PROGRAM / SCHEDULE

ARCHAEOLOGICAL OCEANOGRAPHY
IN THE MEDITERRANEAN AND BLACK SEA

A Symposium on the E/V Nautilus and
STS Bodrum Expeditions to Turkey, 2009-2013

Bodrum, Turkey
Salmakis Resort & Spa
October 19-20, 2014

Organizers

Michael L. Brennan
Director, Marine Archaeology & Maritime History
Ocean Exploration Trust
South Ferry Road
Narragansett, RI 02882

Tufan Turanlı
President
BOSAV Foundation
(Bodrum Karya Kültür Sanat Tanıtım Vakfı)

Dan Davis
Assistant Professor of Classics
Department of Classics
Luther College
700 College Drive
Decorah, IA 52101
To the knowledge of the nature of the land, its plants and animals, we must add a knowledge of all that pertains to the sea. For in a sense we humans are amphibious, no more land-dwellers than seafarers.

-Strabo, Geography
first century B.C.
When we created the Center for Archaeological Oceanography at the Graduate School of Oceanography at the University of Rhode Island in 2002 our goal was to bring together the fields and marine archaeology and oceanography to work together in the deep-water regions of the oceans. More specifically, we sought to address two major issues. The first was to demonstrate that the ancient mariner commonly traveled far from shore in an effort not only to shorten his route but also to avoid the more dangerous coastal routes that could result in the loss of their ship, cargo and crew. The second was to demonstrate that the deep sea is an ideal place to find ancient ships and their cargoes, both organic and inorganic, resting in a much higher state of preservation than those lost in the shallower, sunlit layers of the coastal zone, particularly, in the anoxic bottom waters of the Black Sea.

In addition to proving these two facts to be true, we discovered the tremendous damage being done by bottom trawling activities that have more than likely destroyed the majority of shipwrecks lost in water depths of less than 500 meters, making the deep sea an even more important place to explore in search of preserved chapters of human history than we previously thought.

My hope is that as a result of this symposium, and the publications that will follow, the archaeological community will better appreciate what the deep sea has to offer to their discipline and will strive to embrace what the oceanographic community has to offer them as the new generation of archaeological oceanographers continues probing the deep sea for the history that awaits them.

—Dr. Robert D. Ballard

The 2009-2013 *E/V Nautilus* and *STS Bodrum* expeditions explored the deep Black Sea and Mediterranean coasts of Turkey in unprecedented scope and detail, and with extensive public outreach. This two-day symposium is an opportunity to present the results of these interdisciplinary efforts. Sixteen speakers will present their scientific findings on various topics, including oceanography, underwater mapping, nautical archaeology, marine biology, and the destructive effects of trawling.
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<td><em>Michael Brennan, “Bottom Trawl Fishing Damage to Shipwreck Sites: Case Studies from the Aegean and Black Seas”</em></td>
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<td>9:30 am</td>
<td><em>Gülsen Altuğ, Aydan Saraç, Bekir Ergüner, Betül Yücelü, Bayram Yüksel, Mahmut Şamil Sağiroğlu, Gülruh Albayrak, Emre Yörük, Pelin S. Çiçü Türetken, Sevan Gürün, Samet Kalkan, and Michael L. Brennan, “Black Sea Microbiology and Results from Nautilus Sampling: The Microbial Diversity of Metagenomic Samples of Sediments at Oxic, Anoxic and Suboxic Zones”</em></td>
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<td>10:00 am</td>
<td><em>Meko Kofahl, “The Late Antique Sinop Wrecks: Sinop A, B, C and F”</em></td>
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<td><em>Dan Davis, Michael Brennan, Alexis Catsambis, and Andrei Opaif, “The Ereğli E Shipwreck: An International Merchant Ship of the Early Hellenistic Period”</em></td>
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<td><em>Derya Ürkmez, “Meiobenthos from the 2011 E/V Nautilus Expedition: Notes on New Findings of Marine Nematodes”</em></td>
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<td>2:00 pm</td>
<td><em>José Luis Casabán, “Potential and Limits of Non-intrusive Hull Analysis in Deep Water Archaeology: The Sinop G and Ereğli B Shipwrecks (in abstentia)”</em></td>
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<td><em>Jason Burns, “The 19th-Century Black Sea: Evidence from the Ereğli G Shipwreck”</em></td>
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<td><strong>Paper Session III: Aegean and Mediterranean</strong></td>
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<td><em>Clara Smart,</em> “High-Resolution Photographic and Acoustic Imaging of Submerged Shipwrecks”</td>
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<td><em>Karl Krusell,</em> “Shipwrecks of the Early Hellenistic Period: Knidos M and U”</td>
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<td><em>Rachel Matheny,</em> “Deepwater Roman Shipwrecks near the Datça Peninsula”</td>
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<td><em>John Littlefield,</em> “A Preliminary Analysis of Deep Water Sites Knidos Q and S”</td>
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<td><em>Michael Brennan and Meko Kofahl,</em> “The Late Roman 1 Amphora Wrecks: Knidos A, C, T, and Marmaris B”</td>
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<td><em>Evren Türkmenoglu,</em> “The Knidos F Shipwreck: A Medieval Merchant Vessel”</td>
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<td><em>Selçuk Kolay and Savaş Karakas,</em> “Echoes from the Deep: The Wrecks of the Dardanelles Campaign”</td>
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<td><strong>Closing Remarks</strong></td>
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<td>Time TBA</td>
<td><strong>Bodrum Cup:</strong> First leg of Bodrum Cup, to begin and end in Bodrum</td>
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Bottom Trawl Fishing Damage to Shipwreck Sites: Case Studies from the Aegean and Black Seas
Michael L. Brennan

