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BOOK OF ABSTRACTS



1. Lightweight Construction of an Athenian Trireme: A Feasibility Study

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Greek Triremes, if built of thick planks with mortise and tenon (M&T) joints as current scholarship presupposes, were inevitably heavy, whereas the sources indicate that they were lightweight. This study examines the feasibility of building a lightweight trireme by another method, sewing, or lacing, which coexisted with M&T. Motivation for exploring an alternative to M&T arose from performance trials on the *Olympias* trireme replica which fell considerably short of the assumed performance. The reduced speed of the oaring propelled vessel was attributed to resistance due to its excessive weight. A more direct indication of lighter weight triremes is ship maintenance performed by beaching during daily-weekly intervals. Beaching a ship with the dimensions of the *Olympias* had to be somewhere between formidable to non-feasible, a fact giving credence to the lightweight laced planks solution. A computer model of a trireme hull made of laced thin planks and a robust skeleton was built, using the *Olympias* replica as a model. Finite Element Analysis of this hull in a hogging test-case shows that it is adequately strong; and it weighs about half as much as the hull of the *Olympias*. Lightweight laced triremes were technically feasible, whether they were actually built that way remains an open question until naval archaeology finds the answer.

2. Navigation and Maritime Trade Networks in the Aegean from 9th to 13th Century AD: The Evidence of Shipwrecks

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Shipwrecks are an important source material for studying socio-economic and maritime history, as they provide sufficient data regarding the nature of maritime networks and the patterns of commercial activity. This work attempts to identify the complex trade activity in the Aegean Sea by studying approximately 60 byzantine shipwrecks, mainly from the Aegean but also from the connecting seas such as the Adriatic and the Black Sea, dating from the 9th to the 13th century CE. To this end, a two folded analysis of the nature of shipwrecks has been performed. First as self-contained entities, studying the ship itself, its cargo, and its deposition on the seabed, and then as collective data with careful examination of the spatial distribution and the relation to anchorages and harbours along the coastlines. Preliminary results indicate that approximately 20% of the total amount of shipwrecks in the eastern Mediterranean date to the period under examination which is historically characterized by an increase in agricultural and artisanal activity, thus the number of products circulating through the seas is higher than the previous period. By mapping the evidence, useful observations about the circulation of certain types of amphoras and glazed table-wares can be made and certain geographical regions with high concentrations of shipwrecks can be further investigated. This work attempts to gather all the known shipwrecks from the period under examination and create a catalogue that hopefully will be enriched with new data in the following years.

3. Potential Sailing Mobility in the Eastern Mediterranean: Westbound Bottlenecks and Cross Wind Opportunities

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A recent PhD research has developed new methods for measuring potential sailing mobility of Mediterranean merchant ships in Antiquity, both for direct sailing passages and for breeze assisted coastal sailing. Most previous quantitative works have evaluated sailing passages using averaged wind, consequently losing details of the characteristic variability of Mediterranean winds. Their sole measure of mobility has been a representation of sailing speed on direct crossings. Moreover, these Mediterranean studies have not considered the effect of human factors on mobility, for instance, the choice of whether to sail or to wait for better conditions. The developed methods use meteorological resources at the highest spatial and temporal resolutions to expose the recurring wind variabilities and patterns which are the key to potential mobility. The methodology converts meteorological 'big data' in the order of billions of records to millions of simulated sailing passages, providing a basis for statistical analysis of potential sailing mobility. Inclusion of criteria-based human factors, i.e. the assumed preferences and limits of the mariners of the period, provides practical measures of mobility, representing not only sailing speed, but also, time spent waiting for favourable winds and the probability of conducting feasible passages at given times of the year. In the eastern Mediterranean basin, these methods have been applied to explore the difficulties of westbound sailing during the summer season facing contrary Etesian winds. Both direct passages and breeze assisted coastal sailing have been examined and mobility bottlenecks have been identified. Conversely, the mapping of potential sailing mobility has also exposed opportunities for crosswind passages under the effect of the same Etesian winds, leading to deeper understanding of mobility factors in regional maritime trading links.

4. Reassessing Polybius' Account of the Battle of Aegates (241 BCE) Using Underwater Material Culture

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According to the historian Polybius, the Roman Republic had no warships at the start of the First Punic War. Faced with fighting a veteran maritime power, the Romans had no option but to build their own navy. Polybius writes that the inexperienced Roman shipwrights built, a class of warship, quinqueremes by copying Carthaginian designs. Quinqueremes were heavy galleys rowed by oarsmen arranged in units of five. Each warship was armed with a piercing bronze rostrum or ram, in essence a human-powered ship-to-ship projectile. The decisive naval action concluding the war was the Battle of the Aegates (241 BCE), off Northwest Sicily. Here the Roman fleet destroyed the Carthaginian fleet attempting to resupply their besieged soldiers in Sicily. In 2004 a bronze ram, which had been discovered by fishermen, was confiscated by the authorities in Sicily. This chance find led to a systematic archaeological survey off the Egadi Islands, Northwest Sicily, by RPM Nautical Foundation and the Soprintendenza del Mare Siciliana. Their methodology has proved fruitful and since 2005 twenty-five more rams have been discovered on the seabed, a unique discovery of an ancient naval battlefield site. Prior to 2004 only three main rams were known and are extremely rare. However, these new finds have raised many questions as the recovered rams are all similar in size, mostly Roman and seem to be too small to be from a quinquereme. This paper will assess whether Polybius exaggerated the size of the warships, or whether there could be other reasons to explain the deposition and discovery of rams pointing to smaller warships. The understanding of classes of ancient warships is a debatable matter. Indeed, the evidence offered by the rams discussed in this paper contributes to archaeologists' understanding of warship design. However, the fact that these rams result from warships which did not survive the battle, may have produced a reverse survivorship bias.

