14. Late Pleistocene to Holocene Submerged Shorelines and Landscapes off Franchthi Cave, Greece

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Franchthi Cave, on the northern shore of the Bay of Kiladha (Argolic Gulf, Greece), was occupied regularly, if not continuously, from the Upper Palaeolithic at least to the Neolithic, a time span which includes part of MIS3 and MIS2 (Last Glacial Maximum). As part of the Terra Submersa expedition, a systematic geological-geophysical survey was conducted in the summer of 2014 in the Bay of Kiladha and the Eastern Argolic Gulf. Two research vessels worked in parallel for two weeks and collected data using boomer (0.7-3 kHz) and chirp (2-7 kHz) sub-bottom profilers, side scan sonar (100/400 kHz) and swath bathymetry systems (200/400 kHz). The geophysical survey was followed in 2015 by targeted shallow drilling in the Bay of Kiladha. Processing, analysis and interpretation of the collected data revealed information on the nature and extent of the submerged prehistoric landscapes and on the location of palaeo-shorelines, as well as highlighting the interplay between tectonic movements and sea-level fluctuation during the Late Pleistocene and Holocene. The LGM shoreline (18 kyr BP) was found at 116-127m depth. An older shoreline, probably associated with MIS 6 (140 kyr BP), clusters at 159-173m depth. The differences in depth are the result of tectonic movements along newly discovered
faults. Palaeo-shorelines shallower than 116m correspond to short still-stands during the post-LGM sea-level rise. The submerged landscape close to Franchthi Cave includes an erosional terrace at 11m depth, developed on the LGM terrestrial ground. It is covered by 1- to 3-meter-thick recent sediments and is incised by a meandering palaeo-river with maximum depth at 17-19m (7-9m deeper than the terrace). The new data enable a reconstruction of the Neolithic landscape in front of the cave, and may provide clues as to the drowning of the recently discovered Lambayanna Early Bronze Age settlement to the north.

15. Geoarchaeological Investigations on the Roman Harbour of Pollentia (Bay of Alcúdia, Mallorca, Spain)

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The Roman city of Pollentia was founded on the north-eastern coast of Mallorca (Balearic archipelago) after the Roman conquest of the island in 123 BC. There is evidence that the city had two harbours: a small harbour located to the north, and the main harbour located to the south of Pollentia. Our study focuses on the southern harbour, on a coastal plain in proximity to the ancient city. Four sedimentary cores were taken and bio-sedimentological analysis was performed. Here, we describe the palaeogeographical changes in this area, evolving from an open lagoon environment between ca. 3200 and ca. 500 cal. years BC to a semi-enclosed lagoon during Roman times. Progressively, the lagoon became silted and was isolated from the sea by the development of a large sand spit, probably during the second half of the first millennium BC. We also discuss the water depth, linked to the palaeo sea-level, which is important in defining the possible ancient harbour location.
16. Exploring the Submerged Prehistoric Landscapes of the Inner Ionian Sea Archipelago, Greece

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Dimitris Sakellariou (Hellenic Centre for Marine Research, Anavyssos, Greece)

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This paper reports on the archaeological questions that prompted mapping the drowned landscapes of the Inner Ionian Sea Archipelago, the underwater work conducted, and the main findings of the study. Archaeological research on the islands of this inner and protected part of the central Ionian Sea has brought to light numerous Middle Palaeolithic sites in caves and in the open air. Neanderthal groups were well adapted to the area, which comprised coastal lowlands, rugged terrains of intermediate elevation and upland interiors. The work on land raised the need to reconstruct the palaeogeography of the seascape and to explore the inundated landscapes of the Pleistocene. A study of the bathymetry suggested that during low sea-level stands of the Pleistocene many of the islands were joined together and to the mainland, whereas others remained insular, bringing into focus Palaeolithic sea crossings.

