Book of abstracts

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Changing Waterscapes Around Roman and Medieval Ravenna: New Research from Classe and the Northern Hinterland

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Subsistence strategies and faunal resource exploitation in an Early Bronze Age waterscape: the case of pile-dwelling 4C in Vallese di Oppeano (Verona)

The Early Bronze Age communities of north-eastern Italy inhabited a dynamic landscape, where subsistence strategies were deeply connected with waterscape resources and ecosystems.
The pile-dwelling settlement of Vallese di Oppeano 4C, located in the Valli Grandi Veronesi near Verona, represents one of the few Early Bronze Age settlements know in the region Veneto. Dated to the transition between EBA1 (2,300-1,900 BCE) and EBA2 (1,900-1,650 BCE) and strategically located near a watercourse, this site provides a unique opportunity to investigate human environment interactions within a waterscape context.
Zooarchaeological analysis has revealed a rich and diverse faunal assemblage, comprising domestic species - predominantly sheep-goats and pigs- alongside wild animals, including large and small ungulates, carnivores, birds, fish and pond tortoises. The presence of worked antlers and long bones further suggests that the site functioned as a craft production centre.
Breeding practices seems to be focused on small domestic ruminants, mainly for good quality meat, reproduction and secondary products, while hunting activities for booth food and animal materials (bones, antlers and fur recovery).
This research offers valuable insights into early subsistence strategies, resource exploitation and craftmanship, examining how communities managed, exploited, and adapted to their waterscape during the Early Bronze Age in north-eastern Italy, where husbandry and breeding coexisted with persistent hunting practices reflecting the biodiversity of wetland environments.

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The Unseen Waterscape: *Portus Murgitanus* – Modeling and Analysis of a Relict Coastal Landscape Using Non-Invasive Techniques

This paper aims to rethink the relationship between the urban space of the Roman city of Murgi (El Ejido-Almería, SE of the Iberian Peninsula) and its waterscape. The presented research focuses on characterising this area using non-invasive methods, opening the discussion on models of port areas dislocated from the urban centre, as appears to be the case in this study. The framework seeks to merge conventional divisions into historical-archaeological research, such as urban/rural and land/maritime studies, aiming for a more holistic understanding of waterscapes. Regarding the archaeological background of the study area, since the 1980s, based on the surface of the survey in the area of Guardias Viejas (El Ejido, Almería), part of coastal architecture has been documented in the immediate surroundings of the site, about 250 meters from the coast. This area includes partially destroyed fish-salting basins. Alongside these basins, which measure approximately 12 x 5.5 meters and have attached several walls on the surface, fragments of Murex and shells, closely related to purpura dye production, are evident in significant accumulations in the surroundings. The dispersion of surface material, including ceramics and amphorae, is abundant, particularly in the SW sector, indicating intense maritime economic activity in this enclave. This context, combined with nearby potential saltpans, enhances the functionality of the waterscape that defines the so-called *Portus Murgitanus*. The recent intervention has applied GPR, LiDAR, and tomography to characterise not only possible complementary buildings that do not have visible surface manifestations but also the landscape transformation undergone by the area for a better understanding of the study space. The GPR results show an accumulation of substantial buildings that form the urban layout of what could be identified as Murgi's port area. Meanwhile, tomography provides insights into modifications of the coastal landscape, revealing significant transformations of wetland spaces that could have facilitated the establishment of this port area. Ultimately, this paper not only presents unpublished results but also aims to examine and interpret the relationship between cities and port areas more nuancedly, exploring how this can influence our understanding of urban needs concerning their waterscape.

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From Ficocle through Cervia Vecchia to Cervia Nuova: Human-Environment Interactions in a Medieval Productive Waterscape.

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I. Baldini (University of Bologna), C. Lamanna (University of Bologna), G. Marsili (University of Bologna)

Shaping waterscapes of Crete: integrated data for the reconstruction of Lebena, ancient harbour of Gortyn (Crete)

The contribution reviews the transformation of the coastal settlement of Lebena (Crete) between the Classical and Late Antique periods, with particular attention to the evolution of its sacred and harbour landscapes. In antiquity, Lebena served as one of the two main harbours of Gortyn, the inland capital of Roman and Early Byzantine Crete. Its role and configuration in later centuries, however, remain only partially understood. Past research has focused on the conversion of the Asklepieion sanctuary, where a Christian Basilica was built on one of its terraces. Architectural elements from earlier structures appear to have been reused within the new religious complex, suggesting a process of adaptation and reinterpretation of pre-existing spaces. The study also considers the changing nature of Lebena's harbour in the Late Antique and Byzantine periods, not only in terms of maritime infrastructure and functionality, but also in its relationship with the surrounding landscape and settlement and coastline changes. Through the integration of archaeological, architectural, and topographical data, this research seeks to contribute to a more nuanced understanding of the transformation of coastal and sacred spaces in the context of Late Antique Crete.

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C. Beltrame (Cà Foscari University of Venice), A. Bertini (University of Florence), E. Costa (Cà Foscari University of Venice), P. Mozzi (University of Padua), G. Niccolini (University of Florence)

Roman Waterscapes of the Venice Lagoon: Insights from the Submerged Site of Lio Piccolo (Cavallino-Treporti).

The paper will present the preliminary results of the PRIN 2022 project coordinated by Carlo Beltrame "The lagoon of Venice in Antiquity. Settlement dynamics, adaptive behaviors, paleoenvironmental reconstructions". The excavation of the submerged Roman site of Lio Piccolo has permitted geological and palynological studies to reconstruct the environment of the lagoon of Venice in the Imperial period. The site is composed of the foundations in piles of an important building, perhaps a villa as documented by thousands of fragments of fresco, tesserae of mosaic and pottery, and a *vivarium* to maintain alive the oysters. The *ostrearium* was built in bricks and wood in the half of the 1° c. AD and then abandoned after the end of the 2nd c.
The site is located on a major tidal inlet of the northern lagoon of Venice in Roman times, on the inner side of a barrier island that corresponded to the Roman coastline. This location was strategic as it

allowed direct access to/from the Adriatic Sea as well as connection with the network of tidal channels that extended through the lagoon.
The archaeological structures were built on soft lagoonal muds. The elevation of the *ostrearium* is consistent with its functional interpretation, as it was below the Roman relative mean sea level reconstructed in the area. Consistently, the top of the foundation piles indicate that the building was well above the relative sea level of the time.
Following its abandonment, the *ostrearium* was filled with fine clay silt, creating a sedimentary basin that preserved key paleoenvironmental proxies, including seeds, wood fragments, pollen, and non-pollen palynomorphs (NPPs). Palynological analyses reveal rich pollen assemblages dominated by arboreal taxa, while non-arboreal plants are generally subordinate, except for sporadic increases in cereals and halophytic vegetation. The presence, albeit sporadic, of dinocysts and other NPPs provides insights into past marine connections, contributing to the reconstruction of sea-level variations.