5. Indian Rouletted and Associated Fine Ware Ceramics from Pattanam

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This paper titled Indian Rouletted ware and associated fine ware ceramics (IRWAC) from Pattanam is a first-hand study. Maritime connections between the Mediterranean, West Asian, Southeast Asian, and North Indian regions can be traced from Pattanam, the first Early Historic site in Kerala. The nine-season excavation at Pattanam has revealed that it could be the ancient port of Muziris, which was mentioned in Greek and Roman literature and maps, such as Periplus of the Erythraean Sea, Pliny's Natural History, Ptolemy's Geography, Muziris Papyrus, and the Peutingerian Table map. Indian Rouletted ware and its associated fine ware ceramics are the only material evidence representing the long-distance contacts and cultural exchanges within the Early Historic Indian peninsula and the neighboring regions. Indian Rouletted ware (IRW) was first identified by Sir. IRW got spread across the Indian peninsula because of the extensive networks and exchange activities. From 2007 to 2015 nine seasons of excavations, a total of 61 trenches were excavated and a total of 12030 sherds of Indian Rouletted and associated ceramics were exposed. In this paper I put forward the hypothesis that, the distribution pattern of the IRWAC in the trenches shows that Indian rouletted ware and associated fine ware ceramics, especially IRW ceramics, arrived at Pattanam earlier than the Mediterranean and West Asian contacts. To substantiate my arguments, I have looked at distribution pattern of IRWAC in trenches with other associated artifacts while using scientific dating methods. XRF analysis and typological comparison between Arikamedu Wheeler classification is also part of this study. The Wheeler Type 1, Type 2, Type 3, Type 10, Type 18, and Type 141 are also available in Pattanam, which are also typologically comparable to finds reported in other Early Historic Indian Ocean maritime sites.

6. Pots, Beads and Blanks: Link between Mediterranean Basin and the Early Historic Settlement of Pattanam, India

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Archaeological excavations in port sites along the Indian Ocean littoral have generated an exponential surge in new maritime data. The Indian Ocean maritime network which emerged in the last centuries of the first Millennium BCE and first centuries of the first Millennium CE, points to long distance trade as one of the significant proxies of human history. Pattanam (identified as the ancient port of Muziris), a coastal site situated in the southwest coast of the Indian subcontinent has produced a plethora of artefacts belonging to the Indian Ocean, Red Sea and Mediterranean littoral, indicating an extensive trans-oceanic network in the early historic period (3rd c. BCE to 5th c. CE). Foreign travelers' accounts give us a clear insight into the settlement's interactions with the Mediterranean region. In this paper, the author attempts to investigate the artefacts of Pattanam, indicating Mediterranean connections and further probe into the variety, purpose and function of these assemblages. The importance of Mediterranean connection is underscored by the presence of amphora sherds, terra sigillata, torpedo jar sherds, intaglios, cameo blanks, roman gaming counters and roman glass fragments. Analysis of these Mediterranean artefacts of Pattanam based on their provenance and typological similarity provide insights to understand the two-way trans-oceanic links of the early historic period. This study shows the utility of studying Mediterranean artefacts as means of examining long-distance trade and connectivity during the early historic period.

7. Boat Models as Libation Vessels

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Small boat models are ubiquitous in archaeological sites from antiquity. Often these small and intricate creations are found within funeral contexts, and they are assigned a relatively ambiguous function as a funerary votive. Yet, these models are also found in other locations such as temples and kiln dumps, suggesting they serve in other settings in addition to their use in grave sites. The use of libation in funerary practices further supports their potential as libation tools in other traditions. A phiale, or libation bowl, is found in iconographic representations of ritual and sacrifice in Greek temples. The ritual of libation involves purposeful pouring of a liquid in an act of deference to a deity. The pouring of a liquid ensures it cannot be reused or regained. Unlike animal sacrifice, no remains can be salvaged and used for future sustenance. Ship-shaped rhyton, Bronze Age vessels often used in libation rituals, are found often in the archaeological record. Rhyta are thought to be important and suitable vessels for ritual libation, but recent studies suggest that other types of vessels may serve as appropriate tools. This paper explores the role of small boat models as libation vessels used in ritual contexts.