Exploration by the E/V Nautilus from 2009 to 2012 off the Aegean and Black Sea coasts of Turkey located 40 pre-modern shipwrecks, ranging in date from the 6th century B.C. to the early 19th century of our era. More importantly, these wrecks differ greatly in their state of preservation, due in a large part to the amount each site has been damaged by bottom trawling activities. Analysis was conducted of the damage inflicted upon each wreck site, the extent and intensity of trawl scars visible in side-scan sonar mapping, and the proximity of each site to the coast and other areas of fishing restrictions. In the Black Sea, these results are correlated with evidence of anoxic events caused by internal wave activity at the oxic/anoxic interface as evidenced by the preservation of wooden shipwrecks. These data show areas of the Turkish coast where sites are more severely threatened or where they may have already been eradicated. Damage reflected by the dispersal of wooden timbers or by broken ceramic cargos indicates areas that may be aided by additional establishment and enforcement of marine protected areas.

Black Sea Microbiology and Results from Nautilus Sampling: The Microbial Diversity of Metagenomic Samples of Sediments at Oxic, Anoxic and Suboxic Zones
Gulsen Altug, Aydan Sarac, Bekir Erguner, Betul Yuceturk, Bayram Yuksel, Mahmut Samil Sagiroglu, Gulruh Albayrak, Emre Yoruk, Pelin S. Ciftci Turetken, Sevan Gurun, Samet Kalkan, and Michael L. Brennan

Sediments underlying oxic, suboxic, and anoxic waters were collected with a remotely-operated vehicle (ROV) in the southern Black Sea off Sinop and Ereğli, Turkey during the 2011 and 2012 E/V Nautilus expeditions. The samples were analyzed to understand microbial diversity of these unique fields using culture-dependent and independent methods. Culturable total bacteria count was tested in each sediment sample and pure isolates were screened with a VITEK 2 Compact 30 automated micro identification system. While the highest aerobic colony forming units (CFU) were found in the oxic samples, slightly higher culturable anaerobic bacteria were recorded in the suboxic and anoxic samples. 16S rRNA analyses were carried out to identify the unknown species and diagnosis of archaea, and bacteria was maintained without DNA extraction by polymerase chain reaction (PCR). PCR products of 1505 and 1398 bp amplified from sediments showed the presence of bacterial and archaeal communities. DNA extraction was performed for the samples by following the guide of Macherey-Nagel kit with slight modifications. Prior to NGS library preparation, the precise quantities of the DNA samples were measured with fluorimetric approach, Qubit
NGS libraries were performed with TruSeq LT DNA sample preparation kit (Illumina Technologies, San Diego) according to the protocol of the manufacturer by optimization of some steps as needed. The libraries were sequenced PE 2X100 bp with Illumina HiSeq 2000 platform. The data were analyzed with PhyloSift v1.0.1 by using default markers and the parameters. The results obtained by the phyletic compositional analyses of the sequences of the suboxic samples: 9% of cellular organisms were archaea (69% Nitrosopumilales: play a role in anaerobic oxidation of ammonia and methane, 16% Euryarchaeota; methane producing archaea, 14% unassigned), from the same sample remaining 89% of the detected organisms were bacteria (majority of which were Proteobacteria 43%, among Proteobacteria Gammaproteobacteria was the majority with about 40%). Two percent of the organisms were determined to be from Eucaryota. The highest ratio of archaea was obtained from the sample of the deepest level (i.e., 190 meter), where about 16% of the microbial community was archaea. Eubacterial composition was strikingly different at this depth. Further analyses of the data will be conducted to better delve into the microbial diversity pattern of deep sea metagenomic samples from the Black Sea, which has unique environmental factors in its coastal transition zones. This microbial sequence data will also open new opportunities for identifying microbial community structures, new microorganism and discovering new enzymes.