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N. Bizziocchi (University of Cambridge)

Building on the shores of the Thames: considerations on domestic architecture, urbanism and the riverscape of Roman London

The river Thames has long been recognised as essential to the foundation and development of the Roman city of London. It was a vital part of the Roman network that connected the city, and the province, to Gaul and, from there, to the rest of the Roman empire. This allowed the movement of goods and people, as evidenced by its harbour facilities and by the volume of imported goods found within the city (e.g., Perring 2021). At the same time, the cultural and ritual significance of this waterscape has also been recently highlighted (Hingley 2018). Thus, traditional discussions have mostly focused on the commercial or public aspects of this area within the ancient city, in particular relating to the harbour (Milne 1985), shipwrecks (Marsden 1994) and the monumental complexes constructed along the Thames (e.g., Perring 1991). A review of the sites excavated along the river shores, however, allowed appreciation of the appearance of other buildings that can be characterised as high-status residences. Their rich furnishing and appearance, much different to the majority of the domestic buildings in the city, fosters a question as to the relationship between the riverside location and the development of these buildings. This paper then will explore how this landscape changed over time, and will argue for the key-role of the river, and the riverside location more specifically, for the characterisation of this specific urban landscape and of some of its domestic buildings.

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G. Bucci (University of Ferrara)

Shaping ancient settlements from the Roman Age to the Late Antique. Riverine and coastal waterscapes between *Padus* and *Vatrenus*: underwater and land evidence.

The study to be presented is dedicated to a geoarchaeological examination of sites located along the paleo-channels of two significant waterways, the *Padus* and the *Vatrenus*, both flowing into the Adriatic Sea. Today, these areas are characterized by reclaimed wetlands and natural oases with inland waters. Developing and structuring water-based investigations using hydrographic drones equipped with sub-bottom profilers, side-scan sonar, and multibeam have enabled detailed surveys of currently submerged structures. These structures were once positioned at Roman and Late Roman anthropogenic layers including hydraulic management interventions, the arrangement of small basins for fish and aquatic plant farming, and the construction of docks used for mooring and fishing with small boats. Evidence of reinforced and actively used riverbanks during the Roman and Late Antique periods has been documented through direct and indirect investigations, including underwater surveys. Systems of wooden pilings with plank floors and artificially excavated areas featuring vertical walls in compact clay indicate an environment adapted to human needs for habitation, subsistence, and commercial purposes. This presentation provides an overview of the most recent discoveries within the present-day municipalities of Portomaggiore and Comacchio in the province of Ferrara. It describes the structures concerning the aquatic environment, tracing a path from the paleo channels to transitional waters, coastal salt marshes, and former intertidal areas. The environmental context will be correlated with material culture data, with particular attention to the findings of boat remains.

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M. S. Busana (University of Padua), A. Vacilotto (Universität Regensburg), V. Gobbo (University of Padua)

Metamorphosis of a waterscape: the coastal region between Bibione and Caorle between the Roman and Medieval-Modern ages

Eastern Veneto, and in particular the low plain shaped by the course of the Tagliamento River, represents an ideal context for tracing the transformations of a landscape that has been dominated by water for centuries. Modern urban developments and, to an even greater extent, the hydraulic and agricultural reclamation works carried out in this area have profoundly altered the morphology, perception, mobility, and ways of inhabiting what were originally amphibious landscapes. The ancient surfaces once characterized by waterways and navigable canals, marshy areas, and coastal lagoons connected to the sea through port inlets are now preserved in the form of stratified traces visible in aerial or satellite imagery—often difficult to date with precision—and in a substantial number of archival cartographic documents, which offer representations dating back at least to the medieval period.

Alongside this valuable documentation and the descriptions provided by classical and late antique sources, geomorphological, geophysical, and archaeological data—collected during past investigations and, more significantly, within the framework of the ongoing research project conducted by the Universities of Regensburg and Padua—are playing a crucial role in defining the forms of the landscape, settlement patterns, and human-environment interactions from a diachronic perspective. Drawing on the wealth of documentary and empirical data available for the area encompassing the lower course and ancient mouths of the Tagliamento River, this contribution aims to present a sequence of images that evoke the memory and vitality of the landscape's amphibious nature, with a particular focus on the earliest phases of the Roman and medieval periods. At the same time, it seeks to introduce and discuss certain methodological issues related to the complexities faced by non-invasive or semi-invasive archaeological research, especially regarding the analysis and interpretation of data derived from these ancient water-bound landscapes, which have been deeply transformed over time.

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P. Callieri (University of Bologna), D. M. Mezzapelle (University of Bologna), L. Gasperini (CNR ISMAR)

From the Armenian Plateau to the South China Sea via the Persian Gulf: different responses of coastal communities to climate and environmental change

With a view to enhancing the testimonies that underwater archaeology can provide also for the great Iranian empires, the chair of Archaeology of pre-Islamic Iran of the department of cultural heritage (DBC) has committed itself to reopening a research and teaching sector that was active with the faculty of conservation of cultural heritage from 2003 to 2012 in the Trapani campus, where underwater archaeology was taught by the late Sebastiano Tusa, founder of the first maritime superintendence in Italy, at the Sicilian regional authority

The presentation will focus on the Persian Gulf, a location identified for the PRIN 2022 project dedicated to the adaptation of settlements born in the Achaemenid era to difficult environmental conditions, based on the communication needs of a vast and globalized empire, and then grown over time in relation to long-distance trade. The political situation prevented Italian-Iranian surveys along the Iranian coast of the Persian Gulf, leaving this activity to the Iranian team.

In search of another country in which to carry out research in underwater archaeology, land-locked Armenia has shown interest in opening a new page in archaeological research on the Lake Sevan basin, focusing on the relationship between ancient settlements and variations in the lake level, which could have submerged areas once above water. The Institute of Archaeology of the Armenian Academy of Sciences has approved a collaborative project planned for August 2025, that introduces for the first time an underwater investigation supported by a valuable geomorphological study, entrusted to ISMAR-CNR (National Research Council) that will allow the identification of possible anthropic evidence on the bottom of the lake, paving the way for the intervention of underwater archaeologists.

Finally, the main field of an academic collaboration between the University of Bologna and Shandong University (China), where an important underwater archaeology study group is active, should lead the DBC to collaborate on the theme of the maritime Silk Road.

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E. Cirelli (University of Bologna), M. Costa (Regione Emilia-Romagna), G. Isabella (University of Bologna), C. Mezzetti (University of Ferrara), Chiara Stedile (University of Bologna)

Monastic Landscapes. Changing and remodelling northern Adriatic waterscapes in the *Insula Pomposiana* and the Po Valley Delta between antiquity and modern age.