8. From Loss Compensation to Fabric Contextualization: Characterization of the Çamaltı Burnu I Shipwreck Amphora Assemblage Through A New Integrated Methodology

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The Çamaltı Burnu I Shipwreck amphora assemblage, located in the Bandırma Archaeology Museum in Bandırma, Türkiye, is a collection of over 800 homogenous amphorae excavated from the Sea of Marmara. My research focuses on the study of this assemblage through the integrated workflow of photogrammetry, ceramic petrography, 3D modelling, and 3D printing. The development of this methodology emphasizes the multifaceted benefits of each step of the process, from documentation to analysis, interpretation to conservation. The photogrammetry-based documentation is multipurpose: ensuring the preservation of material lost due to the inherently destructive nature of ceramic petrography, while making further avenues of research available, including the utilization of the 3D models to study the lading of the ship. I apply ceramic petrography to contextualize the fabric, forming, and firing of the amphorae and examine the microscopic nuance in what at first glance appears highly homogenous to the human eye. Lastly, I implement 3D printed loss compensation to fill both the damage extant in the amphorae as well as produced through the sampling required for ceramic petrography. I take the information from both the photogrammetry models of the amphorae and the results of the ceramic petrography analysis to provide the basis for the ceramic 3D printed fills. This 3D printed loss compensation is sensorised to reflexively monitor the stability of the amphora and the state of conservation. In short, my development and application of this methodology integrates the inherently destructive but valuable analysis of ceramic petrography with photogrammetry and 3D modelling documentation and a pioneering application of 3D printing conservation.

9. Graffiti Cargo Jars from Çamaltı Burnu I Shipwreck

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This paper forms the central part of the author's ongoing MA thesis, which focuses on the graffiti on Günseñin Type IV amphorae recovered on Çamaltı Burnu I Shipwreck from the Medieval Age. The primary objective of this thesis is the interpretation of the unpublished material of the 13th century shipwreck with the help of earlier studies from Serçe Limanı, Yassıada, Yenikapı and Novy Svet Shipwrecks. Çamaltı Burnu I Shipwreck sunk in the Sea of Marmara during the Latin invasion of the Byzantine Period. Nevertheless, the absence of carpentry tools and defense weapons lead us to believe that this ship was making a small-distance journey. During that period, wine production was way different than in earlier periods. The wine was produced by monasteries and dependent villages and was consumed locally, but the production surplus began to be sold for profit. Although written documents state that the monasteries carried out the production and commerce of wine, these texts do not reveal anything about the organisation of production and commerce, as they concerned amphoras related to viticulture. Most likely, the monasteries did not wish to declare their income to the central administration. Furthermore, it seems that the studies on the inscriptions and stamps on the amphorae did not reach a level of standardisation like in the Hellenistic Period. However, it still gives us essential pieces of information. Therefore, this paper aims to discuss what their role was in the trade and the movement of goods in the sea of Marmara, as well as their relationship with the capital city and monastic estates that are spread around the sea of Marmara.

10. Portoscuso-type Amphorae as an Indicator of a Commercial Circuit

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The Portoscuso-type amphorae, identified for the first time in 1990 when the Necropolis of San Giorgio was discovered, testify to a Phoenician presence in Southwestern Sardinia starting from the 8th century BC. As transport containers, these are a proof of the inclusion of this geographical area in a commercial circuit. From a morphological point of view, the Portoscuso-type amphorae are similar to the T-3.1.1.1. in Ramon Torres' classification and to the B2 described by Bartoloni. For this reason, it is believed that in the past they may have often been misclassified under these two types. In fact, only the peculiar shape of the rim and the ceramic paste contribute to distinguishing them apart. In the Portoscuso-type amphorae the rim is internally straight and slightly shaped on the outside, while the ceramic paste is described by Ramon Torres as "[...] rojo rosado fuerte por el interior y marrón anaranjado en la cara externa. Presencia de minerales blancos, posiblemente calcite [...]". The objective of this work is a more accurate study of the ceramic paste, through the use of macro photography applied to the specimens found in the site of San Giorgio in Portoscuso, which could be decisive for a more precise recognition of this ceramic class. To this date, examples of Portoscuso-type amphorae are attested in Sardinia, as well as in the Italian peninsula and in the island of Utica. However, the possibility that Portoscuso-type amphorae are present in many other sites in the Mediterranean is not remote and their identification will allow to define with ever more precision one of the commercial routes which, in the 8th century BC included the Southwest of Sardinia and its products.

11. Dive Into Storerooms and Correspondence: A Review of the Underwater Site of Nido del Cuervo (Murcia, Spain)

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The underwater site of Nido del Cuervo (Aguilas, Spain) was discovered in 1977 following an attempt by divers to steal remains from the seabed. On that occasion, ceramic artefacts and 15 stamped lead ingots were recovered. The site was interpreted as a Roman shipwreck, even though a comprehensive analysis has never been carried out. The aim of this study is to typologically and chronologically characterise the site, while contextualising it within the associated maritime landscape and within the commercial maritime trades of the western Mediterranean Sea. The multidisciplinary approach is based on the analysis of artefacts and archaeological reports, as well as epigraphic, cartographic, and toponymic studies, combined with the examination of weather, sea, and nautical conditions. The archaeological materials consist of amphorae Dressel 1C, Dressel 7/11, Dressel 2/4, Almagro 51C, and Africans, stoppers, stamped lead ingots, and a lead anchor. Even if some recovered artefacts have never been found in the museum's storerooms, and others were added to the collections in the following decades as donations made by private individuals, the results point out to the multi-stratigraphic nature of the deposit. Part of the artifacts (lead ingots, an anchor, and Dressel 1C amphorae) confirms the presence of a Late-Republican shipwreck, presumably a small redistribution boat sunk between the second and third quarters of the 1st century BC. Whereas the heterogeneous ensemble of ceramics, dated from the end of the 1st century BC to the beginning of the 7th century AD, represents most likely a dispersion of objects displaced by currents from the nearby anchorage point in Hornillo bay, and testifies to the intense and long-lasting frequentation of the Aguila's coast.