The Late Antique Sinop Wrecks:
Sinop A, B, C and F
Meko Kofahl

The archaeological record is rich in shipwrecks from the period of Roman rule, but diminishes as the Romans lose control of the Mediterranean and the capital shifts to Byzantium. Between 500 and 800 A.D., however, a mere hundred or so wrecks from the Mediterranean and Black Sea represent our physical evidence for documenting maritime trade. The surveys conducted by E/V Nautilus contributed approximately ten-percent of those wrecks to the record. These are clustered in two areas: off Knidos in the Aegean and off Sinop in the Black Sea. This period is particularly interesting due to the dual effects of the Justinianic plague (arriving in A.D. 540) and the Roman loss of control of the Mediterranean and a great portion of territory. How much trade contracted and how ship size adjusted to the new political reality is documented in literature and land-based excavations but remains difficult to corroborate with our limited shipwreck evidence. The five ships found off Sinop therefore represent a significant contribution to our understanding of maritime trade during this tumultuous period. They appear to have been lost just after departing with full cargoes carried in typical, carrot-shaped amphoras. Ereğli C, contemporaneous with the Sinop wrecks, presented with only four LRA1 amphoras, perhaps indicating an empty ship or an organic cargo now lost. These five wrecks (plus Sinop D, not discussed here) add significantly to the physical evidence for southern Black Sea trade during Late Antiquity and point to Sinop as a significant hub along the southern coastal trade corridor between Trabzon and Byzantium.

The Ereğli E Shipwreck: An International Merchant Ship of the Early Hellenistic Period
Dan Davis, Michael Brennan, Alexis Catsambis, and Andrei Opaiț

The trawl-damaged remains of an Early Hellenistic shipwreck were discovered by the 2011 E/V Nautilus expedition off the Black Sea coast of Turkey at a depth of 100 m. Investigations in 2011 and 2012 determined that the ship had been carrying a cargo of liquids (likely wine and/or olive oil) distributed in at least ten different amphora types. Three types originate from Pontic production areas, including...
Chersonesos, Sinop, and an unknown South Pontic center. The other amphoras were produced in Aegean centers, including Thasos, Knidos, and Rhodes. Other finds include an intact kantharos and human remains in the form of a tibia and a femur. The remains of the hull are visible on the surface, some timbers lying in situ, others displaced as a result of multiple trawl passes. An analysis of the hull indicates that the ship incorporated both pegged mortise-and-tenon and sewn construction, a hybrid technique (ostensibly Greek) employed in the construction of several ships discovered in the Mediterranean. Dated on present evidence to ca. 320-280 B.C., the wreck is one of the earliest found to date in the Black Sea. The vessel promises to shed light on local and interregional trade networks at a time when Pontus and the eastern Mediterranean region were undergoing major political and economic challenges in the wake of Alexander the Great and the struggle over the succession.

Meiobenthos from the 2011 E/V Nautilus Expedition: Notes on New Findings of Marine Nematodes
Derya Ürkmez
With an attempt to discover the first meiofaunal data (focusing particularly on free-living marine nematodes) at the oxic/anoxic interface of the Turkish Black Sea, a quantitative study on meiofauna was carried out along a transect throughout oxic, suboxic and anoxic sediments to the west of the Sinop peninsula. The material was collected during the E/V Nautilus expedition in August, 2011. Samples taken to the Benthos Ecology Lab at Sinop University were wet sieved through 500 and 63 μm mesh screens and stained with Rose Bengal solution. Sorting and counting were performed under a stereo microscope (Olympus SX61) using modified Bogorov counting chambers. All meiofaunal taxa were sorted into major taxa and counted for quantitative analysis. Nematodes were put into glycerol via slow evaporation method and mounted on glass slides, which were then identified to possible taxon level with a Nomarski Differential Interference Contrast (DIC) system attached to a Nikon 80i research microscope. As a result of laboratory studies, meiofaunal abundance was found to range from 1140 ind./cm² (anoxic site) to 217078 ind./cm² (oxic site). Taxa composition ranged from 5 to 9 major groups. Free-living marine nematodes were numerically the dominant taxon at each station and represented by 774 individuals belonging to 23 families and 84 species. Taxonomic identifications of nematodes revealed important new findings. A new nematode species for science was discovered in the oxic sample, Halaphanolaimus sergeevae. Two new records were found for the Black Sea: Terschellingia distalamphida (the first record of the species in the Black Sea), being the most abundant species of the family Linhomoidea in the oxic sample and Trefusia aff. longicaudata (first record of the genus in the Black Sea) with the highest dominance (42.5%) in the suboxic zone.

