

## Presentation Abstracts

### Day 2: Maritime Museum NWS Theatre: Tuesday 29 November

#### Three-dimensional digitization techniques and technologies in maritime archaeology (9:00 am – 10:45 am) – Part 1

##### **Nicolas Bigourdan & Kevin Edwards – Western Australian Museum, Fremantle, Australia**

3DMAPPR: a community-based underwater archaeological photogrammetry program in Perth, Western Australia

**Key words:** 3D underwater photogrammetry, Perth, Western Australia, MAAWA, outreach, 3DMAPPR

**Abstract:** The Maritime Archaeology Association of Western Australia (MAAWA), in collaboration with Tempus Archaeology and with the support of the Western Australian Museum's Maritime Archaeology Department, recently initiated the 3D Maritime Archaeology Project – Perth Region (3DMAPPR). Conceived as a means of expanding MAAWA's educational and outreach initiatives, 3DMAPPR had the dual objective of (a) developing a flexible and low-cost photogrammetry package to facilitate the rapid recording of underwater cultural heritage (UCH) sites in the wider Perth region, and (b) providing MAAWA members with training, experience and operational guidelines in underwater photogrammetric recording and processing techniques. Through the development of a reliable 3D recording package, with few technical or logistical overheads, it is intended to provide a meaningful role for 'citizen scientists' in the documentation and monitoring of underwater cultural heritage sites. Combined with MAAWA's recently developed Shipwreck WA website and smartphone application, the data captured as part of 3DMAPPR has the potential not only to inform on-going management of underwater cultural heritage, but also to be repurposed as a resource for research and public outreach. This paper provides an overview of 3DMAPPR, discusses the rationale for the project, its development, evolution and roll out, and current application(s), both within the context of MAAWA and elsewhere.

##### **Kalle Virtanen – University of Helsinki, Helsinki, Finland**

3D documenting of a pile dwelling

**Key words:** Three-dimensional, underwater archaeology, digitization techniques, pile dwelling

**Abstract:** My PhD study focuses on the remains of a pile dwelling at the bottom of Lake Valgjärv, southern Estonia. The site is situated on a shallow underwater ridge in the middle of the lake, where the depth ranges from 1–4 m. Valgjärv is so far the only known pile-dwelling site in Estonia. The 14C samples taken from the piles and timber structures resting on the bottom of Lake Valgjärv provide evidence of three separate phases of settlement or other activity (3500BC–3100BC, 410BC–150BC & 560AD and 980AD). One of the major objectives in my research has been to explore the various ways to document and chart the extent of the underwater archaeological site in Lake Valgjärv. Simultaneously I have endeavoured to develop digitized methods to survey archaeological remains, which extend over a large area and rest in shallow water, such as on Valgjärv site. To encounter the many challenges our specialised working environment bring about, I have started a co-operation with Zagreb's University's Laboratory for Underwater Systems and Technologies (LABUST). LABUST has developed an autonomous surface platform, which carries an accurate GPS device, multi-beam sonar and a camera with it. The platform is propelled by its own electrical engines. Fieldwork to document the structures in Valgjärv was done in the summer of 2015. I am currently processing the photogrammetric and sonar data using Agisoft PhotoScan software with promising results. An aim of the work is to produce a 3D model of the site.

##### **Kotaro Yamafune, Daniel Bishop & Carolyn Kennedy – Texas A&M University, Texas, USA**

A proposed method to create a local coordinate system for underwater photogrammetric recording

**Key words:** Photogrammetry, Agisoft PhotoScan, 1:1 scale constrained model, local coordinate system

**Abstract:** Applications of Computer Vision Photogrammetry for recording underwater cultural heritage sites have become a popular recording method in recent years. However, to use photogrammetric models as scientific data, it is necessary to constrain the 3D models to a 1:1 scale. This process requires significantly more consideration than for terrestrial sites; on-land applications of photogrammetry, like total stations for example, cannot be used underwater. Many archaeologists use Direct Survey Methods (DSM) to create a local coordinate system, which has proven to be a successful method for submerged sites. The problem with DSM is that on large or deep-water sites it becomes time consuming and requires experienced archaeological divers. To avoid the lengthy dive times required for DSM, the authors propose a new method that establishes a local coordinate system with minimum underwater operation time. The proposed method is to prepare a temporary coordinate system on land prior to underwater operations, so that the system need only be put into position on the submerged site. After placing the temporary coordinate system, an initial photogrammetric recording can be constrained to scale by the temporary coordinate system, and reference points previously placed throughout the site will be activated within the first photogrammetric model. A complete local coordinate system of the entire site can then be extracted based on the first photogrammetric model's reference points, and the extracted coordinate system can be used for any subsequent photogrammetric recordings of the site. In this paper, the authors will explain the step-by-step processes of this proposed method.

##### **Jorge M. Hacker, Mick O'Leary, Ingrid Ward & Jonathan Benjamin – Airborne Research Australia & Flinders University, Australia**

Pilot aerial archaeological survey of coastal features in the remote Kimberley area

**Key words:** Airborne LiDAR, fish traps, Kimberley coast

**Abstract:** A vast archive of late Pleistocene cultural sites presently lie submerged on Australia's continental shelves having been inundated by the post-glacial sea-level rise, with over ~50% of total landmass lost in the Kimberley alone. Yet, there is clear evidence of Aboriginal maritime resource exploitation from as early as 40,000 years ago. Here, we present results from an airborne exploratory survey using a combination of an airborne small footprint terrestrial ('red') Light Detection and Ranging (LiDAR) system with a set of natural colour RGB-cameras flown along the southern Kimberley coastline that was aimed at locating known and new coastal archaeological sites. This combination not only provides evidence of preserved fish traps and stone weirs, but also allows 3D-analysis of the detected features. This indicates that it is highly likely that a variety of prehistoric archaeological evidence has been preserved on the inner continental shelf with some archaeological integrity. This presentation will outline how LiDAR topographic data enhanced with RGB-imagery allows for unprecedented high-resolution 3D investigations of shallow marine archaeological sites, which can in turn inform us about the record of early littoral and marine resource use.

##### **Isabel Cartajena, Patricio López, Diego Carabias, Jennifer Pavez, David Letelier, Renato Simonetti & Carla Morales**

ARQMAR, Universidad de Chile, Santiago, Chile

High-resolution digital recording techniques and taphonomic trajectories: multi-imaged photogrammetry applied to a drowned Late Pleistocene site in Central Chile (32°S)

**Key words:** Late Pleistocene, drowned terrestrial site, extinct fauna, 3D mesh model, taphonomy

**Abstract:** Late Pleistocene sites in the Americas provide relevant data for modelling paleolandscapes, studying paleohabitats and available

resources, and discussing the possible migration routes for the peopling of the Americas. However, the interpretation of these sites is often difficult due to the nature of the recovered evidence, mainly animal bones, subject to complex formation processes, with absence or discrete signs of human modification. With the exception of site GNL Quintero 1 (GNLQ1), evidence of late Pleistocene drowned terrestrial sites after the Last Glacial Maximum is very scarce along the Pacific coast of North and South America. The site is located in central Chile (Quintero Bay), where a well-preserved continental fauna bone assemblage was recovered (ca. 24.800–21.600 B.P.) with a high taxonomic diversity, extinct fauna but also small mammals (Camelidae, Cervidae, Xenarthra, Mylodontidae, Canidae, Rodentia and Myocastoridae). Recently, a 3D mesh model of a section of the site was achieved through a diver multi-image underwater high-resolution photogrammetry. 3D images were used for refit, modification identification, orientation, and location of bones within the depositional matrix. Photogrammetry provided an accurate and rapid mapping method for *in situ* recording, and together with 3D modelling proved to be powerful tools for interpreting taphonomic trajectories of the bone assemblage. Although 3D models are commonly used for interpreting wreck sites and other complex structures and artefacts, they also can be successfully applied for studying drowned Late Pleistocene sites with few visible features.

**Morning break (10:45 – 11:15 am)**

## **Three-dimensional digitization techniques and technologies in maritime archaeology (11:15 am – 12:45 pm) – Part 2**

**Tomasz Bednarz (National Maritime Museum, Gdańsk, Poland)**

Research of the 17th-century 'Glass Wreck' using photogrammetric 3D documentation. The 'virtual open-air museum of wrecks in the Gulf of Gdańsk' project

Key words: Glass wreck, 3D models, virtual museum

Abstract: In 2015 archaeological excavations, including 3D documentation, were carried out by the National Maritime Museum (NMM) on the 17th-century 'Glass wreck' from the Bay of Gdańsk. The site lies at a depth of 20 m, 5 nautical miles from the coast of Gdynia. Oak wood used to build the vessel was gathered in the second decade of the 17th century. During the works conducted on the wreck it was determined that it constituted the remains of a 25–30 m long vessel which sank carrying the iron guns and cargo of barrels containing iron bars and glass bottles of various sizes and shapes. The bottles have tin tops and are stamped with the 17th century marks of the Gdańsk tinsmiths, like Salomon Gieseler, granted master's rights in 1655. Moreover, the tinsmiths' marks with the coat of arms of Gdańsk were discovered on the site, they had never been recorded in any catalogues before. Some of the barrel lids were stamped with merchants' marks. Moreover, three lead ingots with merchants' and producers' marks were discovered. Lead came from the deposits in southern Poland. The wreck showed significant evidence of burning. In 2015 the NMM launched the 'Virtual Open-Air Museum of Wrecks in the Gulf of Gdańsk'. The website contains six 3D models of wrecks with their descriptions, photo and video documentation. By the end of 2016, the NMM is planning to post on the website ([www.wsw.nmm.pl](http://www.wsw.nmm.pl)) six more wrecks from the Gulf of Gdańsk. One of them will be the 'Glass Wreck'.

**Barbara Davide Petriaggi, \*Massimiliano Secci, Gabriele Gomez de Ayala, Pier Giorgio Spanu & Luca Sanna – \*Università degli Studi di Sassari, Sassari, Italy**

The role of 3D models in the interpretation and *in-situ* preservation of archaeological heritage: the case studies of Portus Iulius in submerged Baiae (Pozzuoli, Naples), and the ancient harbour in Marina Lunga-Sottomonastero (Lipari)

Key words: Three-dimensional model, interpretation, *in-situ* preservation, submerged Baia, Lipari

Abstract: Archaeologists and conservators have always largely relied on visual spatial representation in the process of recording, analysing and interpreting archaeological evidence, and assessing archaeological heritage. Site plans, artefact drawings and other visual aids have always assisted the analysis of archaeological sites and artefacts. Innovations in computer vision and optics are offering archaeologists and conservators new and empowered tools for recording the submerged resource. Such tools possess a large potential for acquiring information on sites and artefacts, helps in planning activities, interpreting the archaeological evidence, monitoring deterioration and planning conservation and preservation programs for the underwater cultural heritage. Since 2009 the ISCR, in the frame of the project 'Restaurare sott'acqua – restoring underwater', has invested resources in the development of three-dimensional underwater scanning systems to plan and document conservation works on underwater archaeological structures. A trial of Computer Vision Photogrammetry (CVP) and Underwater Laser Scanning (ULS) was applied on a portion of the building with porticoed courtyard of Portus Iulius in the submerged site of Roman Baiae (Pozzuoli, Naples), guided by ISCR. A trial of CVP combined with Differential GPS in the ancient harbour of Marina Lunga-Sottomonastero (Lipari) – both trials have been also supported by the Honor Frost Foundation 2015 Grant Award – offered the opportunity to advance some considerations on the potentials of these recording techniques in attempting to frame such tools within the interpretive and *in-situ* preservation analysis processes of a submerged archaeological site.

**Petra Helmholz, Joshua Hollick, David Belton, Andrew Woods & Andrew Hutchison – Curtin University, Perth, Australia**

Verification of the *Batavia* reconstruction based on underwater photogrammetry and laser scanning

Key words: Photogrammetry, laser scanning, verification, 3D reconstruction

Abstract: During the excavation of the *Batavia* shipwreck in the 1970s part of the wooden hull and additional artefacts were excavated and conserved. In the course of the excavation over 4,000 underwater images were captured to document the expedition. These images have allowed the digital 3D reconstruction of the *Batavia*, as it was found on the sea floor (Woods, 2016). The physical shipwreck timbers were reconstructed and are now located in the Western Australian Museum's Shipwreck Galleries. In 2014 the shipwreck, as displayed in the museum, was surveyed using Terrestrial Laser Scanning (Leica C10) and two sets of images taken from different cameras (Annesley, 2014). The aim of this paper is to compare the 3D reconstructions from the underwater archival photography with the laser scans and 3D reconstruction of the *Batavia* hull currently on display to verify if the *Batavia*, as displayed today, has the same configuration as the original wreck. A difference between both datasets is assumed, as the process of excavation, transportation, preservation and reconstruction will influence the timber parts, which were sitting for approximately 340 years on the sea floor. This difference will be quantified using two different comparative methods. Firstly, distance measurements between objects of interest on the hull of the wreck will be derived based in the images from the 1970s as well as the laser scan in 2014. Secondly, the derived point clouds from both datasets will be compared using a nearest neighbour interpolation and a surface interpolation method.

**Chris Rowland & John Anderson – University of Dundee, Scotland, United Kingdom & ADUS Deepocean**

Developing salvage visualisation methods to impact maritime heritage

Key words: 3D, visualisation, heritage, conservation

Abstract: Using case studies such as the MV *Rena*, this paper explores the adaptation of 3D visualisation methods developed for maritime salvage for use on underwater heritage and conservation sites. The MV *Rena* container ship ran aground on Astrolabe reef in the Bay of Plenty, New Zealand, in October 2011, resulting in the worst maritime oil spill in the country's history. The ship split in two in January 2012 causing further oil leakage and debris to be spread across the reef. The clean-up operation was aided by a number of 3D visualisations created from multiple sonar surveys in 2012, 2014 and 2015, to show how the wreck was moving and breaking up during salvage. Initially the visualisations were created to assist risk assessment and planning for the salvage teams. However, the 3D images are now being used by local conservation groups to highlight their ongoing work and also to offer guidance to visiting divers once the site reopens in 2016. Methods developed for these visualisations are now being adapted for use on maritime heritage sites such as the remains of the German WWI High Seas fleet, scuttled at Scapa Flow Orkney, United

Kingdom, and also the historic wrecks from the WWII Battle of the Atlantic off the East Coast of the USA. As these and other similar sites are 'open' to visitors from the diving community, the problems of monitoring and *in situ* conservation are impacted. We ask the question: how can we improve our visualisation methods to help maximise positive impact?

#### **James Hunter & Kieran Hosty – Australian National Maritime Museum, Sydney, Australia**

Old ships, new tricks: 3D documentation of submerged Sydney Harbour shipwreck sites with digital photogrammetry

**Key words:** Digital photogrammetry, shipwreck, maritime archaeology, Sydney Harbour, site mapping

**Abstract:** Australia's Sydney Harbour hosts a wide variety of historic shipwreck sites. These range from large, fully exposed and intact hulls to smaller, largely disarticulated, dispersed, and buried structural components and artefacts. The environments in which these sites exist also differ significantly in terms of seabed composition, water depth and water clarity. Most historic shipwrecks within the harbour are located at depths near or in excess of 20 metres (66 feet), and are characterised by moderate-to-low visibility conditions. These attributes in turn often negatively influence working conditions – particularly the amount of time available to execute an adequately comprehensive documentation regime. Digital photogrammetry has rapidly evolved into a relatively inexpensive and efficient means of documenting submerged shipwreck sites, but is still fraught with issues. In an effort to test the efficacy of this technique as a mapping tool in Sydney's waters, maritime archaeologists affiliated with the Australian National Maritime Museum selected four shipwrecks with diverse site and environmental profiles. These include the composite-hulled sailing ship *Centurion* (1887), sidewheel paddle steamer *Herald* (1884), wooden-hulled screw steamship *Royal Shepherd* (1890), and iron-hulled steamship *Centennial* (1889). This paper outlines strategies employed to document these sites, and their outcomes.

**Lunch (12:45 pm – 1:45 pm)**

### **Floating forests / submerged forests: an environmental history of trees (1:45 pm – 3:00 pm) – Part 1**

#### **Filipe Castro – Texas A&M University, Texas, USA**

Ship sizes and wood scantlings

**Key words:** Ship sizes, scantlings, architectural signatures

Oceangoing wooden ships were built by specialists according to tradition, taste and availability of materials. When analysing and reconstructing a ship from its archaeological remains, it is not always easy to determine a ship's size based on the size of its structural timbers. This paper proposes an approach to investigate whether there is a clear relation between the sizes of a ship's main structural components and its overall size, and whether this relation is regional, functional, and whether it changes over time.

#### **Adolfo Miguel Martins, Ana Almeida, Antonio Santos, Ivone Magalhaes, Filipe Castro, Jemma Bezan, Marta Dominguez Delmás, Nigel Nayling & Peter Gronendijk – University of Wales Trinity Saint David, Lampeter, Wales**

Reconstructing trees from ship timber assemblages using 3D modelling technologies: evidence from Belinho in northern Portugal

**Key words:** Archaeology, dendrochronology, multidisciplinary, computing, shipbuilding

**Abstract:** During the ferocious storms of 2013/4, violent waves threw up a remarkable set of ship timbers and hundreds of pewter plates onto the beach of Belinho in northern Portugal. An international investigative team was assembled jointly between archaeological experts from the Council of Esposende and the ForSeaDiscovery project whose objective it is to develop innovative timber and shipwreck recording and analysis methodologies, as well as exploring historic timber supply and forest management in the Iberian Age of Discoveries. A key recording strategy included the usage of Faro Arm digital measuring technology, which allowed the detailed recording of individual diagnostic ship timbers and was complemented using photogrammetry. This allowed a complex model of each timber to be rendered in Rhinoceros engineering 3D modelling software. Alongside a detailed timber record using photography, measurement and contract tracing, a comprehensive record of the assemblage was collated. This data is allowing investigators to model and reconstruct parent tree forms for each ship timber. In this way, we can say something about how trees were grown, managed and selected as part of a major Iberian shipbuilding industry. Project Belinho has contributed in many ways to the development of a 3D digital glossary and new methodologies for recording and interrogating ship timber assemblages. The reconstruction of the whole story of 'ship' as a 'floating forest' is innovative in this regard. Equally, the wider international expert team is studying the ship's reconstruction and hull form, wood sciences including dendrochronology, DNA and isotopes, GIS mapping, and looking at trade routes.

#### **Maria M. Intxaustegi – University of the Basque Country, Spain**

A timber voyage: the Havana Shipyard in the 18th century

**Key words:** Timber, shipyard, 18th century, Cuba

**Abstract:** The 18th century was a tumultuous period in Europe. The nations who were looking to the Atlantic Ocean were fighting amongst themselves to ensure the safety of their colonies, and more importantly, their trade routes. Failure to do so would have endangered their incipient economic systems and the power and control of each monarchy. These are some of the main reasons which explain why the development of shipbuilding became such an important subject that would lead all the nations that had overseas colonies in the Atlantic Ocean (e.g. England, Spain, France, Portugal or Holland) entering into a competition to build the most powerful, manoeuvrable and dangerous ships. The future of every nation was inevitably linked to this competition. At this point they were no longer concerned with the development of shipbuilding to bring spices from the Indies, their attention had now turned to holding up their own empires through Naval power. Based on archaeological and documentary sources, we will try to explain why the Havana shipyard, located on the island of Cuba was one of the most important Spanish shipyard during the 18th century, taking into account the geographical location, an abundance of exceptional quality timber, and the shipmasters. We will also take a trip through the construction of a ship line from the first timber to the final launching, paying particular attention to the shipbuilding methodology but also taking into account the organization and management of the shipyard.

#### **Beñat Eguiluz-Miranda, Marta Dominguez Delmás, Ana Crespo Solana, José Luis Gasch-Tomás, Miguel San Claudio & Koldo Trápaga Monchet – Consejo Superior de Investigaciones Científicas [CSIC], Madrid, Spain**

The Ribadeo shipwreck (c. 1600) – a multidisciplinary approach for an Iberian shipbuilding case study

**Key words:** Shipbuilding, forest resources, timber, dendrochronology

**Abstract:** During the dredging work in the Ribadeo estuary (Galicia, Spain) in 2011, a late-sixteenth or early-seventeenth shipwreck was discovered. The scientific and historic interest of that shipwreck is significant, since it is the best-preserved shipwreck dated to the 16th and 17th centuries in Spanish waters, likely a galleon. Many ships wrecked in the coasts of Galicia during the early modern era. However, the Ribadeo Shipwreck has not been historically identified. What type of ship was the Ribadeo Shipwreck? Was it really a galleon? What were the main constructive features of the ship? How were shipbuilding and forest resources for the construction of ships managed in Spain in the turn of the 16th century? To answer these questions, a team of historians, underwater archaeologists and dendrochronologists is working together within the Marie Curie ITN ForSEADiscovery project. By implementing a methodology that crosses archival information produced by historians, constructive analysis done by archaeologists and analysis on the species and geographic origin of wood samples taken from the Ribadeo Shipwreck, this team expects to achieve a threefold result. Firstly, the team aims to historically identify which ship the Ribadeo shipwreck was, and the date and circumstances under which it sank. Secondly, the

group expects to shed light on Spanish shipbuilding patterns and management of forest resources about 1600. Thirdly, we plan to propose a systematic method for the implementation of this interdisciplinary approach by investigating similar case studies in the future.

### Afternoon Break (3:00 pm – 3:30 pm)

## Floating forests / submerged forests: an environmental history of trees (3:30 pm – 4:30 pm) – Part 2

**\*Ana Rita Trindade, Sara Rich, Adolfo Martins, Mohamed Traoré, Nathan Gallagher & Marta Dominguez Delmás – \*Centro de Ciencias Humanas y Sociales–Consejo Superior de Investigaciones Científicas [CCHS-CSIC], Madrid, Spain**

From forests to the sea, from the sea to the laboratory: the *Santa Maria Magdalena* frigate

**Key words:** 18th century, Spain, timber supply, wood science, archival sources

**Abstract:** Driven by the increased demands on seafaring defence, the Spanish Crown launched the *Santa Maria Magdalena* frigate from the Esteiro shipyard of Ferrol (Galicia) in 1773. After nearly 40 years of naval service, she wrecked in a storm in the bay of Viveiro, not far from her origin, as part of an Anglo-Spanish squadron against the French occupation during the Peninsular Wars of Santoña (Santander). In June 2015, the project ForSEAdiscovery (Forest Resources for Iberian Empires: Ecology and Globalization in the Age of Discovery) organised an underwater timber sampling campaign on this wreck site. Through various wood provenance studies (i.e. dendrochronology, inorganic and organic chemistry), combined with historical research in national archives and international sources such as the Sound Toll Registers, the ship's timbers promised to shed light on late 18th c. Spanish naval construction, forestry practices, and timber supply in relation to shipbuilding in northern Spain. As a highly interdisciplinary project, ForSEAdiscovery integrates research fields in the Humanities and Life Sciences; therefore, this paper presents the joint efforts of historians, archaeologists and wood scientists to determine: 1) what kinds of trees were used to construct which parts of the *Santa Maria Magdalena*; 2) their eventual provenance; 3) the timber trade networks and state management involved in supplying lumber to the Ferrol shipyard; and 4) best-practice methodologies to reach these conclusions.

**Sara Rich, Garry Momber & Nigel Nayling – Maritime Archaeology Limited, Southampton, England**

Maritime archaeological timber sampling: methods and results from the silty Solent

**Key words:** Submerged forest, prehistoric sites, timber sampling

**Abstract:** The Solent is a part of a flooded ria system along southern England. The region has been a focal point for shipbuilding and maritime activity for millennia. Today it hosts a number of wooden shipwrecks, submerged prehistoric sites and drowned forests. The archaeological artefacts within these sites can answer questions about our past and their study often dominates research while detailed analysis of the timber itself invariably plays a secondary role. This lacuna is being addressed by the Marie Curie, ForSEAdiscovery, project that is training a team of researchers to recover and interrogate timber samples from underwater archaeological sites. This paper will focus on underwater work conducted in the Solent where the 16th century, Yarmouth Roads shipwreck lies adjacent to a submerged forest. The well-preserved timber retains evidence of climatic fluctuations, forestry and trade casting light on international socio-environmental change. The harsh environment underwater, strong currents, limited visibility and complex archaeological matrices necessitated the development of new methods to rescue and recover appropriate samples. This paper will present and evaluate the methods used by maritime archaeological divers to overcome the challenges faced in this busy marine channel. In particular it will look at the *in situ* timber sampling of the ship structure and the submerged oak forest. It will present results from analysis of the samples, highlighting the need to identify and characterise the timber within the context of the archaeological artefact (such as a shipwreck), while understanding its correlation with the tree from which it was converted.

**\*Aoife Daly, Marta Dominguez Delmás, Wendy van Duivenvoorde & Jeremy Green – \*dendro.dk, Brønshøj, Denmark**

Timber for the *Batavia*

**Key words:** Batavia, dendroprovenance, timber trade

**Abstract:** Remains of the hull of the *Batavia* ship stand on exhibition at the Western Australian Museum – Shipwreck Galleries in Fremantle, Australia. The *Batavia* was wrecked off the coast of Australia in 1629. Although only a small portion of the hull survives, it is an important resource in the study of 17th-century Dutch shipbuilding, not least for studying the procurement of oak used in the Dutch East India Company shipyards. Previous dendrochronological analysis of some timbers suggested a Southern Baltic source for some planks for the ship, clearly demonstrating the trade in timber to the shipbuilding yards in Amsterdam. But timber was transported to Amsterdam from many regions in Northern Europe. Could an extensive dendrochronological analysis of the surviving *Batavia* timbers demonstrate the extent and variety of sources of timber used for this early 17th-century Dutch ship? Sampling and dendroprovenance analysis of planking and framing timbers from the hull is building the history of timber procurement for the *Batavia* ship, and the results that emerge can be compared to that of other vessels from the period. In this talk, the results of the *Batavia* dendrochronological provenance analyses will be presented.

## Day 2: Maritime Museum Functions Centre (Level 2): Tuesday 29 November

### Effective and sustained monitoring of archaeological localities in fresh waters, and *in-situ* preservation and conservation of underwater cultural heritage (9:00 am – 10:45 pm)

**Martijn R. Manders – Cultural Heritage Agency of the Netherlands, Amersfoort, The Netherlands**

Can we preserve *in situ*?

**Key words:** *In-situ* preservation, cultural heritage management

**Abstract:** In the last few decades, much research has been done on finding ways to protect archaeological sites underwater against deterioration. Methods have been developed and tested. Some were successful while others failed. European projects like MoSS, BACPOLES, MACHU, WreckProtect and the latest SASMAP (with the help of small- and medium-sized enterprises) have been all focussing on this subject. There has been an enormous political backup for preservation *in situ* as the first option to consider. Laws have been implemented, governmental budgets to do so unfortunately often failed to increase. This is the case in many areas of the world. Being the first option to consider, and backed up jointly by archaeologists and politicians, is *in situ* preservation the panacea everybody has hoped for? Or is there a downside to this? This presentation will be discussing the nearby future in underwater cultural heritage management and the issue of *in situ* preservation, conservation and stabilisation in particular. Information from practices all over the world will be used to support the issues raised.

**Beat Eberschweiler – Kantonsarchäologie Zürich & Archaeology of Canton Zurich, Switzerland**

## Erosion and archaeological heritage – protection in Lake Constance and Lake Zurich (Central Europe)

**Key words:** Pile-dwelling sites, erosion, protective installations, archaeological, monitoring, erosion markers

**Abstract:** Lake Constance and Lake Zürich contain important archaeological cultural assets. Above all, the so-called pile dwellings of the 5th to the 1st millennium BC are widespread in the shallow water areas of the lakes, and in 2011 a total of twenty of these sites were included into the inscription of 'Prehistoric Pile Dwellings around the Alps' on the UNESCO World Heritage List. However, construction in harbours and along the lakeshore, shipping traffic, and recreational facilities as well as erosion processes all considerably endanger the stability of the underwater cultural assets. Since the 1980s, the authorities concerned with the preservation of archaeological heritage in Baden-Württemberg and the cantons of Thurgau and Zürich have developed working techniques for the preservation of these special underwater cultural assets. Numerous questions about the causes of erosion, the technical installation and the effectiveness of protective measures against erosion and the ecological tolerance of such measures, however, remain open. At this point the Interreg IV project 'Erosion and Archaeological Heritage Protection on Lake Constance and Lake Zürich', started in conjunction with various institutes concerned with lake research. Within the framework of this project the technical methods of mapping and surveillance of the site as a basis of an archaeological monitoring were refined and extended and measures for the integration of protection against erosion were intensified and checked. From the natural scientific point of view, the essential topics for a long-term reduction of anthropogenic-increased erosion are a reduction of ship-induced waves.