12. Looking Under Water at the Museum. Late Punic and Early Roman Material from the Area of Sancti Petri (San Fernando, Cádiz)

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The coastal area of Sancti Petri, at the southern end of the Gadeira, has been one of the backbones of underwater research in the Bay of Cádiz since its early stages in the 1970s. The remains unearthed in the test-pits excavated on the islet of Sancti Petri in 1985 and later, during the restoration of the modern-era castle (2009), as well as several findings from the underwater surroundings, indicate that this point was first settled at least since the 7th century BC, although with greater intensity from the 5th century BC onwards. This paper focuses on the Late Punic and Early Roman items found on the islet of Sancti Petri and the nearby areas, stored in different museums across the bay, which can be dated between the 3rd and 1st centuries BC. It is a heterogeneous set that include items donated to museums, isolated finds and the results of salvage excavations which, to date, have been poorly published and dispersed in the scientific literature. Most of the finds are local and imported transport amphorae fragments, but on the tiny island a more diverse assemblage has been identified, including table and cooking wares, and also indicators of mudbrick structures. The items examined provide the first explicit data on the settlement pattern and the maritime trade in the region during the late 1st millennium BC, one of the most prosperous and important periods of the bay in economic and commercial terms. Consequently, this fresh data allows to reflect on the connection of Sancti Petri with nearby cult and craft facilities, as well as on the evolution of the seascape and the ancient sea level in this area.

13. The Ancient Harbor of Lechaion: A Preliminary Study with Parallel Examples in Shape and Space

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The Ancient harbor of Lechaion is situated 3 km north of the ancient polis of Corinth (Greece). The largest part of the harbor that played an important role in the colonization and commercial expansion of the city is still undiscovered. However, few investigations from the past offer some interesting information about its shape and space. According to Blackman, the harbor of Lechaion shares some similarities with another important harbor of Antiquity, the port of Carthage. The second, according to Strabo, is a kothon with specific characteristics concerning its space and use. While Strabo does not mention other ports with this name, there are similar examples in the Mediterranean and, to a lesser extent, in the Aegean. In this paper an attempt is made to reconstruct the form of the port of Lechaion, through the bibliographic sources, previous studies, as well as through the comparison with ports of similar form. The aim is to provide a comparative approach of the harbor of Lechaion and discuss its similarities and differences with "cothon" and "kleistos limenas" (closed harbors) type of harbors, in order to exclude some conclusions concerning its shape, its organization of space and its harborworks.

14. Roman Port Facilities: Role Significance, Structure and Construction

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Roman Empire dominated the Mediterranean Sea since the end of the Punic Wars and until the end of Late Antiquity. During this period, the Roman ships travelled around this semi-closed sea, carrying and spreading merchant products, transporting people and ideas and introducing an early form of globalization. A cornerstone of this coastal navigating procedure was the existence and the function of the Roman ports. Throughout this epoch, the ports were overwhelming in the Mediterranean region, forming a sea-network that covered an area of 2.500.000 km² and transforming this sea to the Roman *mare nostrum*. The infrastructure of the Roman merchant ports was the result of a technological and constructive evolution that began in the Mediterranean since the Bronze Age. The Romans, having the clarity to understand the value of the port heritage of the Mediterranean and the foresight to develop it, flourished, creating a maritime empire with the Mediterranean ports as its foundation. On the other hand, the Roman naval ports contributed to maintaining peace and were conducive to the prosperity of the Mediterranean region. A main asset of the Roman port construction technique, in comparison with the previous ones, was the use of the *Opus caementicium*, the famous, innovative and longstanding Roman concrete. The study of Vitruvius' deeds and the remnants of the port facilities enlighten our knowledge about this structural raw material and aroused the admiration of the contemporary mechanics and architects. The act of explaining and interpreting the role, the construction and the infrastructure of the Roman ports is a highly topical issue concerning the Mediterranean maritime cultural heritage.

15. The Ports on the Southern Coast of Sicily in the Roman Republic

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Ports were places of exchange then, as they are today, connecting different cities and regions by sea or river. The militarily and economically favourable location in the central Mediterranean region made Sicily the focus of various groups, such as Punic or Greek settlers, as early as the late Bronze Age or early Iron Age. While the spheres of influence of the settlers as well as the indigenous population changed several times between the 8th and 3rd centuries BC, the territorial conditions remained relatively constant after the First and Second Punic Wars due to the Roman takeover. It is this time of supposed stability which brought some of the biggest changes in the maritime urban landscape of Sicily's southern coast. To find out which factors influenced this development, selected harbours between Lilybaeum and Kamarina shall be looked at with special regard to their functionality and their influence on settlement continuity/discontinuity from the 3rd to the 1st century BC. This region, situated on the sea route between the western and eastern Mediterranean, is an ideal field of research for an investigation of the effects of the Roman takeover on a regional hierarchical system of port cities because of the large number of poleis. This paper aims to show how this topic shall be tackled methodically in the course of this on-going PhD project, which shall not only give answer to the question why some cities were further used, promoted or favoured while others were not, but shall also present a concept that can be applied as a model to the study of other regions of the Mediterranean.