Potential and Limits of Non-Intrusive Hull Analysis in Deep Water Archaeology: The Sinop G and Ereğli B Shipwrecks
Jose Luis Casabán
The wooden remains of the Sinop G and Ereğli B shipwrecks, found during the 2011 E/V Nautilus expedition, are located at a depth of 100 meters on the Turkish continental shelf of the southern Black Sea. A close examination of both shipwrecks was conducted using remotely operated vehicles (ROVs) equipped with multibeam and underwater cameras. A visual examination revealed two wooden shipwrecks partially buried in the bottom with different levels of preservation. In the case of Sinop G, various hull components such as frames and deck beams were easily recognizable. On the other hand, Ereğli B was affected by trawler activity that had displaced some hull components from their original location, although the ship’s perimeter was still recognizable and several shaped timbers were scattered near the hull. Despite the absence of diagnostic artifacts or cargos on both shipwrecks, they are tentatively dated to between the 17th and 19th century based on characteristics of the hull components and lack of machinery. This paper evaluates the potential and limits of non-intrusive hull analysis for deep-water shipwrecks. The analysis is based exclusively on the visual examination of the scattered and partially-buried hull remains of both Sinop G and Ereğli B shipwrecks. The final objective is to refine the
chronological frame proposed for the shipwrecks as well as to try to determine the ships’ typologies.

The 19th-Century Black Sea: Evidence from the Ereğli G Wreck
Jason M. Burns

Discovered during the 2012 E/V Nautilus expedition, the wreck of Ereğli G provides a glimpse into the Black Sea trade and shipping of the 19th century. This wooden-hulled, metal-sheathed sailing vessel sits upright on the seafloor and remains fairly intact, with only some damage evident at the stern. Preliminary research on the ship itself, coupled with research in London at Lloyd’s Register, date the vessel to the end of the 19th or beginning of the 20th century. An update on the research and a preliminary analysis of the hull and material culture will be presented and discussed.

High-Resolution Photographic and Acoustic Imaging of Submerged Shipwrecks
Clara Smart, Chris Roman, Ian Vaughn, and Gabrielle Inglis

Systematic, high-resolution imaging is critical for identification, documentation and analysis of submerged cultural sites. Since 2009 the authors have been developing an imaging suite of mapping sensors consisting of a pair of stereo cameras, a high-resolution multibeam sonar and a structured-light laser sensor for the Hercules (ROV). These three systems are operated simultaneously and can be co-registered to create hybrid optical and acoustic seafloor reconstructions at centimeter-scale grid resolutions. The data processing and map-making techniques applied to the collected data are based on the Simultaneous Localization and Mapping (SLAM) concept, which provides a mathematical optimization framework for addressing both sensor and vehicle navigation errors related to doppler drift. The resulting maps can then enable the accurate measurements of small features, such as features on amphorae handles, and allow for the detection of variations in sediment surrounding an archaeological site. Combining acoustic and visual sensors provides insight into the shape and textural characteristics of the artifacts. Additionally, the diversity of this sensor suite makes it robust to various environmental factors, including the high turbidity found at many sites in the Black Sea and the Aegean Sea. Between 2009 and 2012 this system used to survey approximately fifty cultural sites; indeed, during three days of operations in 2012, twenty-two sites were mapped. The majority of sites ranged ~10 x 30 m in size, each mapped in under one hour of survey time. Additionally, several sites were surveyed in a “checkerboard pattern” of overlapping, orthogonal track-lines to reduce occlusions in complex scenes. Archaeologists can use the resulting data products for improved cultural and analytical understanding of a site. Two-dimensional mosaics and three-dimensional stereo reconstruction created using the captured images provide a comprehensive visual representation of a site. Additionally, change detection and precise structural measurements can be derived from maps from bathymetry created visually or acoustically using multibeam or structured light data.

Shipwrecks of the Early Hellenistic Period: Knidos M and U
Karl Krusell

Knidos M and U, discovered and documented by the 2011 and 2012 E/V Nautilus expeditions, are located 300+ meters below the SE Aegean. Both ships had been engaged in low-level trade, laden with locally made amphoras. With regard to cargo, size, and date, these wrecks are directly comparable to two other sites that have benefitted
from hands-on investigation and analysis—the Kyrenia shipwreck (excavated between 1968 and 1970) and the Mazotos shipwreck (investigations ongoing since 2007), located off the northern and southern coasts of Cyprus, respectively. Knidos M includes at least ninety Rhodian amphoras which probably once contained the inexpensive wine for which Rhodes was well known. A handful of these amphoras have exposed toes, which help to date the site to the first third of the 3rd century B.C.

The less-visible Knidos U includes a mushroom rim Solokha I type amphora (also found on both the Kyrenia and Mazotos wrecks) and a Knidian amphora with a characteristic pinecone toe, both of which date the wreck to the second quarter of the 3rd century B.C. While the timbers of both wrecks remain buried below their cargoes, the debris fields suggest that the ships were modest in size, similar to the Kyrenia and Mazotos shipwrecks—roughly 14 meters in length and 4 meters in beam. At the time of their sinking both ships were likely headed north, having set out from Rhodes to trade wine and foodstuffs along the SW coast of Anatolia.