## \*Vicki Richards & Peter Veth – \*Western Australian Museum, Fremantle, Australia

**Title:** *In-situ* preservation of the *James Matthews*: past, present and future

**Key words:** *In-situ* preservation, shipwreck, reburial, monitoring, management

**Abstract:** The *James Matthews* was wrecked in 1841, near Woodman Point, south of Fremantle, Western Australia. The site has been identified as historically and archaeologically important not only because of its significance to early colonial trade in Western Australia but more importantly, it remains one of the world's best preserved examples of a 19th century purpose-built illegal slave trader. The wreck was fully excavated in the 1970s, documented, recorded and subsequently reburied *in situ*. The site remained stable until the late 1990s when changes in the natural near-shore sedimentary processes and increased industrial activity in the immediate area caused significant site exposure. Since 2000, a number of different reburial techniques have been trialled on-site and in 2008 the results indicated that the 'cofferdam' strategy was the most successful. However, funding was not available to implement the full-scale reburial program until significant financial support was offered through the Australian Research Council *Australian Historic Shipwreck Preservation Project*. Hence, in November 2013 the full scale 'cofferdam' remediation strategy was initiated with the support of many local and interstate practitioners and volunteers. This presentation will highlight the results from this 15-year conservation management program and future research directions for the on-going *in-situ* preservation of this historically important shipwreck site.

## Mi Young Cha – National Research Institute of Maritime Cultural Heritage, Mokpo, Republic of Korea

*In-situ* preservation and monitoring of a wooden shipwreck found in an intertidal zone, South Korea

**Key words:** Wooden shipwreck, intertidal zone, *in-situ* preservation, waterlogged archaeological wood, monitoring

**Abstract:** The National Research Institute of Maritime Cultural Heritage discovered fourteen old shipwrecks in the last 40 years. Twelve were re-floated after excavations, and conserved. However, two of the wrecks were reburied following excavations. The situation that all discovered shipwrecks could not be refloated is the present state of affairs in South Korea. However, this is also the reality for many countries around the world. This paper focuses on two wooden shipwrecks that were discovered during fishing activities in the intertidal zone of the west coast in South Korea, and subsequently reported. This paper will introduce *in situ* preservation plans intended to progress in 2016, aiming at monitoring two of the shipwrecks in the condition of deteriorated waterlogged archaeological wood.

## \*Mitzu Antonieta Quinto Cortés, \*\*Mark Jones & \*Jonathan Adams – \*University of Southampton & \*\*The Mary Rose Trust, England

Preservation *in situ* of UCH in estuarine contexts: the relationship between the material remains and the environment

**Key words:** Estuarine, environment, *in situ* preservation

**Abstract:** Preservation *in situ* of Underwater Cultural Heritage (UCH) is becoming a universally accepted approach towards the long-term conservation of material remains. Although there are studies about the characterisation of the marine context, there is still considerable work required to understand decay dynamics in freshwater. This paper shows the first results of an on-going PhD research regarding *in situ* preservation of UCH in estuarine environments, developed by the Centre for Maritime Archaeology of the University of Southampton and the Mary Rose Trust, England. One of the case of studies featured in this initial research is the *Grace Dieu* shipwreck. Built in c. 1416 AD, it is considered to be one of Henry V's 'great ships' due to her considerable size, design and building technique. She was anchored in the Hamble River, Southern England, where she was struck by lightning and burnt to the waterline in 1439. Even though she is entirely submerged in mud, her remains are still evident at extreme low water during equinoctial spring tides. As part of the assessment process, diverse analytical techniques have been used to characterise the biological, chemical and physical properties of the material remains (shipwreck) like FTIR, SEM, moisture content, compression and flexural testing; and of the environment such as particle size analysis, SEM, moisture content and XRF. The first results have shown a good conservation state of the plankton sample suggesting that the burial conditions seem to promote a favourable environment for its preservation.

**Morning break (10:45 – 11:15 am)**

## Naval warfare (11:15 am – 12:45 pm)

### Johan Rönby – Södertörn University, Huddinge, Sweden

The Prince's ships. Early Modern warships and sunken battlefields in the Baltic

**Key words:** Early Modern, State formation, carvels, battlefields, Baltic Sea

**Abstract:** The creation of large carvel-built ships in the late Middle Ages is often described as a major technological change in Northern Europe. Over a period of a hundred years, from mid-1400s and onwards the medieval, rather small one-masted ship was replaced with new full rigged large ships. This ship innovation is linked to the creation of the new nation states and the king's needs for effective exercise of power, including their needs for warfare and naval transports far away from home at newly discovered areas across the globe. In the brackish water of the Baltic Sea some of this early warships still can be studied as well preserved sunken shipwrecks. Archaeological studies of the *Gribshunden* (1495), *The Kravel* (1525) and *Mars* (1564) provide detailed insights into the development of early modern shipbuilding. These shipwrecks can also provide new insights into unknown issues related to practical solutions in naval battles during early modern times and the contemporary change of tactics regarding fighting at sea, from boarding to more use of guns on distance. The wreck sites are however not just the remains of ships, they are also well-preserved maritime battlefields. Visiting and experiencing them can invite discussions and reflections on the various aspects associated with killing of fellow human beings, both onboard early modern ships and in general.

### Irini Malliaros – Bournemouth University, Bournemouth, England

Missing link – evidence of the military and naval evolution of a global empire

**Key words:** Alderney, 16th century, warship, naval warfare, military evolution

**Abstract:** The establishment of a naval force was key to the domination of sea routes and ultimately the expansion of the British Empire. This process began in the 16th century under King Henry VIII but did not develop until the time of Queen Elizabeth I. There has not been a single English example in British waters from this pivotal time in England's military history until the discovery of a late 16th century wreck off the north-eastern coast of Alderney, Channel Islands. Discovered in 1977 and excavated in increments throughout the 1990s, the results of which have been published, and early 2000s, the results of which have not, it has provided a collection, which now fills the gap between the transition from medieval to post medieval England. The material found and recovered to date is primarily of military nature including the ship's ordnance (typically English), harquebuses, calivers and muskets (and associated equipment e.g. powder flasks), blades and plate armour. The ceramic collection indicates operation within the English Channel with examples from Germany, the Low Countries, northwest France and England. There is no indication of this being a naval vessel, however the arsenal on board indicates official military business. Recent assessment of the post-2000 season material has shed new light on old theories. The Alderney wreck stands as an example of England's complete overhaul in the instruments and art of war and a demonstration of the role its naval force played in affirming the new, global power into which it was evolving.

#### **Nicol Tollis – Università La Sapienza di Roma, Rome, Italy**

The military dockyards in the Greek world

**Key words:** Military dockyard, warship, shipshed, Greek, urban organization, sea power

**Abstract:** This paper focuses attention on the birth and development of military dockyards in the Greek world between the 6th and the 3rd century B.C. and to analyse the related urban and typology issues. The improvement of structures – and its related buildings – is strictly connected to the invention of the trireme. This warship, spread over Greece during the 6th century, became the main vessel adopted by the Greek fleets during the Classic Age. The trireme, like all the wooden ships, could not stay in water for a long period; and the fleet needed to be launched in the easiest and quickest way as possible. To accomplish this task, shipsheds were created, buildings set in front of the shoreline of the military harbour, which, as the word says, had to protect the ships. This work aims to scrutinise both these structures – of which we have abundant evidence – including the facility buildings, fortifications and quays that formed military dockyards and to prove the importance of the development and the spread of this model around the Greek world. Within the polis these structures fulfilled both a practical and a representative function; noteworthy is the correlation among the growth of the city as a military power and development of the dockyards, which strongly influence the political and urban organisation of the polis.

#### **Tom Cousins, Tom Harrison & Dave Parham – Bournemouth University**

The maritime archaeology of duplex drive tanks in the United Kingdom

**Key words:** WW2, amphibious, tanks, duplex drive

**Abstract:** The catastrophe at Dieppe in 1942, where unsupported infantry attempted to capture a fortified beachhead, showed the allied forces how difficult such a venture was. As part of the invasion plan for what became Operation Neptune, or the 'Normandy landings', the allied staff saw the need for armoured support for the first waves of men ashore. This need was developed into the concept of 'swimming tanks' that would land a few minutes ahead of the first infantry waves. The development of such a weapon was undertaken in conditions of absolute secrecy in the UK from late 1942 onwards. This secrecy led to the destruction of much of the historical record that relates to these armoured vehicles, leaving a confused and largely unknown record of what was an important aspect of WWII. This project sets out to record the known examples of such vehicles on the coast of the United Kingdom including a group lost as part of 'Exercise Smash', the largest live ammunition exercise of the war, a full scale beach assault training exercise with all supporting arms including amphibious tanks. Six tanks were lost during the exercise in conditions which are not fully understood, but whose loss leads to the changing of the operational plans for D Day. Using archaeological and historic data, the project offers an alternative interpretation of these losses and provides a better understanding of their subsequent impact on Operation Neptune.

**Lunch (12:45 pm – 1:45 pm)**

### **Scientific techniques, use of digital platforms, and application of new technology in maritime archaeology (1:45 pm – 3:00 pm) – Part 1**

#### **Ole Grøn, Lars Ole Boldreel, Jean-Pierre Hermand, Debbie Cvikel & Ehud Galili – Norwegian Maritime Museum, Oslo, Norway**

Stone Age sites in deep water – how do we cope with an international problem?

**Key words:** Seismics, Stone Age, submerged, mapping

**Abstract:** A central problem in maritime archaeology is the submerged Stone Age sites at depths of around 140 m representing the low sea levels of the glaciations. During this period, the water of the oceans was contained in land-based ice sheets. There are indications that these sites, through time, have accumulated to numbers that surpass the numbers of shipwrecks and related structures significantly. In addition the preserved sites' state of preservation may generally be better than on land. A basic problem in relation to the management of such a cultural heritage resource is to develop a cost-effective method for mapping it. Since modelling has significant limitations, which renders it almost unsuited for such a task underwater, other methods have to be considered. This presentation suggests the application of acoustic-response from human-knapped flint and other silicate minerals as a realistic method for locating submerged Stone Age sites. The acoustic responses that have been obtained so far on an experimental basis have in several cases been obtained from flint embedded in the sea floor sediments; in one case from a cultural layer covered by more than 1 m of sediment. The general principle established involves an extensive and necessary fine tuning of the method to be able to pick up responses from small amounts of knapped lithic located as deep in the sea floor sediments as possible.

#### **\*Jin-Yuan Liu & \*\*Chen-Fen Huang – \*Department of Electrical and Computer Engineering, Tamkang University, Taiwan & \*\*National Taiwan University & Institute of Oceanography, Taiwan**

The estimation of buried objects using marine magnetometer in underwater archaeological survey

**Key words:** Marine magnetometers; buried objects; survey tools

**Abstract:** Underwater archaeological surveys are generally conducted using active acoustic systems, such as side-scan sonar, sub-bottom profilers, multi-beam sonar, and passive marine magnetometers; some surveys also employ visual systems, such as remotely operated vehicles (ROV) to undertake photography underwater. For objects lying on the seafloor, these systems provide images for identification, but only the sub-bottom profiler and the marine magnetometer show images or pulses in response to objects buried beneath the seafloor. While the sub-bottom profiler provides images sufficient for an estimate of an object's horizontal dimension, using these images to estimate the overall volume is difficult. In this study we have estimated the volume of buried objects using marine magnetometer observations. In order to gauge the significance of the response pulses obtained from underwater archaeological surveys, the magnetometer system was first calibrated by the facilities deployed in a marine test field established in an *in situ* marine environment. Then, the data from the archaeological site were analysed using the calibration results to estimate the volume of buried objects. A few examples are demonstrated, indicating that buried objects may be discovered for preliminary archaeological analysis. Although the approach may only provide a crude estimate, further refinement may be achieved in conjunction with images from a sub-bottom profiler.

#### **Jorge Russo & Augusto Salgado – Portuguese Navy Research Centre [CINAV], Portugal**

Archaeology of a Great War U-boat attack in the south of Portugal: development and adaptation of methods and techniques

**Key words:** WWI, U-35, 3D printing, biometric recognition

**Abstract:** On 24th of April 1917, the German U-boat, U-35, of Lothar von Arnauld de La Perière, halted, attacked and sunk one wooden sailing ship and three metal cargo steamers, off the coast of Sagres and Lagos, Algarve, Portugal. On the eve of the centenary of this Great War episode, a team from the Portuguese Navy Research Centre (CINAV) started a historical and archaeological project on the U-35's mission and these sunken ships. The sailing ship was searched at more than 650 m deep, in what was the first underwater archaeology mission of such large technical scale in Portugal. The location of one steamer has been confirmed, and the identification of the other two have been proven. During the archaeology and history research of the three steamers, we had the need to develop or adapt methodologies in order to survey and record, such as 3D printing, and to identify crewmembers in historic photographs, by advanced algorithm for biometric recognition.

The objective of this paper is to share these methodologies.

### **Ian Warne – Maritime Archaeological Association of Western Australia (MAAWA), Perth, Australia**

How an amateur group produced a shipwrecks phone app

**Key words:** Technology, shipwrecks, phone apps, amateur group

**Abstract:** The Maritime Archaeological Association of Western Australia (MAAWA), formed in 1974, is a group of divers, historians and enthusiastic volunteers/members, who are interested in Western Australia's rich maritime heritage. The Association is closely affiliated with the Western Australian Museum. Over the past 40 years of dedicated historical and underwater research, a database of historical wrecks has been developed. During this process, MAAWA members discovered masses of historical information stored in libraries, private sheds and other storage areas, which have never been made available to the general public. In 2014 MAAWA (with the assistance of a LotteryWest grant), produced a web page and phone app showing details of the 30 known wrecks in the Swan and Canning Rivers and twelve shipwrecks around Rottnest Island. The website is now easily accessible by schools, libraries, commercial and recreational tourism operators, and the general community who can now access all the same information via the phone app. The phone app contains historical and pictorial information of the vessel when it was still sailing or operating (most are 100 years old) and shows how the wreck looks now, complete with drawings and underwater photos, as well as exact wreck location via Google maps. Since the launch of the website and phone app, more research and interpretation have continued to be carried out, particularly relating to shipwrecks found off the mid-west coast. This is an area rich in maritime heritage resources such as the Dutch (VOC) shipwrecks like the *Batavia* (1629) being located in this area.

**Afternoon break (3:00 pm – 3:30 pm)**

## **Scientific techniques, use of digital platforms, and application of new technology in maritime archaeology (3:30 pm – 4:30 pm) – Part 2**

### **Olivia Hulot & Jaouen Marine – Drassm / French Ministry of Culture, France**

Wreck's digitalization in foreshore context

**Key words:** Wreck, digitalization, foreshore, excavation, coastal trade

**Abstract:** The study of foreshore archaeological sites has specific problems. Retained by sands, wrecks of our community heritage situated in intertidal zones are mainly detectable because of natural erosion or human activities. These threats affecting the sites can also accelerate their degradation, even causing their disappearance. Intertidal wrecks are very fragile but they are a precious and irreplaceable testimony of maritime heritage. It is a real challenge to find appropriate ways to study them. Archaeological foreshore sites are primarily subjected to tides. This constraint requires rethinking of the usual methods used for underwater or land environments, including defining effective technological tools to document the remains in a short period of time. One of the works undertaken in Brittany (Côtes-d'Armor, France) focuses on the study of a small tonnage ship called the *Erquy-les-Hôpitaux*, which wrecked at the turn of the 17th and 18th centuries. It corresponds to a small coaster, carrying mainly alia lime mortar. In 2015, the Drassm (French Ministry of Culture) conducted a specific study of this wreck in order to define and assess various approaches to collect archaeological data. The first step of the study saw 3D digitization techniques applied, which allowed comparison between 3D laser scanning and photogrammetry. The 3D model of the wreck enabled the archaeologists to study it in greater depth following the excavation. Finally, this 3D restitution proved to be a valuable asset also for the presentation of the project to the general public.

### **Philippe Pelgas & \*\*Le Faou Yann – \*National Institute of research Preventive Archaeological, Inrap & \*\*National hydrographic service, Defense Ministry, France**

Integrated approach using sub-bottom profiler combined with sonar multi-beam as a preventive archaeological diagnosis before harbour extension

**Key words:** Maritime archaeology, archaeometry, multi-disciplinary, geomatics

**Abstract:** In October 2015, Inrap's Bureau of Subaquatic Activities was commissioned by Drassm (The Department of Archaeological Subaquatic and Submarine Research, Ministry of Culture) to conduct an underwater archaeological diagnosis before the extension of the Porto-Vecchio marina of 44 hectares (Corsica, France). In addition to conventional archives research, it was decided to carry out a survey using the sub-bottom sediment echo sounder with the multi-beam sounder. The objective of this diagnosis was to locate shipwrecks from antiquity to now, as well as any port, or other, human-made structures. Before starting the diagnosis, it was necessary to take into account the geological context, the sediment dynamics, the nature of the expected relics and their potential size. Seismic Data processed with proprietary software, was transferred in an accessible and known format. The data was collated and analysed by the processing chain developed by the French Naval Hydrographic and Oceanographic Service (SHOM, Ministry of Defence). Metadata files incorporate parameters, which are used to check the profiles acquired. Geo-referencing of each profile permits a cross-check that achieved scores on a profile consistent with adjacent profiles. All these geo-referenced scores are exported and integrated into a GIS. The superposition of different data within GIS allows easier classification of elements found (e.g. geological, archaeological artefacts, etc.). A selection of abnormalities will be tested during the spring of 2016. In conclusion, all these studies have permitted an integrated approach by compilation of a wide range of data of which the results interest archaeology and others disciplines.

### **Arianna Traviglia – University Ca'Foscari Venezia, Venice, Italy**

Sensing tidal landscapes: artificial intelligence and computer vision methods for underwater archaeological heritage in shallow waters

**Key words:** Remote sensing, artificial intelligence, computer vision, coastal tidal wetlands, submerged landscapes

**Abstract:** Remote sensing – intended as the methodology that uses aerial, radar and satellite imagery to pinpoint potential archaeological sites on landscapes or waterscapes – is being increasingly adopted as a critical component of the suite of research methodologies normally employed in the analysis of coastal and shallow aquatic/marine (lagoon or tidal) environments as its water penetration capabilities have long proved suitable for detection of underwater archaeological features. Depth limitation, water reflective properties and water turbidity are only partially limiting the discovery opportunities its use can provide and the advantages of its application over shallow waters in favourable circumstances are manifested. A number of approaches in Pattern Recognition (PR) applied to aerial and satellite imagery of coastal tidal wetlands offer the opportunity to adopt classification methods to identify potential underwater archaeological features based on the automatic learning of patterns, regularities and shapes. These approaches, which enable machine learning of patterns and the use of learned patterns for classification, can overcome the limitations of both simple optical recognition or previous methods based on automated pattern matching, and allow for recognising underwater patterns/shapes produced by a variety

of natural or artificial elements. This paper will expand on some of the preliminary testing of this technique over the tidal landscapes of the Grado-Marano Lagoon (Italy), under which lays the southern fringes of the suburban development of Aquileia, one of the largest cities of the Roman Empire.

## Day 2: Fremantle Port Authority, B-Shed: Tuesday 29 November

### Maritime archaeology, capacity building and training in the developing world (9:00 am – 10:45 pm) – Part 1

**\*Lucy Blue & Colin Breen – \*University of Southampton, Southampton, England**

Capacity building and training in the global south: introductory paper

Key words: Capacity building, training, challenges, methods

Abstract: This paper aims to explore the nature of capacity building in maritime archaeology. It intends to lay the foundations for the session by addressing a series of questions that highlight why capacity building is necessary, the variety of challenges faced when attempting to build capacity, and how they might be overcome. It will identify through example, regional capacity-building initiatives and the individual or institutional motivations behind these developments and how recipient governments and academic institutions engage with such activities. It will address the funding of these activities and their sustainability. It will also showcase through example, different approaches to capacity-building, what themes are delivered and what different methods, projects and training schemes are adopted depending on the nature and variety of the target audience i.e. from one-day workshops to the establishment of UNESCO training centres. Furthermore, the paper will identify some of the theoretical frameworks that underpin capacity-building models, question their necessity and effectiveness. Finally, it will ask how do capacity builders perceive their role and how does the end user perceive the initiative?

**Emad Khalil & Ziad M. Morsy – Centre for Maritime Archaeology, Alexandria University, Alexandria, Egypt**

After one hundred years, is it still 'nascent'?

Key words: Egypt, Arab region, education, training, capacity building

Abstract: The investigation of underwater archaeological sites in Egypt started in the early 19th century. Since then numerous discoveries have been made along the Egyptian coastline. However, formal education and training in aspects of underwater cultural heritage only started in 2009 with the establishment of the Centre for Maritime Archaeology & Underwater Cultural Heritage (CMAUCH) within the University of Alexandria. As a result foreign archaeological missions carry out the majority of underwater archaeological projects in Egypt, and the contribution of Egyptian maritime archaeologists to the exploration, preservation and presentation of underwater cultural heritage is still quite limited. Hence, this paper will look at capacity building in aspects of underwater cultural heritage in Egypt, its development, and the obstacles it is facing. It will also shed light on the role different stakeholders are playing in capacity building and the nature of different education and training schemes.

**Lucy Semaan – University of Balamand, Koura, Lebanon**

Maritime archaeology in Lebanon: state of the art, challenges, and future prospects

Key words: Lebanon, capacity building, development, challenges

Abstract: Lebanon's strategic location in the eastern Mediterranean made it a thriving maritime and seafaring nation since at least the Bronze Age. Despite Lebanon's rich maritime history, maritime archaeology in the country is still in its infancy and has limited scope. Related academic education is non-existent, as well as a national strategy to develop the field. Furthermore, there is a lack of national laws pertaining to maritime archaeology, and Lebanon has only accepted the UNESCO 2001 convention. Since the end of the civil war (1975–1990), Lebanon's coastal heritage has remained threatened by the chaotic reconstruction of the sea front by real-estate corporations and influential individuals who bypass the prerogatives of the Directorate General of Antiquities. Indifference of the population towards their underwater cultural heritage (UCH) does not help mitigate this situation. Hence, local capacity building is needed to develop the skill base and to raise awareness of the significance of Lebanon's UCH. Such an initiative would adopt a sustainable staged-approach with key strategic points pertaining to the expansion of the education basis, encouraging research, community engagement schemes, and cooperative specialized training. This paper will thus present an overview of the development of the field in Lebanon; the challenges it faces; and past initiatives related to building the capacity of UCH and the broader archaeology, and their sustainability. It will also explore why the suggested capacity building model would suit the needs of the Lebanon and its specific challenges in order to ensure the study and preservation of the country's maritime cultural heritage.

**Akatsuki Takahashi – UNESCO Office for the Pacific States**

Progress in Underwater Cultural Heritage (UCH) management by Pacific Small Island Developing States (SIDS)

Key words: Pacific, Small Island Developing States (SIDS), SAMOA Pathway Outcome Document, capacity building, UCH Convention

Abstract: The 3rd International Conference on Small Island Developing States (SIDS) held in Samoa in 2014 resulted in the adoption of SIDS Accelerated Modalities of Action (S.A.M.O.A.) Outcome Document. This Document has explicit references to the importance of Underwater Cultural Heritage (UCH) for sustainable development of SIDS. As a follow up of this historic document, the UNESCO Office for the Pacific States in Samoa has been providing its assistance to Pacific SIDS in their efforts for the protection and management of UCH. This paper will present a summary of the progress in UCH management by Pacific SIDS since the SIDS Conference. Notable progress include, among others, the report on good practice in the management of WW II-related UCH in the Pacific, the project proposal for capacity building of SIDS for UCH management prepared in cooperation with the Pacific Heritage Hub (PHH) at the University of the South Pacific (USP), the outcome of the Canoe Summit organized by the Voyaging Societies in the Pacific at the Festival of the Pacific Arts to be hosted by Guam in May/June 2016, and the ongoing efforts in the ratification of the UNESCO UCH Convention by Federated States of Micronesia (FSM). The paper will then examine challenges facing Pacific SIDS relating to UCH management, and attempt to provide a way forward through the empowerment of Pacific SIDS by enhanced capacity building program and the cooperation with other UNESCO Conventions in culture such as the World Heritage Convention and the Intangible Cultural Heritage (ICH) Convention.

**Robert MacKintosh – University of Southampton, Southampton, England**

Capacity building and the 2001 UNESCO Convention: an Adriatic perspective

Key words: UNESCO, capacity building, 2001 Convention

Abstract: This paper explores the effects of the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage in five of its ratifying States bordering the Adriatic. The 2001 Convention aims to build capacity in its State Parties in a number of ways: through establishing minimum archaeological standards, setting out obligations that have to be implemented in national law, and through other 'generative' provisions such as encouraging training in underwater archaeology and collaboration in research. Little is currently known of the effects of these provisions. A series of interviews with key actors in Albania, Croatia, Italy, Montenegro and Slovenia will determine whether these capacity building aims of the Convention are being put into practice, who is driving this implementation, and which of its methods are truly raising the capacity of national authorities and individuals. The obstacles hindering those methods that are proving ineffective will also be determined. This paper will discuss the results of these questions and will feed into the wider debate of capacity building in maritime archaeology.

## Maritime archaeology, capacity building and training in the developing world (11:15 am – 12:45 pm) – Part 2

### **Stella Demesticha – University of Cyprus, Nicosia, Cyprus**

Between rules and reality: starting up maritime archaeology in the 21st century – the case of Cyprus

**Key words:** Cyprus, fieldwork management, lessons learnt, capacity building

**Abstract:** The practice and management of maritime archaeology, now over half a century old, has gone through various phases in different parts of the world, but it seems that the 21st century has found the discipline in a rather fast developing stage. Moreover, since the ratification of the *United Nations Convention for the Law of the Sea* (1982), the protection of underwater antiquities has been the focus of many international meetings and agreements. With such developments, resources and guidelines, starting up maritime archaeology in the 21st century could be considered a straightforward procedure rather than an adventurous attempt. In practice, however, the mistakes of the past cannot always be avoided, especially those related to still existing administrative or economic constraints. A good case is that of Cyprus, where maritime archaeology is still in its infancy. This late start of the discipline on the island is the result of a private initiative, not a governmental decision in line with the international cultural management trends. Moreover, the demanding excavation of a shipwreck was undertaken – rather than avoided, according to Rule 1 – at a stage when human resources and conservation infrastructures were rather basic, i.e. it all happened against the Annex Rules 10 and 23. This paper discusses the lessons learnt and the good practices carried out in the case of Cyprus, where despite such slips, plans are being made towards a sustainable model for the development of maritime archaeology in the domains of research, protection, education and training.

### **\*Chris Underwood & Martijn Manders – \*National Institute of Anthropology Buenos Aires & Nautical Archaeology Society**

Increasing professional heritage management capacity: illustrating the components that contribute to the success of international capacity building

**Key words:** UNESCO, international, capacity building, training heritage

**Abstract:** Many countries do not have sufficient professional capacity to manage their underwater cultural heritage or fulfil their research objectives. To address this situation, which is acute in some countries, since 2009 UNESCO has facilitated professional training in a number of locations, notably Argentina, Colombia, Croatia, Cuba, Jamaica, Kenya, Mexico, Spain, St. Eustatius, Thailand and Vietnam, in partnership with heritage organisations. Although there are similarities, these courses differ in length, content and sometimes emphasis. What many have in common is the application of teaching units taken from the training syllabus developed in Thailand from 2009, and published as UNESCO's Training Manual for the UNESCO Foundation Course on the Protection and Management of Underwater Cultural Heritage in Asia and the Pacific. Organisers and trainers have learned important lessons; most importantly that successful training courses comprise more than the sum of the individual teaching components. In particular, those international courses that bring together participants from different cultures to present their own challenges, not just differences in language, but also other considerations. This paper, using examples from the courses listed above, will illustrate the structure and organisation of UNESCO's Foundation Course that not only helps to fulfil the specific goals of the professional training, but leaves a legacy that continues to change attitudes towards the management and protection of underwater cultural heritage.

### **Michaela Reinfeld – Philipps-University Marburg & University of Cologne**

From try dive to a wreck documentation, archaeological research and capacity-building in Saudi Arabia

**Key words:** Saudi Arabia, Red Sea, research and training

**Abstract:** The east coast of the Red Sea is archaeologically still largely unexplored. Major port facilities such as Leuke Kome or Al-Shoaibah could not be located reliably and underwater archaeological research on the Saudi Arabian coast has only recently become the subject of scientific discourse. All the more important are projects like the Saudi Arabian–German research and training project dedicated to the study of the maritime history of the east coast of the Red Sea using methods of underwater archaeology. As part of a multi-year training program, archaeologists and research divers from Philipps-University Marburg are involved in the training of archaeologists of the Saudi Commission for Tourism and Antiquities in diving and underwater archaeology. In the long term, this combined training is designed to enable our Saudi Arabian colleagues to perform their own underwater archaeological research projects. To achieve this goal, both the training and networking with universities and research institutions at home and abroad, the establishment of relevant logistics and the raising awareness about the cultural heritage underwater are a high priority in order to achieve sustainable success. The paper provides an insight into achievements in education and research so far and an outlook on future challenges.