The University of Crete commissioned the Institute of Oceanography of the Hellenic Centre for Marine Research (HCMR) to conduct a marine seismic survey and ground-truthing work in the Inner Ionian Sea Archipelago with the aim to reconstruct the now submerged, Late Quaternary terrestrial landscapes. More than 110km of boomer seismic profiles were acquired in the area between Meganisi, Lefkas, Kefallinia, Ithaka and Akarnania. Processing and interpretation of the seismic data included the recognition and mapping of palaeo-sea-level indicators, prograding prodelta clinoforms, submerged marine terraces and active faults. The results of the seismic stratigraphic analysis enable a fairly accurate definition of the palaeo-shorelines during the low sea-level stages MIS2 (20 kyr BP) and MIS6 (140 kyr BP) with implications on the insularity of the present islands and islets.

Our underwater project marries Palaeolithic archaeology with marine geosciences and was funded by the Honor Frost Foundation. It is in line with recent developments in human evolution research that embrace marine archaeology. It has produced new palaeogeographic reconstructions on the northeast Mediterranean Sea. The linking thread is the Quaternary Sea, connecting or separating landscapes, fragmenting and then conjoining them.

17. Geo-Archaeological Investigations at the Submerged Remains of Ancient Olous (Crete): Preliminary Results from 2015

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Nikos Papadopoulos (Laboratory of Geophysical-Satellite Remote Sensing and
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The Ephorate of Underwater Antiquities (Ministry of Culture, Greece) and the Institute for Mediterranean Studies (Foundation for Research and Technology, Hellas) conducted a geo-archaeological investigation at the submerged remains of ancient Olous, on the isthmus of Poros Eloundas (Crete), from August fourth to seventh, 2015. The investigation included visual observation and initial mapping of the visible structures on the seabed as well as the implementation of geo-information technologies such as Global Positioning Systems (GPS), low altitude aerial imagery with remotely piloted aerial systems (drones) and geophysical prospection (electrical resistivity tomography, magnetometry).

Most parts of the coast around the isthmus and a certain sector of the seabed were investigated with geo-information technologies that established the existence of buried structures under the coast and the seabed. In addition, several foundations and structures, feasibly belonging to public buildings based on their materials, dimensions and construction techniques, were located and roughly mapped. At the southern cove, large worked boulders forming a double row running from east to west have been interpreted as possible city wall foundations. The foundation disappears beneath a submerged mole at the west composed of rough stones. At the northern cove, two quadrilateral structures made of large ashlars may also belong to defensive towers. Moreover, paved street remnants were also located.

The combination of mapped features, along with the general topography of the area and wall remains visible on land around the isthmus, gives a general picture of the urban plan of ancient Olous. In addition to presenting the above-mentioned research, the paper aims to illustrate the city’s presence in ancient records and to understand its role in Cretan history up to early Byzantine times, when the city was abandoned.

18. Anthropogenic Overprints on Natural Coastal Aeolian Sediments: A Case Study from the Periphery of Ancient Caesarea, Israel

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Since the rise to dominance of humans, mainly following the agricultural revolution, the earth’s soils and sediments have been affected by anthropogenic activities. In order to explore the effect of human settlement on the proximate environment, the current study focuses outside the settlement of ancient Caesarea, a well-known Roman to Early Islamic period urban centre in the central coastal plain of Israel. The investigation has been conducted by analysis of humanly induced macroscopic artefacts as well as microscopic remains found in buried sediments. Such anthropogenic markers are retrieved through boreholes, assessed by sedimentological analyses coupled with radiometric dating techniques and micro-archaeology, and integrated with archaeological and historical records.

Two units were identified in the study area south of ancient Caesarea, based on their petro-sedimentological properties. The lowermost unit is a red-brown loam locally known as Hamra, while the uppermost covering unit is inferred as loose sand. The sand unit, reaching thicknesses of up to 9m, is chronologically constrained between 6ka to the present, and consists of four facies. Out of these four facies the uppermost and lowermost lithologies were interpreted as natural beach and aeolian deposits that are interbedded with two grey-coloured anthropogenic sand facies that contain artefacts. One anthropogenic facies represents an urban garbage mound and the other is an agricultural pedo-sediment; both date to the Roman–Early Islamic periods. The pedo-sediment appears to be improved, in terms of soil fertility, and we therefore propose that it is the outcome of manuring enrichment for agricultural purposes. Taking advantage of the high coastal freshwater aquifer in the study area that facilitates capillary rise, we propose that this pedo-sediment represents buried agricultural plots. This study demonstrates the potential to
further knowledge and understanding of human societies and their connection to and impact on the environment, and could be of relevance to other archaeological sites around the Mediterranean.