Deepwater Roman Shipwrecks near the Datça Peninsula: Knidos J, K, X and Z
Rachel Matheny

Between 2009 and 2013, four Roman shipwrecks were discovered during the E/V Nautilus expeditions off the SW coast of Turkey. Together they provide a unique opportunity to study maritime activity in the Roman East. Three of these shipwrecks appear to be contemporaneous, dating to the 1st and 2nd centuries A.D. The Knidos J and K wrecks are comprised mostly of Rhodian amphoras similar to Peacock and Williams’ Class 9 (Camulodunum 184), which dates from the late 1st century B.C. to the early 2nd century A.D. Knidos K also produced a Cretan wine amphora (Crétoise 2 or AC2) of the same date range. Hull remains—including frames, planks, and ceiling planks—are visible on Knidos J and reveal that the ship was assembled with mortise-and-tenon joinery. A revisit to this site would be beneficial as more accurate details could be gathered on hull construction, such as frame-spacing and planking thickness. Although Knidos Z has been heavily trawled, the presence of an Agora M54 amphora and two incomplete Rhodian amphoras, similar to those from the Knidos J and K shipwrecks, give it a comparable date. The Knidos X site, a Late Roman (3rd to 4th century) wreck, was carrying household vessels as well as bricks and roofing tiles, enough to suggest a ship’s galley. As the current corpus of Roman wrecks heavily favors the western Mediterranean, these shipwrecks not only contribute to an understanding of Roman maritime traffic throughout the Mare Nostrum but also elucidate seaborne trade in the eastern Mediterranean during this period.

A Preliminary Analysis of Deep Water Sites
Knidos Q and S
John Littlefield

The 2011 E/V Nautilus expedition located at least 26 potential shipwrecks in the waters around ancient Knidos off the SW coast of Turkey. Two of these sites, of the Imperial Roman era, were located in deep water ranging from 340 to 390 meters and were examined based on extant pottery remains; no visible wooden hull remains were discovered. Both sites are extensively damaged with few surviving intact ceramic vessels. However, both sites contain pottery that is largely absent from existing literature and may thus offer significant insight into these ceramic types. Knidos Q appears to be little more than a trawler debris pile of modern plastics and trash, yet contains several coarseware ceramics and four similar four-handled jars previously known only from the Carian peninsula and sparsely documented. The second site, Knidos S, is made up of at least 100 amphoras of three distinct types, and a single coarse ware cooking pot. Determining the origins of the amphora types has been less than precise, but all appear to be of local regional origin. Analysis of the two sites may reveal clues pertaining to localized and interregional trade during the 4th century CE.

The Late Roman Amphora 1 Wrecks:
Knidos A, C, T, and Marmaris B
Michael L. Brennan and Meko Kofahl

A relatively heavy concentration of wrecks dating between 400 and 700 A.D. was discovered off the southern coast of the Datça peninsula. They provide evidence that the area was in use as a regular maritime corridor, particularly for those ships plying their trade from the direction of Rhodes to Knidos and points farther west. Four shipwrecks located in this region—Knidos A, C, T, and Marmaris D—date to this period based on the LRA1 amphoras found on them. The typical contents
of LRA1 amphoras—wine, oil, and pitch—were all produced in Cyprus and the Levant during Late Antiquity and the Early Byzantine period. A destructive earthquake in A.D. 459, known from historical accounts and recently confirmed by geological evidence, suggests that the majority of those ships either visited Knidos in the earlier half of the 5th century, or were bypassing Knidos en route to locations farther north. Knidos A and C are both large amphora piles on the seabed, having slumped following the decay of the ship’s hull structure. Both wrecks have visible trawl damage but are largely intact mounds with topographic relief. Marmaris B, on the other hand, was likely a nearly identical shipwreck, but is now a heavily trawled site, with little relief above the height of an amphora, and with a majority of the artifacts broken and scattered. Finally, Knidos T features only a handful of LRA1 amphoras on an otherwise small site. This ship did not carry a liquid cargo in these vessels, and was likely either carrying no cargo or one of an organic nature. A comparison of these shipwrecks from the same period shows a vast difference in site topography due to post-sinking natural and anthropogenic processes.