### **Mark Staniforth & Paddy O'Toole – Flinders University, Adelaide & Monash University, Melbourne, Australia**

A value-based model for capacity building in maritime archaeology in the developing world

**Key words:** Capability, capacity building, value-based model, knowledge capital development, Vietnam

**Abstract:** Over the past decade, the lead author has conducted public awareness raising, capacity building and training activities in the Asia and the Pacific region. This work has focussed largely on Vietnam, which provides the case study for our paper. From this activity a value-based model has emerged. The model is based on a value proposition that maritime archaeology is the only ethical way of dealing with underwater cultural heritage, which we argue is a world resource that belongs to current and future generations. The aim of this paper is to explain how the elements of our value-based model interact to establish and enhance capability through knowledge capital development. This model provides a basis for effective collaboration and co-operation in the teaching and training of maritime archaeologists in the Asia and Pacific regions. The model works through commitment to empowerment, participative learning, learning reinforcement mechanisms, and intensive communication with the stakeholders of the host country. Our notion of capacity building is based on a process over time, which is considered necessary to achieve long-term change or at least critical reflection on the part of the host country. In practical terms, this causes a direct exposure by the host country to the ethical and disciplinary tenets of maritime archaeology. Training alone will not work and so the model takes an integrated approach by supplementing training in a variety of forms with academic research and cultural heritage management based approaches to help answer specific problems faced by the host country.

### **Lucy Blue, Jeremy Green & \*Tom Vosmer – \*C/- Department Maritime Archaeology, Western Australian Museum**

Maritime archaeology survey of Oman (MASO) 2015

**Key words:** Oman, survey, shipwrecks, coastal assessment, training

**Abstract:** The Marine Archaeological Survey of Oman (MASO) project was initiated by the Ministry of Heritage and Culture (MHC) of the Sultanate of Oman in 2014 and involved the Western Australian Museum (WAM) and the University of Southampton, Maritime Archaeological Stewardship Trust (MAST). The primary project objective was to identify and investigate possible sites of maritime archaeological significance along the coast of Oman, as well as establish a baseline understanding of the maritime archaeology of country, and provides training for MHC employees. The project comprised six main parts:

- Archival research: identifying potential sites for investigation;
- Desktop assessment: identifying all archaeological sites located along the coast and offshore of Oman and particularly those areas that are likely to be significant sites of underwater cultural heritage;

- Coastal reconnaissance and focused coastal survey: a field survey of targeted coastal areas identified by the desktop assessment that have a high archaeological potential or are threatened by coastal development;
- Remote sensing survey: survey of specific areas selected from the coastal survey;
- Diver and underwater visual search and survey: to survey and investigate areas identified by the coastal reconnaissance and located by the remote sensing survey; and
- Training and capacity building: to develop the expertise of the MHC underwater archaeological team.

In addition, a key aim was to raise awareness about the significance of Oman's underwater cultural heritage for government ministries and NGOs that have responsibilities for the maritime environment in Oman. This paper will report on the findings of this project.

**Lunch (12:45 pm – 1:45 pm)**

## Poster presentations, Part 1 (2:00 pm – 3:00 pm) – Part 1

### Boats and trade

#### **Angela M. Rodríguez S., C. Valeria Sepúlveda & Diego A. Carabias – ARKA Arqueología Marítima, Chile**

**Title:** The Valparaiso Customs wharf: corporate tableware as a source of information for the Pacific Steam Navigation Company (PSNC)

**Key words:** Corporate tableware, Valparaiso Customs Wharf, material culture, 19th century, shipping freight and passenger companies

**Abstract:** In the mid-19th century the port of Valparaiso became an important centre for commerce, transport and trade which resulted in the construction of the Customs Wharf, the first major port infrastructure developed in Chile up to that time. Built between 1873 and 1883, the Customs Wharf allowed the operation of vessels owned by a number of multinational shipping freight and passenger companies, most notably the Pacific Steam Navigation Company (PSNC). This company covered the route connecting England and the Pacific Coast of South America, from 1840 until the 1950s. The Customs Wharf was a site of constant and intensive port activity for almost thirty years, thus the area surrounding it became a common place for artefact disposal. Through underwater test excavations, this submerged refuse site (S3-4 PV) has yielded a diverse archaeological assemblage including a high density of corporate tableware associated with the PSNC. Preliminary ceramic analysis suggests a relationship between design motifs and manufacture marks versus the density of artefacts present at the site. This implies an association between the archaeological evidence, the period of operation of the Customs Wharf and the presence of the PSNC in Valparaiso. Through the study of the PSNC's corporate tableware, we aim to verify the periods of highest activity of this company in the Customs Wharf. Furthermore, this opens the discussion regarding corporate tableware as a new source of archaeological evidence for the study of shipping freight and passenger companies, along with the international/globalized nature of their operations.

#### **Antonella Antonazzo – University of Rome 'Tor Vergata', Italy**

**Shipwrecks and cargoes: routes and trades in the Mediterranean through the Hellenistic relief bowls**

**Key words:** Trade routes, shipwrecks and cargoes, Mediterranean, Megarian bowls, Late Roman Republic

**Abstract:** Underwater Archaeological Research, by the investigation of specific categories of objects from the cargoes, offers a peculiar possibility to make a reconstruction of the routes' maps and of the trades' trends in the area of the Mediterranean Sea during the Roman Late Republican period: in the present paper, in particular, these objects are represented by the Hellenistic Relief Bowls ("Hellenistic hemispherical mold-made ceramic relief bowls"), also known as "Megarian Bowls". The investigation is focused on the interpretation of groups of Megarian Bowls exclusively recovered from shipwrecks (as part of the cargo) or from submerged sites. Finds of Megarian Bowls are known, in fact, in the cargoes of the Apollonia B wreck in Cyrenaica (Libya), of the Grand Congloué near Marseille (in France), and of the wrecks of Spargi-La Maddalena in Sardinia (Italy) and of Čiovo Island in Dalmatia (Croatia). Particularly important is the comparison of these finds with the Megarian Bowls recovered from the wreck TSS2 in the site of Torre Santa Sabina, located on the Adriatic coast 30 km north of Brindisi (Italy). This is the most important group of finds of this type discovered in Italy, because of both the amount (ca. 600 fragments belonging to at least 300 cups) and the provenance (cargo of a ship). Furthermore, many dozens of Hellenistic Relief Bowls also come from the submerged site of Resnik, near Kaštel Novi (Croatia): these are probably a locally group and suggest that in Resnik there was an atelier for Hellenistic ceramics.

### Scientific techniques and technological applications

#### **Katarina Batur & Vladimir Bermanec – University of Zadar & University of Zagreb, Croatia**

**Archaeometric analysis of raw materials for lead-based pigments from shipwreck sites in the eastern Adriatic**

**Key words:** Shipwrecks, Mljet, Gnalčić, Adriatic, pigments

**Abstract:** As creative and spiritual creatures, human beings have always been inspired to modify surrounding environments to be colourful and pleasant for living. The growing demand for paint resulted in the exploitation of various raw materials which, after being ground and mixed with a binding medium, yielded delightful colours for painting objects used in everyday life. The aim of this paper is to present a study of lead-based raw materials used in paint production found at two shipwreck sites: a 1st century AD ship sunk near the Cape Glavat on the island of Mljet, and a 16th century Venetian merchantman sunk near the islet of Gnalčić. Taking into consideration the other cargo items and ships' inventories, these minerals were probably transported as merchant goods. Well-known since Antiquity for their great covering properties, white lead (cerussite, PbCO<sub>3</sub>) and red lead (minium, Pb<sub>3</sub>O<sub>4</sub>) were artificially produced; both compounds were found in the Gnalčić and Cape Glavat shipwreck cargoes. The lead sulphide or galena (PbS) found on the Cape Glavat site is an ore extracted from natural sources. The identification and analysis of the materials was realized in collaboration with Faculty of Science, University of Zagreb. By applying the methods of macroscopic examination, X-Ray Powder Diffraction and Scanning Electron Microscopy, the results will allow comparison between the white and red lead from the Roman and Late Renaissance periods, exploring the technology improvements in production of lead-based pigments, maritime transport and continuity of the trade with raw materials for paint production through history.

#### **Frida Ocelli & Micaela Leonardi – Studium sas, Turin, Italy**

**The reconstruction of the water supply using LiDAR images**

**Key words:** LiDAR, inland waters, landscape

**Abstract:** The occupation of the natural harbour of Vado Ligure since the Republican age was already known during the last century. The reconstruction of the stratigraphic deposit and the recovery of a large volume of materials, possibly a consequence of recent archaeological research (survey, excavations and dredgings) connected to the reorganisation of the commercial harbour, allowed the team to reconstruct the historical importance of 'Portus Vadorum' and to frame it in a wide commercial network developed both within the Mediterranean sea and the hinterland. Moreover, the discovery of elements related to sailors' personal equipment allowed the acquisition of new information about the people and the life on board.

#### **Patrick Baker – Western Australian Museum, Fremantle, Australia**

## Photography for underwater archaeology – a brief history

**Key words:** Photography, underwater archaeology, photogrammetry, digital

**Abstract:** In 1836, diving pioneer John Dean identified the wreck of the *Mary Rose* (1645), recovering artefacts and carefully recording them by watercolour paintings; debatably an early attempt at underwater archaeology. Two years later, the invention of photography was announced and eagerly adopted worldwide. Successful attempts at underwater photography date from 1890, initially recording the natural world. Not until the 1930s was photography of underwater cultural sites attempted. The rapid growth of scuba diving from the 1940s onwards resulted in discoveries of many ancient wrecks. As underwater archaeology developed, photography was needed for precise technical recording as well as for general illustration. Photogrammetry, already well established for terrestrial and aerial mapping, was adapted and attempted for underwater recording. Water clarity remained a major hurdle to site recording in all but the clearest conditions and photomosaics became the most useful tool for viewing large areas underwater. Then, from the 1970's onwards the ready availability of super-wide-angle lenses, optically corrected for in-water use, enabled high quality images to be obtained in almost any visibility. In the past 15 years traditional film-based photography has been almost universally replaced by digital imagery. Photogrammetry has developed from a highly specialised skill to a readily available desktop activity. It is now possible to use any site photography, both current and 'legacy', to produce comprehensive three-dimensional graphical views, enabling researchers or laypersons to view a site in great detail and from any viewpoint. Not only can new sites be readily studied via a 'virtual' environment, so can many sites from the past, using 'legacy' photography, providing this exist.

## **E. Kiki Kuijjer, R. Helen Farr, Robert Marsh, Ivan D. Haigh & Erik van Sebille – University of Southampton, Southampton, England**

Exploitation of prevailing winds and currents by the earliest known seafarers, colonising Australasia c. 50,000 years ago

**Key words:** Australasia, Palaeolithic, migration, ocean modelling

**Abstract:** The maritime environment is central to the migration of Anatomically Modern Humans (AMH) to Australasia, c. 50 ka. The archaeological record of early settlement is limited, but evidence suggests short crossings of open water at a time when sea levels reached c. 60–80 m lower than today. The nature of the colonisation process (whether it entailed deliberate seafaring or unintentional drift, and what this can imply about AMH behaviour) is still poorly understood. To resolve this, it is crucial to understand the environmental conditions that influenced dispersal – especially coastlines, waterways and ocean currents. Here, dynamical effects of the maritime environment on early seafaring are addressed with computer models of ocean circulation and novel drift calculations, forwards and backwards in time. To demonstrate this method, modern-day ocean drifts have been explored, using a particle-tracking algorithm developed to account for the 'windage' effects of prevailing winds on a drifting body. Large ensembles of simulated drifts are calculated and further analysed to determine the most probable timescale and trajectory of drift between coastal departure and arrival points in present-day circumstances. These are assessed against observations of drifting buoy trajectories. Regional ocean model configurations are currently in development, to apply this approach to selected time-slices relevant to the timing of the colonisation (spanning 30–60 ka). A first-order influence on regional ocean currents is relative sea level, which will be accordingly specified for each configuration (time-slice). Thus, new information will be gained on the influence of the maritime environment in relation to this migration.

## **Jarrad Daniel Kowlessar, Wendy Van Duivenvoorde & Jonathan Benjamin – Flinders University, Adelaide, Australia**

Mount Dutton Bay: photogrammetry and three-dimensional modelling of a cultural landscape

**Key words:** Three-dimensional, maritime cultural landscape, geographic information system, visualization

**Abstract:** Photogrammetry is an increasingly utilised tool in maritime archaeology and its advantages to site recording are well known. However, the use of photogrammetric data can be expanded to capture the larger scale spatial information and relationships within the broader context of an entire maritime cultural landscape. This presentation demonstrates the application of such modelling through the study of the Mount Dutton Bay coastal area. This complex of sites, via photogrammetry techniques, uniquely establishes the land-sea link of the early 19th century South Australian pastoral industry. The landscape contains a variety of individual archaeological features, central to which is the built terrestrial heritage of a major wool processing point. This woolshed is situated in direct proximity to the maritime feature of a purpose-built jetty, used as the major transportation hub. Used as an import/export point for ketches servicing the broader pastoral industry of the region, the jetty was instrumental in the transport of wool, grain and guano, as well as necessary pastoral supplies. This project presents a study, designed to make use of photogrammetry and three-dimensional visualisation within a geographic information system, to reconstruct the landscape with a high level of detail for each archaeological complex therein. This system, used for the archaeological interpretation of the maritime cultural landscape, provides a unique insight of the inter-spatial relationships linking the network of components that make up this complex environment.

## **Thommadura Kamal Kumara De Zoysa – Maritime Archaeology Unit, Central Cultural Fund, Sri Lanka**

Scientific techniques for the conservation of a zinc-iron composite object

**Key words:** Conservation, zinc, calcareous, object, solution

**Abstract:** Artefact preservation is one of the most important considerations when planning or implementing any action that will result in the recovery of material from a marine archaeological site (Donny L. Hamilton 1997: 2). Therefore, there is a possibility to discuss scientific techniques used for conservation of maritime archaeological material. A zinc/iron composite object was recovered from an historical wreck site. There are two ends of an iron plate, protruding from a zinc body, which had been covered by calcareous growths. A dilute acid solution was used to remove calcareous, which could not be removed using mechanical methods. Calcareous was present on the surface and in the tiny holes of the artefact, so the object was immersed in the acid solution to remove marine encrustations. The zinc then reacted with the solution. To stop this reaction, a scientific technique was applied for the zinc body based on theories of chemistry. The main point of this technique was to stop the reaction of zinc while the object is in the solution. Increasing the density of electrons on the object acted as a cathode with the help of a Direct Current Power source. A carbon rode was used as an anode. Cathode, anode and other items were used to set up this treatment unit. Valuable archaeological information about the object was revealed by applying these methods, which will be discussed in detail at the presentation of this poster, as well as in the extended research paper for the proceedings.

## **Dolores Elkin, Guillermo Gutierrez & Chris Underwood – National Research Council & National Institute of Anthropology, Buenos Aires, Argentina**

Metal shipwrecks in Patagonia, Argentina – contributions to their research and management

**Key words:** Archaeology, heritage, metal ships, Patagonia, Argentina

**Abstract:** The archaeological study of metal hulled ships has begun to develop relatively recently worldwide, and the same applies to material remains from the industrial period in general. Fortunately, there is nowadays an increasing interest on 'modern vessels', partly thanks to the pioneer and stimulating research conducted by professionals from Australia and North America, not just in archaeology and anthropology but also in addressing issues in related fields such as site formation processes and conservation. This paper presents the way in which some metal shipwrecks located off the coast of Patagonia, Southern Argentina, are investigated both from an anthropological and archaeological perspective as well as regarding their management. The time frame spans from the late 19th century to the first decades of the 20th century. The sites considered include sailing ships as well as steamers, covering the transition between them, and they vary in terms of their state of preservation, geographic location and accessibility, and their specific environmental context. The main research questions addressed have to do with the technology involved in the vessels under study and the site formation processes which have been in effect since they entered the archaeological record. Some aspects regarding their management as cultural heritage resources and their presentation to the public are also discussed, particularly given the remote location of some of these sites.

## **Underwater cultural heritage in the Indian Ocean region**

**Tânia Manuel Casimiro & David Mearns – IAP/IHC–FCSH, UNL, Portugal**

A Portuguese Indiaman voyage through its finds (*Esmeralda*, 1503)

**Key words:** Portuguese wreck, ceramics, artefacts

**Abstract:** In early 1502, Vasco da Gama departed Lisbon in command of the 4th Portuguese Armada to India. During the voyage, his fleet of 20 ships stopped in various locations in the Western and Eastern coasts of Africa, such as Mozambique, before sailing to India where they stayed until early 1503. Before returning to Portugal, five ships were left in the Indian Ocean under the command of Vicente Sodre, da Gama's maternal uncle. Two of those vessels, the *Sao Paulo* and the *Esmeralda* wrecked off the coast of Oman in May 1503. The wreck site was recently discovered and excavated. This poster presents a study on the artefacts found on that site, pottery being the most abundant. Through the study of those commodities it is possible to trace the itinerary of those ships. Ceramic productions from Portugal, Spain, Italy (on board when it left Lisbon) as well as Africa, Middle East and China were largely recovered. This is evidence of the many different contacts that the Armada, and the wrecked ship in particular had since it left its port of origin until its final day, as well as some of their other activities. On the other hand, these objects together with metals, stone and glass are also able to provide insights into the daily life on board one of the first Portuguese East Indiaman. 'What were these objects used for?', 'how were they acquired?', 'who used them?', and 'what was their economic and symbolic value?', are just some of the questions being asked.

**Traditional sailing:**

**Ziad M. Morsy – Alexandria Centre for Maritime Archaeology, Alexandria University, Alexandria, Egypt**

Sailing the Nile waters during the 19th and 20th centuries

**Key words:** Nile, boats, sailing, traveling, traditional

**Abstract:** For centuries, hundreds of sailboats of different shapes and sizes were used to sail the Nile all year long. On the other hand, hundreds of photographs have been taken in the last two centuries of various sailing boats in Egypt, and besides the fact that there is a corpus of western travellers' writings about Egypt in the last two centuries, so far, there has been no attempts to utilize these resources to establish a database of the types of traditional sailing boats, or to record their features and characteristics. This poster will highlight the different typologies, shapes and usage of different Nile Sailboats in Egypt during the 19th and 20th centuries.

**Afternoon break (3:00 pm – 3:30 pm)**

**Poster presentations, Part 2 (3:30 pm – 4:30 pm) – Part 2**

**Site management**

**Olivier Dayrens, J.P. Baigl, J. Dez, E. Rieth & Philippe Pelgas – French Institute of National Preventive Archaeological Research, France**

A subaquatic diagnosis on coastal river the Charente in Saintes city, France

**Key words:** Fresh water, appro

**Abstract:** Within the framework of the installation of mooring dolphin in Saintes (Charentes, France), in the coastal river, La Charente, in front of the Bassompierre Place, the French institute for preventive archaeological research carried out a subaquatic preventative diagnosis in the autumn of 2015. The subaquatic team discovered antique remains (top of column, wooden stakes) near the right constructed river bank. For forty years, research in Charente was about boats, the navigability of the river, the river lay out, and the management of forest timber, amongst others. The majority of the discovered shipwrecks were mainly monoxyle pirogues. One of them, such as Port Berteau 2 was an assembled construction: a boat for the circulation on the coast and the estuary. The majority of the shipwrecks date from medieval times (VIth to the XIth) and the gallo-roman remains are rare in the Charente river. Results include the discovery, dated by radiocarbon and by tree-ring dating, will be integrated into the research program on the ancient Saintes city between the 1st BC and the 5th AC. One of the future aims will be to investigate if it was the ancient Saintes harbour, and if it was a maritime or a river harbour.

**David Nutley – Comber Consultants, Sydney, NSW**

A propeller out of the blue

**Key words:** Propeller technology management UNESCO

**Abstract:** In late 2015 the Port Authority of New South Wales located a large, isolated and unusual 19th century era ship's propeller in Sydney Harbour. The unexpected find lies in the main shipping channel and just west of the Harbour Bridge. The discovery raised questions about its significance and options to be considered for ongoing management – including *in situ* conservation or recovery. The propeller is now to feature in a Discovery Channel documentary on Sydney Harbour. This poster will outline the nature of the propeller and its place in the evolution of propeller technology, its heritage significance as an object associated with an unknown ship but not a shipwreck and considerations for its ongoing management in line with the 2001 UNESCO Convention.

**Maritime depictions**

**W.H. Rukshan Priyandana & Rasika Muthucumarana – Maritime Archaeology Unit, Sri Lanka**

Ships depicted on murals from Sri Lanka's colonial period

**Key words:** Murals, painting, ships, 3rd century

**Abstract:** The tradition of painting Sri Lankan murals began in the 3rd Century B.C., after the arrival of the main Buddhist Mission from India at the time of Emperor Ashoka. A few illustrations of ships can still be seen on the murals, which were painted during the Anuradhapura Period, and which lasted for a millennium, and also in the Polonnaruwa period, which covers the following three centuries. The Kandyan period—Colonial times covering the 15th to 19th centuries—was the time of revival of these mural painting traditions in Sri Lanka. This research focuses on this period about the history of the ships depicted in the murals, which present historical accounts of the Buddha and events related to this religion. It is interesting to note how differently such vessels were portrayed when situated on inland rivers, lakes or fresh water bodies; they are depicted as small traditional boats while those at sea were presented as sailing ships or steam ships of European origin. The artists would only have knowledge of the appearance of ships and boats that they had seen themselves; they could not know what ancient ships looked like. Locally built ships were unlikely to have been in use after the 15th Century due to the Colonial occupation of the coastal areas of Sri Lanka. However, small local boats would have been in use in inland waterways, as are depicted in some of these murals.

**Current and future prospects of underwater cultural heritage studies and management in East Asia:**

**Yumiko Nakanishi, Takashi Tetsu & Rintaro Ono – Cultural Property Preservation Division, Osaka Prefectural Board of Education, Japan**

Pursuing sustainable preservation and valorisation of underwater cultural heritage: attempt in Okinawa at an underwater site museum

**Key words:** Underwater site museum, sustainable, valorisation, Okinawa, decentralised structure

**Abstract:** Increasing interest in cultural heritage management has been the trend for the past few decades. Archaeological sites are often turned to site museums as places to visit for tourists and other members of the public. The phenomenon is widely seen, even in the underwater sites, as not being limited to the terrestrial sites. This presentation aims to propose a methodology towards establishment of sustainable and locally oriented management of underwater cultural heritage in a form of an underwater site museum. We introduce our experimental attempts towards constructing a model case for an underwater site museum by holding site open day events at two underwater sites off the coast of Kume-jima and Ishigaki-jima Islands in Okinawa. Underwater cultural heritage indeed attracts many non-archaeologists. Wreck diving is one of the major fun activities and people seem to be interested in visiting and viewing UCH. Baiae Underwater Archaeological Park is a famous example of underwater archaeological site constantly open for public access. Nevertheless, it is completely different from the fun wreck dives as the public visits there are supervised by the managing body of the archaeological park consisting of specialists such as archaeologists, architectural historians, conservationists and the like, who investigate, evaluate, preserve and valorise the site. In the case of Baiae, the state government directly manages the park. On the contrary, in Japan, where everyday practice of cultural heritage management largely rests upon on the local government, the decentralised structure of CHM should construct different types of methodology to manage an underwater site museum.

**\*Jin-Yuan Liu, Gwo-Long Shy, Jui-Kun Chiu & Ching-Ting Hsin – \*Department of Electrical and Computer Engineering, Tamkang University, Taiwan**

The development of underwater cultural heritage studies in Taiwan: past, present and future plan

**Key words:** East Asia, archipelago, underwater cultural heritage management

**Abstract:** The underwater archaeology in Taiwan started with diving activities by a group of professional divers more than two decades ago. At that stage, several shipwrecks were sporadically discovered and reported on news media, which raised much public attention. Later, the Taiwan Underwater Archaeology Institute was established in 2003 to promote underwater culture heritage (UCH) studies. In 2006, the Ministry of Culture sponsored a pioneering project, conducted by Sinica Academician Cheng-Hwa Tsang, with assistance of Prof. Jin-Yuan Liu in the National Sun Yat-sen University, to launch a systematic underwater archaeology survey in Penghu Archipelago sea areas. This endeavour has been fruitful and comprehensive; many shipwrecks with historical values have been discovered, studied and documented. On the other hand, a group of people, including legislators, scholars, and government personnel, have actively promoted the establishment of relevant laws governing the UCH preservation. As a result, the Legislative Yuan has passed the UCH laws in 2015; it is now administrated by the Branch of Underwater Heritage Preservation in the Ministry of Culture. At present, the study of UCH in Taiwan has achieved a certain degree of maturity, in terms of experience, human resources, and law-making, etc. Looking ahead, we shall continue field surveys and carry out missions according to the laws towards more comprehensive UCH studies, such as on-site protection and management, maritime museum and underwater leisure activities, information management, and international collaboration, etc., with the hope that a maritime archaeological centre at the national level may soon be established in the near future.

**The archaeology of submerged palaeolandscapes: a global perspective:**

**Mick O'Leary, Ingrid Ward, Marcus Key & Mackenze Burkhart – Earth Sciences, Curtin University, Perth, Australia**

Challenging the offshore theory for fossiliferous chert artefacts in south-west Australia

**Key words:** Offshore archaeology, chert, provenance, fingerprinting, geochemistry

For the past four decades an offshore provenance has been purported for Eocene fossiliferous chert material that abounds in aboriginal artefact assemblages along the western margin of south-western Australia. The traditionally accepted "Offshore Hypothesis" is that the lithic source of the artefacts found in the Perth Basin of Western Australia is located off the west coast, and was submerged by sea level rise during the early to middle Holocene, by 6 ka. Preliminary studies of fossil bryozoan-bearing chert debitage from south-west Western Australia reveal similar assemblages as found in Wilson Bluff Limestone, located over 1,000 km to the east of the Perth Basin in the Eucla Basin. This possible inland source is further supported by preliminary geochemistry analyses (using LA-ICP) that also indicate a better match than with the limestone from the Perth Basin. Thus, the "Offshore Hypothesis" needs to be re-evaluated. This study aims to build on the initial work, by undertaking further investigations of the geochemistry and palaeontology of both the Perth Basin and Eucla Basin limestone, and to investigate as yet unexplored prehistoric Aboriginal trade routes, as well as trade between south-western and central Australia.

**Achilleas Iasonos – Centre for University of Southampton, Southampton, England**

Reconstructing the maritime framework of Agios Georgios, Peyia, and Figtree, Protaras, Cyprus, for the 9th to 4th millennium B.C. period using LiDAR data

**Key words:** Geoarchaeology, submerged-palaeo-landscapes, sea-level change

**Abstract:** Sea-level changes during the Holocene period is identified as one of the main reasons of coastal inundation where palaeo-landscapes went from terrestrial to submerged. The study focuses on providing survey results of a geoarchaeological survey that was carried out at Agios Georgios, Peyia, and Figtree, Protaras, in Cyprus in an attempt to identify submerged features that suggest sea-level change, and other archaeological features or materials that imply the presence of anthropogenic impact. Geological features such as beach-rock, notches, littoral caves, wave-cut platforms, cliff overhangs and other anthropogenic features such as pottery material, fish tanks, and slipways were reported, according to both horizontal (distance from coast) and vertical measurements (bathymetry of feature) in order to extract numerical values which were used to reconstruct LiDAR models. The study intends to promote a methodological model which aims to reconstruct the palaeo-landscape of specific areas via LiDAR data when regional-sea-level was lower than it is today, based on the results of a geoarchaeological survey. Furthermore, it aims to test the validity of what other authors have stated about regional sea-level in the Mediterranean Sea for the period covering the 9th to 4th millenniums B.C.

**Maritime archaeological sites and legacy data: revisiting old shipwrecks with new technologies:**

**Peta Knott & John McCarthy – Wessex Archaeology, Salisbury, England**

A new look at old cannons: 46 years of investigating the Gun Rock site

**Key words:** Cannon, photogrammetry, recreational divers, wreck

**Abstract:** A scatter of cannon lying at the base of Gun Rock since at least 1769 was first investigated by the Tyneside British Sub-Aqua Club 114 in 1970. These recreational divers set the standard for that time, logically researching and surveying the underwater site, consulting with experts about raised diagnostic artefacts and writing a report on their findings. They also commissioned the local television station to record their investigation at Gun Rock, in the Farne Islands, England. English Heritage (now Historic England) commissioned Wessex Archaeology in 2013 to conduct a site survey, and invited the Tyneside Club to participate. The exposure of the Club divers to both current archaeological practice and equipment reinvigorated the Club's interest in the site. Of particular interest was the trial use of photogrammetry to model several of the cannon. In 2016, a new initiative to examine the Gun Rock site was taken by a collaborative research team comprising the Tyneside Club, volunteer archaeologists and Wessex Archaeology. A range of artefacts, preserved in private collections since 1970, were re-assessed with new methodologies and the newly discovered underwater cannon were recorded using photogrammetry. The level of detail captured using photogrammetry, when combined with legacy data, provides a fresh interpretation of the site and contributes to Tyneside's goals of comprehensively identifying the wreck and sharing their knowledge with other divers via a dive trail. An ambition of the Club is to inspire visitors to the site and contribute their observations allowing more extensive monitoring and research activities.