During the last ten centuries, the Po Delta area has undergone very complex landscape changes. In the Antiquity its appearance was completely different from what became the medieval *Insula Pomposiana* and from today scenery. Several factors have transformed its morphology, first the historical land reclamation carried out by the monks, who made habitable and cultivatable vast areas of land that were previously marshland. Before the drainage and water regulation work, the landscape near Pomposa probably looked like an expanse of low, swampy and uncultivated lands, interspersed with thick woods and inadequate lake basins. Also, natural changes moved the original form of the waterscapes toward a vast Mediterranean deltas' region, unique in its fragile balance. One of the most important impact factors was the monastic settlement whose origin is still under discussion. Over the years, various hypotheses have been formulated to explain the flourishing of the extraordinary monastic complex, but the elements are still not very convincing. In this contribution, we will try to characterize the territorial context in which the settlement and the weaving of rural properties developed in which it was already established in antiquity and then grew and became the powerful religious complex, located at the intersection of a dense river road network and land which connected the territories controlled by the Archbishop of Ravenna with the properties of the nascent Lombard and Venetian elites. We will try to demonstrate the overlap of the monastery with a vast rural property of ancient tradition and the weight of the cultural influence of Ravenna in the aesthetic choices of the construction of the monastery. We will also underline the human/monastic role in the transformation of this natural deltas landscape over the year in a wider northern Adriatic context, and how it could be possible preserve this delicate territory from a disastrous new-human role.

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F. Fasson (Università degli Studi di Bari Aldo Moro), A. Paolini (Mic Soprintendenza Speciale per il PNNR)

Shaping the Waterscape at the edge of Rome: The Case of the *Suburbium* South-East

Within the boundaries of the Regional Park of the Appia Antica, a significant portion of the Campagna Romana is preserved, representing a remarkable example of a rural landscape today. This contribution focuses on the Almone River basin, located in the southern suburban area of Rome, analyzing the historical landscape through the complex and varied diachronic relationship between hydrography, natural environment, and human settlement patterns, with particular attention to human interventions related to water management and utilization. Following the methodological guidelines of Landscape Archaeology, the study was conducted through a multidisciplinary and multiscalar approach, aimed at achieving a holistic understanding of the landscape and an integrated interpretation of it. The research objectives were achieved through the analysis of historical-cartographic archival documents aimed at the historical reconstruction of the territory, the selection of specific representative areas for detailed examination, and the execution of surveys using precision technologies such as DGPS, photogrammetry, and LIDAR. These technologies enabled the creation of high-resolution mapping of the landscape, both in its natural components, through the generation of digital terrain models, and in its anthropogenic modifications, through the detailed mapping and surveying of various types of structures.

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P. Forlin (University of Bologna)

Lost landscapes, recovered memories. Permanent floods and the making of waterscapes in medieval Holland

Catastrophes such as floods or sea surges have the potential to turn human landscapes into waterscapes in a matter of minutes, hours or days. This is the case with the St Elisabeth flood that, in 1421, caused the collapse of the dikes which protected a profitable agricultural land near the city of Dordrecht in Holland. The Groote Ward, a polder containing tens of settlements, was inundated, and the region remained submerged for centuries, until reclaiming projects activated a postdisaster reclamation of the land. Nevertheless, an area at the very centre of the polder -the Biesbosch- remains underwater still today. This poster focuses on the impact of the catastrophe and explores the memory of the disaster and the post-disaster shaping of the area by local communities and powers. In detail, the archaeology of disappeared settlements, relocated communities, and recovered boundaries is presented.

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A. Gaucci (University of Bologna), C. Corni (University of Bologna), J. Juncker (University of Strasbourg), S. Ladouce-Godier (University of Strasbourg), F. Salomon (University of Southampton), Enrico Zampieri (University of Bologna)

Waterscape and Settlement Infrastructure in the Etruscan Port of Spina (FE)

The research of the Universities of Bologna, Strasbourg and the CNRS at the Etruscan port of Spina aims to collect data to contribute to the reconstruction of the geomorphological and environmental framework of the area during the 1st millennium BCE, as well as to enhance our understanding of the settlement's structure and its transformation over time. Drillings in a wide area (30 km2) and an excavation started in 2022 are providing new data on the wet environment and infrastructure that bordered the settlement to the west.

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E. Gallocchio (Parco archeologico dei Campi Flegrei), E. Gasparini (Istituto Centrale per il Restauro)

Waterscapes in the Phlaegraean Fields (Naples): continuity or transformations?

The coastline of the Phlaegraean Fields, between Pozzuoli and Miseno, is literally in constant motion. The bradyseism has raised it by about 20 cm in the last 12 months and by about 140 cm since 2005. However, the history is much longer, and the remains from the Roman period are now submerged at depths between 2 and 10 m.
Despite such natural difficulties, between the 2nd century BC and the 2nd century AD, this area had been chosen for the creation of one of the largest ports in the Mediterranean, with warehouses and industrial spaces. Today, with extraordinary continuity, modern industrial establishments can be found with long piers for the loading of their products. Therefore, this space, known from historical sources as *ripa*, seems predisposed for this specific type of exploitation.
However, recent underwater investigation has shown that this is not the case. Other interests and forms of exploitation have modified these shores many times. The sources confirm economic use, initially for oyster farming, for which Sergius Orata became famous, but also for the natural thermal resources, with the renowned Villa of Cicero overlooking the sea, followed by a brief military phase with Augustus, and finally the late antique period with the development of the imperial *palatium*.
A sequence of intense transformations over the course of four/five centuries demonstrates the imposition of élite interests on the coastal landscape. Such interests were capable of significantly altering the natural environment also thanks to the technological innovations that found particular acceleration in those periods.
The intensification of bradyseism, coinciding with late antiquity, and the intensification of other volcanic phenomena, culminating in the eruption of Monte Nuovo in 1538, will create a pause in these human-induced transformations. Only temporary, as we have seen, and awaiting new, unpredictable (?!) developments.

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S. G. Gillet (Tel Aviv University), V. Iacomi (independent researcher)

From Pirates to Potters? A Case of Resilience and Opportunistic Adaptability of Coastal Communities' Economic Relationship with Mediterranean Waterscapes.

It seems to be a recurring pattern that throughout Antiquity some groups living by the shores of the Mediterranean utilized piracy as their particular path to economic development. From the Minoan thalassocracy to the "Sea Peoples," from the Illyrians to the Cilicians, many different peoples exploited both the seclusion favored by rugged landscapes and the familiarity with the water intrinsic to coastlands. The perceived evil character of said pirates earned certain populations (namely the Cretans, Cilicians, and Carians or Cappadocians, depending on the sources) the proverbial label of "tria kakista kappa." What happened in these regions after pirates were "defeated" or "settled" as the Romans boasted to have done? In our recent research conducted on the origin and evolution of Late Roman 1 amphora (LRA1) trade networks, we noticed that manufacturing centers of this form were concentrated in precisely the same regions that, centuries before, were allegedly such hotbeds for piracy. Pottery production, unsurprisingly, is a complex industry with a chaîne opératoire that has tight connections to riverine and maritime waterscapes, especially when it is meant for large-scale export. In Cilicia, this industry started blossoming after Vespasian's full annexation in the late 1 c. CE. Crete and Caria (and the whole Aegean region) were also major ceramic exporters in the Mediterranean world from the Hellenistic Period to Late Antiquity. So, is it possible to identify a pattern in the resilient integration of economic activities with the regional waterscapes in this sector of the Mediterranean? In this paper, without indulging into simplistic or deterministic analyses, we will incorporate a longue durée perspective to study the strategies of opportunistic adaptation employed by the inhabitants of these regions as they responded to the shifting socio-political conditions.