The Knidos F Shipwreck: A Medieval Merchant Vessel
Evren Türkmenoğlu

Knidos F, discovered during the 2010 E/V Nautilus expedition, lies on a sandy seabed at a depth of 370 m. The wreck was located to the north of the ancient site of Knidos, between the Datça peninsula and Kos. The debris field, made up of 506 amphoras, covers an area about 136 square meters and has a maximum relief of 0.52 m. The large number of intact amphoras indicates that the site has not suffered damage in modern times. The sediment that partially buries the wreckage suggests that the hull is in a remarkable state of preservation. Based on the identification of the amphoras, the ship is dated to the 11th century A.D. The main amphora type accords with Günzenin’s Type 1 and originates from Gaziköy (ancient Ganos), which is situated on the NW coast of Marmara, a region still known for its wine production. This type of amphora had a wide distribution along the Turkish coast, particularly from the Black Sea to the coast of Marmara. At least eight shipwrecks found during the Marmara underwater survey were carrying the same type. One of those shipwrecks, Tekmezlar I, whose cargo was loaded into an estimated 20,000 amphoras, is the largest Byzantine wreck found to date. The wide distribution of Günzenin Type I amphoras points to a well-organized and busy long-distance trade network from the Black Sea to the Mediterranean. The recent discovery of Knidos F represents the latest evidence of this network and will enrich discussions on the issue.

The Bodrum Live 2013 Expedition: A Model for Robotic Based Experiential Exploration

In August 2013, an international team of scientists, educators, and students embarked on a new model of mobile exploration in the Aegean combining underwater robotic systems and telecommunication. This approach utilized two new platforms, a small AUV (autonomous underwater vehicle) called DORA and the STS (sailing training ship) Bodrum. The goal was to fill in maps from previous expeditions, re-acquire several previously detected targets, and develop the protocols for safe and effective coordination of AUV operations and educational activities. DORA is a 500-meter depth-rated Gavia AUV that was used to map the seabed in depths ranging from 200-400 meters. The AUV was launched in shallow water (~ 60-100 meters) and programmed to follow a path downslope, bottom tracking from an altitude of 10 meters above the seabed. The combined 100% acoustic mapping coverage from the expedition missions was nearly 8 square kilometers. The AUV’s high-resolution sonars allowed the team to locate and identify objects on the seabed, including individual amphoras. In addition to re-imaging two previously known ancient wreck sites, the team found what may be two new shipwrecks, named Knidos AA and AB. The Bodrum Live 2013 expedition was designed from the
start with an emphasis on educational activities with four high school students, two educators, and four undergraduate and graduate students on board. Students and educators performed a variety of mission-critical tasks during the expedition, including AUV mission planning, vehicle launch and recovery, and data analysis. Students worked together to conduct research related to the history of the region and to develop an algorithm that solved a mission planning challenge involving efficient surveying of multiple target sites. Educational outreach included a variety of social media approaches including Twitter, Facebook, Vine videos, and blog entries from almost every participant on the cruise. Bodrum 2013 provided a useful and successful pilot study for a compact and portable exploration paradigm, one that combined advanced robotic systems concomitantly with hands-on, experiential education.

**Echoes from the Deep:**
**The Wrecks of the Dardanelles Campaign**  
Selçuk Kolay and Savas Karakas

Why is there such a lack of detailed information about the wrecks of the Dardanelles Campaign, one of the world’s most important naval battles, and why are these wrecks not open to recreational diving? If we consider the geographical position of the Dardanelles, several reasons may be offered—heavy sea-traffic, strong currents, deep depths, locations within prohibited military zones. Indeed, the wrecks are found not just within the Dardanelles, but also around Anzac and in the Sea of Marmara. Our research covers 33 wrecks from all of these areas, and includes the discovery of the French passenger ship Carthage, the British submarine E14 and the British minesweeper Renarro, all of which were located during the expedition and captured on film for the first time. The survey was carried out using new and sophisticated sonar technology called 3D Multibeam Sonar Imaging. Before this, due to the limited visibility underwater, it had never been possible to obtain the image of an entire wreck, but with this new technology we were able to produce a single image of each wreck in its current condition. This paper attempts to answer numerous questions regarding the wrecks and provides missing data.
ABOUT THE SPEAKERS

Gülşen Altuğ, Ph.D.
gulsenaltug@gmail.com

Gülşen is a professor in the Department of Marine Biology of the Fisheries Faculty at Istanbul University. She earned her B.S. from the Department of Biology at Cukurova University in 1984. She completed her M.S. and Ph.D. at the “Institute of Science” at Cukurova University in 1991 and 1995, respectively. Her research focuses on marine bacteriology, including bacterial diversity and micro-geographical variations, clinical, industrial and ecological uses of marine isolates, bacterial pollution, epibiotic bacterial communities and anti-bacterial characteristics, bacterial remediation (oil degrading capacity of marine isolates), and resistant bacterial isolates against heavy metals and antibiotics.

