considering that the first two crews of *Hunley* were lost with all hands, and each crew member knew of the demise of the crews that preceded them, but still volunteered, it is little wonder that they persevered in sinking the USS *Housatonic*.

In 1995, a team under the direction of novelist Clive Cussler discovered the wreck of the Confederate submersible *Hunley*. Once her location was known, it was feared that unscrupulous individuals might loot the wreck, and in so doing desecrate the grave of the crew, assumed to be entombed within the hull. It took five years to plan and execute the vessel's recovery.

This volume, the first in a planned series of archaeological reports, documents those years of effort in a series of phases: historical, planning, execution, analysis, and conclusion. In the first phase the authors place *Hunley* in historical and environmental context, and detail the previous investigations culminating in her discovery. The second phase covers initial planning and preparation efforts for recovery and conservation, including a conservation symposium and the design and construction of the Warren Lasch Conservation Center in North Charleston, S.C. The report's third phase concerns the execution of field efforts, including the development of the frame and slings used to recover *Hunley*, as well as excavation, recovery, and post recovery survey operations. Analyses include: site description, the artifacts and their condition; the geology, biology, and the site formation process; hull analysis, detailing the hull design of this and comparable vessels, *Hunley*'s operational systems; and a review of the artifact assemblage. The final chapter presents conclusions including speculation about potential root causes for *Hunley*'s sinking.

This volume provides something for everyone; readers interested in history, technology of early submersibles, the Civil War, complex maritime archaeological projects, underwater site formation processes, or the importance of our fragile underwater cultural heritage will find this report especially thought-provoking. The editors, Neyland and Brown, have done a masterful job merging the 16 chapters into a congruent volume wherein the authors provide a detailed explanation of the daunting technical complexities involved in planning and executing the excavation, recovery, and conservation of this culturally significant vessel. Each of the chapters can stand on its own merit, allowing a reader with specific interest, or lacking time to read the entire volume, an opportunity to readily glean needed information. Chapters are written in an accessible style which simultaneously provides the high level of technical information and data expected by academics and researchers. Excellent photographs, illustrations, and data enrich each chapter and contributed greatly to my understanding of the material. The appendices provide a wealth of supporting data, including the summary of proceedings of the symposium organized to gather information about how best to conserve *Hunley*.

This detailed description of risk management, decision-making, management structure, and the division of responsibilities provides a great example of a complex, well-run and highly successful enterprise.

This report differs from many in that it provides a look behind the scenes at the complexities of managing a large multi-stage project. This detailed description of risk management, decision making, management structure, and the division of responsibilities provides a great example of a complex, well-run and highly successful enterprise. I would consider this volume a valuable resource for anyone designing a complicated underwater archaeological project.

Neyland served as the Principal Investigator for the *Hunley* project, and provides in the introduction background information regarding previous efforts to recover intact vessels, and the challenges involve of conserving iron ships and marine equipment. Some of these cases were successful, while others ended poorly. Considering that the structural condition of *Hunley* was an unknown, the presentation of these examples underscores the level of risk inherent in this type of operation and the absolute necessity of planning and preparation for each project phase from initial investigation to museum display. This theme of deliberate planning with regard to safety, archaeology, logistics, and cost is evident throughout the book.

Neyland notes in the introduction that finding a stopping point was a real challenge, but he chose to close this first volume as conservation of *Hunley* was getting underway. I noted with pleasure that he diverged from that decision with his inclusion of facial reconstructions of the crew, which are based on actual skeletal remains. As a submariner, I am most grateful to Neyland and his team for the respectful treatment of *H. L. Hunley*'s last crew; their names, stories and facial reconstructions were thoughtfully presented, honoring them, and giving life to this fascinating artifact of American history.


H.L. Hunley recovered from Charleston Harbor, 2000 (Naval Historical Center)

Richard Hendren is a Ph.D. student in the Nautical Archaeology Program at Texas A&M University. He served 30 years in the U.S. Navy and earned a Master's degree in Human Relations from the University of Oklahoma. His research interests include remote sensing and naval artillery.

RETROSPECTIVE:

VIRAZON

INA's first research vessel embarks for the Mediterranean in 1964

For 50 years, archaeologists, students and volunteers participating in INA research projects in Turkey had the pleasure of diving from and living aboard *Virazon*. *Virazon* is a former U.S. Army T-boat built in New Orleans in 1953.

In 1964 the U.S. Army loaned *Virazon* to INA Founder Dr. George Bass in order to test equipment in the emerging field of underwater archaeology. She was loaded aboard *Ruth Lykes* and carried as deck cargo to Athens before joining INA archaeologists excavating the Byzantine shipwreck at Yassıada, Turkey.

INA acquired *Virazon* permanently in 1979 and for 35 years she served on dozens of INA shipwreck surveys and excavations. In 2016 *Virazon* was sold to a Turkish couple offering daily scuba diving trips and certification courses from Bitez Marina outside of Bodrum (www.barakudabodrum.com).

In 2016 INA christened *Virazon II*, the first ship to be classed as an Archaeological Research Vessel. *Virazon II* was designed and built by Navtek Naval Technologies in Istanbul and is fully equipped to support the next generation of INA archaeologists and explorers conducting research around the world.

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