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E. Giorgi (University of Bologna), S. Medas (University of Bologna), G. Sigismondo (University of Bologna-University of Salento), F. Carbotti (University of Bologna-University of Salento), Veronica Castignani (University of Catania)

It's not water under the bridge. Archaeology, environment and waterscapes at Butrint, southern Albania

The area centered on the ancient settlement of Butrint (present-day southern Albania) represents a quintessential example of waterscape. Over the centuries, the human presence had to deal with a highly dynamic environment, dominated by water: the marine inlet of the Bronze Age gradually turned into a coastal lagoon in Greek and Roman times, while in the late antique and Medieval period it became a thriving marshland, exploited until the 18th century; then it was subjected to land reclamation functional to contemporary agricultural activities. These shifts, highlighted by recent paleo-

environmental studies, deeply influenced the settlement patterns and even the shape of the ancient city, where subsidence phenomena and rising water still represent a challenge for the conservation of its remains. The latest research carried out by the Butrint Project (University of Bologna and Archaeological Institute of Tirana) has investigated transformation processes in a diachronic perspective and through a multidisciplinary approach. Thanks to the insight offered by underwater surveys and topographic studies, new considerations on the location of the ancient port and on the Roman bridge of the city became possible.

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I. Guarneri (CNR ISMAR), C. Beltrame (Cà Foscari University of Venice)

Oysters from the *vivarium* of Roman period in the Lagoon of Venice

During underwater excavations carried out at the archaeological site of Lio Piccolo (Cavallino/Treporti) in the northern lagoon of Venice, a deposit of oyster shells was unearthed. The investigation revealed that the site comprises a *vivarium* of the 1st century AD for oysters connected to the remains of an important building, perhaps a rich *villa*. The consumption of oysters by the Romans is well-documented, and examples of oyster culture grounds, or *ostrearia*, are also reported by Günther (1897).
A subset of the shells (N=461) was analysed to collect biometric data and to examine their condition, including potential colonization by epibiotic organisms and the characteristics of the attachment margins related to the establishment phase. Oysters have planktonic larvae that, after a temperature-dependent period, become competent to settle. At this stage, they require a hard substrate for establishment, giving a potential insight in identifying the intended use of the structure.
The shells of *Ostrea edulis* are predominant at the site (86%), with approximately 60% falling within the commercial size range (70–90 mm in height), corresponding to an age of 5 to 7 years (Richardson et al. 1993, web.archive.org; Pogoda et al. 2011; Clarke 2012).
Observations of the attachment margin on the left valves indicate that natural recruitment occurred in ~60% of cases, with oysters settling on substrates such as other mollusc shells, plant material (e.g., branches, reeds, or seagrass leaves). In 7% of the left valves, recruitment took place on anthropogenic surfaces, characterized by flat attachment areas, regular shapes, and even deposits of materials. The data collected thus far suggest that oysters were harvested elsewhere and kept alive in the *vivarium* until consumption, rather than being fully cultivated on-site.

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A. Ginalis (German Archaeological Institute, Department Istanbul)

Thessaly and the impact of waterscapes on human mobility and the shaping of economies in Late Antiquity

Since the very beginning of seafaring, and even more so during the Byzantine era, the various coastlines of Thessaly played a significant role in maritime connectivity. Their diverse coastal landscapes and waterscapes proved to be vital for the importance of the province as a strategic junction of the Aegean and the wider Mediterranean networks.
The gulfs, open coastlines, peninsulas, archipelagos and river deltas encompass a large variety of human space of occupation that reflects not only the full spectrum of maritime-related activities, but also different environments such as open seas, riverine areas or marshlands. As such, the human-environment interaction is not to be seen as static but rather as a constantly changing parameter.
This paper therefore examines the impact of waterscapes on human mobility as well as on the shaping of economies through the transition of urban space and other human coastal occupation in Late Antiquity. The impact of changing waterscapes on spatial developments resulted either in the replanning of urban spaces or the shifting of human occupation. Neither was seen as obstacles, but rather as natural developments that needed to be faced accordingly.

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E. E. Kas Hanna (Pontificia Università Gregoriana, Pontificio Istituto Orientale), A. Arena (Catania University)

Memoirs in the Book of Roger the economy and hydrogeological resources of Sicily between Arabs and Normans (9th-12th century)

The hydrogeological resources of Sicily in the Middle Ages were of fundamental importance to the populations inhabiting the island, not only in terms of survival but also from an economic commercial perspective. The Sicilian geography, characterized by a mountainous landscape alternating with hills and plains, features a water network that, unfortunately, does not always respond optimally to agricultural and settlement needs. Although Sicily is rich in important basins, including the Simeto, Salso, Imera, and Platani rivers, no archaeological study has ever been undertaken to better understand their role in land exploitation and the commercial life of the settlements. In the Middle Ages, the management of water resources focused primarily on the conservation and distribution of water through irrigation systems and the use of natural springs. The Arabs, who dominated Sicily from the 9th to the 11th century, were skilled in creating complex irrigation systems, such as qanats, which used underground water to irrigate agricultural lands, particularly in the interior areas of the island. Additionally, the architecture of cisterns, built to store rainwater, played a crucial role in arid regions, allowing people to cope with water shortages during the summer months. The Normans continued to improve these water management systems, also building aqueducts that connected the main cities of the island. Medieval Sicily, therefore, was marked by a continuous adaptation to the hydrogeological characteristics of the island, characterized by a geographic heterogeneity that deeply influenced the

economy and daily life. This contribution aims to present data related to the island's hydrogeological resources, starting from the Arabic text of the *Book of Roger*, with the ultimate goal of raising awareness about the role of watercourses in the lives of the inhabitants who occupied the fortresses and Mudun of Sicily.

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A. Kovač (University of Zadar)

The Transformation of Issa: Shaping Cultural Identity from the Hellenistic to the Roman Period

This abstract explores the transformation of Issa (the modern-day Vis in Croatia) during the transition from Hellenistic to Roman rule, focusing on the island's role in shaping local identity through dynamic interactions with different cultures. Issa, founded as a Greek colony by Dionysius of Syracuse in the 4th century BC, was an important center in the eastern Adriatic, influencing its neighbouring coast and hinterlands. The island's geomorphology, with its numerous coves, provided a safe harbour for Dionysian fleets, contributing to Issa's prominence. This unique topography and its isolation as an island allowed Issa to develop a distinctive identity, shaped by its geographical position and interactions with other cultures. Following Dionysius's death, Issa established its own colonies along the coast, marking its autonomy. During the Republican period, Issa maintained privileged status under Rome, particularly during the Illyrian Wars, and was granted full autonomy after the fall of Demetrius of Hvar. However, the island's independence ended during Caesar's proconsulship, signaling the shift from a Greek identity to a Roman one. This paper examines the blending of Hellenistic and indigenous elements within the Roman framework, challenging conventional ideas of Romanization. Issa's identity was an amalgamation of local communities, Greek colonists, and their interactions with neighbouring cultures, creating a unique cultural blend distinct from other Greek colonies. While Greek identity manifested through political organization and language, indigenous elements were evident in burial practices. The island's multicultural identity was further shaped by its external trade connections, which brought in material culture from across the Roman Empire. The cultural landscape of Issa is examined through various lenses, such as administration, religion, urban development, and funerary customs, to reveal how local communities integrated Roman elements into their cultural frameworks. Ultimately, the study of Issa illustrates the fluidity of identity in a Roman context, where both indigenous and Roman influences coexisted and evolved in a dynamic, ever-changing process.