19. Marine Geophysical Implications in the Ancient Harbour of Byblos, Lebanon

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Byblos (Jbeil; Lebanon), is known to be one of the world's oldest continuously inhabited cities, as attested by the ruins of many successive civilizations since the Neolithic period. Byblos played a major role among Levantine harbour cities from which Phoenicians prevailed along Mediterranean sea routes, exporting Levantine goods and spreading the Phoenician alphabet. Archaeological investigations in Byblos, which revealed archaeological findings of utmost importance, were exclusively land based until after the Lebanese civil war. Its sea front, however, had remained terra incognita until Honor Frost’s underwater survey work searching for the antique harbour of the city. But it wasn’t until later that the exact location of the harbour basin was identified, within the framework of the ‘Byblos and the Sea’ research programme which built on Frost’s earlier studies. Since 2011 the ‘Byblos and the Sea’ team, funded by the Honor Frost Foundation, has conducted a multidisciplinary field investigation in collaboration with foreign specialists and the Directorate General of Antiquities of Lebanon. The main objectives of this investigation have been to link the ancient city to its shore, to understand the near-shore maritime approaches to the city, and finally to locate the well-attested Bronze Age harbour of Byblos, which was responsible for the economic growth of the city during antiquity. Since 2014, the evolution of coastal geomorphology has been the focus of several offshore geophysical campaigns conducted by the Geological Department of the University of Patras, under the scientific direction of George Papatheodorou, within the framework of ‘Byblos and the Sea’. These marine surveys collected bathymetric, sub-bottom profiling and side scan sonar data. Marine remote sensing techniques have been used systematically in underwater archaeological
research, as these non-destructive tools are capable of detecting and mapping underwater archaeological features lying on the seafloor or buried beneath it, as well as evaluating the evolution of palaeogeography. During the upper Quaternary the sea level dramatically changed in response to climatic changes and tectonic activity, and caused migrations of the shoreline over time. In order to solve the equation of palaeogeography, current bathymetric data were correlated to available sea level change curves. The existence of three plateaus (‘flat surfaces’) at about 30m depth constituted a unique finding of palaeo-shoreline markers. Additionally, the presence of a small basin north of the islet of Jasmine could be of potential archaeological value linked to the ancient city of Byblos.

20. The Geoarchaeology of Natural Hazards in Ancient Harbours

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Soumaya Trabelsi (Sousse University, Department of History, Sousse, Tunisia)

This paper explores the relationships between Mediterranean archaeology and the geosciences, with particular emphasis on ancient harbour evolution. We review recent geoarchaeological research probing the palaeo-environmental evolution of ancient harbours. In particular, we attempt to elucidate the revival of catastrophism. Our lecture presents different natural hazards in harbour contexts: (1) rapid sedimentation versus dredging in Naples harbour (Italy) and the ancient anchorages of Akko (Israel); (2) relative sea-level changes in Naples (Italy) and Phalasarna (Greece); and (3) supposed ‘tsunami’ deposits in Lechaion (Greece) and Tipaza (Algeria).

In particular, we demonstrate that sedimentary ‘tsunami’ data from the Mediterranean shows strong evidence for a 1500-year periodicity that presents robust statistical correlations with markers of climate cooling and deterioration in both the Mediterranean and North Atlantic. We suggest that up to 90% of ‘tsunami’ attributions of high-energy events in the Mediterranean’s coastal record should be reconsidered. Specifically, our findings invite closer and more robust scrutiny of ‘tsunami’ events, including greater proxy analysis, in future studies of coastal archives. We argue that there is an absence of rational grounding and over-emphasis on natural catastrophes. Research into the decline/collapse of ancient harbours is, in our view, over-
simplistic. Caution is needed to ensure that neo-catastrophism does not alter the paradigm of geoarchaeology, e.g. the analysis of the interactions between society and nature.