## Three-dimensional digitization techniques and technologies in maritime archaeology:

### Andonis Neophytou – University of Cyprus, Cyprus

All the way from the start: restructuring the 3D model of the Mazotos shipwreck

**Key words:** Digital reconstruction, 3D, photogrammetry

**Abstract:** Integrating digital technologies into the archaeological excavation process is not something new. In fact, most projects, nowadays, rely on digital technologies for documentation and mapping. What happens though when technology decides to make a leap during the process of a long-term excavation? The new tools and technologies clearly supersede the older ones, sometimes so much so that the initial tools become obsolete. What becomes of the old data sets, then? How do they compete with the new ones? The Mazotos shipwreck project is a representative example of an excavation where digital technology has been extensively used. Since 2007 various procedures and methods have been applied, tested and ultimately used to document the excavation. Seven years of work have produced three different kinds of data sets, acquired with more than seven different types of software, suggested by three Research Associates. In 2013 the team decided to seriously re-assess and restructure the documentation methodology in order to regenerate updated excavation plans, and optimize the mapping procedures. During this process 795 finds in the 3D model of the site were 'reburied', re-measured, reconstructed and repositioned in 3D space. This poster presents the major steps in this process.

## The social archaeology of ports, harbours and watery places:

### Adrian Anastasi – National Archaeological Institute, Tirana, Albania

The typology of ancient ports in the Albanian coast: the case study of Dyrrah

**Key words:** Ancient ports, Dyrrachio, Albania, maritime history of ancient Mediterranean sea, Illyrian coast

**Abstract:** The purpose of this presentation is to provide a synthesis on the ports of Albanian coast of classic archaic period, their connections with preceding periods and if they have common elements for creating a typology. As the geomorphology of the Albanian coast distinguishes very clearly the coast of Jonian sea with the Southern Adriatic one, does it influence the typology of these ports and, if so, how? Specific studies in this field, in Albania, are absent and the ancient sources do not always shed light on these questions. The underwater archaeological research that the National Archaeological Institute has conducted on the Albanian coast, have provided such results that we can anticipate the first opinions and conclusions. Dyrrahu, odiern Durres, a port over 3,000 years old, is an interesting case of study, as it is an important part of the maritime history of the ancient Mediterranean sea.

## Day 3: Maritime Museum NWS Theatre: Wednesday 30 November

### Boats in context and the study of early watercraft (9:00 am – 10:30 am) – Part 1

#### Ligaya Laccina – Flinders University, Adelaide, Australia & National Museum of the Philippines, Manila, the Philippines

Exploring variation in traditional boatbuilding practices: 1,500 years of Southeast Asian lashed-lug watercraft

**Key words:** Southeast Asia, lashed-lug boats, Butuan Boats, traditional boatbuilding, Southeast Asian boatbuilding

**Abstract:** Constructing a lashed-lug boat is a labour-intensive and time-consuming process. When preparing the boat planks, boat builders would carve a series of projecting blocks, or lugs, from along the length of each of the planks. When the planks were edge-joined to form a shell, the lugs were then aligned with those on adjacent strakes. Similar to cleats on Viking ships, the lugs were drilled with holes used to insert rope to fasten the boat's frames, thwarts and other components. Archaeological, historic and ethnographic evidence has demonstrated that lashed-lug watercraft were constructed in and around Southeast Asia for at least 1,500 years – from around the 5th century, as with the Pontian Boat from Peninsular Malaysia, and extending to the late twentieth century and possibly up to the present, on Lembata, a remote island in eastern Indonesia. The persistence of lashed-lug boats for such an extended period suggests an enduring and unchanging Southeast Asian boatbuilding tradition. Recent research, however, has revealed a surprising variability in the design and construction of these watercraft. For example, four lashed-lug Butuan Boats from the southern Philippines, all dated to between the eighth and tenth centuries, each exhibit a different keel plank lug shape and design. A much greater variety of lashed-lug boats are evident when observing examples from throughout the region and when considering other aspects of construction, such as plank fastening, boat ends, and timbers used. This paper discusses these examples and explores the concepts of variation and tradition within Southeast Asian lashed-lug boat construction.

#### Abhirada Komoot – Thailand

World's history unlocked: a study of the historical context of the Phanom-Surin shipwreck in Thailand

**Key words:** Phanom-Surin Shipwreck, historical context, Indian Ocean shipbuilding, Thailand, Southeast Asia

**Abstract:** The Phanom-Surin shipwreck (PNS) is the first ever sewn ship of western Indian Ocean influence discovered in Thailand. Results from a C14 dating obtained from short-life organic material – a rattan rope – found in the ship reveals an approximate date range of 7th–9th centuries. Taking into account the historical context, the PNS was likely in service during the Dvaravati period (7th–11th centuries), when the influx of Western Indian Ocean and Indian cultures were found all over the ancient harbours and inland settlements of present-day Thailand. Associated ceramics from China and possibly Persia demonstrate a complex layer of ancient maritime connections between the Indian Ocean regions and the South China Sea. The PNS is the oldest foreign-style shipwreck found in Thailand to date, and has the potential to unlock the mystery of ancient voyages and trade across regions in this early period of Southeast Asian history. Prior to the discovery of the PNS, the question of how people conducted trans-oceanic voyages was poorly understood. However, the excellent preservation of the materials from the PNS wreck has the potential to shed some light on many aspects of seafaring in the first millennium CE. In this paper I will provide context to the shipwreck, analysing the world that surrounded the sailors when they made landfall in such unfortunate circumstances. By understanding the historical context that shrouded the event, we will be able to better understand the cultural material associated with the shipwreck as excavations progress in the coming years.

#### Charlotte Minh Ha Pham – Asia Research Centre, Murdoch University, Perth, Australia

Seafaring and boat use in central Vietnam

**Key words:** Vietnam, seafaring, boats, maritime routes

**Abstract:** The central coast of Vietnam, at the heart of a major maritime trade route between China and the Malay Peninsula and beyond, was a very dynamic arena of maritime activities and exchanges. In its harbours, hundreds of country traders and local fishing boats, royal galleys and trading coasters, shared the waters with Chinese, Siamese and Malay vessels as well as with a few large European ships. Given such a location, to identify the origin of shipwreck remains found in Vietnam is not straightforward. Often, the ships are deemed 'Chinese' or 'Southeast Asian'. Three shipwrecks were found in Vietnam recently, roughly dated to the 9th, 13th and 16th–17th centuries, respectively. So far, minimal studies have been conducted on these wrecks – on their nautical technology or in their context of use. Could these ships be Vietnamese? Can their features be related to the general characteristics of Vietnamese ships in that time period? What activities were they engaged in? What maritime route did they follow? How far could they travel? In the absence of evidence to link these wrecks to specific

cultures, or to identify them as Vietnamese, this paper offers an overview of the seafaring capacities of the Vietnamese, an examination of the routes they sailed, of the maritime conditions they faced, as well as the activities they were engaged with. By doing so, it will provide a context for their use in Vietnam, and discuss the possible links of these shipwrecks to Vietnamese nautical traditions.

**Clara Fuquen Gomez – University of Southampton, Southampton, England**

Logboats of Coquí: an ethnographic approach to maritime material culture

**Key words:** Logboats, Colombia, maritime ethnography, identity

**Abstract:** This research focuses on the traditional logboats of Coquí, an Afro-descendant community in the Pacific coast of Chocó, Colombia. It considers these boats as an entry point into the life of the community and explores the technological and functional aspects of the watercraft, their wider context, and related social practices. Based on a transdisciplinary approach, it draws on an ethnographic methodology to look at the question of whether, and how, the boats inform about the life of the community, their history, their identity and their maritime concerns. It reflects upon the multiple ways in which people in Coquí relate to their boats and the many levels at which these boats operate. It demonstrates that the watercraft of the community of Coquí is significantly complex and holds a fundamental importance to their existence. The present study addresses the need of a comprehensive in-depth look at traditional boats in which the relationships between people and boats are as relevant as the purely technological and functional interests, still dominant in the field of boat studies and maritime archaeology. It shows that ethnography is an effective methodology to unveil the richness of the materiality of social life, and the diversity of human engagements with the world.

**Morning break (10:30 am – 11:00 am)**

**Boats in context and the study of early watercraft (11:00 am – 12:15 pm) – Part 2**

**Pavla Peterle Udovic & Miran Erič – Arheoved Company, Slovenia**

Logboat from Ljubljana (SI-81): new evidence of Iron Age transportation on Ljubljansko Barje, Slovenia

**Key words:** Logboat, Iron Age, Slovenia, communication, transportation

**Abstract:** During archaeological supervision, before the construction of a building, archaeologists observed unexpected wooden fragments. After extending the area, the bottom of a superimposed logboat was identified. Radiometric dating revealed it to be from the 8th century BC. Based on an excavated section, the logboat measured 95 cm in width, with an estimated length of 10–12 m. Ljubljansko barje, with 76 discovered logboats, is the most important historical area in the region. Evidence of 18 dated logboats reveals continuous use for transportation from Neolithic to modern ages. There are two Iron Age logboats on Barje – one from Matena, today as part of exhibition in National Museum, and other one from Zakotek. But only a few of them are older: one from Bronze Age and three from the Neolithic period. The 8th century BC is an era marked by the use of iron. At the transition from the Bronze to the Iron Age, Slovenia witnessed a change in settlement pattern, which is visible via the abandonment of old settlements and springing up of new ones on elevations. They were surrounded by extensive barrow cemeteries and iron-working areas; and there were many smaller defended settlements and lowland settlements. Some of the settlements, near the excavated area, are situated north: one on Castle Hill and other directly under the steep slope of the hill in the Tribuna site. The others are situated east of the Gradišče and Rudniku sites, and better-known hillfort on Molnik above Orle surrounded by burial grounds.

**Stephen Wickler & Tori Falck – Tromsø University Museum & University of Tromsø, Norway**

The social context of boats and maritime trade in late medieval and early post-Reformation Norway: stockfish in northern Norway

**Key words:** Late medieval watercraft, maritime trade, northern Norway, Oslo harbour

**Abstract:** In this paper, vessel remains from harbours in two widely separated regions of Norway provide a point of departure for exploring the social context of maritime trade from the 15th to early 17th century. The wrecks of two late medieval cargo ships from adjacent offshore islands near the Arctic Circle provide insights into the extensive stockfish (dried cod) trade. Both ships were built in southern Norway where they were purchased by local fishing communities for transport of stockfish to Bergen in south-western Norway. In addition to the vessels themselves, a wide array of small finds from one wreck provide unique insights into the lives of crewmembers from a community directly involved in a flourishing international maritime trade network. Due to urban expansion in Oslo, ongoing mitigation archaeology in the in-filled former harbour at Bjørnvika has revealed more than 30 wrecks and related harbour installations from the late medieval period up until 1624 when the main port was relocated following a massive fire. Documentation of wrecks and harbour infrastructure facilities provide an unparalleled opportunity to conceptualize the socio-economic context of a major urban port from a previously little known period. The case studies presented here illustrate the potential for going beyond nautical technology to gain a deeper understanding of the maritime cultural milieu in which watercraft performed. Both the contrast between a “marginal” location in northern Norway and the urban port of Oslo and the overarching framework of maritime trade binding them together are equally relevant to this perspective.

**Charlotte Dixon – University of Southampton & British Museum, England**

Miniaturising boats: the value of models

**Key words:** Models, museums, cultural value, Sri Lanka, outrigger canoe

**Abstract:** Models of boats from different parts of the world are commonly found in ethnographic museum collections, yet they are considerably understudied and rarely displayed. This paper considers the potential of these intricately crafted objects as evidence for traditional boats and attempts to place them in their wider sociocultural contexts. By asking questions about their production and collection, as well as exploring physical attributes, this paper seeks to raise awareness of such objects and how they can be used in future studies of traditional boats to research boat types, construction techniques, and cultural value. Through the presentation of a particular group of models from Sri Lanka this poster will demonstrate how certain types of boats have been represented in model form more than others. In addition, the high level of detail found on models of outrigger canoes, or oru, will be discussed along with their representation in other iconographic forms, such as postcards. By focusing on oru the cultural value of these boats for local Sri Lankan communities will be considered, as well as their meaning and value for international collectors. In doing so, this paper uses a three-tiered approach to reflect on the boats represented in model form; their connection with local cultures and model makers; and their significance for collectors and museums.

**Mário Varela Gomes & Tânia Manuel Casimiro – Instituto Arqueologia Paleociências Universidade Nova de Lisboa, Lisbon, Portugal**

Ship representations in 17th century Portuguese tin glaze ware

**Key words:** Tin glaze ware, ships, decoration, symbolism

**Abstract:** Portuguese tin glaze decorated in blue or purple on white was made in Portugal at least since 1580, and using traditional methods until the late 18th century. During this time these ceramics displayed a number of different decorations, with boats or ships being the most recurrent representations. These are presented in many different ways although frequently illustrated as sailing. Several types of vessels have been recorded from the small fishing boat associated with fisherman, to large vessels believed to correspond to ships, naus, galleons or even pataxos, among other types of vessels known in the 16th–18th centuries. The purpose of this paper is to demonstrate the different types of boats depicted and how these relate to ships of different flags that pottery makers would have observed daily, entering the Portuguese ports, as well as consideration of their economic, social and symbolic importance.

## Boats, trade and exploration (1:30 pm – 3:15 pm)

### **Nikolina Stepan & Irena Radić Rossi – University of Zadar, Zadar, Croatia**

Evidence of prehistoric seafaring in Dalmatia

**Key words:** Adriatic, prehistory, Bronze Age, seafaring

**Abstract:** During the past several decades, research on prehistoric sites in Croatia did not experience much progress, but the number of known underwater sites significantly increased. Archaeological finds discovered on both coasts of the Adriatic Sea suggest connections between the two opposite shores since the Mesolithic and Neolithic period, which intensified during the Bronze and Iron Ages. We will present the three Bronze Age finds from deeper waters, which certainly support the idea of the intensified maritime activity during the Bronze Age. These three finds are well-preserved pottery vessels found in the Central and Southern Dalmatia. One of them has typological and morphological characteristics corresponding to the period of transition from the Eneolithic to the Early Bronze Age, while the other two belong probably to the period of the late Bronze Age. Taking into account the depth at which they are found, these finds are currently among the oldest direct evidence of navigation found in Dalmatia. Whether we are dealing with the accidentally discharged cargo or shipwreck remains, the presence of those objects clearly suggests the existence of maritime transport and particular sea routes in this part of the Adriatic Sea.

### **Shelley Wachsmann – Institute of Nautical Archaeology, Texas A&M University, Texas, USA**

Hahotrim, Israel

**Key words:** Nautical archaeology, metals trade, Late Bronze Age, Iron Age, stone anchors

**Abstract:** An inspection dive carried out by the Israel Department of Antiquities and Museums (now the Israel Antiquities Authority) in 1980 opposite Kibbutz Hahotrim, south of Haifa, revealed a scattering of artefacts in an area that had been swept clean of sand by a storm that revealed the underlying hard clay seabed. The finds consist mainly of small metal artefacts and sherds scattered about two very large stone anchors. Many of the metal artefacts were broken, and appear to have been collected as scrap metal. Identifiable among the artefacts are pieces of horse bits, blades, chisels, small fragments of copper ingots, nails and a single plowshare of a type common on the Cape Gelidonya shipwreck. The scatter also included a complete lead bun ingot, as well as fragments of other lead ingots, two of which bear ingot marks. One lead ingot fragment is roughly semi-circular on one side, and was cut on its other side with a sharp striking instrument. The outline of a hole survives on the cut side. This is reminiscent of ingots carried by two hybrid-Keftiu porters in a wall painting from the tomb of Amenopet (T. 276) at Thebes. Similar holes also appear in contemporaneous tin ingots found along the Carmel Coast. The group of metal artefacts appears to be the contents of one or more baskets of recycled metals, which found its way into the sea at the end of the Late Bronze Age or beginning of the Iron Age.

### **Igor Miholjek – Croatian Conservation Institute, Department for Underwater Archaeology, Zagreb, Croatia**

Recent discovery of post-Medieval shipwrecks in Croatia

**Key words:** Post-Medieval shipwrecks, Croatia, recent discoveries

**Abstract:** Post-Medieval shipwrecks in Croatia have already been investigated in the past. The most famous among them are the shipwrecks from the second half of the 16th century: the first, carrying glass cargo from Venice to Constantinople was found near the island of Gnalčić, and the second, belonging to a family of traders from Dubrovnik, was found near the island of Šipan. Investigations were carried out in the 1970s and 1980s, and the research conducted over the last ten years by the Department for Underwater Archaeology from the Croatian Conservation Institute has yielded five new post-Medieval shipwrecks. Two are located in the Dubrovnik aquatorium: first one near Brsečine carrying Genovese bronze artillery pieces, and the second one in front of Cavtat. Other shipwrecks were found near the Mijoka shallow close to the island of Murter carrying valuable crafts from the Nurnberg goldsmiths, and near the Sv. Pavao shallows on the island of Mljet carrying a valuable cargo of Iznik pottery, meant to be sold in Western market. The fifth shipwreck belongs to the period of the Napoleonic wars: after the fall of the Republic of Dubrovnik, the French and the Russians waged war at sea, which yielded the shipwreck found near Molunat, south of Dubrovnik. This shipwreck is considered to be a part of a fleet of four ships from Dubrovnik, commandeered by the French. This paper presents an overview of the history and research of post-Medieval shipwrecks in Croatia, including the recently discovered shipwrecks.

### **Mike Belasus – German Maritime Museum, Bremerhaven, Germany**

Did Icelandic stockfish change northern German shipbuilding?

**Key words:** North Atlantic, trade, shipbuilding, fish

**Abstract:** The main geographic area of the Hanseatic League's trading routes was along the coasts of the North and Baltic Sea. Their mariners were using no compass for a long time but sea books, which contained descriptions and orientation by landmarks. Their shipbuilders built ships in different methods, in the Kollerup-Bremen type method, like the "Bremen Cog" in the German Maritime Museum, and in clinker fashion. In the late 15th century, German merchants mainly from Hamburg and Bremen started their trade in the North Atlantic islands of Faroe, Shetland and Iceland with its focus on stockfish. For the islanders stockfish became a currency with which they could purchase those items that were not available in their desolate and inhospitable environment. Like in other parts of northwest Europe important changes happened in shipbuilding in Northern Germany during the 15th and 16th century. Was this a result of the new challenges of the open ocean and the demands of the trade over long distances that had to turn ships into floating warehouses and micro cosmoses for the crew to survive at sea for several weeks? This talk will present this one aspect of the research project 'From the North Sea to the Norwegian Sea – interdisciplinary studies on the Hanseatic League'. It gathers four researchers, a land archaeologist, a historian, a zoo-archaeologist and a ship archaeologist to share light on the effects of the German northern trade from the 15th to the 17th century on both sides.

### **Marc-André Bernier – Underwater Archaeology Team, Parks Canada**

Ghost Ships of the Arctic: the underwater archaeology of Sir John Franklin's HMS *Erebus* and HMS *Terror*

**Key words:** Arctic, exploration, 19th century, 3D-recording

**Abstract:** In 1845, Sir John Franklin and his men sailed from England on HMS *Erebus* and HMS *Terror*, hopeful to find the final link of the Northwest Passage. Both ships were abandoned in 1848, and it was believed that the crews walked to their deaths across the Arctic. In the decades that followed, search expeditions brought back relics, some written documents and numerous accounts from the Inuit giving some information on the grim fate of the Franklin Expedition crews. However, the recent discovery of HMS *Erebus* in 2014 and of HMS *Terror* in 2016 re-open the interpretation of what happened to Franklin's men as they tried to escape the Arctic. Both wrecks are extremely well-preserved in the cold waters of the Canadian Arctic, rising from the sea floor up to the upper-deck. This paper will highlight the underwater archaeological assessment of HMS *Erebus* (2014-2016) and the post-discovery validation of HMS *Terror* (2016) conducted by Parks Canada's Underwater Archaeology Team, including the recording methodology of these three-dimensional wrecks found in one of Canada's most challenging environments.

**David Steinberg – Heritage Branch, Northern Territory Government, Darwin, NT, Australia**

**Title:** A 'floating Venice off Arnhem Land': the research potential of the *Sanyo Maru* shipwreck

**Key words:** Pearlring, Japanese, shared heritage, northern Australia

**Abstract:** In July 1937, the *Sanyo Maru*, a large and sophisticated mother ship attached to the Japanese pearling fleet, sank in a squall off the Northern Territory coast. Based in Palau, these mother ships periodically visited the pearling grounds of the Arafura Sea providing supplies for the hundreds of pearling luggers based in the area, returning with the treasured harvest of pearl shell. A prominent journalist visited the fleet's anchorage and described it as a 'floating foreign township' and a 'floating Venice', and argued that it had a population that exceeded that of any northern township. The mother ships were described as 'miniature emporiums, with holds chocked with merchandise and tinned foods' for the lugger crews. This paper will discuss the historical context of the *Sanyo Maru*, report on the results of fieldwork, and canvass the research potential of this singular and highly significant historic shipwreck.

**Afternoon break (3:15 pm – 3:45 pm)**

## **Presenting maritime and underwater archaeology in museums in the 21st century (3:45 pm – 5:30 pm)**

**Christopher Dobbs – The Mary Rose Trust, Portsmouth, England**

**It's not about a ship: presenting the *Mary Rose* in a new museum**

**Key words:** Museum, display, interpretation, relevance, authenticity

**Abstract:** One concept of the new *Mary Rose* Museum was to present the results of this major underwater excavation in a way that would be relevant to a 21st century audience. Although not overstated, archaeology is at the heart of the interpretation, as the context of the artefacts is the key to the museum. But how do we ensure that our displays do not turn out to be worthy but dull? How do we make them both authentic and interesting? One method we used was to emphasise the intensely personal nature of the objects – to ensure that the artefacts and the people were as evident as the ship herself. This and other concepts will be presented. The museum welcomed one million visitors in the two years after opening but the Museum was again closed from December 2015 to June 2016 to allow the final building phase to be completed before fully revealing the hull in summer 2016. At last it can be viewed without the previous encumbrances of the large air ducts from the intensive drying program or the spray systems from the 30-year spraying phase. This presentation will also show the latest method we are using to help the objects, the people and the ship come to life. This illustrates how we approach that final, essential part of the archaeological process: disseminating the results of our work by displaying the ship and her contents to the widest possible museum audience.

**\*Zrinka Ettinger Starčić & Hrvoje Potrebica – \*Museum of Lošinj, Croatia**

**Apoxomenos – underwater cultural heritage and museums in the service of the local community**

**Key words:** Apoxomenos, museum, local community, cultural tourism

**Abstract:** Seventeen years ago, a bronze statue of a young athlete was discovered on the seabed near the island of Lošinj. It was named Apoxomenos. Immediately after its discovery, the statue exceeded its cultural and artistic importance and incited deliberations about heritage and the need to preserve it. The beauty and portrayal of details of this unique and very rare artistic underwater find has put Croatia on the world heritage map. There are nations much bigger than Croatia, and world famous museum centres, that cannot boast an artefact as sensational as this one. The opening of the Apoxomenos Museum in Mali Lošinj – the first museum on the Adriatic fully dedicated to underwater archaeology – indirectly presents the northern Adriatic (the Kvarner Bay) as an area of high classical civilisation. In this museum exhibition, one exhibit, presented in an entirely modern concept of artistic projection and promotion, changes the perception of the cultural-heritage space, extending it from the coast to under the sea. The ever-growing public interest in underwater cultural heritage has changed the perception of underwater archaeology, and even the local community has begun seeing it as a scientific discipline, which is not an end in itself, but serves and benefits the community. In this societal environment, from being a tourist attraction and the most important of elements on offer to the tourist, Apoxomenos is gradually becoming a brand and basis of cultural tourism, and as such makes an essential contribution to the economy of the region.

**Richenda Prall & Megan Mentz**

**Museum of Moving Objects (MOMO) Inc.**

**Shoe-box archaeology and how to snorkel a wreck and stay dry! Presenting and interpreting West Australian maritime heritage to schools, aged care and the wider community**

**Key words:** Maritime archaeology, workshops, schools, age-care, communities

**Abstract:** The Museum of Moving Objects (MOMO) Inc. is a mobile museum, founded in 2011, to bring history and archaeology to life in schools and communities through object driven workshops, exhibitions and collaborative projects across West Australia. MOMO has taken an innovative approach to the interpretation of Western Australia's maritime heritage not only through the way it interprets artefacts but also by bringing together diverse audiences in one room – librarians, teachers, school students, aged care residents and their family members. This paper will examine how MOMO has approached and presented Western Australia's maritime heritage through its object driven workshops; 'Annexation & Commemoration – Dirk Hartog Island' and 'Murder & Mayhem – the *Batavia* Story' to school age students, aged care homes and respite centres in Perth. As a result of these workshops, MOMO has been collaborating with local residential care homes in affecting beneficial change to residents with dementia and alzheimer's. Often the long-term memory is the last to go in sufferers of dementia. There is evidence to show that through participation in MOMO's inter-generational maritime workshops, residents have become more animated and stimulated in their own memories and dialogue. Participation has shown to have improved social inclusion, reduce stigma through social awareness, and assist the development of dementia friendly organisations.

**\*Kevin Edwards, Nicolas Bigourdan & Michael McCarthy – \*Flinders University, Adelaide, Australia**

**Making a lot with very little**

**Key words:** Maritime archaeology, exhibition, digitization, public engagement

**Abstract:** In Western societies, the 21st century appear to have ushered in an era where funding for many enterprises, including the arts, is rapidly dwindling. With a few exceptions, less staff, less funds, less resources, alongside increasing demands for exciting content, appears the norm in any Western nation's galleries and museums. This includes the products of maritime and underwater archaeology, which, given the time taken for conservation, is perhaps the most expensive of all museological endeavours. The 'Steamships to Suffragettes' exhibit, centering on the SS *Xantho* and its owners, the Broadhurst family, has been one of the 'key' exhibits at the Western Australian Museum's Shipwreck galleries for decades, and has found itself largely immune from this trend. Constantly changing, entering yet another iteration in 2016, it is a possible pointer for those now seeking to present their work in an increasingly difficult environment. This paper will describe the continually evolving link between archaeological fieldwork, conservation, exhibition, and public engagement characterising what is in effect a 'living exhibit' involving professional and amateur (avocational) practitioners, often at work in the gallery itself and regularly interacting with the visiting public.

**Omaima Ahmed Gamal Elbastawisy Eldeeb**  
**Flinders University, Adelaide, Australia**  
Underwater cultural heritage & maritime museums

Key words: Maritime heritage, museums, virtual reality

Abstract: Underwater cultural heritage has both an historical and archaeological value. It can reveal a new side to human nature and open up windows to the past. This unique heritage asset contains the remains of ships and shipwrecks, their cargoes, harbours, shipyards, quays, jetties and lighthouses, wharves, fish-traps and the now-submerged ruins of ancient cities and buildings. Underwater cultural heritage can be presented to the general public in attractive ways and the easiest way of presenting such heritage is via museums. Some museums are still following traditional and outdated methods, which confine artefacts and site information to glass showcases with written labels, which is no longer consistent with modern-day exhibition practices. Without an exciting and engaging approach to the presentation of underwater cultural heritage, museum visitations often result in a lack of enthusiasm for this heritage asset. Creative ideas and methods in presenting underwater cultural heritage, i.e. effective in attracting audience, include the reconstruction of underwater archaeological sites or entire ships that visitors can enter and explore. More recently, the use of technology for exhibitions has taken on a new dimension with the use of advanced multimedia, 3D modelling and virtual reality. This paper will discuss some of the creative display methods and ideas, and outline what can be done to encourage audiences to visit museums. Moreover, this paper will provide a brief overview of some of maritime museums around the world and their strategies with presentations and displays.