16. Early Modern Archival Data from Kotor Archive in the Reconstruction of Maritime Trade and Harbors

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In this research I focused on early modern archival data from Kotor Archive (where the oldest mostly of juridical and administrative documents in nowadays Montenegro are stored). Following the results of some comparative studies (Houston 1988), it appears that some aspects of preindustrial societies are similar (author compares harbor facilities and merchant vessels from Roman Empire and preindustrial London, 19th century). The main goal of this research was to collect and analyze data related to the craftsmanship of the area of the Bay of Kotor and surroundings before the industrial revolution, while trying to reconstruct the maritime trade/trade network on the Adriatic, together with the locations and capacity of harbors. Traded goods, mentioned often in archival documents, are also a focus of this research, since they are indicators of the economy of the region. Considering that the most common exported goods mentioned in the documents are dairy products, salted fish, wax, but also resin and tar, wool, animals' skins, and different wood types, it can be concluded that the economy is dominantly rural (based on rural products/raw materials). Indications related to harbors of the area can be obtained as well through the study of these archival documents (harbors' capacity, e.g. the harbor of Rose, situated at the entrance in the Bay of Kotor, or mentions of some sites not yet recognized as harbors). The aim of this archival research was also to check if there is data regarding a possible harbor situated in the bay in which recently has been discovered a shipwreck (that unfortunately has not been studied but buried without known coordinates).

17. The Urban Layout of Harbour Cities of the Iberian Peninsula: Towards the Relationship of Harbour and City

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My work aims to present an overview of the harbour cities of the Iberian Peninsula from the 2nd century BC to the 5th century AD. The primary focus of the study is to understand how access to the sea shaped these cities. Through a systematic analysis, specifics and commonalities will be identified on different levels, which will enhance our understanding of the physiognomy and function of these cities. On a macro level, the long-term perspective of my work allows for observations of developments that are relevant to our understanding of the interplay of harbours. On the micro level, the comparison allows us to draw conclusions about everyday life in the individual harbour cities. For this purpose, the cities will be examined based on two approaches. One focusing on the urban layout and the other focusing on the agents connected to the cities. The interplay of these two perspectives, which is what I refer to as physiognomy in my work, makes it possible to better grasp the entanglement between harbour and city. In this paper I stress my methodology regarding the examination of the urban layout of the cities. By means of a functional space analysis, I aim to highlight the architecturally developed structures like storage and commercial premises as well as religious, administrative and public buildings. These are placed a spatial relationship within the cities in order to be able to evaluate their function, and the quality of their location in regard to the sea and the harbour. In this way, overarching architectural concepts can be made visible and analysed in terms of their significance.

1. Spilling the Beans - An Archaeobotanical Approach to Reconstruct Past Environment and Agrarian Practices of Coastal Neolithic Communities in the Central Levant, Tabarja Wata Slam 100

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Archaeobotanical research in the Central Levant, or what falls within the borders of modern Lebanon, has long been hindered by a slowdown in archaeological excavations, a disregard for plant remains sampling, a paucity of the relevant data and an absence of national expertise to analyse it. Indeed, no study of early agriculture via an archaeobotanical approach has been undertaken in this inherent part of the Fertile Crescent so far. Tabarja Wata Slam 100, a large-scale systematically excavated site, located on the Lebanese coast, dating back to the Middle and Late PPNB (8164 Cal BC - 6593 Cal BC) as well as to the Pottery Neolithic (Yazbeck et al. 2020), has yielded a remarkable amount of charred plant remains. Among them, cereals comprising emmer, wheat and barley, in addition to pulses comprising peas, vetches and fava beans, were uncovered from a combustion pit dating back to 8725 ± 45 BP (7884–7604 Cal BC) (Yazbeck et al. 2020). Two complementary archaeobotanical disciplines, Anthracology (the study of charcoal) and Carpology (the study of seeds and fruits), are mobilised to reconstruct the environmental and socio-economic parameters of the first neolithic agrarian societies in the Central Levant and to study the way various crops – whether annuals or fruit trees – were successively integrated into the local diet. Ethnographic observations will also be undertaken to remodel agrarian practices of village communities living in a coastal environment, in terms of seasonality, water resource management, crop processing and the possible diffusion of cultivated plants. Local sampling of modern flora is underway to allow a comparison with charred plant remains and to develop a phytogeographical and phytosociological overview. The resulting botanical material will hopefully constitute a threshold for setting a modern and archaeological reference collection for future archaeobotanical research in Lebanon as well as the eastern Mediterranean.