Mari Yamasaki (Early Concepts of Man and Nature (Research Training Group), Johannes Gutenberg-Universität Mainz, Mainz, Germany)

At first glance, the notion of coastal landscape appears clearly identifiable as that strip of land located in proximity to a mass of water. How far from the water such a strip of land would stretch to, however, is subjective and ambiguous. There is no clear-cut limit as to how wide an area should be to be considered coastal. Yet, we find ourselves able to immediately identify a location as coastal or otherwise, regardless of how many kilometres we are from the shore. Maritime coastal landscapes, and Mediterranean coastal landscapes in particular, tend to evoke a specific set of images and characteristics commonly associated to them such as dietary customs, the existence of a sea-specific lexicon, familiarity with navigation and the presence of coastal landmarks. However, are these criteria also identifiable on an archaeological level? When is it possible to embed a community within a coastscape rather than a landscape close to the sea? In this respect, the conceptualization of landscape has little to do with geographical objectivity and much more with perception. This paper aims to present an attempt at identifying a series of archaeologically identifiable, objective parameters that can be used to recreate a cognitive geography of ancient coastal zones. More specifically, through a selection of case studies from the Eastern Mediterranean Bronze Age, this study proposes a method for estimating the perceived proximity to the sea in archaeological contexts, contributing to a holistic definition of this maritime character.

22. The Marsa Bagoush Research Project – MBRP

Emad Khalil (Alexandria Centre for Maritime Archaeology and Underwater Culture Heritage (CMAUCH), Alexandria University, Alexandria, Egypt, Alexandria University, Alexandria, Egypt)

The site of Marsa (anchorage) Bagoush (ancient Zygris – Ζυγρίς) was mentioned in the Roman navigation guidebook Stadiasmus Maris Magni of the third century AD which states that ‘From Leuce Acte to Zygris 90 stadia; there is an islet; put into the place with it on your left; there is water in the sand.’ In 1861 Captain T. A. B. Spratt (1811-1888), commander of HMS Medina, surveyed the site of Marsa Bagoush as part of a hydrographic survey conducted by the British navy along the Egyptian northern coast. The map produced showed Marsa Bagoush as a confined bay bordered from the north by a series of protruding reefs, which allows only for few entrances into the bay. However, in the late nineties, the INA conducted a limited archaeological survey of the site, which resulted in the discovery of few amphorae. Yet, since 2015, with the kind support of the HFF, the site of Marsa Bagoush has been under investigation by the Alexandria University Centre for Maritime Archaeology & Underwater Cultural Heritage. The investigation resulted in
the discovery of evidence for at least three shipwrecks, in addition to evident changes in the geomorphology of the coast line since antiquity. Hence this paper will present the MBRP and its most recent achievements and discoveries.

23. Coastline, River Changes and their Effects on Anchorages / Harbours and Habitation Patterns: Akko (Israel) as an Example

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Ann Killebrew (Department of Anthropology, Penn State University, Pennsylvania, USA)

Jamie Quartermaine (Oxford Archaeology, University of Oxford, Oxford, UK)

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Changes in shoreline and river course dictate anchorage/harbour positions, which, in turn, influence the habitation patterns of a coastal settlement. A model case study is that of Tel Akko/Acre and its vicinity. Upon analysis of previously gathered data as well as the newer results obtained for the ‘Total Archaeology Project’, the establishment of localized areas of some of the settlement areas and thus, the patterns, was possible. Since the first archaeological excavations undertaken in the 1970s, Tel Akko is known to have been an important trade city from the early second millennium BC onwards. Maritime connections are in evidence at the site from the Middle Bronze IIa period (early second millennium BC), although the locations of its anchorages/proto-harbours or harbours and their facilities have yet to be established. The unusual banana/crescent shape of Tel Akko necessitated a renewed study of the foothills of the tell, especially its southern and south-western borders. A previous assumption that an inner anchorage based on the Na’aman River was checked, as was the area assumed to have been the river estuary. Studies such as ERT (electrical resistivity tomography) and GPR (ground-penetrating radar) were carried out in the past and contributed to our understanding of the area; however, only in a recent study was a reconstruction of the evolution of the tell’s coastline since the Bronze Age determined, as well as the possible location of the ancient anchorages. This research is based on
the study of new sediment cores drilled at the base of the tell and in the Old City of Akko (Saint Jean d’Acre) 1500m west of the tell.