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L. G. Lagóstena Barrio (Universidad de Cádiz, Área de Historia Antigua), M. J. López Medina (Universidad de Almería, Área de Historia Antigua)

Research on waterscapes in Roman *Baetica*: the Riparia and Aquivergia projects (2012-2024).

Since 2012, led by researchers from the universities of Cádiz, Almería and Jaén, we have been developing an intense research, based on the historical study of the society-environment interaction in the geographical and cultural framework of the Roman province of *Baetica* and its waterscapes. These works are framed in the development of three consecutive research projects of excellence, funded by the Spanish Ministry of Science and Universities: RIPARIA: historical and cultural conceptualization, territorial function and use of wetlands in Roman *Baetica*; RIPARIA 2. The historical society-environment interaction: wetlands and lake spaces of Roman *Baetica*; and AQVIVERGIA. Society-environment interaction in river basins of southern Hispania: conceptualization and praxis.
This research, focused on the historical study of wetlands and river basins in Antiquity, is inspired by the theoretical postulates developed by Dra. Ella Hermon under the concept of Riparia, which considers waterscapes as ecological spaces particularly sensitive to change, and therefore suitable for studying the impact of the relationship of past societies with these ecosystems. The development of our projects has allowed us to address a large number of case studies, related to a wide variety of perspectives on the consideration, value and function of wetlands and river basins for ancient Baetican societies. In this contribution we present the most outstanding cases among those analyzed in the framework of these projects, and the most relevant results of these investigations.

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A. Lasheras González (École des hautes études hispaniques et ibériques, Casa de Velázquez), M. Lépée (École française de Rome, section Antiquité)

Shaping Waterscapes Economy: A Comparative Study of Economic Buildings of Port Cities in *Gallia* and *Hispania* (1st-5th c. AD)

Waterscapes could both attract and constrain economic activities in Antiquity. While their liminal nature fostered connectivity between regions and societies, being at the interface between land and water often required specific works and conditioning, accordingly reflected in their (economic) development. Our contribution aims thus to explore how waterscapes could have been shaped by the urban and architectural setting of such activities during the Roman Imperial period.
Based on a suited selection of maritime and riverine ports in *Gallia* (*Narbonensis*, *Lugdunensis*, *Cisalpina*) and in *Hispania Tarraconensis*, we will explore the urbanisation of waterscapes by buildings related to trade and other economic activities (warehouses, shops, workshops), as well as the eventual specificities that these buildings have developed in order to adapt to waterfront environments (in terms of construction, architectonic morphology or location, among others). Following a diachronic approach, covering from the 1st to the 5th c. AD, we will focus on their lifespan and tendencies (maintenance, transformation, reuse, etc.), particularly considering patterns of continuity or rupture at different scales, from the building itself to larger zones within portscapes.

Through this comparative analysis we ultimately aim to address broader issues such as defining the economic activities hosted by waterscapes and their long-term evolution; identifying the investment strategies linked to the development of these activities; and characterizing, at last, the anthropization of these interface areas over five centuries of Roman history.

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G. Lepore (University of Bologna)

Archaeology of liminal areas: places of worship and environmental myths in swamps

Lagoons and marshes—indeed, all wetland environments—constitute a privileged setting for important cult sites and the staging of complex myths. The "hybrid" nature of these landscapes, which are neither fully land nor water and are constantly shifting, makes them especially suitable for expressing a distinctive form of religiosity, often oriented toward the underworld and chthonic deities, though not exclusively. Marshes are frequently associated with entrances to Hades—as illustrated by the myth of Persephone's abduction by Hades—and they serve as liminal spaces traversed by gods and heroes of the ancient world, including Dionysus, Artemis, Poseidon, Heracles, and many others.

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M. J. López Medina (Universidad de Almería, Área de Historia Antigua), E. Aragón Núñez (Universidad de Almería, Área de Historia Antigua), I. Rondán-Sevilla (Universidad de Cádiz, Área de Historia Antigua), L. G. Lagóstena Barrios (Universidad de Cádiz, Área de Historia Antigua)

The *officina purpuraria* of Torregarcía (Almería): waterscape and maritime connectivity

Within the AQVIVERGIA project, one of the case studies is the *officina purpuraria* of Torregarcía (Almería) located on the western coast of the Cabo de Gata-Níjar Natural Park. This workshop exploited purple dye during the Roman Imperial period and is a specific example in the south of the Iberian Peninsula.
Non-invasive prospecting work has been carried out at this site, which has allowed us to georeference the structures, make high-resolution models, orthogonal plans, etc. Amongst all these works, those carried out on the large shell pit stand out. From the radargrams and Isabel Rondán's analyses, we know that it is more than two metres high at its highest point and has a volume of some 678 m^3. On the other hand, there is very little molluscs diversity documented, and by far the most dominant species is *Hexaplex trunculus* (which gives the best quality purple).
This production must have had an outlet to the main port of the civitas of Urci, whose urban centre is located in El Chuche (Benahadux, Almería), on which Torregarcía would have depended. This port is known from literary sources as Portus Magnus (in the capital of Almería). For this purpose, the sea

route would have been used, where small port structures or *stationes* would have been particularly important. One of these must have been located in Torregarcía itself. In order to identify the site, several actions were carried out, such as a micro-bathymetry in front of the site and a sediment column in the Amoladeras rambla, which shows the formation of a palaeo-estuary, next to a watering place and one of the archaeological structures. Thus, this case study demonstrates the importance the importance of the mouths of rivers and ramblas in the southeast of the Iberian Peninsula for maritime connectivity.

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J. Martínez Jiménez (University of Granada, Department of Prehistory and Archaeology)

Habitus and expectations late antique place-based identity and urban water culture

For more than four centuries, the cities of the Roman Mediterranean lived immersed in an urban culture that fetishized disposable water, brought in great quantities by aqueducts. The daily life of Roman cities was, therefore, determined by this expectation of easily and readily available water; by this artificial waterscape. From the fourth century onwards, however, the changes and transformations in the municipal model affected the way cities managed water supply systems. As the inflow of constant and abundant water decreased across the empire between the fourth and seventh centuries, urban communities, that had developed and grown accustomed to a certain way of living, were forced to adapt to the new circumstances. This, in turn, had an effect in the way city populations understood themselves in relation to their built environment.
In this paper, I want to present how Place Theory and environmental psychology can give us an inkling on the development of place-defined urban identities in the late antique Mediterranean by focusing on the water culture that emerged in Roman cities between the fourth and sixth centuries and how it adapted to the evolution of artificial waterscapes during this period.