**Marina M.S. Nuovo – Sapienza Università di Roma, Rome, Italy**

Aims and targets of maritime museums and exhibitions in Europe: case studies from Germany, Greece and Italy

Key words: Maritime museum, naval museum, floating museum

Abstract: In the past two decades, maritime museums and museums dedicated to the complex relation between humans and sea have become very popular in Europe. However, their institutional aims and exhibition strategies vary widely. Museums that examine underwater archaeology are divided into at least four different categories: 'naval', 'ancient navigation', 'maritime' and 'floating' museums. 'Naval' museums are dedicated to the discovery of single shipwrecks. Along the Mediterranean coasts, dozens of these museums can be counted. Museums of 'ancient navigation' generally have an educational function as a main goal. In the third group there are museums dedicated to the history of navigation from ancient to contemporary times. The fourth category includes the so-called 'floating' museums, where vessels of great historical importance are anchored in a port and accessible to visitors. The purpose of this paper is to focus attention on some of these museums in Europe, exploring their priorities and methodologies. The question will be asked: what is important to be exhibited in a maritime museum, and how? Through interviews with their curators, a few case studies will analyse the aims of German, Greek and Italian museums and compare them with the expectations of their visitors.

**J.D. Hill & Corioli Souter – The British Museum, London, England**

Curating an ocean of objects. Object histories of the Indian Ocean

Key words: Indian Ocean, exhibitions, objects, Thalassology

Abstract: It is said that archaeology is the study of past human cultures through things. If correct, is the heart of maritime archaeology the study of people's engagement with the oceans through any of those objects that shed light on these deep histories of humans and the seas? This paper reflects on our experience of curating an exhibition about the deep history of one ocean, the Indian Ocean: an exhibition that uses objects to tell their stories and introduce to an audience the deep and complex history of travel, trade and connection around this Ocean. Object-centred (pre)histories bring particular challenges in synthesis and rendering these complex histories of maritime activities and cultural entanglement. For example, how to bring to life an apparently plain object with a fascinating story to tell and evoke a sense of the ocean. How do you deal with the limitations of what objects are available in your Museum's collections, and the limitations of what objects can and cannot tell us about? Some of the objects we have chosen for our exhibition come from shipwrecks and underwater excavations, others from terrestrial archaeological excavations, but most are not archaeological finds. Bringing together two recent trends in the historical disciplines of Object Centred history and Ocean Centred histories (the 'New Thalassology') raises bigger questions about what the strengths and limits of 'maritime archaeological' museums and exhibitions might be.

## Day 3: Maritime Museum Functions Centre (Level 2): Wednesday 30 November

### Maritime archaeological sites and legacy data, revisiting old shipwrecks with new technologies (9:00 am – 10:30 am) – Part 1

**\*Mariangela Nicolardi & Irena Radić Rossi – \*University Paris1 Panthéone-Sorbonne, Paris, France**

The Gnalii shipwreck, 50 years on

Key words: Maritime archaeology, Venetian shipwreck, Renaissance history, new technologies, international project

Abstract: In the early 1960s, local divers discovered a significant shipwreck site, near the small island of Gnalii at the south-western entrance of the Pašman Channel. The extent of the site and the excellent preservation of the ship remains and its cargo make it one of the most interesting Late Renaissance shipwrecks known. Several archaeological interventions in the late 1960s and early 1970s rescued part of the equipment, armament and cargo of a large merchantman, dated to the late 16th century. Unfortunately, after several years of arduous struggle to save the site, the researchers were forced to arrest the rescue operations. In the summer of 2012, an international, interdisciplinary expedition returned to Gnalii, with the intent to determine the condition of the hull, verify the quantity of the artefacts remaining on the bottom that required recovery and conservation, and perform a proof of concept to support a full-scale excavation of the shipwreck. Extensive research in the Venetian archives revealed the owner and the name of the ship and many interesting details of its amazing story. The international and interdisciplinary project 'The Shipwreck of Gnalii – Mirror of Renaissance World' currently involves a number of Croatian and foreign participants, focusing on the re-examination of the existing documentation and finds, the systematic interdisciplinary research, and the application of new technologies in the marine environment. It promotes the systematic research and study of all the available archaeological and historical sources, in order to reconstruct the ship, its rich, fascinating and intriguing story.

**Madeline McAllister – University of Western Australia, Perth, Australia**

'Reinventing' legacy data and archaeological interpretation: 3D digital visualisations of shipwreck sites

Key words: Legacy data, interpretation, 3D, shipwrecks, visualisation

Abstract: In recent years, advances in computer science and machine vision have resulted in a rise in the application of three-dimensional digital techniques and technologies in recording underwater shipwreck sites. Despite an increase of application and testing, underwater archaeologists are yet to embrace a discourse on the impact that 3D visualisation technologies have on interpreting archaeological data. This paper presents current PhD research on the *James Matthews* (1841) a colonial shipwreck in Western Australia. Image-based 3D visualisations of the site, based on both recently recorded and legacy data are combined into one platform to allow archaeologists to view this site over time. A detailed discussion on the method and results undertaken to create this 3D digital site archive will be

the focus of this paper. Digital 3D visualisations provide a new medium for advanced archaeological interpretation of sites but underwater archaeologists are not engaging with the underlying issue of how this technology affects our interpretation. As a discipline that relies heavily on the visual media, understanding that digital 3D visualisations are an overlooked and 'silent power' in terms of manipulating and changing interpretations of sites is the underlying theme for this paper. It is vital that underwater archaeologists begin to contribute to the theoretical discussion on the impact of advanced visualisation technologies and the way it is changing how archaeologists interpret sites. This research is associated with the ARC Linkage-Project 'Shipwrecks of the Roaring Forties: a maritime archaeological reassessment of some of Australia's earliest shipwrecks' (LP130100137, Lead CI: Dr Alistair Paterson).

#### **Trevor Winton – Flinders University, Adelaide, Australia**

Integrating legacy excavation survey data with new technologies – the *James Matthews* experience

**Key words:** 3D model reconstruction, sub-bottom profiles

**Abstract:** The Western Australian Museum (WAM) carried out four seasons of excavations and reburial on the *James Matthews* wreck site by between 1973 and 1977. During the 1975–1976 excavation archaeologists completed a detailed *in-situ* survey of the fully exposed starboard-side hull from keelson to deck knees, and from bow to stern. The project team subsequently prepared a two-dimensional scaled site plan of the exposed shipwreck material, which also included information on the types of timber used in the ship's construction. Later in 2000, WAM staff and volunteers excavated six test trenches to determine the extent of degradation of exposed and buried timbers. In order to assess new non-linear sub-bottom profiler (SBP) technology for *in-situ* management applications, the author undertook a series of trial sub-bottom profiles across the *James Matthews* wreck site in 2015. The summary envelope data from this survey delineated the outline and gross structure of the shallowly buried material. In addition, the raw data comprising phase and magnitude of the reflected acoustic waves was also collected. This paper presents the progressive results of using new non-invasive SBP technology to assess both the depth of burial and also the major buried material types and their relative state of degradation. The assessment is based on the statistical comparison of the SBP phase and magnitude data with the legacy survey data. This comparison necessitated the virtual 3D model reconstruction of the known shipwreck remains, integrating the never-previously used three-dimensional excavation survey information together with the conservation data.

#### **\*Andrew Woods, Nick Oliver, Joshua Hollick, Jeremy Green & Patrick Baker – \*Curtin University, Perth, Australia**

3D reconstruction of the *Batavia* (1629) wreck site from historical (1970s) photographs

**Key words:** *Batavia*, 3D reconstruction, 3D models

**Abstract:** The wreck of the *Batavia* (1629) was discovered in 1963 on Morning Reef, Wallabi Group in the Houtman Abrolhos. The site was excavated in four seasons in the 1970s. During these seasons over 4,000 underwater photographs were captured of the site by Jeremy Green and Patrick Baker. The project team has scanned all the original 35 mm photographs of the *Batavia* wreck site and applied 3D reconstruction techniques to generate a large selection of detailed 3D models of the *in-situ* ship's timbers (prior to and during excavation) and the surrounding site. These 3D models provide a realistic depiction of the 3D shape and layout of the site, which can be visualised in full-scale in a virtual environment display such as at the Curtin HIVE or a head-mounted display. Some of the historical photosets had been captured for the purpose of generating a successful 2D photo-mosaic of the area. However, 3D reconstruction techniques have allowed a much more detailed and realistic 3D rendering of the area to be generated. 2D photo-mosaics assume a flat site and therefore impose significant distortions on the imagery, whereas 3D reconstruction produces 3D models, which can allow accurate site measurements to be obtained. This paper will discuss the 3D reconstruction processes used including the automatic selection of image sets to generate a large number of models across multiple areas and seasons. Many of the extensive 3D models will be presented.

### **Morning break (10:30 am – 11:00 am)**

## **Maritime archaeological sites and legacy data, revisiting old shipwrecks with new technologies (11:00 am – 12:15 pm) – Part 2**

#### **Megan Coghlan & \*Jeremy Green – \*Western Australian Museum, Fremantle, Australia**

Helping to identify historic shipwrecks. The DNA analysis of ivory

**Key words:** DNA, ivory, shipwrecks

**Abstract:** The identification of the source of elephant tusks from the *Vergulde Draeck* (1656) and the *Zeewijk* (1727), two Dutch East India Company (VOC) shipwrecks, has helped to identify the nature of the ivory trade. The VOC was involved in the African ivory trade in a complex way, obtaining ivory mostly from West Africa, through the Dutch West India Company who imported into the Netherlands where it was bought by the VOC for trade in the Indies. However, for a short period of time in the 18th century ivory was purchased by the VOC from East Africa by the Company in Cape Town. The analysis of elephant tusk DNA found on the two sites indicates the sources of ivory and has helped to show that, in the case of the *Zeewijk*, the ivory was almost certainly illegal trade.

#### **\*Walter Bloom, Liesel Gentelli, Jeremy Green, Martijn Manders, Alistair Paterson & Jon Woodhead – \*C/- Western Australian Museum & Murdoch University, Perth, Australia**

The analysis of Spanish coins from shipwreck sites

**Key words:** Coins, analysis, laser ablation, archives, shipwrecks

**Abstract:** The objective of this study is the identification of the source of silver imported to Spain from Spanish America. The Western Australian Museum has a collection of about 80,000 coins mostly dateable and identifiable, from the 17th to early 19th century. The coins are mostly *reales* from Spanish Colonial and Metropolitan mints, *thalers* from German City and Imperial mints, and *daalders* from Spanish Netherlands and United Netherlands provincial mints. Analysis using laser ablation technology has examined the Spanish Colonial mints of Potosi, Lima, Mexico and Santa Fe, and the Spanish Metropolitan mints. Initial results show that it is possible to identify the different mints and also possibly identify the year of minting. With this information it may be possible to trace what happened to the silver when it arrived in Europe. For example, did the Spanish Metropolitan mints use colonial silver or were they using European silver and did they mix the silver. The research raises a number of exciting and interesting questions that is being supported by archival research in Europe. The results and progress of this work will be outlined in this presentation.

#### **Dan Franklin & \*Elizabeth Smits – \*University of Amsterdam, Amsterdam, the Netherlands**

The legacy of the *Batavia* – new research on Beacon island: graves, bones and isotopes

**Key words:** *Batavia*, graves, skeletons, physical anthropology, stable isotopes

**Abstract:** The 1629 mutiny of the *Vereenigde Oostindische Compagnie* (VOC) *retourschip Batavia* has captured public imagination not only historically, but also with the latest discoveries in the 21st century, modern interest has once again been rekindled. There is a considerable body of research based on the analyses of the skeletal remains of the victims recovered to date. What has not occurred, however, is a collective analysis of all the remains that takes advantage of the most

modern developments in forensic approaches towards skeletal analysis. The study of the skeletal remains has entered a new phase with the appliance of stable isotope technology. The goal is to reconstruct diet and provenance of the men, women and children who died in the aftermath of the shipwreck and mutiny and were buried on Beacon Island. The chemical elements in food are determined by the soil, groundwater, flora and fauna and become incorporated in our bodies, bones and teeth. The stable isotopes carbon and nitrogen are linked to the terrestrial and marine food chain and therefore provide information on the diet. Other stable isotopes such as strontium and oxygen primarily provide geographical information. These analyses are based on the composition of the tooth enamel, which is formed in early life. As enamel stays unchanged it reflects the region a person grew up.

**Lunch (12:30 pm – 1:30 pm)**

## **Current and future prospects of underwater cultural heritage studies and management in East Asia (1:30 pm – 3:15 pm)**

**Do-Hyun Kim – ICOMOS Korea, Pukyong National University, Busan, Republic of Korea**

Underwater archaeology in Korea

Key words: Underwater archaeology, underwater cultural heritage, shipwrecks in Korea, Far East Asia

Abstract: The Korean Peninsula located in Far East Asia, has a long historical relation with Japan, Taiwan and China. Furthermore, it has an abundance of archaeological resources reflecting the maritime activities of the prehistoric period to recent times. Understanding the underwater archaeology in Korea would be useful for current and future prospects of underwater cultural heritage studies and management in East Asia. Daegokcheon Stream Petroglyphs (UNESCO tentative list Ref. 5486) are inscribed rock art engraved along 3 km-long cliffs, which include Bangudae and Cheonjeon-ri Petroglyphs. The engraved images of Bangudae include: humans (14), sea/land animals (193), ships (5), tools (6), and unidentified (78). Among sea animals, whales are particularly numerous. They are varied in type and depicted in a level of detail that has earned the monument its reputation for being the world's most famous whale petroglyphs. The many images of whales suggests that they were an object of worship for pre-modern people who lived in this area during the Neolithic/Bronze Age, and signify their beliefs about life, death, and the afterlife. A few prehistoric log boats and over ten well-preserved wooden ancient/medieval shipwrecks has being excavated with valuable artefacts such as ceramics, porcelains, anchor stones, wooden name tags and etc. There are also important underwater cultural heritage sites. These underwater cultural heritage and relics in Korea could show the complexity of the historical dynamics consisting of maritime transportations, communications, trade and piracy activities.

**Norimitsu Sakagami, Yinji Li & Jun Kimura – Tokai University, Tokyo, Japan**

A model educational Underwater Cultural Heritage program utilizing a remotely operated vehicle

Key words: Educational program, underwater cultural heritage, ROV

Abstract: This paper reports on the result of the on-site educational program with a low-cost ROV that was carried out at the Yabuuki underwater site off the shore of Ishigaki Island, Okinawa, during 2013 and 2015. The program was developed for local high school students to enhance their understanding of the underwater site related to the Island's local maritime trading activities in the past. The site is located on the western coast of Ishigaki Island where there are several iron grapnel anchors and Okinawan ceramic jars at a depth of 12–32 m. The major component of the program included students' involvement with operating the ROV to explore and access the site while archaeologists were working underwater. The ROV, specially designed for untrained operators, can be controlled by a video game controller, which allows the operators to have the ROV access an underwater site smoothly, with a high-definition camera mounted on the vehicle. Throughout the program, instructors aimed to stimulate participants' interests in the local underwater site and pursue the management of the underwater site in collaboration with the Ishigaki's community. Students were asked to complete a set of questionnaires at the beginning and end of the program in order to assess the educational effectiveness of the program. The results indicate that the program was successful in terms of the increase of students' awareness about the existence of local underwater cultural heritage resources.

**Whan Suk Moon & Kyeong-jung Roh – National Research Institute of Maritime Cultural Heritage, Republic of Korea**

The results of the underwater archaeological excavation at sea off Taeon, Korea

Key words: Underwater excavation of Republic of Korea, Taeon, shipwreck, Goryeo dynasty

Abstract: Twenty-four underwater archaeological sites in Korea have been excavated since the Shinan excavation of 1976. Therefore, fourteen of the shipwrecks and approximately 98,000 objects have been recovered. The National Research Institute of Maritime Cultural Heritage, Korea, is concentrating the site of sea off Taeon recently, where had been a sea passageway of trading shipments and cargo vessels of grains and special products from the past. However, this area is notorious for its fast tidal current, scattered rocks and heavy fog. These have been proven through research and the discovery of shipwrecks and annual excavations. The recovered objects including shipwrecks from the sea off Taeon is an important key in determining the past such as departure points, cargo, lifestyle and shipbuilding techniques. Furthermore, underwater archaeological excavations in Taeon led to the establishment of another institute, which has the skills and expertise in archaeological excavation, conservation and exhibition.

**Chiaki Katagiri, Rintaro Ono, Yuji Yamamoto & Hiroki Miyagi – Okinawa Prefectural Museum and Art Museum, Okinawa, Japan**

Shipwrecks and sea routes in the Ryukyu Archipelago

Key words: Ryukyu Archipelago, sea routes, marine accidents, wreck sites, correlation

Abstract: A maritime nation called the Ryukyu Kingdom ruling the islands between Japan and Taiwan once existed. In the sea area of present day Okinawa in Japan, many wreck sites have been discovered as a result of continuous distributional survey of the underwater cultural heritage in the past ten years. This paper presents our analytical research on the relation between the locations of the wreck sites and sea routes. The Kingdom thrived during medieval times on the transit trade owing much to the tributary relationship with the Ming Dynasty, China. In the following modern times, in the 17th and 18th centuries, while subordinating to both China and Japan, the Kingdom prospered with a complex culture based on the established networks within the archipelago. Since the late 18th century, the ships of the western great powers started to appear. The trade ship-related sites loaded with Chinese pottery occupy the majority in the medieval and the local ships related sites increases during the following modern period. Furthermore, in the late modern period, the western wreck sites started to appear, and increase all of a sudden. Distribution of the wreck sites consisting of trade ships and local ships seem to be correlated to the location of sea routes and sunken rocks depicted on the ancient sea maps, while the distribution of the western wreck sites do not share the same correlation. This paper presents our analytical research on the chronological transition and causation of the distributional correlation of the wreck sites and shipping routes.

**Hironobu Kan, C. Katagiri, Rintaro Ono, M. Nagao, Y. Nakanishi & S. Yoshizaki – Kyushu University, Fukuoka, Japan**

3D visualization of USS *Emmons* (WWII wreck) off Okinawa Island using multi-beam bathymetry and PhotoScan SfM software

Key words: WWII, multi-beam echo sounding, Ryukyus, Japan

Abstract: Seventy years having passed since the end of the Second World War, the documentation of the war through material evidence, beyond first-person

witness accounts, is increasing in significance. The USS *Emmons*, a US Navy Gleaves-class destroyer minesweeper (106 m in length), lies in around 40 m of water off the northwest shore of Okinawa Island. It stalled due to damages incurred during an attack of Japanese kamikaze planes on 6 April 1945. The ship was abandoned and intentionally sunk. The wreckage of kamikaze planes are also scattered on the seafloor. This paper aims to contribute toward research on and preservation of the USS *Emmons* as an underwater archaeological heritage site, faithfully illustrating WWII and Japanese kamikaze planes through high-resolution digital elevation model (DEM) generation and 3D visualization. Unlike in terrestrial archaeological surveys, the documentation of large-scale underwater archaeological sites through the creation of high-resolution 3D models is difficult, because GPS mapping techniques cannot be applied to the seafloor. We eliminated this problem by incorporating precise control points obtained from high-resolution multi-beam echo sounding bathymetry in the creation of 3D models using Structure from Motion (SfM) software; 1,716 images of the wreck obtained during SCUBA expeditions were used. The ultra-high resolution DEM, with a grid size of 10 cm was created for an area of 120 m x 30 m, covering the entire wreck site, using the SfM 3D model. The 3D model provides a primary record of the current state of the wreck and allows for the establishment of various measures for its conservation.

#### **Charlotte Looman & Melissa Bendell – Flinders University, Adelaide, Australia**

Communicating maritime archaeology to the Vietnamese public

Key words: Vietnam, public archaeology, community engagement

Abstract: The protection of underwater cultural heritage has come to the forefront of Vietnamese heritage issues in the face of China's power play in the South China Sea. Efforts to develop maritime archaeology have started with several short-term training programs for heritage professionals and government officials, and several research projects in the north as well as in the central province of Quang Nam. The next step in the development of maritime archaeology in Vietnam should be to engage with the community. Looting and treasure hunting are genuine problems faced in Vietnam, where most of the underwater cultural heritage is found in market stalls rather than museum exhibits. Heritage professionals must communicate with the wider public the importance of their maritime and underwater cultural heritage, for that is one of the key ways to protect it. This paper will present various ways of engaging with the public, including public presentations such as museum exhibitions, as well as the use of traditional media and social media, by looking at several case studies around the world. It will also address the difficulties and limitations of such an endeavour in Vietnam.

**Afternoon break (3:15 pm – 3:45 pm)**

### **Tying the knot: western and eastern trade ships in the Pacific and Indian Oceans (3:45 pm – 5:30 pm)**

#### **Rasika Muthucumarana – Maritime Archaeology Unit, Central Cultural Fund, Galle, Sri Lanka**

Missing links of Indian Ocean wrecks

Key words: Godawaya wreck, Indian Ocean, shipbuilding, Sri Lanka

Abstract: During last fifty years, many European wrecks (mostly steam powered ships) were found and recorded around Sri Lanka. Among them were Dutch wrecks from the early 17th century. However, apart from the Godawaya shipwreck dated to the 1st century BC, very few remains and clues have been found; mainly those of 13th–14th century stone anchors, old harbour sites and inscriptions, but not wrecks. When considering the Asia Pacific region, it includes the 9th century with the Belitung shipwreck. In 2014, a team of Dugan conservationists provided photographs of a wreck in the north-west coast of Sri Lanka. The wreck is in shallow water and covered with sea grass. The main attraction of that site is two large wheel-shaped objects on the wreck. Local fishers referred to these as the wheels of the chariot that belonged to the queen Alli (Alli Rani, a legendary queen who ruled the area a long time ago). There was also information from local fishers on the north and east coasts about potential wrecks or remains such as the ones that the Maritime Archaeology Unit were searching for. Archival research and remote sensing expeditions were carried out, working closely with local divers and fishers. This paper presents the recent investigations conducted in Sri Lanka in search of the missing links relating to Indian Ocean trade and shipbuilding.

#### **Indika Upul Hewage & Rasika Muthucumarana – Maritime Archaeology Unit, Sri Lanka**

Identifying the steamship SS *Malabar* (1860)

Key words: SS *Malabar*, Galle Harbour, Maritime Archaeology Unit (MAU), P&O Company, shipwreck

Abstract: Some of the shipwrecks within Galle Harbour remain unidentified, which naturally warrant further, detailed research. As research was being carried out on a few of these shipwrecks over the last few years, a local diver brought forward interesting information about a wreck yet to be discovered. With this new information, the Maritime Archaeology Unit (MAU) carried out dives and some very interesting findings came to light. According to the available information, it is most likely the remains of SS *Malabar*, which sank in 1860. The ship belonged to the P&O Company and its dramatic story was provided by the Company's website concerning its fate just before it grounded. The late Sir Arthur C Clarke, a pioneer diver in Sri Lanka, also published some information in the book 'The Treasure of the Great Reef' in 1964. However, it was still not known exactly where wreck was lying in Galle Harbour. Further archival-based research and the gathering of information from other sources such as 'Wreck Receiver Information in Galle', finally revealed the shipwreck, found close to the reef at the depth of 12 m, to be SS *Malabar* that sank in 1860. This paper discusses further evidence and information gathered by the team's recent site investigations.

#### **\*Graeme Henderson, Andrew Viduka, Alex Moss & James Parkinson – \*Wreck Check Inc., Australia**

Closing in on the *Fortuyn*

Key words: Trade routes, Indian Ocean, shipwrecks, remote sensing

Abstract: In 1610 Hendrick Brouwer pioneered a Dutch trade route making use of steady westerly winds between latitudes 35° and 40° south, turning north in the longitude of Sunda Strait (105° east). It was then inevitable that ships would sight Western Australia. In 1616 Dirk Hartog in the *Eendracht* made the first landfall in Western Australia at Dirk Hartog Island (113° east) and sighted the nearby mainland coast. Four Dutch shipwrecks have been found on or near the Australian coast. Three more VOC ships, missing between Cape Town and Batavia, are thought to be wrecked in Australian waters. Over many years attention has been given to locating on the Abrolhos Islands one of the still-missing 18th century VOC ships. The authors of this paper, however, have observed that, by the 18th century, the route had been fine-tuned, allowing for seasonal wind changes, and that, according to ships logs, the routes most followed by both outward- and homeward-bound VOC ships were considerably to the west of the Australian coastline. Since there were two routes and a possibility of wrecking using either route, it is likely that undiscovered Dutch shipwrecks will be in the Australian Territories of Christmas Island and the Cocos (Keeling) Islands, rather than on the Australian coast. This observation is supported by a contemporaneous eyewitness account of wreckage in the water, one of several archival sources that support this likelihood. This paper outlines the archival research, and results from two seasons of remote sensing work conducted at Christmas Island and the Cocos (Keeling) Islands.

#### **Hugh Edwards – Author and Independent Researcher, Western Australia**

Silver – key to a shipwreck mystery?

**Key words:** United East India Company (VOC), shipwrecks, silver

**Abstract:** Four known Dutch (VOC) ships, wrecked on the Western Australian coast during the 17th and 18th centuries, were all trade ships carrying large quantities of silver coin, amongst other cargo. The *Batavia* (1629), *Vergulde Draeck* (1656), *Zuytdorp* (1712) and *Zeewyk* (1727) were discovered in the 1960s, resulting in the Commonwealth *Historic Shipwrecks Act 1976* – enacted to protect Historic Shipwrecks. But two vessels – the *Fortuyn* (lost in 1724) and *Aagtekerke* (lost in 1726) – remain on the missing list. The *Zeewyk* was discovered in 1968 as a result of a chance finding of an elephant tusk. Survivors had built a sloop using timber salvaged from the shipwreck, and from nearby mangroves, and successfully reached the East Indies in ten months after the wrecking. The officers had reported seeing wreckage from another ship on the reef behind their own stranded vessel, “These from a ship or ships which the same fate has struck here”. Modern diving expeditions have located more cannon and anchors on the site than seemingly would have been carried on one ship. Since *Aagtekerke* loaded 2,935 pounds of ivory at the Cape of Good Hope in January 1726, the tusk may be from this still missing ship. Like *Zeewyk*, the *Aagtekerke* also carried two to three tonnes of silver. However, *Zeewyk*'s survivors had salvaged their silver and took it to the East Indies. Therefore, if silver is found at the site, does it indicate the presence of another shipwreck? The search continues.

**David L. Mearns, David Parma, Ayyoub Al Busaidi, Ahmed Al Siyabi – Blue Water Recoveries Ltd, West Sussex, England**  
Archaeological study of an early 16th century Portuguese East Indiaman: Al Hallaniyah Island, Oman

**Key words:** Shipwreck, Oman, Portuguese East Indiaman, Sodr , Vasco da Gama

**Abstract:** Two Portuguese naus from Vasco da Gama's second voyage to India, left behind to disrupt maritime trade between India and the Red Sea, were wrecked in May 1503 off the north-eastern coast of Al Hallaniyah Island, Oman. The ships: *Esmeralda* and *S o Pedro*, were commanded by da Gama's maternal uncles, Vicente and Br s Sodr , respectively, who perished during the loss. Contemporary salvage by the surviving Portuguese, and by Malik Ayaz in 1508, resulted in the removal of all guns and much material from the wrecks. A targeted archival research effort led to the wreck site being initially located in 1998. Following a hiatus, the project was resurrected in 2012 simultaneously with development of a National underwater archaeology program within Oman's Ministry of Heritage & Culture (MHC). The MHC is the official government body responsible for the protection of Oman's underwater cultural heritage and their management of this project represents the first such government led archaeological excavation of an historic wreck site in Omani waters. Large-scale expeditions have been mounted in 2013, 2014 and 2015 to investigate the site on a collaborative basis with the MHC. To date over 2,800 individual artefacts have been excavated and a comprehensive geophysical survey of the bay was made. Detailed scientific analysis of the artefact assemblage confirms the location of the wreck site and *Esmeralda* as the probable source of the remaining, un-salved wreckage. This ongoing project provides a unique opportunity to study one of the earliest ships ever found from the Age of Discovery.

**\*Ali Moosiae & \*\*Sorna Khakzad – \*Siraf Pars Museum, Iran & \*\*University of West Florida, Florida Public Archaeology Network, USA**  
An account of stone anchors in the northern shoreline of the Persian Gulf

**Key words:** Stone anchor, Persian Gulf

**Abstract:** This presentation introduces the historical stone anchors found at the Northern shoreline of the Persian Gulf, in the areas between Bushehr and Hormuzgan provinces. The Iranian side of the Persian Gulf is under ongoing and rapid urban and industrial development. Limited systematic studies have been conducted on the underwater and coastal cultural heritage in these areas. This presentation shows a collection of stone anchors and stone weights, based on site observation, archival study, interviews with local people and findings during excavations. Some of these anchors were found underwater and some on the shoreline, however, no archaeological excavations were conducted and the findings are the objects that were collected during site visits which were considered in danger of destruction and loss. The locations of the objects were registered through Global Positioning System. Data on these anchors including weight, size, photos and drawings, which will be provided. The main objective of this presentation is to provide a categorisation of these anchors and comparative analysis with similar findings in the other areas around the Persian Gulf and Indian Ocean. The results of this research as a pilot project will lead us to learn more about seafaring techniques and history in the Persian Gulf, and the sea trades and sailing between Persia and other countries during past history.