Michael L. Brennan, Ph.D.
mike@oceanexplorationtrust.org

Mike is the Director of Marine Archaeology and Maritime History for OET and Expedition Leader for Nautilus. Mike’s research focuses on environmental assessments of shipwreck sites ranging from ancient times to World War II. His past work has focused on documenting the extent and intensity of bottom trawl fishing damage to ancient shipwreck sites in the Black and Aegean Seas. Mike has been working on expeditions since 2006 and with Nautilus since 2009. His other research interests include excavations at Maya sites in northern Belize and employing geochemistry to source limestone from monuments to quarries. Mike graduated from Bowdoin College in 2004 with a degree in archaeology and geology, completed his M.A. in archaeology from the University of Rhode Island in 2008, and his Ph.D. in geological oceanography at URI’s Graduate School of Oceanography in 2012.

Jason Burns, M.A., R.P.A.
jason@searchinc.com

Jason Burns, head of the Maritime Archaeology Division of SEARCH, a cultural resource management firm, has over eighteen years of archaeological experience. A veteran of the U.S. Navy, Jason earned his B.A. at the University of Florida in 1996 and his M.A. in history/historical archaeology (with an emphasis on underwater archaeology) at the University of West Florida in 2000. His thesis, The Life and Times of a Merchant Sailor: The Archaeology and History of the Norwegian Ship Catharine, was subsequently published in the Plemum Series in Underwater Archaeology in 2003. Jason served as the first underwater archaeologist for the Georgia Department of Natural Resources, where he created a statewide program for underwater archaeology and ultimately became Deputy State Archaeologist. He is a subject-matter expert on 19th-century sailing ships and the archaeology of those site types.

José Luis Casabán, M.A.
jlcasaban@neo.tamu.edu

Jose is a Ph.D. Candidate in the Nautical Archaeology Program at Texas A&M University. His dissertation research focuses on the study of late 16th-century Spanish ship design and seafaring. He has also specialized in the archaeological applications of underwater photogrammetry, CAD, and GIS. After the completion of his M.A. in Post-Excavation Skills at the University of Leicester (UK) in 2000, he worked as a field archaeologist and surveyor in different CRM firms in Ireland and Spain before directing several archaeological projects both on land and underwater.

Dan Davis, Ph.D.
davida06@luther.edu

Dan earned his B.A. in Classics at the University of Iowa in 1996, his M.A. at Texas A&M University’s Nautical Archaeology Program in 2000, and a Ph.D. in Classics and Classical Archaeology at the University of Texas at Austin in 2009. He has eighteen seasons of experience working on underwater archaeological projects in the U.S., Europe, and the Mediterranean region, including Turkey, Italy, Greece, Israel, Ukraine, and the Republic of Georgia. His research interests include ancient navigation and seaborne trade, ship construction, ancient maritime culture, and harbor archaeology. Since 2006 he has served as expedition archaeologist with Robert Ballard and Michael Brennan, and is now an assistant professor in the Department of Classics at Luther College in Decorah, Iowa.

Savas Karakas
savaskarakas@iztv.com.tr

Savas Karakas, a native of Ankara, holds a B.A. in Economics. Starting his television career in 1995, today he is an award winning documentary producer (IZ TV, Turkey) who keeps track of his grandfather who fought at Gallipoli in 1915. ‘Gallipoli: History in the Depths’ and ‘Gallipoli: War beneath the Waves’ are just the two of his many documentary productions. He currently works for Turkish documentary channel IZ TV and hosts the series ‘Traces on Water.’
Meko Kofahl, M.A., Ph.D. candidate
meko.kofahl@gmail.com

Meko earned her M.A. in the Nautical Archaeology Program at Texas A&M University, where she is also currently pursuing her doctorate. Recent fieldwork includes three seasons aboard the E/V Nautilus working in both an archaeological and data processing capacity and helping to identify amphora and shipwreck finds. Prior experience includes Etruscan fieldwork at Murlo in Tuscany; surveying submerged Roman port sites in Minorca; and participating in contract archaeological exploration in the sites under Rome with Roma Soterranea. Her M.A. thesis traces the 6th-century plague via trade routes in the Mediterranean, using literary and archaeological evidence to more precisely identify its specific passage.

Selcuk Kolay
skolay@superonline.com

Selcuk Kolay, a researcher with Kolay Marine Ltd. (Turkey), was appointed as a board member of the Rahmi M. Koç Museum and Cultural Foundation. As the director of the museum, he worked on various research, salvage and restoration projects from 1996 to 2000. In 2000 he founded his own company and is active in international trade and underwater exploration. He is discoverer of many shipwrecks, including HMAS AE2, Ottoman light cruiser Midilli (ex-German Breslau), and the Turkish submarine Atîlay.

Karl Krusell
kwkrusell@gmail.com

Karl is a Ph.D. student in the Nautical Archaeology Program at Texas A&M University. Originally from Long Island, NY, he studied Classics and Mandarin Chinese at Middlebury College in Vermont. His research interests include Bronze Age archaeology, Aegean prehistory, ancient shipwrecks and maritime traditions, harbor archaeology, and Greek and Latin literature. His M.A. research focuses on early harbors in the Aegean and eastern Mediterranean. Recent fieldwork includes underwater excavations at “Old Knidos” in Burgaz, Turkey.