2. Beachrock Along the Mediterranean Coast of Israel: Geoarchaeological Aspects

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Beachrocks, composed of intertidal-associated sediments rapidly cemented by calcium carbonate, have important implications for understanding coastal morphological processes. The Mediterranean coastline of Israel exhibits abundant beachrock occurrences, characterized by linear, parallel to shore, outcrops with distinctive typical morphology. In the archaeological context, beachrock was used for various purposes (e.g. grinding devices, construction material, ship's ballast). Archaeological materials are often found consolidated within beachrock. This study focuses on selected beachrock outcrops that formed since the sea reached its present level about 4,000 years ago. Local morphology, sedimentology, facies variability, and diagenesis ages show important differences between beachrock outcrops along the Israeli coastline. The current state of beachrock morphology of selected sites on the Sharon coast is based on field measurements, field-related interpretations, petrographic and sedimentological data. Previously published data and new OSL ages of beachrock samples provide a temporal benchmark (ca 1,500–1,000 years before present) for burial of unconsolidated beach sediments at the former foreshore. Beachrock finds of the Byzantine–early Islamic periods from excavations at Yavne revealed a sophisticated industrial compound. This is the first evidence from the Israeli coastline of using beachrock plates as a major raw material for construction. It is suggested that the beachrock was chosen for its suitability, due to the easy and low cost necessary quarrying and transportation. These observations add to the understanding of the evolution of sandy beaches, and the use of beachrock as a proxy for inland–coast economic interactions in Antiquity.

3. The Maritime Cultural Landscape of the Western Pagasetic Gulf, Greece, During the Late Roman and Byzantine Periods

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As a notion, Maritime Cultural Landscape (MCL) embodies the combination of different methodologies to better interpret and examine the archaeological context of an area through the perception of the people that inhabit it. In this presentation, the Maritime Cultural Landscape of the western Pagasetic gulf, located in central Greece, is presented, with particular focus being paid on the south-western coastline and the concentration of shipwrecks and wreck-sites located there that date to the Late Roman and Byzantine periods, in an attempt to place them in the general landscape. The Pagasetic gulf has witnessed a significant amount of maritime movement during the aforementioned periods, with the rise of important hubs of maritime activities such as the port cities of Demetrias, Thessalian Thebes and Almyros. It was considered interesting to try and employ the notion of the MCL to this area to try and better understand the landscape that people perceived and how they navigated inside it. To better examine the Maritime Cultural Landscape in the area, different methodologies were employed. Since winds and currents are major factors that dictate sailing and navigation, meteorological data was collected, from stations inside the gulf and were processed to provide the information concerning the general wind and wave movement of the gulf. Furthermore, with man being at the epicenter of the MCL, important in this study was the small-scale ethnographic research that took place and provided contemporary evidence that complement the study of the archaeological material. To conclude, the Pagasetic gulf is an interesting area to study through the lens of the Maritime Cultural Landscape and try to draw out the people's use and interaction with their environment and their perception of it.

4. The 4th Millennium BC on the Western Black Sea Coast and the Submerged Sites at Ropotamo and Sozopol

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My PhD focuses on the 4th millennium BC Balkan peninsula and specifically on the submerged prehistoric settlements of Ropotamo and Sozopol. The transition from the Late Chalcolithic (LCA) to the Early Bronze Age (EBA) is a period of great change with a gap in C14 dates of several hundreds of years. The archaeological records for these two periods differ drastically from one another. By the end of the LCA, there is evidence of a very complex social structure which relied mostly on agriculture with a vast network of connections and trade that spread from the Aegean to Central Europe as well as advanced metalworking and craftsmanship. In comparison, the EBA is highly different, characterised by flat isolated settlements with predominant stock-breeding traditions and a more mobile way of living.

Ever since the gap was identified there have been debates among scholars on the reasons for this drastic change in the way of prehistoric life. The predominant reason being attributed to climate change and fluctuations of the sea level.

With this archaeological background comes the rationale behind this research. The aim is to enrich our understanding of the 4th millennium BC on the Balkan peninsula by answering a very specific research question: is there evidence of climate change in the submerged prehistoric sites at Ropotamo and Sozopol. If so, what is the nature of such change and how were the inhabitants of those settlements affected by it during the 4th millennium BC? The aim is to gather qualitative and quantitative data from submerged prehistoric sites that will give an irrefutable answer to that question. It will be done through underwater excavations with very a high-resolution documentation and interdisciplinary research. The results of this will be combined into a complete image of the past.

5. Navigation and Maritime Trade in Ancient Times in the Strait of Gibraltar: A First Approach

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The subject of this research is navigation and maritime trade in the Strait of Gibraltar, a space that has stood out throughout history as a privileged nautical point; a crossroads of navigation routes widely used from prehistoric times to the present day. The historical context is from protohistoric period to the end of Antiquity. The issue and justification for the research lies in the fact that maritime culture has traditionally been studied by looking at archaeological findings on land, without taking into account navigation and its characteristics in order to analyse coastal and underwater sites. It is therefore necessary to catalogue and analyse underwater cultural heritage from a nautical and maritime perspective. That is, looking at the ability of human beings to navigate as a source of wealth and as an engine for the growth of coastal settlements, shaped by the needs of ships and sailors, and not the other way around. The first objective of my PhD thesis is to identify the underwater archaeological heritage in the study area. To do so, the first task is the preliminary research that I present in this paper, a state of the art carried out after consulting the available bibliography and documentation, from the beginnings of underwater archaeological research to the present day. The result is a catalogue of underwater sites and findings, categorising them according to their chronology, circumstances and date of discovery, source of information and spatial relationship with the natural and cultural environment. The results obtained lead to the elaboration of graphs and maps that allow the findings to be statistically and spatially related for its analysis. Therefore, this work is not only a state of the art, but also an update of it, which raises a set of questions that will determine the next stages of the research.