We propose that the southern anchorage was situated in the outer marine-dominated estuary of the Na’aman River until the Early Persian period. This anchorage possibly shifted to the western open coast of the tell during the Late Persian period, before its subsequent relocation to the Akko promontory (Saint-Jean-d’Acre) in late Hellenistic time. On the basis of this historical information, we attempted to locate the Hellenistic harbour of Akko by coring in the Old City, in proximity to the modern harbour. Here we found more than 4m of marine sands deposited in part during Hellenistic times. These results are being corroborated by the archaeological data gathered thus far.

A salvage excavation carried out in 2010, as well as a probe in the summer season of 2016, further demonstrate the coastal and river changes, and possible anchorages, which, in turn, influenced the habitation pattern on the tell and the Akko/Acre area.

24. Inundated Neolithic Villages on the Carmel Coast, Israel

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Jonathan Benjamin (Department of Archaeology, Flinders University, Adelaide, Australia)
Deborah Cvikel (The Leon Recanati Institute for Maritime Studies (RIMS), University of Haifa, Haifa, Israel)
Danni Rosenberg (The Zinman Institute of Archaeology, University of Haifa, Haifa, Israel)

The Neolithic period witnessed a major revolution in human existence: the transition from a nomadic way of life (hunting and gathering), to a food-producing economy based on domestication of plants and animals, and residence in permanent settlements. Since the 1960s researchers in Israel have developed methods for identifying, excavating, documenting and researching submerged prehistoric settlements.

Six inundated sites dated to the Neolithic period have been discovered along the Carmel coast. The Atlit-Yam site dates to the Pre-Pottery Neolithic (ca. 9200-8500 years BC), while several sites date to the Pottery Neolithic period (ca. 8000-6500 years BC). These settlements shed light on the economy, material culture and lifestyle of the coastal Neolithic inhabitance of the Eastern Mediterranean. They show how the ancient populations dealt with environmental changes, sea-level rise, the flooding of the coastal area, and how they reacted to sea-level rise. The research provided evidence on the invention and development of water wells, the extraction of olive oil and the evolution of the Mediterranean subsistence and diet. It also demonstrates the potential effects of future sea-level rise and flooding of coastal plains.

Sea-level rise occurred during the Neolithic period, and may occur in the future due to global warming. A rise of more than one meter in the twenty-first century, as predicted by some specialists, will necessitate costly human adaptation and heavy investment in coastal protections, as in Venice and The Netherlands. At some point in the future, sea-level rise may cause an inevitable population transfer, abandonment of settlements and removal of valuable assets inland, as practiced by the Neolithic populations of the Carmel coast.
25. Metohi: An Underwater Middle Helladic Site in the Pagasitikos Gulf, Central Greece – Interaction Examined Under the Notion of Maritime Cultural Landscape

Elias Spondylis (Hellenic Institute for Marine Archaeology (HIMA), Athens, Greece)
Vasiliki Ivrou (Hellenic Institute for Marine Archaeology (HIMA), Athens, Greece)

Interaction among communities of the Middle Helladic world has long been, and continues to be, an issue of central interest in the archaeology of the first half of the second millennium BC in the Aegean. This presentation is based on the investigation of materials (architecture and finds) from the 2009-2016 surveys conducted at the submerged site of Metohi in the Pagasitikos Gulf – the third submerged settlement of that era to be excavated. This project is part of an archaeological underwater survey conducted since 2000 by HIMA, under the direction of archaeologist Elias Spondylis, on the west coast of the southern Pagasitikos Gulf. The significance of Metohi, however, is not the fact that it constitutes one of the rare submerged settlements in MBA Greece, but that the extent of finds from underwater survey and trench excavations indicates a flourishing town situated on the crossroads of intra-extra Thessaly relations via the coast and the sea. This presentation adopts a maritime perspective, viewing the coastal littoral from the sea. It examines various parameters including natural processes on the coast and hinterland that were, and remain, vital to the connectivity of cultures through the sea during the Middle Bronze Age and thereafter. We will discuss the nature of the medium-sized town and try to place its existence within a regional and extra-regional route, drawing heavily on the concept of Maritime Cultural Landscape in this part of Pagasitikos Bay.