John Littlefield, M.A., R.P.A.
littlefieldjd@gmail.com

John earned his B.Sc. in Anthropology/Archaeology from the College of Charleston and his M.A. from the Nautical Archaeology Program at Texas A&M University (TAMU). He has earned certificates in Maritime Conservation from TAMU and Dendrochronology from the University of Arizona. He has worked on a number of terrestrial archaeological projects across the Unites States and Europe, and has been involved in underwater excavations and surveys in the United States, Turkey, and Italy. For the last eight years he has worked in the Mediterranean region, specializing in ancient ship construction, the transport of architectural materials during the Hellenistic and Roman eras, and wooden/metal shipboard technologies. Other research interests include dendroarchaeology, terrestrial and underwater methodologies, and experimental craft of the American Civil War.

Rachel Matheny, M.A.
rmatheny@neo.tamu.edu

Rachel earned her B.A. in Anthropology and Archaeology from Baylor University and a Master’s in Classical Archaeology at Oxford University. She is currently pursuing a doctorate degree in the Nautical Archaeology Program at Texas A&M University. Her thesis focused on Roman maritime trade, particularly the transportation of metal cargoes. Her doctoral research explores human agency within Roman maritime trade, particularly as reflected in the personal possessions of ancient Mediterranean sailors. In addition to having worked at terrestrial sites in central Texas and Italy she has also spent the past two summers working under Dr. Cemal Pulak studying artifacts from the Uluburun shipwreck.

Andrei Opaiţ, Ph.D.
aopait@gmail.com

Andrei earned his Ph.D. at the University Al. I. Cuza, Iassy, Romania in 1994. He has thirty-five years of experience in Roman pottery, working on ceramics discovered in Romania, Tunisia (Carthage and Leptiminus), the Crimea (Chersonesus and Pantikapeum), Greece (Athenian Agora, Chios), and Turkey (Pompeiopolis). Since 2011 he has collaborated with Dr. Robert Ballard as expert on pottery discovered on shipwrecks. His research interests include the Roman economy, seaborne trade, amphoras and coarse ware. He now works as a freelance pottery expert.

Clara Smart, M.S.
clarajsmart@gmail.com

Clara earned her B.S. in electrical engineering at Northwestern University, her M.S. in ocean engineering at the University of Rhode Island (URI), and is now working toward her Ph.D. in ocean engineering at URI. She currently works with Dr. Chris Roman developing techniques and sensors for high resolution seafloor mapping. Clara’s work includes detecting active diffuse seafloor venting using the structured light laser sensor as well as developing tools and scientific data products associated with the still camera system. Since 2011 she has worked aboard E/V Nautilus as both a navigator and mapping specialist.
Art Trembanis, Ph.D.
art@udel.edu

Art is an associate professor at the University of Delaware where he is the director of the Coastal Sediments, Hydrodynamics, and Engineering Lab. His research focuses on coastal morphodynamics and seafloor mapping, and involves the development and utilization of advanced autonomous underwater vehicles (AUVs). Art graduated from Duke University with a degree in geology with honors and completed his Ph.D. in marine science at the Virginia Institute of Marine Science (VIMS), College of William and Mary following a year spent in Australia on a Fulbright fellowship.

Evren Türkmenoğlu, Ph.D. candidate
t_evren@hotmail.com

Evren is pursuing his Ph.D. at Istanbul University and working as a research associate in the Division of Conservation of Marine Archaeological Objects. A specialist in the archaeology of Mediterranean ships, particularly those of medieval date, he has participated in several field projects, including those at Tektaş Burnu, Pabuç Burnu and Çamaltı Burnu in Turkey, and at Bajo de la Campana in Spain. He recently worked for Istanbul University’s Yenikapi Shipwrecks Project and is responsible for the publication of two wrecks, YK17 and YK27.

Derya Ürkmez, Ph.D. candidate
deryaurkmez@gmail.com

Derya Ürkmez is a research assistant and Ph.D. candidate at Sinop University, Faculty of Fisheries, where she is in charge of leading the laboratory studies at the Benthos Ecology Lab. Her research focuses on meio-benthos ecology and particularly deals with the ecology and taxonomy of free-living marine nematodes in the Black Sea. She is a member of the European Society of Nematologists (ESN). Derya has participated in and worked on several international projects on the ecological status of the Black Sea and marine protected areas. She has presented at several international workshops, conferences and symposia, and has received numerous grants and awards, including the “First place among young scientists” award, given at the Micropaleontology, Microbiology and Meiobenthology Congress (EMMM 2011) in Moscow.
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