6. Management of Beached and Intertidal Shipwrecks

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Tidal motion, sediments transportation, coastal erosion and exposure duration are some of the challenges influencing decisions making related to the management for shipwrecks in intertidal zone. The management process of these unique sites requires multidisciplinary approaches, in order to create and adapt a suitable management plan for each site individually, based on each site's unique conditions and its surrounding environmental conditions. Also, each site has its own unique opportunities to survive, despite its existence within these special circumstances. The presence of archaeological and cultural heritage remains in this dynamic zone subject it to various types of natural and cultural threats. Management of maritime cultural heritage in the era of blue economy and ocean decade have to take into consideration dealing with the conflicts that result from sites' locations and marine activities which relate to marine spatial planning process. Also, management procedures should aim to achieve sustainable development goal of sustainable tourism and maritime cultural tourism. This research looks at several cases and examples of archaeological and historical sites, which are subject to different conditions and circumstances from around the world, in order to define various challenges, opportunities and management procedures that could be conducted in each case based on its own conditions and requirements. Also, this research determines challenges, threats and opportunities of a specific case study from the Red Sea coast of Egypt.

7. Insights Into Wooden Ship Construction and Maritime Activities in the Early 20th Century. A Shipwright Family From Crete to Limassol

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This paper discusses the recently studied archival evidence on the wooden ships made by the Denizer family, with the aim to better understanding the wooden ships and their place in the social and economic context of the early 20th century in Limassol, Cyprus. In the first half of the 20th century, wooden ships were predominantly used for fishing and the transportation of goods in Cyprus. Several studies so far demonstrated the general typology, specific functions, and technical details of these ships. On the other hand, up to today, only a limited number of studies have touched upon the shipwrights and looked at the wooden ships from the perspectives of their constructors. Undoubtedly learning about these skilled craftspeople plays an important role in understanding certain material culture and social and economic contexts in studying ships and shipwrecks. Therefore, the presented study focuses on a family who came from Crete to Cyprus and brought their skills and family tradition to Limassol during the British colonial era of Cyprus. By studying family history through semi-structured interviews, family photos, archives, and personal notes from the family members, the study revisits certain maritime activities in the era within their economic, social, and political context. Furthermore, shipwrights and their material culture and identity through certain ships they constructed, such as the biggest ship of the family, which was even mentioned in the obituary of the family members are also visited in the paper. Overall, through a detailed study of one of the shipwright families of the first half of the 20th century in Limassol, this paper brings a new aspect to the wooden ships and their material culture in maritime heritage studies of Cyprus.

8. The CIDOC CRM Modelling Example of Koules Fortress Exhibits

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This paper aims to describe an example of semantic modelling cultural heritage information and data from the historical site of Koules Fortress, which is located at the center of the old port of Heraklion in Crete (Greece). The paper discusses the process of semantically representing the exhibits that are housed inside the fortress and are accessible to the public. This semantic model is going to be developed based on the CIDOC Conceptual Reference Model (CRM), which is an open format theoretical and practical tool that allows cultural heritage data to be expressed through semanticized scenarios. These scenarios transform the data into entities in ontologies and they can be implemented in RDFS, OWL, on RDBMS and in other forms of encoding. The CIDOC CRM aims to unify and interconnect digital cultural information and achieve a more comprehensive public access through the web. Thus, through this semantic modeling, the information of the exhibits of each cultural space, and in the specific case of the exhibits of the Koules fortress, will be open to the researchers and the interested public, providing them with a high level of integrity and information.

9. Non-Destructive Methodology for Analysing the Land-sliding Impacts on Maritime and Underwater Stones

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A large part of the architectural and structural heritage of the ancient cities was built on the coast, especially in the Greek and Roman eras. Land-sliding affected the structure of many buildings which in many cases became partially submerged. The topographical changes resulted by land-sliding are still continuing, and affect the maritime and underwater sites. The causes of damage on maritime and underwater structures caused by land-sliding are environmental, chemical, physical and biological. These effects produce different deterioration phenomena to the stones. An experimental study "was carried out to compare the deterioration factors of land-sliding on maritime and underwater-logged stones, by using non-destructive devices; such as multispectral imaging (UVM VIS, IR 850 nm), ATR-FTIR and Spectrophotometry. The analyses contributed to determining the Conservation methodologies and techniques for submerged sites and structures, as well as achieving in-situ preservation. The comparative experiment was divided into two parts; analysis of waterlogged stones from the volcanic area of Baia archaeological site, in Naples, (Italy), and limestones that were placed in the same site at a depth of 12 meters for understanding the marine environment. By studying the vulnerability of the stone and the acidity of the stone, the analyses revealed different results according to the type of stone, the degree of acidity resulting from the presence of the stone in a volcanic area, the temperature of the water, and the depth at which the stone was placed under the water.