26. Locating Ancient Stryme in the Changing Palaeogeography of the Thracian Coast (North Aegean Sea, Greece)

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Olga Koukousioura (School of Geology, Aristotle University of Thessaloniki, Thessaloniki, Greece)
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Georgia Karadimou (School of Geology, Aristotle University of Thessaloniki, Thessaloniki, Greece)
Panagiotis Tsourlos (School of Geology, Aristotle University of Thessaloniki, Thessaloniki, Greece)
Eleni Aidona (School of Geology, Aristotle University of Thessaloniki, Thessaloniki, Greece)
The ruins of ancient Stryme are situated on the northern part of the Molyvoti Peninsula on the Thracian Sea, about 25km SW of the modern city of Komotini (N. Greece). Recent research has shown that this city was one of the largest Archaic–Classical settlements in the region. Stryme was also mentioned twice by Herodotus as one of the largest cities conquered by Persian king Xerxes during his campaign in ancient Greece.

The geoarchaeological research on ancient Stryme aims to reconstruct the palaeogeography and ancient landscape of the Thracian coast in the vicinity of the Molyvoti Peninsula. This will contribute to the understanding of the geomorphological evolution of the coastal zone during the Upper Holocene, and to the geographical identification of the settlement that has been inconclusively identified as ancient Stryme. This research is part of the Molyvoti, Thrace, Archaeological Project (MTAP), in collaboration with the Ephorate of Antiquities of Rhodope and Princeton University.

The research took place in the coastal zone and the deltaic plain of the Filiouris River east of the ancient settlement. To reconstruct the geomorphological changes, a detailed geomorphological survey in combination with stratigraphical and palaeontological techniques was applied. In addition, a drilling project of two vibracores was carried out. The chrono-stratigraphy of the cores was determined by $^{14}$C A.M.S. radiocarbon dating. The evaluation of the data allows the following time-scenario interpretation. The sea was present in the area before 5,500 to 6,000 years BC. Initially the sea transgression flooded the lower part of the Filiouris River valley 3.4 km further inland from the present coastline, close to the present Mitrikon Lake. Sea level rising, before 3,200 years, contributed to an environmental change in the inner part of the Filiouris Valley, when a brackish, lagoonal environment with fresh water inputs was formed. The geographical setting of the area during the habitation of the city is in good accordance with Herodotus’ description, proving the existence of a lake west of the main river.

27. The Delos Underwater Survey Project (2014-2016)

Mantha Zarmakoupi (Department of Classics, Ancient History and Archaeology, University of Birmingham, Birmingham, UK)

Magdalini Athanasoula (Ephorate of Underwater Antiquities, Hellenic Ministry of Culture and
This paper presents the results of the three-year Delos Underwater Survey Project (2014-2016), a synergasia between the Ephorate of Underwater Antiquities of the Hellenic Ministry of Culture and Sports, and the Institute of Historical Research of the National Hellenic Research Foundation under the direction of the Head of the Ephorate of Underwater Antiquities, Dr. Aggeliki Simosi. The survey focused on the submerged areas of two Hellenistic neighbourhoods that were created at the height of Delos’ urbanization period, the Stadion District and the Skardana District. The Cyclades have seen a relative rise in sea level of about 2m over the last 2,000 years, engulfing many areas of the once heavily urbanized island. By examining the submerged areas of these two neighbourhoods the aim of the project was to define their use and role in the commercial activity of the island in the late Hellenistic period.