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B. T. McDonald (Tufts University), A. Ginalis (German Archaeological Institute, Department Istanbul), P. Maranzana (Bogazici University)

Küçükçekmece Lagoon in Late Antiquity: A Waterscape of Greater Constantinople

Located around 20 km west of Istanbul lies the Küçükçekmece Lake. Forming a roughly 10 km deep lagoon stretching from the Marmara Sea into the Thracian landmass, this distinctive waterscape between the Black Sea and the Sea of Marmara was likely a key maritime route, with the Sazlıdere river (ancient Bathynias) and the Küçükçekmece inlet connecting these two seas. Due to strong siltation processes the lagoon closed at some point – deducing when exactly is an aim of our project's ongoing

environmental investigations – resulting in the waterscape's present form. Archaeological investigations on the lagoon's western peninsula, Firuzköy, have revealed evidence of largescale construction, industry, and long-distance trade, demonstrating the area's socioeconomic status, especially in Late Antiquity.
The site's proximity and probable connections to Constantinople raise significant questions about its regional importance. Did this Thracian waterscape alleviate Bosphorus maritime traffic? While a wide range of pottery (especially amphorae) suggest far-reaching trade, the full extent of the site's commercial network is yet to be understood. Did the Küçükçekmece inlet serve as a Constantinopolitan satellite harbour of industry from the capital's Thracian hinterland? And finally, are the late antique structures and archaeological material found on the Firuzköy Peninsula, which are suggestive of a hospital or healing centre, demonstrating a quarantine station for maritime commerce? If so, this may provide new evidence and information on the well-attested outbreaks of the Justinianic Plague/First Plague Pandemic (6th-8th centuries AD) in Constantinople.
This paper reviews our project's recent archaeological investigations to explore these questions surrounding an exceptional waterscape of Greater Constantinople. Our findings contribute to the broader understanding of Byzantine maritime networks, urban-rural economic relationships, and potentially, late antique approaches to public health and disease management during largescale epidemics.

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S. Medas (University of Bologna), A. Asta (Soprintendenza Archeologia, Belle Arti e Paesaggio per l'Area Metropolitana di Venezia e le Province di Belluno, Padova e Treviso), S. Cipriano (Museo della Centuriazione Romana, Borgoricco), P. Mozzi (University of Padua,), S. Primon (geologis, indipendent researcher)

Contribution to the study of the ancient Venice lagoon waterscape: **underwater archaeological investigations in the Vignole Vecchie canal**

The underwater archaeological investigations in the Vignole Vecchie canal were preliminary to public works aimed at the conservation of lagoon sandbars and mudflats, which are currently endangered by erosion caused primarily by wave motion. The investigation has made it possible to identify an embankment dating back to Roman times along the current Marani sandbar, located between the Certosa island and the Venice Arsenal. The structure consists of a bank made of wooden piles and a compaction composed mainly of brick fragments (mainly tiles with fins), amphorae and pottery. Excavation tests along the canal bank, corresponding to the edge of the sandbar, allowed the presence of the structure to be recognised over an extension of more than 150 metres. The analysis of the archaeological evidence and the geomorphological context provide new data for the reconstruction of the ancient lagoon landscape. The subject, of course, is directly related to the dynamics of the management of the water and land areas, the last necessarily protected by bank defences, in much the same way as today. At the same time, it relates to the way in which the resources and opportunities

offered by this peculiar, complex and delicate environment were exploited; an environment – that of the Venice lagoon – already well organised in Roman times.

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V. Mirto, G. Lepore (University of Bologna)

From the ancient port to the tourist city transforming the coastal landscape of Saranda (Southern Albania)

The coastal landscape of Saranda, in southern Albania, represents an exemplary case study for understanding the outcomes of complex interactions between historical, environmental, and anthropogenic dynamics within Mediterranean waterscapes. The transformation process of this coastal region—from a pivotal element in ancient trade networks to a contemporary tourism hub— raises critical questions regarding the relationship between economic development, preservation of historical memory, and the construction of a new territorial identity.
This research examines the impact of the tourism boom over recent decades on the archaeological and environmental heritage of Saranda. Urban expansion, at times uncontrolled, has altered the balance between historical pre-existences and new infrastructures, in some cases compromising the conservation of archaeological sites and distorting perceptions of the natural landscape. The port of Onchesmos, a significant maritime hub in ancient Chaonia, exemplifies how water has played a crucial role not only in connectivity and commercial exchange but also in shaping a multilayered cultural identity over the longue durée.
The study focuses on changes in settlement and infrastructure systems along the coastal strip, highlighting profound transformations that have recently affected both urban and rural areas as a direct consequence of building proliferation linked to tourism overexploitation. The integration of archaeological data, historical photography and cartography, and remote sensing data enables an assessment of the loss of historical landscape elements and aids in redefining perceptions and functions associated with coastal spaces.
Therefore, the Saranda case study contributes to the broader debate on waterscape archaeology, emphasizing the importance of coastlines as elements of continuity and transformation between past and present. From this perspective, a multidisciplinary approach provides new insights for reconstructing ancient landscapes, thereby informing reflections on sustainability strategies in Mediterranean coastal regions increasingly subject to intensified anthropogenic pressures.

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S. Morsiani (Soprintendenza Archeologia, Belle Arti e Paesaggio per le province di Ravenna, Forlì-Cesena e Rimini), G. Montevecchi (indipendent researcher)

The waters of Ravenna in the Roman Period

The current town of Ravenna suggests a Forma Urbis that represents the evolution of a place deeply shaped by its role as an imperial capital in the 5th century, enclosed within walls of late antique tradition. But what would the urban environment have looked like in the early centuries of Roman Era? The cognitive support of archaeological investigations, for this period, is still rather limited. However, this contribution aims to offer some reflections on Ravenna and its territory, as a result of the latest detailed excavation pertaining to the first centuries of the roman Imperial Age. Based on the available data, it is possible to hypothesize and highlight some key aspects of a landscape that has profoundly changed over time. The ancient settlement was in fact the result of an anthropic occupation between the hinterland and the ancient coastline, which marked its proximity to the Adriatic marine environments; moreover, Ravenna was crossed by the waterways that characterized the city nucleus, enabling the connection of Ravenna with the area Delta del Po; last but not least, the presence of lagoon internal waters ensured to Ravenna the functionality of the military port structures of Augustan tradition. In the natural landscape of Ravenna. the urban settlement was defined by continuously expanding inhabited areas, alongside adjacent littoral cords suitable for the development of extra-urban necropolis, as well as important hydraulic and road infrastructures that marked an area of great strategic and military importance.