10. Public Engagement with Maritime Cultural Heritage in Museums: Lebanon as a Case Study

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In Lebanon, awareness and knowledge of maritime heritage are absent at the public level. My research evaluates public engagement concerning marine cultural heritage (MCH) in Lebanon through the primary resource of Museums. It interrogates the role that museums are playing in education and dissemination of the MCH. The research draws upon an extensive review of museum engagement, particularly concerning maritime displays and narratives. This consists of auditing and observing three museums in Lebanon: The National Museum of Beirut, the Archaeological Museum of the American University of Beirut and the Pépé Museum in Byblos. The audit includes comparing the museums' physical display of maritime artefacts and the narrative representing them. The observation targeted the maritime-related artefacts, the layers of the maritime narrative representing them, and the method in which they are displayed and signposted. This approach made it possible to better understand the role of each museum with respect to communication with the public. Additionally, following the investigation, qualitative research was undertaken by interviewing the museums' directors to learn about their perspectives, which added more depth to the understanding of the development of maritime heritage in the museums.

11. Bridging the Gap Between Maritime Archaeology and Public Engagement in the Arab Region; Egypt Case

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Countries of the Arab Region were the core of some ancient civilisations, the wealth of material culture inherited from these civilisations is unparalleled. All Arab countries adjoin or contain water bodies. Throughout ancient history, the shores of the Eastern Mediterranean, Red Sea, Arabian Gulf, and the banks of the Nile, Tigris, and Euphrates Rivers, bore-witness to thriving maritime cultures, and their waterborne activities. Hence, we have inherited a vast array of maritime and underwater material culture. Despite that, there is an evident lack of maritime museums and the sustainable outreach resources for maritime and underwater cultural heritage targeting the general audience, even in countries that have active underwater archaeology research programs. In 2019, a Maritime Archaeology Outreach Project (Bahar) has been carried out by the Alexandria Centre for Maritime Archaeology, Egypt. The project has contributed on understanding the public perception of this heritage, which helps to create and design specific outreach activities to attract target groups. The paper will examine the challenges associated with public engagement in a dynamic region with historic political, cultural, and ethnic tensions. Moreover, a situation study, gap analysis and recommended actions based on the outcomes of the Bahar Project.

12. MARE CYPRIUM: Multimedia Applications for Cypriot Maritime Cultural Heritage

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Funded by the Honor Frost Foundation (HFF), the Mare Cyprium Project is a digital archaeology public outreach exercise. It integrates data produced by the Maritime Archaeological Research Laboratory (MARELab), University of Cyprus (UCY) into a series of digital multimedia applications (DMAs). The main aim is to promote the value and complexity of Cypriot maritime cultural heritage. The project will focus on diverse case studies attempting to reach a diversified public. The case studies include artefacts, shipwrecks, harbours, and traditional boats. The DMAs are: i) a 3D animation of wreck site formation processes; ii) a 2D animated storytelling of an artefact's biography; iii) a thematic timeline of an ancient harbour; iv) an articulated Web-GIS of ship graffiti; v) a 3D glossary of shipbuilding terms; and vi) a 3D collection of traditional boats. This paper will critically discuss the general project idea and rationale, the DMAs concepts and scenarios, and the results of their preliminary development.

13. Under the Waves of the Saronic Gulf: Design and Development of a Cultural, Locative Media Application

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Shipwrecks are time-capsules, which are an important source of history, for the people and the stories that they carried, as well as evidence of its own wreckage. The present study focuses on the preservation of the identities of the shipwrecks from World War II that have been found in the depths of the Saronic Gulf of Greece. A cultural, locative, mobile application was designed and developed as part of my master's degree at the University of the Aegean. The application consists of eleven (11) sites, located in the area of Vouliagmeni, in the Saronic Gulf, in Athens, Greece. Ten (10) of the eleven (11) sites, are shipwrecks from World War II, while the last - bonus - site is the well of Vouliagmeni, which is very close to the wreckage area and could not be left out, due to its significance. Multimedia, such as videos, photographs and narrations compose the application, while the importance of the project is the education, entertainment and raising awareness of the people of the area, or anyone interested. A key role is played by the character of a 'Dive Buddy', who guides the user with her vocal narratives. Behind the voice of the Dive Buddy is hidden the creator of the application. The UI design with the wavy fonts, the blue buttons, and the calming sounds of the sea, together with the sound of the diver breathing, are attractive factors to the users of the application, who can transform into divers and explore all the above without limitations.

14. Beyond the Model: The Creation of Interactive Narratives Through Digital Experiences

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Over the last decade there have been drastic developments in remote sensing techniques, with increased adoption across a wide range of disciplines. Within this multi-disciplinary setting, archaeology has significantly benefitted, through methodologies such as Structure-from-Motion (SfM), laser scanning and structured-light-scanning, in both terrestrial and underwater archaeological research. While promoting research, the digital records extracted from these techniques, can be used to create a wide array of dissimilar virtual narratives and so enriched public engagement. However, some misconceptions remain as to the feasibility and efficiency of such narrative outputs to a belief that they require increased financial expenses, complex technological support and individually coded platforms. This paper will lay out a series of case study examples that contest this dogma, demonstrating the creation of digital experience using openly available, easily manageable, and financially affordable solutions. These outputs utilise engaging medias, from the use of Virtual and Augmented Realities, VFX cinematics, and 360-degree experiences. The paper will also dive through similar experiences into the depths of the Black Sea, home to the oldest intact shipwreck in the world and will disseminate all the potential strategies for the development of these experiences, their affordances, limitations as well as their measured impact within the general public. Finally, it will also demonstrate the potential of such narratives to enrich public engagement, drive archaeology and create interactive and multisensorial narratives that strengthen recollections and drive curiosity.