Over the course of three seasons the survey project identified structures providing evidence for commercial activities in the submerged area of the Stadion District, changing the predominant assumption that this neighborhood did not have an instrumental role in the operation of the Delian emporion. The project also identified remains of harbour installations in the submerged area of the Skardana District, indicating that the bay of the Skardana was an anchorage. These finds are significant, as they clarify the function of the bays that were located next to the newly formed neighborhoods on the island. It seems that commercial harbours operated both in the bay of the Stadion District and in the bay of the Skardana District, complementing the activities of the central harbour. Whereas previous research had focused on the main harbour area, assuming that the emporion of Delos depended solely on a single harbour, the Delos Underwater Survey Project – the first underwater survey to be conducted around Delos – provides a different picture of the ways in which the port-city functioned. Although the mechanisms of trade were weighted towards direct preferential links between emporia ports, rather than towards random coastal tramping or cabotage, an emporion has several harbours, which could be used according to the weather conditions. The results of the survey project show that the bays of the Stadion District and the Skardana District served as anchorages around the island, allowing skippers to avoid crossings in difficult weather conditions, thus facilitating the busy emporion of Delos in the Late Hellenistic period.

Finally, the project conducted a preliminary survey for shipwrecks during the 2016 fieldwork season. The six shipwrecks that were found around Delos, Rheneia and in the channel between Delos and Rheneia date to the Hellenistic through the late Roman periods. They point to the continuation of the activity of the harbour of Delos and the usage of the channel between Delos and Rheneia, which must have continued to operate as a main waterway of the Aegean through the late Roman period, connecting the Eastern and Western Mediterranean.

28. Fishponds and Maritime Structures in the Roman villae maritimae: New Data from the Southern Latium Underwater Survey

Michele Stefanile (Dipartimento Asia Africa Mediterraneo, Università degli Studi di Napoli ‘L’Orientale’, Naples, Italy)

The villae maritimae along the Tyrrhenian coast of Italy are important testimonies of Roman architecture during the Late Republican and Imperial ages. Their analysis allows us to
understand how the Romans were able to build directly on rocky coasts and jagged promontories, often deeply changing the natural landscape. Despite a long and fruitful tradition of studies on the subject, scholars have rarely worked on what now lies below the sea level, where a considerable part of the most remarkable structures is currently found. Maritime infrastructures such as fishponds, private harbours or impressive waterfronts, often submerged because of sea level rise, can offer important new data about Roman architecture and about the exploitation of marine resources.

The Southern Latium Underwater Survey, established in cooperative agreement between the new Underwater Archaeology Research Unit of the University of Naples ‘L’Orientale’ and the Soprintendenza Archeologica del Lazio, aims to reconsider the maritime villas of Southern Latium, and to increase our knowledge through data retrieved from underwater contexts. In September 2013, the first campaign of underwater surveys took place at Gianola, in the submerged part of a huge villa. Building techniques and decorative elements suggest a first phase during the second century BC. In a few days of work, a big fishpond was documented, with very interesting artefacts related to the tank closing system and the mixing of freshwater and saltwater for a more profitable fish breeding. New research conducted in 2014 and 2015 was concentrated on the waterfront of this villa and others in the same area. At the Tiberius villa in Sperlonga, underwater research resulted in the documentation of a complex system for the breeding of moray eels within a natural cave, and deep work on coastline changes.

29. The Maritime Cultural Riverscape of Ports Along North Africa’s Atlantic Façade

Athena Trakadas (Department of History, University of Southern Denmark, Esbjerg, Denmark)

Over millennia, sea-going ships travelling along Africa’s north Atlantic façade have taken advantage of the large tidal rivers, such as the Oued Loukkos, Oued Sebou and Oued Bouregreg, using them as safe havens and ports. This diachronic pattern is evident in the presence of Phoenician, Punico-Mauretanian, Roman, Idrissid, Almoravid, Almorad, Marinid, Portuguese, and Spanish material culture within the fluvial landscape. Although the river remains the constant overall ‘port’, the specific location of activities within the river-scape appears to change over time. This presentation will discuss a new methodology examining the environmental (geomorphological) factors for these movements, contextualized within the region’s socio-cultural dynamics.