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J. Page (Barcelona Supercomputing Centre)

Not All Canals Lead to Rome: The Creation and Purpose of Inland Canals in the Roman Era

The Roman era saw the construction of a range of navigable canals, modifying and enhancing natural waterscapes. At a time when water transport was a fraction of the cost of overland travel, canals were economically important infrastructure, reducing the price of transportation and fostering development along their paths (Salomon *et al.* 2014). Canals could also supply other benefits, bypassing dangerous hydrological features, or providing a more direct route between two destinations. Most prior research on Roman canals has focused on large, state-financed projects, such as the *Fossa Corbulonis* and the Portus canals. The majority of these ran along the coast or through deltaic areas to connect rivers and harbours (Salomon and Rousse 2022; 2023). However, state-financed coastal canals may represent a fraction of the artificial waterways created during the Roman period. There is increasing evidence for smaller-scale canal construction in inland areas. Built over short distances, these canals often connected cities (such as Avenches, Orange, and Vercelli) to pre-existing natural watercourses. Their full extent across the Roman world and those responsible for their construction remains unknown, but they provided important transport connections to cities not located directly on rivers or lakes. Little attention has also been paid to excavated channels that could doubly function as navigable waterways, such as drainage or irrigation ditches. If a fraction of these supported watercraft (which the evidence suggests was possible in some cases) they would represent a significant expansion of navigable

waterways across the Roman world. Focusing on surviving examples from Italy, France, and Germany, this paper will discuss the socio-economic importance of short-distance canals and dual-purpose channels in the Western Roman Empire. It will analyse the factors behind the creation and the extent of inland canals and their impact on local communities, shedding new light on this little understood part of Roman waterscapes.

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M. Pizzi (Universität Regensburg)

Portus in Late Antiquity: evolution of a "storagescape"

The seaports, quintessential "meeting places" between the natural and the anthropic landscapes, metaphorically represented the "gates" of urban centers for long-range trade. These locations served as initial storage points for goods, prior to their redistribution, which is why this category of buildings embodied, more than others did, the role of ports as promoters of connectivity and mobility of goods. Moreover, their prominent presence and layout contributed, at least in some cases like Portus, to defining a true "storagescape". Portus constituted the final point of supply flows destined for the city of Rome until the Middle Ages, although the nature of its role changed over the centuries, following a downward trajectory after the imperial era, in line with post-classical developments and the needs of the Urbs. Its storage buildings serve as litmus tests to track this trajectory, recording both usage changes consistent with their reduced operational capacity - partly influenced by environmental factors - and new constructions, proof of the site's continued importance. This paper will analyze the warehouses active at Portus during Late Antiquity and their transformations, attempting to assess the evolution of its "storagescape" over time, with a broader view of the changes affecting the "use of space" in the maritime-fluvial system that still supported the city's supply chain.

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L. Radaelli (University of Salerno; Aix-Marseille Université, CNRS, Centre Camille Jullian), V. Amato (University of Molise), D. Musmeci (University of Salerno), P. Munzi (CNRS, Centre Jean Bérard), A. Santoriello (University of Salerno)

A geoarchaeological approach to the identification of water traces in ancient Daunia: the case of Arpi

Since 2014, the Daunian site of Arpi (Foggia) has been the focus of investigations by the Centre Jean Bérard and the University of Salerno. These investigations aim, among other objectives, to increase knowledge about landscape transformations between the Iron Age and the Roman period in relation to human settlement strategies. The archaeological and geoarchaeological investigations (field and

mapping geomorphology and stratigraphy, supported by boreholes and paleoenvironmental analyses), carried out within *Water Traces between Mediterranean and Caspian Seas before 1000 AD: From Resource to Storage* project (2018), have made it possible to identify the main elements of the landscape, with a special focus on water traces. Starting from these results and other ongoing research, the aim of this contribution is to illustrate the role of hydrography in the transformations of the landscape, considering both the main water network, represented by the Celone valley and other minor streams, as well as that related to surface runoff of meteorological waters. Despite the issue of aridity, Arpi and the Tavoliere are marked by a difficult relationship with water, mainly due to the geological nature of the more superficial, clayey, impermeable soils, and the landforms, characterized by minimal slopes. The effects of these two factors and the actions of intensive agriculture have contributed to accelerating erosion and deposition processes, which are responsible respectively for the disappearance of some archaeological traces and the preservation of paleoenvironmental information. This paper also aims to illustrate, within a broader framework of knowledge about the exploitation of river environments, the strategies adopted by local communities to deal with the water resource management problem within the site, through a system of waterways designed for the disposal of surface waters. Moreover, the research considers extra-site aspects, analysing the relationship between hydrography, road networks, and forms of land management.

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F. M. Riso (Universite Catholique de Louvain), A. A. Rucco (Cà Foscari University of Venice)

Il fiume Secchia e l'area di Cittanova di Modena: evoluzione insediativa nel modenese tra età Romana e Medioevo

This contribution explores the history, the topographical and the socio-economic evolution of the Modena area in relation to the Secchia River, the Campi Macri, and the site of Cittanova, a significant meeting area from antiquity to the Middle Ages. The analysis of historical and archaeological data highlights the strategic importance of the Secchia River and the surrounding sites, located along the Via Emilia, in a position favourable for communications between Tyrrhenian Italy and the Po Valley. The excavation campaigns of 2020-21 and 2023 in the locality of Cittanova focused on the Roman period and uncovered a vast multifunctional area consisting of a series of spaces arranged around a large courtyard, including an apsidal and heated room, three wells, and a furnace. Located near the first foothills of the Apennines and waterways such as the Secchia, this area of Modena was characterized by a spatial structure suited to the needs of a large annual market (the Campi Macri), with infrastructure and communal spaces. Just north of the current centre of Cittanova, stratigraphic investigations conducted between 1985 and 1987 identified a settlement complex organized around a motte surrounded by a ditch. The materials found, including fragments of soapstone and ceramics dating to the mid-10th century, indicate stable occupation during the early medieval period. The site's geomorphological characteristics suggest that the settlement was not determined by environmental constraints but rather by geopolitical dynamics. New stratigraphic and geoarchaeological findings allow

for a reconsideration of Cittanova's role within the early medieval settlement structure of the Modena plain, suggesting that its foundation responded to territorial control and resource exploitation needs rather than a necessity for refuge from adverse environmental transformations. The study of the Cittanova site, in light of the excavation campaigns carried out over the years, thus enables the reconstruction of an integrated vision of the territorial, economic, and cultural dynamics that influenced the Roman planning of *Mutina*, from the Roman period to the Middle Ages.

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I. Rondán-Sevilla (Universidad de Cádiz), L. G. Lagóstena Barrios (Universidad de Cádiz), M. J. López Medina (Universidad de Almería), E. Aragón Núñez (Universidad de Almería)

The Ancient Waterscape of *Lacus Ligustinus* revisited: a research-based approach using non-invasive methodologies and coring.

The ancient palaeoestuary of the Baetis River, now the Guadalquivir River, in southwestern *Baetica* consisted of an extensive lagoonal and estuarine area known as *Lacus Ligustinus*. Greco-Latin authors previously mentioned and described this riverine landscape, including Strabo, Pomponius Mela, Pliny, and Avienus. Undoubtedly, the lagoon's formation played a pivotal role in shaping settlement patterns, establishing communication routes and networks, and driving the transformation and adaptation of this environment in Antiquity. Within the framework of the Aqvivergia project, a comprehensive historical study is being conducted in this area, focusing on a range of ongoing issues: the lagoon's siltation and the extent of its flood-prone area, the study of settlements and cities along its banks, approaches to reconstructing the palaeolandscape in question, and the historical causes behind the transformation of this lacustrine environment. To address these challenges, we have developed, and continue to refine, a non-invasive methodological protocol based on aerial remote sensing, with high-resolution LiDAR, complemented by geophysical techniques such as GPR surveys and geo-electrical tomography, as well as micro-stratigraphic coring aimed at characterizing the paleoenvironment. This research focuses on a historical analysis perspective of society–environment interaction and its causes and consequences within a waterscape as ecologically sensitive as *Lacus Ligustinus*.