**\*Liu Lina & Liu Shuguang – \*Xi'an Jiaotong University, China**

Exploration and analysis of the regional cooperation scheme for the protection of the Underwater Cultural Heritage in the South China Sea

**Key words:** Underwater Cultural Heritage, South China Sea, Cooperation Scheme, UNESCO 2001 Convention

**Abstract:** The significance of the South China Sea (SCS) results not only from the long-standing international shipping transit and natural resources, but also the extensive and various types of Underwater Cultural Heritage (UCH) on the seabed. These include shipwrecks, submerged ancient cities and ports, preserve regional history and maritime civilization. This paper first highlights the current legal protection for UCH surrounding six states in the South China Sea. The next part analyses the necessity of regional cooperation with protection for UCH in the SCS. In the third part, the authors propose to build up a cooperation mechanism for joint UCH management in the SCS region, which is for peaceful settlement of the potential UCH disputes, and improvement in the relationship among these states. This part lays out four aspects systematically to enhance confidence building and regional cooperation for UCH protection in SCS with respect of UNESCO 2001 Convention, which actually interprets a specific, practical international cooperation scheme for State Parties. In Conclusion, that joint cooperation of UCH will help complete our knowledge about maritime trading in the SCS, even Southeast Asia. Reasonable development and protection of cultural resources in the SCS should consequently facilitate sustainable development in surrounding countries and regions.

## Day 3: Fremantle Port Authority, B-Shed: Wednesday 30 November

### The geoarchaeology of harbours: current research and future directions (9:00 am – 10:30 am) – Part 1

**Nikos Kourampas, Anna M. Kotarba-Morley, Alison Crowther, Mark Horton & Nicole Boivin – University of Stirling & University of Edinburgh, Scotland**

**Title:** Geoarchaeological reconnaissance of Unguja Ukuu, a Late Holocene/Early Islamic trade port in southern Zanzibar

**Key words:** Geoarchaeology, backshore, East Africa, Late Holocene, Indian Ocean trade

**Abstract:** Geoarchaeological reconnaissance at Unguja Ukuu, a late 1st Millennium CE Indian Ocean trade port, aimed at documenting the geomorphic context of the ancient settlement and sampling excavated sediments for micro-morphological, and other, analyses. This paper outlines and interprets the stratigraphy of the settlement shore and discusses hypotheses concerning the distribution of port functions within it. The coastal stratigraphy of Unguja Ukuu records aggradation of an inhabited backreef shore from mid-7th to the 9th centuries CE, perhaps on the wake of an earlier Holocene marine transgression. Deposits generated at the ancient settlement include middens and palaeofloors interlayered with backshore sands and, in later phases, a peri-urban dump. Residues from intense processing/consumption of fish and other marine resources supplied translocated phosphates that impregnate and cement the sandy sediment. A diachronous, dark-earth type anthrosol developed on these deposits, and continued to evolve post-abandonment. Ocean-going vessels may have approached the Unguja Ukuu shore by navigating the network of tidal channels (parts of a sea-flooded Late Pleistocene(?) drainage) across the shallow tidal platform. The Holocene evolution of these channels and adjacent creeks – as yet undocumented – may thus be critical for understanding the environmental context of the Unguja Ukuu port emergence

and decline.

**David Blackman – University of Oxford, Oxford, England**

Forty years (and more) since Colston: an archaeologist's view

Key words: Ancient harbours, relative sea level, sea level indicators, geoarchaeology, Colston Symposium

Abstract: In the 1960s to 1970s, archaeologists working on coastal sites became increasingly aware of the significance of the debate among geomorphologists about relative sea level change. For the author, the Colston Symposium of 1971 (published in 1973) was a key moment: he tried to evaluate the archaeological evidence for sea level change, in the Holocene. We realised that archaeologists could provide useful indicators of earlier sea levels for geomorphologists, and vice versa. Both sides also had to learn that unanimity of interpretation did not exist. This paper discusses the various types of archaeological indicators, referring to a number of sites which the author has studied; it describes some lessons which he has learned, and mentions some points of caution. Finally, it looks at the great contribution which geoarchaeology is making to the study of ancient harbours, which had not been imagined, at least by archaeologists, at the time of the Colston Symposium.

**Stefan Feuser, Felix Pirson & Martin Seeliger**

**Heinrich Schliemann-Institute, University of Rostock, Mecklenburg-Vorpommern, Germany**

Elaiia, the maritime satellite city of Pergamum

Key words: Geoarchaeology, Elaiia, harbour, Pergamum, antiquity

Abstract: Between 2006 and 2011, Elaiia, the harbour-city of ancient Pergamum, had been examined using a combined methodology including archaeological survey, architectural survey, geomatics, geophysics and geoarchaeology. The layout of the city and its harbours could be reconstructed together with its settlement history. The aim of this paper is to present a micro-regional biography of the littoral between a progressive human development from Hellenistic to Late Roman/Early Byzantine times and a constantly changing natural environment. The combination of a closed harbour, a fortified harbour-front with presumable shipsheds and a beach-harbour served the needs of Pergamum and the Attalids in Hellenistic times. Elaiia was the commercial harbour of the Pergamenians and the military base of the Attalids where parts of their fleet were garrisoned. Apart from its relation to Pergamum, the development of Elaiia largely depended on changes in the natural conditions. Those changes were mainly caused by alluvial and colluvial deposits of the river Kaikos. While the fortified harbour-front started silting-up as early as the 1st c. BC/AD, the closed harbour stayed navigable until the 4th c. AD connected to the sea via a channel built into a natural tide-way. While this closed harbour silted-up in the course of the 5th c. AD, approximately 1 km south of the city several wall structures were constructed in shallow water covering an area of ca. 1,150 m × 265 m. However, these were not used as further harbour installations but as a saline producing salt on local and regional scale.

**Maii Roio – Estonian National Heritage Board, Tallinn, Estonia**

Tallinn Harbour from the Middle Ages: studies in the former seabed

Key words: Old harbour, shipwrecks, construction works

Abstract: In May 2015, during construction works in Kadriorg in Tallinn, two shipwrecks were found inside the sediments of the former seabed. The wrecks were lying underground at the depth of approximately 4m. The construction site is located in Kadriorg, not far from Tallinn Old Harbour. Only 100 years ago, the construction site was actually sea area and it was filled in 1930s. After the surface layers were removed to an extent of 2m, ground penetrating radar was used to determine the approximate dimensions of the wrecks before archaeological excavations. Both wrecks date back to the Middle Ages. The older of the wrecks, the so called Peeter wreck, turned out to be a cog. The wreck finds in the ground and coastal waters are so far the main indicators of the harbour site dating to the Middle Ages and early modern period. It is still not clear where the older harbour site was located. In the presentation, the development of Tallin will be analysed.

**Morning break (10:30 am – 11:00 am)**

**The geoarchaeology of harbours: current research and future directions  
(9:30 am – 12:15 pm) – Part 2**

**\*Geoff Hewitt, Brad Duncan, Cathy Tucker & Hans Dieter Bader – \*Geoff Hewitt Archaeologist, Melbourne, Australia**

There's a pier buried under there: rapid geomorphic and anthropogenic change along the Victorian coastline

Key words: anthropogenic, environmental change, maritime archaeology

Abstract: Human intervention in the littoral region can often generate unforeseen and sometimes extremely rapid changes to the coastline resulting in the formation of large and complex archaeological signatures. This paper will examine how the installation of harbour facilities can irrevocably change local environmental conditions, leading to maritime archaeological sites in unexpected places. Case studies are presented for Queenscliffe, Portland and Lakes Entrance in Victoria, Australia.

**Anna M. Kotarba-Morley – University of Wollongong, NSW, Australia**

New geoarchaeological results from the Greco-Roman port of Berenike Troglodytica on the Red Sea coast of Egypt

Key words: Red Sea, harbour geoarchaeology, Greco-Roman ports, ancient harbours, maritime trade

Abstract: Berenike Troglodytica was the most important harbour on the Egyptian Red Sea coast during the Ptolemaic and Roman periods and was a major hub connecting trade between the Indian Ocean and the Mediterranean. Berenike's geographical position was extraordinarily propitious owing partly to its natural harbours, protected against the prevailing northern winds, as well as its location on the large peninsula of Ras Benas, which was an ancient view shed. This paper will discuss how multifaceted geoarchaeological approaches to the study of ancient ports can contribute to a better understanding of the mechanisms and logistics of maritime trade, as well as fluctuations in its quality and quantity. It will also disseminate the latest results of laboratory analyses from coring campaigns in Berenike's harbours, with an aim of shedding new light on the significance of the impact of local and regional palaeoclimatic, landscape, seascape and environmental changes on the development and decline of the port, and the Red Sea-Indian Ocean maritime trade and exchange.

**\*Ross Thomas, Benjamin Pennington and Alexandra Villing – \*The British Museum, London, United Kingdom**

Naukratis in its Riverine Setting (Presented by David Blackman for benefit of audience)

Key words: Naukratis, riverine, trade, Egypt

Abstract: Naukratis was the Mediterranean port of Egypt from its founding c.630-620BC until the construction of Alexandria by Kleomenes of Naukratis, on behalf of Alexander the Great. Long after the construction of Alexandria, Naukratis remained an important city, boasting the oldest Greek sanctuaries in Egypt and an impressive industrial centre and river port on the main transport route to Memphis from the Mediterranean, along the Canopic branch of the Nile. This presentation will focus on a program of auger coring, supplemented by an Electrical Resistivity Tomography (ERT) profile. These data inform on the location and navigability of

the Canopic branch of the Nile, a river that was a major communication, trade and transport artery between Egypt and the Mediterranean during this period; and on the evolving relationship between the river and the port of Naukratis, Egypt's primary Mediterranean trade hub during the Late Period (664–332 BCE). During the Late Period the river channel abutted the site, before migrating westwards, away from the edge of the town, during the closing centuries BCE. A swampy backwater was left directly beside the site, which silted up and was built over in Roman times. The river itself ceased to flow during the later first millennium CE, after which it was canalised.

**Lunch (12:30 pm – 1:30 pm)**

### **The final frontier: underwater archaeology, new technology development and the deep shipwreck resource (1:30 pm – 3:15 pm)**

**Bong-Huan Jun, Jin-Yeong Park, Hyunwon Shim, Banghyun Kim, Seongyeol Yoo, Hyuk Baek, Woo-Young Jeong, Pan-Mook Lee & Young-Hwa Jung – Korea Research Institute of Ships & Ocean Engineering, Republic of Korea**

Preliminary performance experiments in the sea of a multi-legged ROV Crabster for survey of underwater cultural heritage

**Key words:** Crabster, walking underwater, underwater cultural heritage, turbid water, tidal current

**Abstract:** The Marine Robotics Laboratory of Korea Research Institute of Ships & Ocean Engineering has been developing a novel ROV (Remotely Operated Vehicle), which uses six artificial legs to move and control its motion. Its name is Crabster. Using precise control of these articulated joints of the legs, the robot is able to accomplish subtle and fine motion and attitude change for imaging sonars and optical cameras. In addition, the ROV walks on sea floor minimizing sediment blowing and can keep its underwater position better against currents and flow. As these advantages are considered to be suitable for marine archaeology investigation, we conducted preliminary tests to evaluate the mission capabilities for search and recovery of underwater artefacts near the find-spots of Mado shipwrecks in the west coast of the Korean peninsula from April to May in 2015. The Crabster is equipped with a scanning sonar, an acoustic camera, several optic cameras, LED lights, an ADCP (Acoustic Doppler Current Profiler), an altimeter, a CTD (Conductivity, Temperature, Depth) sensor in default. A magnetic sensor also can be added if necessary. Two manipulators are installed on the front two legs. Maximum operating depth is 200 m. The Crabster can perform forward and backward walking, rotate and side step. Circular acoustic images and high-resolution acoustic images were acquired using the scanning sonar and acoustic camera, respectively. It successfully achieved searching and detecting, approaching and sampling of an imitation ancient bowl. This paper describes the Crabster system and the results of the sea trial experiments.

**Won-sik Kim, Yong-hwa Jung & Hyun-do Kim – Korea Institute of Geoscience and Mineral Resources, Republic of Korea**

The 3D seismic survey of the shipwreck, Mado 4, using EOS3D-A in Republic of Korea

**Key words:** 3D seismic, underwater, shipwreck, archaeological exploration, excavation

**Abstract:** Recently, the team located a shipwreck of historical significance in the Tae-an, Yellow Sea of Republic of Korea. This region has high probability of shipwrecks due to bad weather in the past and a fisher reported to the authority about the remains of ancient ceramics enmeshed in his fishing net. The team conducted underwater excavations and found the wreck, and named it 'Mado 4' after the nearby island. In its early days, the KIGAM (Korea Institute of Geoscience and Mineral Resources) had developed the 3D seismic survey system, EOS3D-A, for the purpose of exploration in shallow-water area by the aid of MSIP (Ministry of Science, ICT and Future Planning) of Republic of Korea. The Institute decided to demonstrate EOS3D-A on Mado 4 to confirm the applicability for underwater artefacts. 3D archaeological exploration is such an advanced technology that only 2–3 cases were reported using SEAMAP-3D equipment in Turkey and Germany. EOS3D-A consists of several frames for mounting the omnidirectional or directional-hydrophone and is designed to facilitate the expansion horizontally. Consequently, it is possible to extend the number of channels randomly in the field. The special material was inserted at the connection joints of each frame in order to reduce the sailing noise or mechanical vibration. In addition to it, we put funnel-shape around each hydrophone for detecting only up-going signals at the most. We succeeded in obtaining a 3D seismic image, which is similar to the expected shape of the shipwreck.

**\*Andrew Hutchison, Ross Anderson, Andrew Woods, Petra Helmholz, Wes Olsen & Joshua Hollick – \* Curtin University, Perth, Australia**

Artefact classification in the debris field of HMAS *Sydney II*

**Key words:** HMAS *Sydney II*, Indian Ocean

**Abstract:** This paper describes the assessment and classification of the numerous small artefacts in the debris field of the WWII wreck of HMAS *Sydney II*, in 2,500 m of water in the eastern Indian Ocean. The wreck was located and surveyed in 2008, and then resurveyed in a dedicated visualisation mission in 2015. The extensive debris field (approximately 500 m by 250 m) is characterised by easily identifiable parts of the ship and its fittings, but also by a large number of much smaller artefacts that seem to have originated from inside the ship. The research described here seeks to analyse both the 2008 and 2015 data sets (still image, video and acoustic data) to identify and classify the type, numbers and physical distribution of these smaller artefacts. The efficiency of using automated/algorithmic process, versus human observation, will be discussed, and a demonstration of the visual interface to the data set will be included.

**Denis Degez & Vincent Creuze – Département des Recherches Archéologiques Subaquatiques et Sous-Marines (Submarine and Undersea Archaeological Research Department), Marseille, France**

The Six Million Dollar Hand'. A robotic hand for remotely-operated deep archaeology

**Key words:** Deep, archaeology, robotic, haptic, method

**Abstract:** By now, underwater robotics has reached a high level of efficiency, allowing access to deep water wreck sites for analysis of, and sometimes for, their exhaustive study. To achieve this, we have to do more than simply operating light touches on the upper archaeological layer, or picking up an isolated artefact as the only evidence of cargo. It is important, in fact, to consider more the exhaustive studies of these wrecks that are so rich in information for archaeologists. However, the issues of remote artefact collection on deep wrecks are far from being solved. During the last five years the French Underwater Archaeology Research Department (DRASSM) had led a substantial experimentation program on deep sites, and performed a large number of tests in order to elaborate robotic devices able to remotely mimic the gesture of an archaeologist and then, give way to the whole study of abyssal shipwrecks. As a result of this experimental basis, in 2015, the ANR SeaHand Project was born, involving DRASSM, the P<sup>3</sup> Institute (CNRS), the Montpellier Laboratory of Informatics, Robotics and Microelectronics (LIRMM, University of Montpellier -CNRS) and industrial partners. The SeaHand project aims at developing a haptically controlled underwater robotic hand specifically designed to perform archaeological works in deep water. Haptically, means that the hand provides the pilot with the sense of touch, allowing the handling of very fragile artefacts. The SeaHand Project – the focus of this paper – is funded by the ANR (French National Research Agency).

**Iván Negueruela Martínez, Rocío Castillo Belinchón, Juan Luis Sierra Méndez, Milagros Buendía Ortuño & Patricia Recio Sánchez. – Museo Nacional de Arqueología Subacuática, Cartagena, Spain**

Prospecting and digging at 1,100 m with an ROV: the campaign to archaeologically investigate the shipwreck *N<sup>a</sup> S<sup>a</sup> de las Mercedes*

**Key words:** Deep-water archaeology, ROV, multi-beam, TOPAS, *Nuestra Señora de las Mercedes*

**Abstract:** The scientific expedition to the wreck *Nuestra Señora de Las Mercedes* (NSM) was organised by the Ministry of Education, Culture and Sport in Spain, in collaboration with the Spanish Institute of Oceanography (SIO) and in the presence of the Spanish Armada. This campaign, carried out in August 2015, was led by National Museum of Underwater Archaeology. This presentation will include the work conducted during the 2015 campaign, including analysis of the preliminary results of this scientific expedition, which was aided by the ship "Ángeles Alvariño", a new oceanographic vessel of the SIO. A geological survey of the area was first conducted (bathymetric map, reflectivity study) using multi-beam, sound velocity profiler and TOPAS (TOpographic PArametric Sonar). Thereafter, an archaeological study was carried out using an ROV, which was able to reach a depth of 2,000 m. Some 200 artefacts were referenced and documented – anchors, cannons, ingots, dishes and silverware. Some were subsequently cleaned and excavated carefully with the ROV. Finally, twelve objects were recovered. This deep archaeological survey was a complete success in terms of locating, recording and digging (at a depth of 1,136–1,138 m), the remains of the NSM. A second season will take place in September 2016. The Spanish frigate NSM was treacherously sunk in 1804 by the English Navy in a fit of illegal piracy, and the shipwreck was exploited in 2007 by Odyssey Marine Exploration. In 2012, the Supreme Court of Washington dictated final judgment in favour of Spain, thereby forcing the company Odyssey to transfer to Spain all objects recovered from the wreck. After the successful legal process, it was necessary to conduct methodical, archaeological work that will be presented here.

**\*Jonathan Adams, Kram Batchvarov, K. Dimitrov, Justin Dix, R. Helen Farr, D. Garbov, Johann Rönnby, D. Sakellariou, Fraser Sturt, & L. Vagalinski – \*University of Southampton, United Kingdom**

Deep water archaeology in the Black Sea

**Key words:** Black Sea; Deep water archaeology; Palaeoenvironment; Sea level change; UNESCO.

**Abstract:** In 2014 the *Black Sea Maritime Archaeology Project* was designed to investigate the submerged palaeolandscapes of the Bulgarian shelf of the Western Black Sea. This was prompted by the richness of the associated archaeological record on land and by starkly divergent views on the nature and chronology of key processes of environmental change and their resulting impacts on adjacent human populations. Low global sea levels during the last glaciation isolated the Black Sea from the world's oceans either side of the Bosphorus sill. Its hydrology meant that as well as becoming a lake, its water level fell considerably. As the ice retreated, sea level rose and there was a reconnection with the Black Sea. Debate centres on how low the Black Sea level fell; when the reconnection occurred and at what rate did the basin refill? The social implications were raised by Ryan and Pitman (1997), who suggested that due to a catastrophic failure of the Bosphorus sill, the Black Sea refilled in a very short time. As well as proposing that this might have been the 'biblical' flood they suggested that subsequent population dispersal accelerated the spread of the Neolithic way of life across Europe. Other opinion favours a 'slow-fill' model in which the socio-cultural effects were concomitantly less. We present geophysical and core sample data collected during 2015/16 and describe the features and sites discovered during the surveys. The authors also point to wider implications of a deep water archaeology that espouses the principles enshrined in UNESCO 2001.

**Afternoon break (3:15 pm – 3:45 pm)**

### **Poster presentations, Part 3 (3:45 pm – 4:45 pm)**

**The geoarchaeology of harbours: current research and future directions:**

**Maria Ktori – University of Cyprus, Cyprus**

The Limassol carnayo: understanding maritime aspects of oral traditional culture and preserving authenticity and integrity

**Key words:** Oral tradition, vernacular shipbuilding, carnayo, Cyprus

**Abstract:** In a pre-industrial society, the craftsmen had the necessary professional ability and experience to handle manual work, by applying acquired knowledge from years of learning and practicing their craft. Because it is ever-evolving, vernacular shipbuilding does not present a uniform development; periods of prosperity interchange with those of decline and affect traditional crafts differently. Cyprus had a long shipbuilding tradition, serving the basic needs of a closed, self-sufficient economy. The Limassol carnayo shipbuilding installations are related to industrial operations spanning over a century. The urban development in the western edge of Limassol, the carnayo relocation and subsequent construction of the new port, gave significant impetus to the city's overall growth. The carnayo location and dimensions have influenced the maritime landscape and the local's contact with the sea. Maintaining the carnayo area is a combined effort to conserve both tangible and intangible cultural heritage. The area, constructions, and oral testimonies blend and become modern ambassadors of a traditional craft, but presents both heritage management difficulties and prospects. The revitalisation of the currently neglected carnayo can be achieved by reusing nearby industrial buildings, emphasising on its historical value. Shipbuilding tools and ship replicas are combined with the shipbuilding techniques, and historical knowledge as described by the craftsmen. Moreover, the vernacular shipbuilding and oral testimonies from the shipbuilders will become accessible to a wide audience, an audience that will embrace, understand and protect them. These issues will be presented and discussed in the broader context of maritime heritage management.

**Patricio López, Isabel Cartajena, Diego Carabias, Renato Simonetti & Carla Morales – ARQMAR – Centre for Maritime Archaeology Research of the Southeastern Pacific, Valparaíso, Chile**

Preserved meat supplies or slaughterhouse waste disposal? Zooarchaeology and the wreck of the *Infatigable*

**Key words:** Zooarchaeology

**Abstract:** The study of food bone assemblages recovered from archaeological deposits from wreck sites represents a new research field for Chilean Maritime archaeology. In harbours, underwater site formation processes might be particularly complex, with palimpsest events often making difficult to separate deposited bone remains resulting from industrial activities taking place near the waterfront - such as butchers' workshops, from domestic refuse or wreck sites. This is the case of the wreck of the *Infatigable* (site S3 PV), a Chilean Navy sailing transport vessel, lost in the harbour of Valparaíso in 1855 as a consequence of an accidental explosion and subsequent fire. Through underwater archaeology excavations, numerous domestic animal bones -including cattle, caprine, pork and poultry- were recovered and taphonomically analysed for butchering patterns and diet information. The results of the analysis were then compared with a bone assemblage from a nearby submerged refuse site associated with the remains of the Customs Wharf of Valparaíso (site S3-4 PV), 1884-1912, also recently archaeologically investigated. The data obtained from the zooarchaeological analyses and historical evidence suggests that the recovered material from the *Infatigable* wreck site represents primarily preserved meat supplies packed for storage and later consumption. By comparing two samples from Valparaíso bay and the related archaeological and environmental evidence, we aim to stimulate further discussion on bone assemblages and contamination processes taking place in harbours while providing new information on victualling activities and food practices within a Chilean Navy vessel during the mid-nineteenth century.

**Cultural landscapes and seascapes:**

**Carmen Obied & Steven Lopez – Centre for Maritime Archaeology, University of Southampton, England**

Sensory navigation in the Roman Mediterranean: the Levantine and Ionian seascapes

**Key words:** Roman, navigation, senses, Seascapes, 3D

**Abstracts:** Sensory navigation is well documented within ancient geographical narratives, but lacks research driven from an archaeological perspective. This research illustrates the ancient mariners' dynamic relationship with the sea in the eastern and central Mediterranean in Roman antiquity. It adopts interdisciplinary data, which draws on ancient textual evidence in conjunction with supporting archaeological, environmental and geospatial data. It applies the theoretical concept of Common Sense Geography (Geus & Thiering, 2014), emphasising the practical experience and mental-mapping of ancient mariners as the primary source for ancient geographers' conceptualisations of maritime travel. This allows the identification of the diverse ways the five senses were used in the Roman period as cognitive navigational tools while sailing and interacting with the Mediterranean Sea. This research is depicted through hypothetical journeys within the case-study regions of the Levant and Ionian Seas. Each journey was devised using the sea-journey descriptions of specific ancient authors applying an archaeological framework. These regions present a high degree of variation, physically and conceptually, while aspects connected to the nature and scale of navigation are examined in relation to regional maritime conditions, harbours, activities and seafaring routes. A geospatial analysis is conducted using ArcGIS/QGIS illustrating a bird's-eye-view of the case-study regions along with three-dimensional maps of each seascape. This emphasises contrasting elevations along the coastlines, thus revealing how the landscape may have been divided into distinguishable navigational markers that likely aided ancient mariners' orientation in antiquity. As a result, this research demonstrates a more intimate insight into 'experiencing' the Roman maritime cultural landscape.

**Augusto Salgado, Jorge Freire, Jorge Russo & Tiago Fraga – Portuguese Navy Research Centre, Portugal**

Maritime conflict: a view of the Great War from a cultural landscape approach

**Key words:** Maritime cultural landscape, Great War, Lisbon

**Abstract:** In the summer 2015, within a multidisciplinary research project, a dive was done on an 'unknown' wreck, at the mouth of the river Tagus. The wreck was later identified by the team's archaeologists, as the only 'known' remains of one of the 72 German and Austro-Hungarian merchant ships seized in Portuguese ports by the Portuguese authorities in February 1916, that led to the official Portuguese entry into the Great War. The ship was the Rescue Ship, *Newa*, later renamed *Patrão Lopes*. But she was not really 'found' in 2015, because it was never really lost. The spot has been part of the maritime culture landscape of the area, and has been widely used by the fishing community, but with its historical importance long forgotten. Ten years earlier, another team found the remains of the famous British clipper *Thermopylae*, which was sunk in 1907, during a military festival. The ship was sunk with the new 'mobile' torpedoes, in a demonstration of power and new war technology, organized by the Portuguese Naval League to the King and to the nation in an attempt to revitalize the Portuguese Navy. Both these ships have been studied in the realm of nautical archaeology. However, they lack a study approach as part of the maritime cultural landscape that led to the Great War. With this aim, a research team, in a joint endeavour by the Cascais Municipality and the Portuguese Navy Research Centre (CINAV), is looking at these vessels as key elements of a maritime conflict landscape.

**Carlos del Cairo Hurtado – University Externado de Colombia–Terra Firme Foundation, Colombia**

Mosquitoes, forts and ships: Maritime landscapes of war in the 18 century, Cartagena de Indias, Colombia

**Key words:** War, shipwrecks, forts, mangroves, mosquitoes

**Abstract:** The French attack of 1697 and the British attack of 1741 to the port of Cartagena de Indias in the Caribbean, turn out to be a case study of interest to the archaeology of maritime cultural landscapes of war. All the components, natural and cultural such as military constructions, the numerous modifications made for tactical purposes in the natural environment of the Bay, an underwater landscape of abandoned shipwrecks and walls, the natural modifications of the coast line, compose a palimpsest of meanings of this maritime and coastal territory. Through the methodology of Actor Network Theory- ANT, this research based on oral historical sources and underwater and coastal archaeological evidences in the bay of Cartagena de Indias is aimed at identifying a hybrid relation between land and sea with a symmetry of humans and non human actors with capacities of agency in the social context of defence, war and maritime activity. The results of the archaeological research held in Bocachica between 2010–2016 permitted to create polisemic cartographies of actors and associations based on three layers of landscapes of war: battlefields, defence and industrial production for military construction. In each layer, the mosquitoes, waves, mangroves, forts, ships, sea, sun, wind, soldiers, trees, maps – among others actors – compose the universe of a cultural maritime landscape in Cartagena de Indias based on a dissolution of the dichotomy nature-culture.

**Early watercraft – a global perspective of invention and development:**

**Katja Kavkler & Miran Erič – Institute for the Protection of Cultural Heritage of Slovenia, Ljubljana, Slovenia**

Large Roman logboat from Liublianica River, Slovenia: a significant challenge in newly established conservation workshop

**Key words:** Roman logboat, waterlogged wood, conservation, melamine resin

**Abstract:** The Institute for the Protection of Cultural Heritage of Slovenia (IPCHS) has a long tradition in conserving works of art. Contrary to other archaeological objects only some waterlogged wooden objects have been conserved at the Institute in the last three decades. Experimental studies in the field of waterlogged wood conservation with the PEG and sucrose methods were started in the 1980s. IPCHS was continuing with the waterlogged wood conservation practice and in 2012 and 2013 established a workshop with continuous practice of conservation of organic materials from archaeological sites. In the last years, new methods e.g. freeze-drying and melamine resin, were tested. A first larger project was given to the group last year. Due to protection issues, one of the largest Roman logboats in Europe was excavated in July 2015 in Ljubljana river at Vrhnika (southwest from Ljubljana). Including 'Lipe' and 'Sinja Gorica' barge, this is one of the five Roman logboats discovered so far at Ljubljana Moors. About 16 m long and 1.30 m wide, the vessel was found in several fragments with the biggest section about 7 m long. The logboat was in use for a long time and many details of repair are still evident like iron clamps holding broken pieces together. In some cases, textile material soaked in resin was used to fill cracks in the wood. For the above mentioned reasons and since at the time of conservation was scarce, we decided to use the melamine resin method, which is being carried out at the moment.

**Miran Erič, Ljuba Jenče, Barbara Sosič & Zala Erič**

**Institute for the Protection of Cultural heritage of Slovenia, Ljubljana, Slovenia**

Does an extended logboat *drevák* from Notranjska region (Slovenia) originate from shipbuilding tradition of Roman times?

**Key words:** Logboat, navigation tradition, construction, Slovenia

**Abstract:** In 2015 the Slovenian Register of the Intangible Cultural Heritage was enriched with a description of making a characteristic extended logboat, called *drevák*. Its presence can be traced back to 17th century, when the first written sources witnessed its use in the Ljubljana River basin – a region of karstic fields 'polje' in Notranjska region. The boat is made from spruce and today it is still used for fishing, rescuing, recreational and heritage promotion purposes. The shape of *drevák* is constructed from C profiled chine-girders and embedded with 1–3 floor planks, which are no more than 60cm wide. The flat central bottom construction rises towards the bow and stern and ends with elliptically shaped overhead. From visual sources and still existing boats we can gather that they have been 5 to 12 m long. In contrast with other similarly constructed boats, *drevák* has no knees or floor timbers. Until recently it has been believed that the origin of this type of logboat is in the basin of the Po River (Italy), but latest researches in construction details of ships from Roman times in the Ljubljana (Slovenia) and Kupa Rivers (Croatia), gave us a reason to reconsider the origin of *drevák*. In Europe, there is rare evidence of similar construction details as *drevák* has; the closest can be found in Krefeld-Gellep II (Germany) logboat from Early Middle Ages. During the research we found a surprising similarity with structure and construction solution in extended logboat on Lake Suwa near Nagano in Japan.

**Bojan Kastelic, Miran Erič, Goran Zlodi & \*Franc Solina – \*University of Ljubljana, Ljubljana, Slovenia**

Global database of early watercraft: the case of Slovenia

**Key words:** Early watercraft, global database, Arches

**Abstract:** Management and presentation of cultural heritage over a given territory requires a dedicated database, which can store all relevant information (text, photography, 3D models, animations, etc.) and an intuitive way of accessing this information (search according to different criteria such as geo-location, time frame, type of find, state of preservation etc.). We decided to put to test a recently available open source platform Arches 3.0 to construct a database of all known log-boats and other early watercraft in the territory of Slovenia—EarlyWatercraft.org. Existing inventories are mostly proprietary, expensive and difficult to interconnect and to upgrade to new requirements. Existing database inventories are therefore difficult to combine and this makes the study of early watercraft finds on a global level, independent of present state boundaries, more difficult. In contrast, information stored in applications developed on the Arches platform can be easily merged. The EarlyWatercraft.org application demonstrates the ability of the Arches platform to be employed in a wide range of uses; it can be applied for small-scale solutions but it can also be extended to accommodate large-scale (global) inventory requirements. The Arches open source heritage inventory and management system is sponsored by the Getty Conservation Institute and the World Monuments Fund. The EarlyWatercraft.org enables the storage and management of all relevant data relating to finds for specialists but, at the same time, also to present early watercraft, which is a less known area of cultural heritage, to the general public.

#### **Fresh waters – effective and sustained monitoring of archaeological localities:**

**\*Massimo Capulli & Arianna Traviglia – \*Università degli Studi di Udine, Udine, Italy**

Anaxum project: a bottom-up approach to riverine archaeology

**Key words:** River, landscape, shipwreck, remote sensing

**Abstract:** The Stella River (Udine, Italy) was in antiquity one of the most important watercourses of the Friuli Venezia Giulia Region, its relevance residing in that it connected the populations living in the foothills of the Carnic Alps to the ones living near the Adriatic Sea coast. This function was facilitated by the fact that the Stella is a resurgence river, characterized by a constant water flow, thus ensuring sufficient flow rate to be sailed along all year round. The Anaxum Project (named after the Roman appellation for the river), a partnership between the Department of Humanities and Cultural Heritage of the University of Udine and the local Archaeological Superintendence, aims to reconstruct the history of the Stella River basin focusing on human-landscape relationships through time. This presentation will expand on the outcomes of the first five years of the project, including a reappraisal of the study of the shipwreck Stella 1 (1st AD) and the ruins of the Roman bridge (along the Via Annia) crossing the river, and some considerations on the Precenicco shipwreck (11th/12th AD). The paper will then illustrate the development of innovative and integrated geophysical techniques and the application of remote sensing methodologies employed in reconstructing the evolution of the area.

#### **Underwater archaeology in the Mediterranean:**

**Katerina Velentza – University of Southampton, Southampton, England**

The transport of sculpture in the eastern and central Mediterranean during the Hellenistic and Roman periods

**Key words:** Sculptures, Mediterranean, Hellenistic—Roman times

**Abstract:** This research examines the transport of sculpture in the Eastern and Central Mediterranean during the Hellenistic and Roman periods. From the early 19th century onwards various marble and bronze statues of Classical Antiquity have been discovered in the waters of the Mediterranean Sea. Some of them come from surveyed shipwrecks such as Antikythera, Mahdia, Megadim and Artemission, while some others have been discovered out of context. Many scholars of Classical Archaeology have analysed several of the finds mainly from an art historical perspective basing the interpretation of their underwater deposition only in possible hypotheses. The present study though examines the sculptural material found in the Eastern and Central Mediterranean Sea from a maritime archaeological perspective to fill a gap in our understanding of the movement of sculptures during the Hellenistic and Roman times. Through the examination of sculptural material discovered in Greece, Italy, Israel, Turkey, Croatia and Tunisia, I attempt to interpret the various statues within their maritime context while taking into account the geographical location of their discovery. Additionally, I assess the scale as well as the nature of the transport of sculpture, which according to the ancient sources, was developed as a trading or/and looting activity towards the end of the Hellenistic period (Plutarch 32.2.4; Pliny NH 22.13- 36.33; Cicero Letters to Atticus 1.8.2). Through this research I aim to prove the archaeological significance of the numerous sculptures discovered in the Mediterranean Sea and show the necessity of the investigation, protection and preservation of their underwater context.

#### **Art and representation:**

**Ramon Orrite & Angel Tobar**

Art and documentation serving the underwater archaeology in the interpretation of history

**Key words:** Wreck, art, portrait, P&O, Bourne

**Abstract:** In the same way that a wreck provides information about the precise moment in which it occurred, from contemporary pictures we obtain data about historical facts as well. Thus, a proper examination of iconographic documents and its interpretations determine the understanding of history. In 1807, the British 12 gun schooner Felix of the Royal Navy was cast away on the coast of Santander, Spain. From the research of this wreck, important documents and two relevant pieces of art – an etching of the schooner and a portrait of the Commander Richard Bourne – came to light to support how this episode should be interpreted in history. Analysing in detail the picture, we identify the type of vessel and rigging as well as the location where the cannon of the fortress was shooting it moments before it sunk in rough seas. Related to the portrait, it reveals the principal actor involved in several historical events linked to the schooner. Bourne led several attacks on ships, privateers and batteries on the shores of northern Spain. In one of these, he was dangerously wounded and his military career came to an end. Once recovered, he was the founder of the successful shipping company P&O whose ships nowadays are crossing the oceans as reflected with the arrival to Sydney of five cruisers from different parts of the world. Past and present come together, with current social events, to define the history that will be investigated by future nautical archaeology studies.

## **Day 4: Maritime Museum NWS Theatre: Thursday 1 December**

### **The social archaeology of ports, harbours and watery places (9:00 am – 10:30 am) – Part 1**

**Aylin Güngör – University of Hamburg, Hamburg, Germany**

Landing site – trading site: ancient 'meshworks' in maritime hotspots of the Mediterranean

**Key words:** Harbours, trade, 'emporion', cross-cultural exchange, maritime hotspots

**Abstract:** When dealing with the ancient Mediterranean and its harbours, 'emporion' emerges as a phenomenon remaining unsolved in the relevant theoretical discourses and lacking a coherent definition. Approaching ports, harbours and maritime cities, it is obvious that many of them had an 'emporion'. A systematic

research of archaeological record not only offers a way out of the scholarly definition-dilemma regarding this type of harbour, but also draws the attention to a further interesting aspect. The hypothesis of this paper assumes that 'emporion' were places that allowed cultural relationships between different ethnic groups: 'Qui dit emporion, dit donc confrontation ethnique et culturelle, réussie socialement dans un but économique' (Gras, 1997: 106). But what exactly was an 'emporion' and how do archaeological remains give evidence of this mingling of cultures? Assuming that 'emporion' were commercial hotspots in the Mediterranean – a conclusion based on historical sources – this paper deals with the architectural, cultural, and institutional aspects and their material culture of trade networks in the ancient Mediterranean. In order to understand the interdependencies of human impact and social networks, archaeological case studies will analyse socio-spatial and socio-economic dimensions of trade networks in the Greek Mainland and its colonies in Asia Minor and Magna Graeca. Therefore, the research focussing on 'emporion' and their social phenomena of cultural exchange sheds a new light on the so-called Greek colonisation. As it has been idealized due to the hellenocentric point of view, it requires a change of perspective offered by the current discourse of postcolonial studies.

#### **Julia Daum & Martina Seifert – University of Hamburg, Hamburg, Germany**

The Adriatic communication area

**Key words:** Ports, harbours, maritime cultural landscapes, 'meshworks'

**Abstract:** In 9 AD, the province of Dalmatia finally became part of the Roman Empire, 150 years after Scipio celebrated his triumph over the Dalmatians. From this point on, Roman traders began to settle along the Adriatic east coast in the main harbours of Narona and Salona. Whence they started to build their meshworks: first along the coast and later in the hinterland of Dalmatia. It seems that some Roman harbours were centres of individual meshworks of families, involved in trade, and that some of these family meshworks were connected by marriage. How were these meshworks organised? Who were these families and were they involved in harbour building? One intention of this project is to prove the possible impact of these families on the development of the harbour facilities and harbour landscapes in the Adriatic area. To establish this, it is necessary to analyse the harbour remains, taking into account their general chronological development. Another prosopographic analysis of the chronological and regional distribution of the known families, which were involved in trade, is necessary. The cultural research in this area has shown already a strong connection between Italy and the coastal landscape of Dalmatia. To analyse the trade and especially the traders helps us to understand the Adriatic Sea as an area of communication. This project is part of the German research program 'SPP 1630 – Harbours from the Roman Period to the Middle Ages' and continues its Tyrrhenian Harbours Project, where important factors in the development of harbours were examined.

#### **Hanna Steyne – University of Manchester, Manchester, England**

Cultural landscapes at the urban waterside

**Key words:** Urban ports, cultural landscape, Victorian London, River Thames, embankment

**Abstract:** Victorian London was the largest city and the largest port in the world at the time. It was home to the wealthiest people, but also people experiencing excruciating poverty. The River Thames shaped the city and the period, seeing the development of enclosed dock systems and industrial and manufacturing advances that in turn provided employment for thousands of people. The Thames was also full of sewage and its pollution caused tens of thousands of deaths from cholera, typhoid fever and dysentery. As the subject of a 'maritime cultural landscape' the city of London provides unique opportunities to test and critique the concept. The Victorian Thames waterfront in London was filled with hundreds of wharves, quays, docks and associated 'maritime infrastructure'. Between 1850 and 1900 nearly 7 km of river frontage on the north bank and 1.6 km on the south bank were demolished and replaced with the engineering 'triumphs' that were the Chelsea, Victoria and Albert Embankments. This paper will explore the relationships between the river and working-class riverside residents, and the social and economic impacts and effects of the Thames Embankment constructions. Using Victorian London as a case study, the paper will discuss the difficulties that the dichotomy between maritime and urban landscapes poses for studies of urban ports and harbours, and whether maritime cultural landscapes, and similar notions, are useful methodologies or terminologies for studying the social archaeology of watery places, urban or otherwise.

#### **Ngo The Bach – Thang Long–Hanoi Heritage Conservation Centre, Hanoi, Vietnam**

Van Don commercial port (Vietnam) – geographical location and its role in the history and archaeological research

**Key words:** Van Don, commercial port, port, trade, archaeology

**Abstracts:** Van Don is an island district in Quang Ninh province. This land located in Vietnam's Northeast region, is the gateway of trade and transportation between Vietnam and other regional countries. With such a favourable location on the routes of maritime trade, it has soon become the most important ancient international trading port of Dai Viet (Vietnam today). From the Ly Dynasty (12th century) to Le Trung Hung Dynasty (17th century), Van Don was always known as the major commercial port, where bustling business activities were taking place. It also had an important role in the economic, military and political areas, and has had continuous and long development in the history of commercial ports in Vietnam. From the late 17th century until the 20th century, due to political changes, policy changes of the feudal state of Vietnam, Van Don had gradually lost its leading role, slowly drifting into oblivion and abandonment. This paper introduces an overview of the geographical location and role of Van Don Port in history, including the achievements of archaeological research undertaken. On that basis, it presents the outstanding scientific issues aimed at contributing to the overall assessment about the history of its establishment, change, and the role of Van Don as a trading port in the history of Vietnam.

**Morning break (10:30 am – 11:00 am)**

### **The social archaeology of ports, harbours and watery places (11:00 am – 12:15 pm) – Part 2**

#### **Giulia Boetto, Irena Radić Rossi, Katarina Batur & Maja Grisonic – University of Zadar, Zadar, Croatia**

Submerged coastal structures of the ancient settlement in the bay of Caska (island of Pag, Croatia)

**Key words:** Caska, Cissa, Pag, submerged structure

**Abstract:** The Croatian island of Pag was part of Liburnia, the most Romanized part of the province of Dalmatia. The most important settlement on the island, Cissa, stated by Pliny the Elder (Nat. His. III, 140), is thought to be located by the largest valley known as Novaljsko polje, which had the unique potential to be surrounded by three natural bays: the bay of Novalja (set on the main Eastern Adriatic seafaring route), Stara Novalja and Caska. Caska is the archaeological site where the curious and impressive archaeological monuments are located. On land the necropolis, part of the Late Roman settlement and the storage part of a productive complex with dolia has been unearthed. The underwater excavations, directed by Irena Radić Rossi (University of Zadar) and Giulia Boetto (Centre Camille Jullian, Université Aix-Marseille-CNRS), discovered port structures and two ships from the 1st c. AD (a sewn and a mortise-tenon built ship), that have been reused in the 2nd c. for the construction of piers and wharfs. We present a partially excavated submerged structure made of five rectangular wooden caissons, constructed with overlapping trunks fitted by the corners following the Block-bau system, with poles in mortises and the filling with stones without any mortar. A thick layer of vegetal residues nearby and a concentration of murex shells are of great interest. The structure, with some analogies in the Southern France and Black Sea region, was probably an operative platform.

#### **Simon Luca Trigona & Frida Occelli – Soprintendenza Archeologia della Liguria, Italy**

Vado Bay (Liguria, Italy): dredging in a long life ancient harbour

**Key words:** Harbour, commercial network, epigraphic evidence

**Abstract:** The occupation of the natural harbour of Vado Ligure since the Republican age was already known during the last century. The reconstruction of the stratigraphic deposit and the recovery of a large volume of materials, possibly a consequence of recent archaeological research (survey, excavations and dredging) connected to the reorganisation of the commercial harbour, allowed the team to reconstruct the historical importance of 'Portus Vadorum' and to frame it in a wide commercial network developed both within the Mediterranean sea and the hinterland. Moreover, the discovery of elements related to sailors' personal equipment allowed to acquisition of new information about the people and the life on board.

#### **Marnix Pieters – Flanders Heritage Agency, Brussels, Belgium**

Living at the coast and working at sea: social archaeology of a 15th century fishing settlement along the coast of Flanders (Ostend, Belgium)

**Key words:** Fishing settlement, social archaeology, egalitarian society

**Abstract:** During the last three decades, intensive archaeological work has been carried out on the site of a deserted late medieval fishing settlement of Walravensijde. This settlement, situated in the central part of the Belgian coast next to Ostend (Belgium), experienced its heyday in the 15th century. The archaeological excavations produced a wealth of material evidence that can be interpreted in terms of social and cultural aspects of life in a medieval fishing settlement in the southern part of the North Sea area. The archaeological analysis of the excavated features and finds proves the existence of a specific material culture related to work at sea and to the location of the settlement at the coast. Both aspects present an important percentage of danger. These fishing communities seem, based on the archaeological data, to be more egalitarian than their rural or urban counterparts. Furthermore, they also seem to be intensively connected to the commercial networks at play in their area of activity. This results in the presence in the settlement of luxury items such as imported ceramics and exotic spices. The word 'fishing' is in this context indeed an oversimplification of their activities that can consist of piracy, piloting, beech combing, trading and warfare to name but a few. This presentation will give an overview of the social aspects of the maritime community of Walravensijde based on the excavation of about 2 hectares of this settlement between 1992 and 2005.

#### **J. Tea Katunarić Kirjakov – Arts Academy, University of Split, Croatia**

Ancient shore and port of Pharos / Pharia, island of Hvar, Croatia

**Key words:** Ancient shore, port, Hellenistic colony, amphora, maritime cultural landscape

**Abstract:** Underwater examination of the bay of the first Hellenistic colony in Croatia named Pharos, later a Roman settlement Pharia, today Stari Grad, on the island Hvar, was carried out for the very first time in 2008 and 2015. In 2008, underwater survey of the bay of Pharos / Pharia revealed shores of the ancient port. In 2015 underwater excavation was held. Clearly visible part of the coast is lined up with amphora fragments that lie calcified on underwater slope of the shore at the outskirts of the town. Stratigraphic units are dating from Greek to Republican time. The finds are mostly wine amphorae from Greek, Hellenistic and Republican period. Some of amphora are local production and some of them are imports from Mediterranean. MSCT technology was used to get better understanding of structure of amphora. In Hellenistic stratum, very fragile wooden construction was found. It could be part of the hull of the ship. Exploration of ancient shore and port of Pharos / Pharia revives paleo landscape as well as maritime cultural landscape of the bay with Hellenistic and Roman town and its large fertile chora. Investigation will give better understanding of life and economy of the town and its chora, maritime trade routes as well as understanding relationship of the inhabitants of the bay with land and sea.

**Lunch (12:15 pm – 1:15 pm)**

### **Cultural landscapes and seascapes (1:15 pm – 3:00 pm)**

#### **Brad Duncan & Martin Gibbs – Heritage Division, Office of Environment & University of New England, New South Wales**

Please God, send me a wreck!/: conflicting perceptions & alternative archaeological interpretation of shipping mishaps in Victoria

**Key words:** Shipping mishaps, maritime cultural landscapes

**Abstract:** Shipwrecks have been conventionally examined archaeologically from various aspects (including ship design, cargoes, and trade route identification) and have traditionally been regarded as tragic catastrophic events. Victorian shipwrecks occurred within a near shore arena, often close to the coasts of small isolated maritime communities. These incidents potentially stimulate a range of reactive behavioural traits and perceptions from nearby residents which have not been extensively explored, and may offer new understandings of the effects of shipping mishaps on frontier societies. A range of altruistic/ opportunistic responses to maritime disasters are examined in a maritime cultural landscapes context, along with new archaeological characterisations and material culture associated with the exploitation of shipping mishaps around Queenscliffe, Victoria. These observations present interesting new insights into understanding and interpreting the maritime cultural landscapes of shipping mishaps / their subsequent archaeological signatures from a social and cultural perspective.

#### **Crystal Safadi – University of Southampton, Southampton, England**

The maritime world of the Early Bronze Age Levant through space and time

**Key words:** Maritime, GIS, space, Levant, Bronze Age

**Abstract:** Maritime spaces are endowed with a set of natural characteristics, which acts above and beneath the water surface. They foster a home for the movement of winds, of water, of ships, and of people. Yet these spaces are not present in isolation. Land and sea seamlessly merge shaping waterfronts that are marked by human activities. The importance of these coastlines and their archaeological record is paramount in maritime cultural landscape studies. Our knowledge of maritime spaces is growing, much of their affordances, however, remain concealed. By reconstructing and analysing spatial and social processes, we can reach a better understanding of lived maritime spaces. The Early Bronze Age (EBA) (c. 3600 to 2000 BC) in the Levant conventionally marks the first urban period. The Levantine littoral played a major role during the mid-third millennium, when maritime connections, particularly with Egypt, became vital. Although archaeological narratives have attempted to explain maritime affairs and social complexity of the EBA Levant, most did not consider the totality of Levantine space, neither appraise the Levantine littoral as a seamless space of sea and land. This paper aims to study and analyse the coastal Levant during the EBA as a space of maritime affordances and accessibility. It builds on a rhythmical and a time-space analysis of the Levantine littoral and of the EBA maritime archaeological record of the area, in order to move beyond notorious social events to everyday social processes, and shift from a representation of space as a container towards social space.

#### **Minna Koivikko – National Board of Antiquities, Helsinki, Finland**

Maritime landscape and recycling ships as a cultural behaviour of UNESCO World Heritage Site Suomenlinna, Sea Fortress

**Key words:** Cultural landscape, recycling, UNESCO

**Abstract:** This paper bases on a forthcoming doctoral dissertation, which handles recycling practices related to ships. The study site is the cultural landscape of the 18th-century fortress islands in front of Helsinki, (Finland). The sea fortress was built during the Swedish reign, used in the defence of St. Petersburg during the Russian rule, and eventually became part of the defence of the capital of the newly independent state of Finland in 1917. The fortress is an important monument of

Finland's past, but it also has a global significance as a UNESCO World Heritage Site. Although, the history of Suomenlinna is well established, the development and monuments in the underwater landscape were unknown before this study. The aim was to develop tools to reconnect unidentified skeleton wrecks to their historical contexts. This was achieved with an analysis of the geographical location. Wrecks of the fortress were divided in three groups: accidental sites, rejected ships and recycled hulls. The main focus lies with recycling practices of different eras. Floating vessels were recycled to serve in different forms and functions as scuttled objects at the underwater cultural landscape. Nevertheless, the vessel easily lost her identity in the dismantling process, which makes the reconstruction of her life cycle a challenging task. Still, this study managed to identify vessels of the original Army Fleet and the fate of the last wooden sailing war ships of the Russian Baltic Fleet from the underwater cultural landscape as basis of a waterbrake and blockships of the Crimean War.

#### **Sam Harper – CRAR+M, University of Western Australia, Perth, Australia**

Engraving the seascape life at Port Hedland, Western Australia

Key words: Engraving, Port Hedland, seascape

Abstract: The engraved art at Port Hedland, Western Australia, includes a distinct maritime component, with a unique way or style of engraving maritime fauna (including whales, sharks, dugongs, stingrays, dolphins, jellyfish, a variety of fish species and turtles). Additionally, with the exception of lizards and birds, no terrestrial fauna has been engraved here. This body of engravings is distinctly different from other rock art repertoires across the Pilbara region of Western Australia where macropods (kangaroo, euro and wallabies) and other land animals are fairly common. In addition to this there is a rich suite of engraved material culture, which can be linked to maritime pursuits. For example particular boomerang engravings were noted by Aboriginal informants to be used for fishing (Tindale 1987), there are probable fishing line motifs engraved in association with marine species suggest hunting scenes and other maritime hunting pursuits. The dominance of marine themes within the Port Hedland rock art suggests this art repertoire is restricted to the mid-to-late Holocene. This art consequently has the potential to show how people have negotiated the change from landscape to seascape. This paper will explore the theme of adaptation and development of a maritime culture as documented within the engravings.

#### **Sven Ouzman – University of Western Australia, Perth, Australia**

Ships in shelters: comparing Indigenous management of colonial contact and invasion through the rock arts of southern Africa and northern Australia

Key words: Africa, Australia, contact, rock-art, ships

Abstract: Southern Africa has a single known Indigenous rock painting of a European ship. Yet the region has had contact with Europeans for over half a millennia. Northern Australia has had barely 200 years of such contact, yet European ship depictions are known in the rock art of the Pilbara and Kimberley and are common in Arnhem Land. This mismatch between event and the recording thereof is not adequately explained by examining historic records and ethnographies, as these tend to be non-Indigenous 'outsider' records in distinction to rock art, which is a primary insider's form of documentation. To complicate matters, the authorship of several ship depictions is contested, with authors neither entirely 'Indigenous' nor 'colonist'. In this study I move away from notions that 'contact' rock art simply records colonial encounters by bounded individuals. I adopt a comparative archaeological and historical approach situated in the 'colonial south' to try to understand what conditions made the depictions of 'contact' imagery likely – and what these images of ships in shelters meant then – and today.

#### **Yftinus van Popta – University of Groningen, The Netherlands**

From fresh to salt: dynamics of the maritime cultural landscape of the Zuiderzee (The Netherlands) between 1100 and 1400 AD

Key words: Maritime cultural landscape, submerged, reconstruction, medieval habitation, the Netherlands

Abstract: The focus of this paper is on the maritime cultural landscape of the former Zuiderzee (Southern Sea): a large inland sea in the north-western part of the Netherlands with a highly dynamic past: from land (pre-Roman period) into lake (Roman period), into sea (Middle Ages) and eventually into polder (1940–1960 AD). The reclaimed part is often referred to as 'the largest ship graveyard on land in the world', as it contains over 430 remains of wrecked ships. This has led to multiple studies that particularly focus on shipwrecks. Changing the focus from object- and shipwreck-orientated maritime archaeological studies to more integrative and spatial studies with the maritime cultural landscape forms the core of this research. One of the research aims is to reconstruct the landscape between 1100 and 1400 AD with special attention for the human element in this changing landscape. I will demonstrate some of the techniques and methods that I have developed and adopted. It has a strong focus on the interrelation between landscape development (geomorphology), occupation (remains of drowned settlements and former islands) and shipping (wrecks) in a GIS: a paleo-geographic bottom layer provides information on the natural landscape. The second layer contains information on high density spots of medieval archaeological remains, pinpointing drowned settlements. The third layer contains shipwreck data that can be used to interpret the presence or absence of water. A density analysis of wrecks has, for example, shown distinct patterns and relations between wreck sites, seaports and submerged settlements.

## **Day 4: Maritime Museum Functions Centre (Level 2): 1 December**

### **Site management (9:00 am – 10:30 am) – Part 1**

#### **Danielle Wilkinson – Cosmos Archaeology, NSW, Australia**

Balancing safety and significance: the SS *Dicky* shipwreck

Key words: Public hazard removal, conservation management

Abstract: What happens when a popular and beloved shipwreck site suffers at the hands of natural processes to become a public danger? This is the case of S.S. *Dicky*, a dilapidated iron shipwreck, which grounded in the intertidal zone of Dicky Beach, Caloundra, over 120 years ago. S.S. *Dicky* is the first intertidal historic shipwreck in Australia where modern health and safety issues as well as strong local significance have been forefront for immediate and ongoing management. Cosmos Archaeology was engaged by Sunshine Coast Council in 2014 to investigate removing the whole wreck as one piece. But how do you move a 30 m-long fragmented iron shipwreck imbedded in clay whilst battling surf and weather? Simply put, you do not, especially if you want to retain its heritage significance. In order to address the concerns for safety as well as loss of significance in the face of continuing collapse, Cosmos Archaeology brought together a specialist team to develop methods for the removal, conservation and interpretation of this shipwreck. This preparation led to a permit followed by the excavation and partial removal of the upper remains. But the story of S.S. *Dicky* does not end there, as the use of 3D imagery, conservation strategies and a park display will all facilitate ongoing interactions between the public with the shipwreck. Buried remains of the vessel will also be managed to ensure S.S. *Dicky* maintains its presence at Dicky Beach into the foreseeable future.

#### **Dave Parham – Bournemouth University, Bournemouth, England**

The challenge of the Swash Channel wreck

Key words: Risk, management, Swash, England, *in situ*

Abstract: The Swash Channel Wreck is the remains of a large early 17th century Dutch vessel located in the approaches to Poole Harbour on the south coast of the

United Kingdom. The site consists of almost the entire portside of the vessel, including the bow and stern castles, ship's armament and rigging with other associated material, all of which was potentially at risk following its discovery in 2004 while work on a large maritime infrastructure development scheme was under way. The discovery prompted a research project between 2006 and 2009 that aimed to understand the character of the site and the risks it faced. The results of this work showed the seabed around the site was actively eroding and the site was subsequently at risk from biological and mechanical degradation. As a result, Historic England funded rescue excavation was undertaken between 2010 and 2013, where those areas of the hull structure that were deemed to be at risk were excavated and raised to be digitally recorded and later conserved for display with the remainder of the structure protected in situ. This paper outlines the problems the site faced in terms of natural marine processes and human impact, details the management structure that surrounded it and the subsequent management decisions and research priorities that drove the work undertaken. It also covers the planned management of the site in the future, which includes interpretation and display of the material recovered and the in situ preservation of the remaining material on the seabed.

#### **Ville Peltokorpi – University of Helsinki, Helsinki, Finland**

Impacts and issues of the commercial exploitation of the Åland champagne schooner

**Key words:** Salvage, champagne, auction, protection, conservation

**Abstract:** In 2010 a group of divers from Sweden were diving at a previously unchecked anomaly in the outer archipelago of Åland Islands. The anomaly turned out to be a shipwreck containing a number of bottles, which looked as if they were made for sparkling wine. Further investigation revealed that the bottles contains was, in fact, champagne. Also, five bottles of beer were found. The local government made a quick decision to salvage and commercialise the champagne and beer findings by arranging a yearly champagne auction and recreate the beer for commercial use. While many experts, including ICUCH, expressed their concerns and were against the auction, the general public was informed by the local politicians that all the actions were taken solely for the benefit of maritime archaeology. In 2014 the actions of the local government were reviewed by the Finnish Deputy Chancellor of Justice, who among others decided that the auction and the actions of the local government were not only against the object and purpose of the local laws protecting UCH, but also against the Valetta Convention on the Protection of the Archaeological Heritage. It was also declared that the local government had not acquired adequate knowledge prior to making decisions regarding the find. After the decision no further auctions have been held. This paper deals with the issues that emerge from the commercial exploitation of UCH, the way commercialising of and selling out UCH affect public awareness, and how we should deal with perishable or consumable cultural heritage.

#### **Joanne Edney – Southern Cross University, NSW, Australia**

The secret life of wreck divers

**Key words:** Diver impacts, behaviour, shipwrecks, management

**Abstract:** Wreck divers are mysterious; little is known about them. There have been few recent studies about their motivations, preferences and attitudes, and while this information is useful, it has some limitations because actual behaviour is known to differ from self-reported behaviour. The aim of this study was to explore the secret life of wreck divers and collect empirical data about their behaviour, which could be used by heritage managers when developing management strategies for sites visited by divers. The study was undertaken in November 2014 at Chuuk Lagoon in the Federated States of Micronesia, a world-renowned wreck diving destination. A group of wreck divers wore head-mounted GoPro cameras while wreck diving, to collect data from the visual perspective of the diver. The researcher also wore a head-mounted GoPro to record diver and dive guide behaviour. This study is the first study of wreck diver behaviour and the first example of using wearable cameras to study divers. The video data of the divers were analysed to determine specific behaviours or activities, their duration and frequency. The data collected by the researcher was also analysed, and the effects of the behaviour of the dive guides, and other divers on participants, were noted in addition to behavioural information. The results from this study demystify wreck divers and can be used by heritage managers to develop more robust management strategies. Management decisions based on actual behaviour of wreck divers can more effectively manage impacts, and over management strategies based on perceived or anecdotal information.

**Morning break (10:30 am – 11:00 am)**

### **Site management (11:00 am – 12:15 pm) – Part 2**

#### **Nia Naelul Hasanah Ridwan, Gunardi Kusumah, Semeidi Husrin, Adli Attamimi, Shinatria Adhityatama & Zainab Tahir – Indonesian Ministry of Marine Affairs and Fisheries, Jakarta, Indonesia & James Cook University, QLD, Australia**

The vulnerability of HMAS *Perth* shipwreck site, Banten Bay, Indonesia

**Key words:** HMAS *Perth*, site vulnerability, multidisciplinary research, site protection and management

**Abstract:** The Research Institute for Coastal Resources and Vulnerability (RICRV), Indonesian Ministry of Marine Affairs and Fisheries, started to conduct research on the WWII shipwreck site of Her Majesty's Australian Ship (HMAS) *Perth* in 2015, which is located in Banten Bay, Banten Province. Considering that the site is a 'war graveyard' for 353 crewmembers that need to be respected, RICRV decided that it was necessary to conduct an integrated and multidisciplinary study to determine the shipwreck's current condition, and identify its vulnerability and any factors of threat – both natural and cultural. The research aim is also to provide a baseline data for the local authorities and relevant institutions in taking a necessary action to protect and manage the site. Research activities included site recording, water quality and side scan sonar measurements, as well as analysis of waste pollution on shipwreck site area through the simulation of hydrodynamics and trajectories of particles of debris, which can describe the ocean dynamics, and movement patterns of the trash. It can also help to find out the waste source location and to address the problem of litter contamination at HMAS *Perth* site. Moreover, the research results show that currently HMAS *Perth* is endangered by the activities of illegal salvagers who loot the ship's iron/metal, sea sand mining operations, waste pollution, and vessel traffic disturbance. In addition, nowadays, HMAS *Perth* site is well known among SCUBA divers therefore, a regulation should indeed be provided to protect and preserve it.

#### **Rocío Castillo Belinchón, David Munuera Navarro, Ángel Tobar Escudero, María Elena Labrandero Pulgar, Rogelio de la Vega Panizo & David Fernández Sánchez [TBC] – Museo Nacional de Arqueología Subacuática, Cartagena, Spain**

Documentation of a submerged hermitage in the reservoir of 'Buendía' (Spain): an example of collaboration between divers and institutions for the protection of UCH

**Key words:** Inland waters archaeology, hermitage, Visigothic, sports divers, UCH protection

**Abstract:** In October 2013 three sport divers reported to the National Museum of Underwater Archaeology of Spain an unexpected find underwater at a reservoir in 'Buendía' (Castilla La Mancha, Spain). This is an artificial area carved in sandstone, with an access door, a window and several engravings, similar to those recorded in some Visigothic hermitages in the area. In June 2015, a campaign was conducted in order to inspect, document and assess the site. Following the initial historical and archaeological investigation, we conducted underwater and land surveys for this site and others nearby hermitages for comparative analysis. The National Museum of Underwater Archaeology of Spain has a great scientific interest in this site for different reasons. It allows us to document the site, a possible hermitage found in inland waters, which is a pioneering underwater research in Castilla La Mancha, and a milestone in the whole Spanish State where there have been very few surveys in reservoirs and none corresponding to this historical period. In addition, it is also an excellent example of collaboration between sports divers and institutions on the protection of UCH.

**Ine Demerre, Sven van Haelst & Marnix Pieters – Flanders Heritage agency, Brussels, Belgium**

Archaeology at the beach of Raversijde (Ostend, Belgium): a case for using different techniques in an intertidal area

Key words: Intertidal archaeology, multi-disciplinary, SeArch project, management, reconstruction

Abstract: Between the end of the 19th century and the 1970s, the intertidal zone in the central part of the Belgian coast was subject to severe erosion. As a result vast amounts of peat and clay beds surfaced, for instance at the beach of Raversijde, revealing extensive Roman and medieval human activities such as peat exploitation and salt making. Many of the findings were then recorded by local amateur archaeologists through photographs, sketches, plans and finds registration. The building of groynes stopped the erosion and as a result of changing sedimentation conditions the formal beach surface became covered by sand, as it still is today. The reconstruction and geo-referencing of the recorded findings in the past, combined with its current buried condition prove the site to be an ideal case for exploring different conventional and non-conventional detecting techniques, and compare them with ground truth. Together with a better knowledge of the site itself as a base for an assessment towards a thoughtful management and its preservation, this research also underpins the development of a reliable research methodology that enables an accurate and cost-effective evaluation of the archaeological potential of all Belgian marine areas under development, one of the main goals of the IWT project 'SeArch: archaeological heritage in the North Sea'.

**Elena Flavia Castagnino Berlinghieri & David Blackman – Soprintendenza Beni Culturali e Ambientali of di Siracusa, Syracuse, Italy**

An underwater archaeology lesson for our time

Key words: Pioneers, Kapitän, Frost, Gargallo, UNESCO

Abstract: Between the end of the 1950s and the beginning of the 1960s Sicily became a veritable 'experimental laboratory' of underwater archaeology, attracting some of the world's most important international institutions. This paper focuses on the work of the pioneering underwater archaeologists, in the belief that their research in Sicily – in particular Syracuse and Marsala – has provided lessons for the entire Mediterranean Sea. The commitment of Gerhard Kapitän and Honor Frost to the very first research investigations and to the field-testing of new techniques and methods of excavation and survey in Sicilian waters translates into a lesson that is still relevant today. Remarkably, objectives of research remain essentially those laid down in 1958 by the Mediterranean Institute of Underwater Archaeology founded by Pier Nicola Gargallo at Syracuse, and by the Experimental Centre of Underwater Archaeology founded at Albenga in the same year under the direction of Nino Lamboglia. Today these very same objectives are echoed in the UNESCO Convention for the Protection of the Underwater Cultural Heritage adopted in Paris on 2nd November 2001 and ratified by the Italian Government with Law n. 157 of 23 October 2009.

**Lunch (12:15 pm – 1:15 pm)**

**French scientific and exploration voyages in the Southern Hemisphere: the making of a shared cultural heritage (1:15 pm – 3:00 pm)**

**Emilie Dotte-Sarout – The Australian National University, Canberra, Australia**

18th–19th century French voyages in the South Seas and their legacy for Oceania archaeology: a shared intangible heritage?

Key words: French 19th century voyages, archaeology, Oceania, intangible heritage

Abstract: A topic of importance for maritime archaeology in the southern hemisphere is the investigation of past encounters between European voyagers and Indigenous populations during the era of European scientific explorations. These encounters typically created two sets of material remains: those left as archaeological traces in the "south seas" and those brought back as museum collections in Europe. France played an active role in these voyages and the creation of such collections. These nowadays represent a tangible cultural heritage that is shared between France and the countries visited by these explorers. As is often the case, the intangible heritage that was also created through these encounters has been more easily overlooked. I argue that the profound intellectual changes provoked in France by the discoveries of unknown landscapes, people and cultures do represent a shared intellectual heritage. Indeed, they are at the roots of the development of new ideas on what it means to be human, and participated in laying the foundations of the science of anthropology. More especially, the impressions and subsequent theories built from these encounters conditioned the representations of the Indigenous people of Oceania in Anthropology, including archaeology. This heritage appears to still be very much present in our modern interpretations of archaeological data in the region. I will consider the history of some of the concepts born out of these encounters, and will try to trace the legacy of some of these ideas in Oceania archaeology today.

**Billie Lythberg – University of Auckland, New Zealand & Cambridge University Museum of Archaeology and Anthropology, England**

The implications of the voyage collections of Bruni d'Entrecasteaux for modern creative artists

Key words: Bruni d'Entrecasteaux, voyage artefacts, reconnections, artistic reappropriation

Abstract: The French naval expedition led by contre-amiral Joseph Antoine Bruni d'Entrecasteaux left Brest in September 1791 in search of the lost vessels of Jean-François de Galaup, comte de La Pérouse, last seen by Europeans at Botany Bay in February 1788. Unbeknownst to Bruni d'Entrecasteaux, *La Pérouse* had been shipwrecked in Vanikoro after visiting Arthur Philip's Fleet at Botany Bay; no artefacts have been recovered from this voyage. Like other 18th century European explorers, who entered the Pacific on august scientific expeditions, with clear designs to describe, collect and categorize all that they saw, Bruni d'Entrecasteaux and his crew 'collected' – in Tasmania, the western Pacific Islands, and Indonesia. However, their voyage ended in political disarray in Java in mid-1794, following the death of Bruni d'Entrecasteaux in its later stages. Voyage personnel, collections, and records were subsequently scattered, and many artefacts lost their connections even to the voyage itself. Recent research has reconnected more than 100 artefacts to this expedition and uncovered a interesting story of multiple 'shared cultural heritage': in the dispersal of the Bruni d'Entrecasteaux collections along colonial and imperial trajectories; their recent unearthing in museums across western Europe; and their modern reappropriation by modern Islanders and artists. These artefacts, only recently resurfacing from a long slumber in relative anonymity, may as well be archaeological findings emerging from deep waters to stimulate creative praxis. This paper will explore the recuperation and reinterpretation of the voyage and its collections by modern artists, both indigenous and non-indigenous.

**Fanny Wonu Veys, Bronwen Douglas and Billie Lythberg – National Museum of World Cultures, Leiden, the Netherlands**

The scattered object collection from the voyage of Bruni d'Entrecasteaux

Key words: Bruni d'Entrecasteaux, Pacific material culture

Abstract: This paper addresses both the history of collecting undertaken during the French voyage led by Joseph Antoine Bruni d'Entrecasteaux in *La Recherche* and *L'Espérance* and the specificities of some of its unique objects. The naval expedition left Brest in September 1791 in search of the lost ships of Jean-François de Galaup, comte de La Pérouse. The voyage of Bruni d'Entrecasteaux knew an unfortunate fate, with its captain dying before the ships stranded in Java in 1794. The ailing sailors and scientists together with their collections and records were dispersed. I will discuss the diverse ways in which some of the voyage's collections ended up in museums in France, Norway, the Netherlands and the United States. Together, the objects present an interesting snapshot of material culture extant in late eighteenth-century New Zealand, Tonga, New Caledonia, Solomon Islands and Admiralty Islands. This collection tells a rich story of contact between Pacific Islanders and encounters with Europeans, of power relations and of the importance of historical items of material culture for today's Pacific Islanders.

**Bronwen Douglas – The Australian National University, Canberra, Australia**

Sailors, savants, naming: France, Britain and the knowing of Oceania, 1750–1850

Key words: Oceania, voyages, cartography, geography, anthropology

Abstract: This paper addresses the tangled interplay of praxis and theory in the classification, mapping, and naming of places and people in what is now called Oceania (the Pacific Islands, Australia, New Guinea, and Aotearoa-New Zealand). Europeans variously knew this vast, mainly maritime zone from the 16th century, most often as the South Sea/Pacific Ocean or Terra Australis/Océanie. Chronologically, I span the classic era of scientific voyaging under sail during the century after 1750, roughly bookended by the towering navigational legacies of Cook and Dumont d'Urville. Conceptually, the term praxis encapsulates British and French maritime experience in the Pacific and its materialisations in the works of cartographers such as Dunn, the Arrowsmiths, Buache, the Robert de Vaugondys, Brué (who voyaged in Oceania with Baudin), Monin, and Dower. The theory considered is hydrographic, geographic, and anthropological/racial. Mainly French, it includes works by Brosset, Fleurieu, Beautemps-Beaupré (who voyaged in Oceania with Bruni d'Entrecasteaux), Malte-Brun, Bory de Saint-Vincent, and Dumont d'Urville, but also those by the Englishmen Dalrymple and Pinkerton. I consider the constitution, mutual appropriation, and cross-fertilization of practical and abstract, British and French knowledge and their varied syntheses in French classificatory and British nominalist approaches. Taking an existential, non-teleological stance, I conclude by sketching the spatial and human contours of still largely Indigenous Oceania as known globally in 1850.

**Emilie Nolet – Université Paris 1, Paris, France**

Tuamotu environments and societies in Early French accounts: from repulsion to ethnography

Key words: Atolls, French Polynesia, historical accounts

Abstract: The Tuamotu Islands (French Polynesia) are a group of 78 atolls lying between the Society and the Marquesas archipelagos, and the largest group of coral atolls in the world. Contacts between Europeans and Tuamotu islanders have been sporadic and fleeting up to the 19th century, in particular in the Eastern and most isolated part of the group. Most early European visitors showed little interest and enthusiasm for Tuamotu's societies and cultures. Contrary to Tahiti, the "New Cythera", the Tuamotu Archipelago has been persistently described as a harsh and hostile environment where Polynesian settlers were caught up in a never-ending struggle for life. Adaptation to environments less rich and diversified than those existing on surrounding high islands would have led among other things to a 'breakdown of social hierarchies' and to a generalized competition for the control of resources, wars in the last pre-European period being a consequence. Early European narratives have thus contributed to shape an enduring negative image of atolls environments and of their influence on Polynesian societies. However, various kinds of sources, including archaeological records, local oral history and even some travellers and missionaries' accounts, reveal a more complex pattern. They show that islanders had in fact developed extensive knowledge of their natural milieu and efficient strategies for coping with changing environments or making the most of local resources. Among these sources, some early French travel and missionary accounts can contribute to a better understanding of Tuamotu islanders' adaptation and resilience capacities and to dismantle persistent stereotypes.

**Myra Stanbury – C/- Western Australian Museum, Fremantle, Australia**

'Vive la France' – Louis de Saint Aloüarn and the French claim to the western part of New Holland

Key words: French voyages, 18th century, shared heritage

Abstract: The Age of Enlightenment marked a new phase in the history of oceanic exploration. The mystery of the uncharted region of the southern hemisphere was still to be solved. French curiosity about *Terra Australis* was upheld by French literary and scholarly writings, including the reports of discoveries by other European navigators rather than the activities of French explorers. In March 1772, Breton mariner Louis de Saint Aloüarn became the first French commander to order one of his officers to take possession of the western part of New Holland for France. The voyage across the southern Indian Ocean in the ship *Gros Ventre* was almost forgotten in historical annals until 1998 when French coins and a bottle confirming the act of possession were discovered on Dirk Hartog Island, in Shark Bay, Western Australia. The discovery opened a new phase of historical investigation on the part of French historians; French descendants of de Saint Aloüarn and other personnel from the *Gros Ventre*; and, further archaeological work by the Western Australian Museum. News spread quickly across the world media, and in Australia a number of authors delayed the imminent publication of their books pending confirmation of the discoveries, wishing to be among the first to share the information in print. This paper will outline the significance of the *Gros Ventre* voyage and the cultural evidence that now links France and Australia with a shared heritage.

## Day 4: Fremantle Port Authority, B-Shed: Thursday 1 December

### The archaeology of submerged palaeolandscapes: a global perspective (9:00 am – 10:30 am) – Part 1

**Fraser Sturt & Nic Flemming – University of Southampton, Southampton, England**

Submerged landscapes: 'Good to think'

Key words: Submerged landscapes, prehistory

Abstract: Over the last decade there has been a global expansion of interest in the archaeology of now submerged continental shelves. This rapid upsurge of attention belies a more complex history of study that has varied in intensity across space and through time. In some regions this has led to the concept of submerged prehistory being discovered, lost and rediscovered on multiple occasions as academic interests fluctuate. While not uncommon in academia this trend poses a challenge for archaeology in terms of how to consolidate the current interest and momentum into a more substantial, steady, and consistent contribution to the scientific community. In this paper we combine a review of past trends and realisations with outcomes from recent and ongoing work on submerged landscapes. We use a selected global range of examples, with the most detail from Europe, to pose a series of questions as to where research into submerged landscapes may be heading, and how emergent technologies and relationships might influence it. Finally, to paraphrase Levi-Strauss (1964: 89), we use these examples to demonstrate that most significantly of all submerged landscapes are good to think with, and as such should be pushed more to the forefront of the wider community's mind.

**Garry Momber – Maritime Archaeology Trust, Southampton, England**

The significance of the drowned landscapes to mobility and the transmission of prehistoric technologies

Key words: Prehistoric, dispersal, palaeolandscapes, maritime, coastal

Abstract: Bouldnor Cliff is a submerged landscape under 11 m of water off the Isle-of-Wight, United Kingdom, that contains important sedimentary sequences, archaeological remains and palaeo-environmental ecofacts. The deposits host an archive of information that is providing data on the environmental conditions and material evidence from the British, Later Mesolithic c. 8,000 BP. The archaeological horizons are covered by protective layers of Holocene estuarine silt. The material has survived because it remained in the base of a 7 m thick palaeo-channel that has subsequently been sectioned by erosion. Evidence of human activity is prolific. It includes flint tools, prepared string, the largest single collection of Mesolithic worked wood in Britain (understood to be the construction site for a log boat), and preserved sedimentary ancient DNA. The DNA evidence is the first of its kind in the world and indicates the presence of canis, auroch, deer, wild fowl,

rodents and wheat (einkorn). Elements of the site suggest the use of technology that is 2,000 years ahead of that found on the British mainland. This includes the discovery of the einkorn, which has proved controversial. This paper presents these new finds as important markers that place the site in context with the growing body of evidence that demonstrates the mobility of prehistoric communities before and during the late Devensian post glacial transgression in northwest Europe. The results highlight the significance of inundated landscapes and coastlines for the understanding of human dispersal. The discoveries emphasise the unseen potential for archaeological material within in-filled palaeo-channels globally.

**\*Hauke Jöns, Moritz Mennenga, Jørgen Dencker & Martin Segschneider – \*Lower Saxony Institute for Historical Coastal Research, Wilhelmshaven, Germany**

The Splashcos-Viewer – first online atlas of submerged paleolandscape archaeological sites in Europe

**Key words:** Viewer, Atlas, Europe, submerged archaeological sites

**Abstract:** During the last six years the EU-financed SPLASHCOS-Network set its focus on the investigation of the prehistoric submerged landscapes in the area of the European shelf sea. The research is based on an interdisciplinary combination of archaeological, geophysical, geological, oceanographical and biological methods. The 25 states, which have joined the program, have screened their databases and publications for archaeological sites. Besides the coordinates, information like type of site, preservation conditions for organic material, dating and depth are registered. The data available in the viewer allows for the first time a Europe-wide comparison, but also better protection and offers a base for investigations, visualizations and discussions of the sites and the connected submerged paleolandscapes. The archaeological data will be available online by a web viewer or via WMS, provided by Marine Information Service (Maris.nl), added up by bathymetrical, chemical geological and other maritime data. Thereby, the Splashcos-viewer is not only a tool to publish the relevant data, but also acts as a basis for further scientific research, fostered by the possibility to add external data via WMS. The Splashcos-viewer could well be extended for global use for enhancement of awareness and accessibility of data.

**Katarina Jerbić & Ida Koncani Uhač – Flinders University, Adelaide, Australia**

Submerged prehistoric landscapes of the Eastern Adriatic: a case study site at Zambratija Bay

**Key words:** Submerged prehistory, Eastern Adriatic, Zambratija

**Abstract:** Sea-level change during the early and middle Holocene period inundated the Adriatic region, impacting hunter gatherer and later, early agricultural societies. This paper will focus on the submerged prehistoric site in the Zambratija Bay in northwest Istria, Croatia. The site was discovered in 2008 and until now only very preliminary investigations have been undertaken. A bathymetric survey of the bay to map the seabed has shown a natural depression in the area of the submerged site. Also, more than 120 vertically placed wooden piles were observed, visibly protruding from the seabed surface, indicating an architecturally complex and well-preserved site. A peat platform some 30 x 60 m in size was discovered in the central part of what appears to be a settlement. The results of the first radiocarbon analysis of a wood sample revealed an age ranging between 4,230 and 3,980 cal BC (2 Sigma) that would correspond with the ceramics present at the site. Further investigations will be performed on the site with the intention to determine if this was a traditional sub-Alpine pile-dwelling site. Other aspects, such as reasons for abandonment and relationship with the marine transgression, will be discussed.

### Morning break (10:30 am – 11:00 am)

## The archaeology of submerged palaeolandscapes: a global perspective (11:00 am – 12:15 pm) – Part 2

**Piers Lacombe, Ingrid Ward & Tom Whitley – RPS MetOcean & UWA, Australia**

Visualising dynamic sedimentary coastlines helps improve understanding of post-glacial occupation patterns, North West Shelf, Australia

**Key words:** Underwater archaeology, sediments, sea-level change, visualisation, Australia

**Abstract:** Work aimed at finding prehistoric submerged archaeological remains almost completely absent in Australia, despite the terrestrial evidence on the North-West Shelf (NWS), is now indicating human occupation back to 50 ky BP. The capacity of computer-based visualisations to illustrate past change is now almost limitless, with computers able to deal with vast and complex datasets. Recent leading-edge models have clearly demonstrated the first-order effects of post-glacial coastal changes on the NWS through overlaying relative post-glacial sea levels on the modern bathymetry. However, the development of coastal resources and their human use are perhaps more likely to be controlled by second and third order effects associated with the movement of sediments and resultant variations in coastal sedimentary environments. This paper notes the complexity and dynamics of the NWS, and the increasing knowledge about the presence and nature of its preserved drowned palaeoshorelines. Palaeotidal and other modelling are also increasing understanding of the potential range of oceanographic and sediment dynamics on the shelf at lower relative sea levels, especially through the transgression. We present modified versions of coastal change on the NWS based on possible past coastal configurations, and note the implications for past human occupation and resource use. Our intention is to promote consideration of physical processes in archaeological thinking and improve targeted prospection of submerged cultural sites. To formally test these ideas requires appropriate research and new ways to include information in conceptual models of human occupation.

**Rachel Bynoe, Fraser Sturt, Justin Dix, Simon Parfitt, Nick Ashton, Simon Lewis, Nigel Larkin, Peter Hoare & Chris Stringer – University of Southampton, Southampton, England**

The cold case of the Eccles Bonebeds: diver ground-truthing in the North Sea

**Key words:** Submerged Palaeolithic, North Sea

**Abstract:** Dramatic sea level fluctuations throughout the Pleistocene caused the intermittent exposure and submergence of continental shelves on a global scale, with implications for hominin dispersals and occupation. For Britain these changes were particularly important as they resulted in either insularity from, or peninsularity of, the continental mainland, with the North Sea basin submerged and exposed respectively. Sitting at the peripheries of the Palaeolithic world, the record from these now submerged landscapes is thus crucial to our interpretation of the changing nature of hominin interaction with these environments and landscapes through time. A series of sites dating to between 0.9Ma and 0.6Ma have provided some of the earliest archaeological traces north of the Alps and have been recovered from the eroding coastlines of the southern North Sea contained within the extensive deposits of the Cromer Forest-bed Formation (CFbF). In addition to these *in situ* sites, a large number of distinctive CFbF faunal remains have been collected on local beaches after eroding out of submerged deposits. Current and ongoing research is using a combination of methods to target and dive on these offshore deposits, aiming to discover the source of the eroding material and link-up the onshore and offshore records. This paper will present discussion on the issues involved with the identification of these submerged Pleistocene deposits, as well as the variety of methods being currently employed in their investigation, potentially providing access to some of the world's oldest submerged archaeology.

**Jørgen Dencker – The Viking Ship Museum, Roskilde, Denmark**

Bromme-, Maglemose-, Kongemose-, Ertebølle Culture. Four submerged sites from 12–1 m water depth in the same confined area

**Key words:** Submerged landscape, sea-level rise, inland/coastal sites, 12–4,000 BC

**Abstract:** Denmark has been dealing with submerged Stone Age sites for more than 40 years and a significant number of well-preserved sites are known today. Many of the sites have been located in connection with construction work. In a rather small area in the belt 'Storstrømmen', in southern Denmark, we now have submerged stone sites from Bromme-, Maglemose-, Kongemose- and Ertebølle Culture at depths ranging from 12.5 to 1 m dated to about 12,000–4,000 BC. A rather unique situation is where the settlements had to be moved due to increasing sea level drowning the landscape.

**Jemma Bezzant, R. Bale & Nigel Nayling – University of Wales Trinity Saint David, Wales**

Drowning landscapes, past submergence and present coastal change at Borth, West Wales, United Kingdom

**Key words:** Intertidal, community, GIS, submerged forest, flood myth

**Abstract:** The iconic submerged treescapes on the western United Kingdom coast at Borth in Wales have provided a connection to the past for communities for generations. Drawing on well-established flood myth tropes, the 12th century Welsh Black Book of Carmarthen recounts the apocalyptic drowning of Maes Gwyddno in this part of Cardigan Bay. Dynamic coastal change impacting on late prehistoric communities is evidenced by human and animal footprints and hearths; all embedded within a complex sequence of intercalated peats and silts. In 2011 a £29m Welsh Government-funded scheme commenced construction of a series of sea defences designed to provide 50 years protection for this award-winning coastal town. Archaeological mitigation for this project was provided in 2014 by a team from UWLAS with expertise in wetlands, dendrochronology, GIS and palaeo-landscapes in order to engage with this uniquely difficult intertidal site. Palaeoenvironmental sampling was managed through a project GIS in order to bridge the dryland/intertidal interface and to provide a live, responsive dataset to drive decision making within the fieldwork phase. Bathymetry, geology, climate, plus oceanographic and submerged archaeological data were also modelled. This paper looks at the GIS methodology and how sample sites were selected and recorded using confidence indicators in 3D geographical space. It also touches on the politics and debates behind UK government policy on managed retreat and how local communities have responded to the immediate threat of shifting coastlines.

**Lunch (12:15 pm – 1:15 pm)**

**Last chance to view posters in B-Shed**

All posters must be removed by 3:00 pm