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E. Rosatti (La Sapienza University of Rome - Ca' Foscari University of Venice), C. Beltrame (Ca' Foscari University of Venice), S. Rampin (University of Padua), P. Mozzi (University of Padua)

Canalizing the past: investigating the inland waterways network of the Roman port system of *Altinum* (Italy)

Altinum is a city of the *X Regio Venetia et Histria*, positioned between several rivers on the inner edge of the Roman-era Venetian lagoon. Beginning probably with Romanization, a network of urban canals was gradually excavated (Rousse 2016), and the settlement ended up surrounded and crossed by water, like other cities in this region (e.g. Aquileia; Iulia Concordia). According to the sources, these water spaces improved wetland health and served to land reclamation and the defence of urban areas. Navigation also seems likely, and it is no coincidence that archaeologists found quays and storage houses along these urban waterways (TIRELLI 2001). The whole city functioned as a port, and the canals, according to the interpretative model of the triptyque portuaire (Mouchard 2020), constituted its navigation and landing space. This contribution presents the ongoing research on the urban canal network through a core drilling campaign as part of a doctoral thesis and a PRIN project at Università Ca' Foscari di Venezia on the *Altinum* port system (Beltrame *et al.* 2023). Several reconstructions of the water network have been proposed, in some areas supported by an effective remote sensing investigation (Ninfo et al. 2009). Still, these are often hypotheses that lack ground truth and in which the canals are not three-dimensional entities (Salomon, Rousse 2023). The core drilling campaign aims to verify these assumptions and estimate the width, depth, and chronology of these canals using cross-sections of the channels, stratigraphic reconstruction of their infills, and radiocarbon dating. This research represents a step forward to better understand the *Altinum*'s paleo-hydrography and its use for navigation over time.

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B. Srivastava (University of Bologna)

Politicising a Religious Waterscape: Spatially Analysing the motivations behind the construction of the Medieval Fort in the city of Prayagraj, India

The Sanskrit word *Sangam* refers to union and is used in Indian subcontinent, for places where two or more rivers meet. These distinct waterscapes hold religious merit and one of the most significant of them lies in the city of Prayagraj, situated in northern India. The city is located at the confluence of the rivers, Ganga, Yamuna and the mythological Saraswati; serving as the highest station for funerary rituals, salvation and pilgrimage, as attested by numerous religious and secular texts, the oldest dating to 1200 BCE. In the 16th century CE, Mughal Emperor Akbar (1556-1605), decided to construct a fort at the banks of the river Yamuna, at a distance very close to the place where the rivers meet. Known as the Fort of Allahabad, Akbar, in his biography, expresses his desire for the establishment of the fort at the location, in reverence to its long held religious affiliation. However, scholars have refuted this claim on various grounds, suggesting a more military and economic purpose behind the establishment. The objective of this poster is to resolve the debate by spatially analysing the fort and its relationship with the landscape, ultimately helping in understanding the motivation behind its construction. The paper does this in three ways, first, by conducting a thorough structural analysis of the fort itself, then by analysing its relationship with the immediate vicinity and finally understanding the spatial positioning of the fort within the larger geographical context of the Mughal Empire in 16th

century. The paper would utilise open-source software like QGIS and various plug-ins to perform these spatial analyses. Through this study, the paper will demonstrate the transforming nature of waterscapes and the information it can provide about the complicated relationship between polity, society and nature in historical contexts.

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M. Stefanile (Scuola Superiore Meridionale), M. Silani (University of Campania 'Luigi Vanvitelli'), M. L. Tardugno (Soprintendenza Archeologia Belle Arti e Paesaggio per l'area metropolitana di Napoli)

Sinus Puteolanus: economic and social structures of a waterscape from the Archaic period to the Late Antiquity.

Since the Archaic Age, the Gulf of Pozzuoli was a natural crossroad for people, goods and knowledge from across the Mediterranean. The topography of the region, characterized by the presence of easily accessible, naturally sheltered landing places, has led to its selection as the site for the socio-economic infrastructures connecting the man and the sea. The area was already selected by the dominant centre of Greek colonization, Cumae, as a site for *epineia*, strategic locations enabling the control of the Tyrrhenian routes. The arrival of Rome and the establishment of the colony of *Puteoli* in the 2nd century BC led to a progressive modification of the coastal landscape through human intervention. The so-called *ripa puteolana*, the stretch of coast between *Puteoli* and *Baiae*, became quickly one of the most important ports in the ancient Mediterranean, a point of contact for goods and people coming from Spain to Arabia, passing through Africa and in particular Egypt. From the Late Republic to the Late Imperial age, *Puteoli* functioned as a pivotal hub for the exchange of goods produced in Campania and other products from the Mediterranean economy. Various communities established their headquarters in the suburban districts of the colony, and the traces of their identity, along with their sense of belonging to their respective homelands, are discernible in the osmotic relationship they cultivated with Rome. A notable illustration of this phenomenon is provided by the Nabataean community, whose most significant contribution to the region was the construction of a sanctuary dedicated to their god *Dusares*. This sanctuary, inscribed on marble dedications, was deliberately interred by the Romans to ensure its preservation as a sacred site. The present article aims to illustrate the recent discoveries that have led to a new definition of the socio-economic topography of the *ripa puteolana*.

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J. Tabolli (University for Foreigners of Siena), E. Mariotti (University for Foreigners of Siena), A. Salvi (Soprintendenza Archeologia Belle Arti e Paesaggio per le province di Siena, Arezzo e Grosseto), E. Vanni (University of Siena), M. Bischeri (University for Foreigners of Siena), M. Pacifici (University

for Foreigners of Siena), C. Fermo (University for Foreigners of Siena), F. Cozza (University for Foreigners of Siena)

Ancient thermo-mineral healingscapes at San Casciano dei Bagni

This paper presents the interdisciplinary methodologies applied in the research at Bagno Grande, an Etruscan and Roman sanctuary (4th cent. BCE - 5th cent. CE) in San Casciano dei Bagni (Tuscany). In light of the most recent discoveries, we will focus on the interaction between the hot spring and the archaeological site throughout 8 centuries. The definition of the thermal waterscape as a healingscape resulted in a continuous dialogue between the architecture of the shrine in its phases, the surrounding landscape and religious practices focused in this area. The paper investigates also the role of collective memory for the understanding of this complex archaeological record and the ongoing anthropological research project.

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U. Thun Hohenstein (University of Ferrara), S. Gazzo (University of Genoa)

New data on the exploitation of aquatic resources during the Bronze Age in Polesine

Studies dedicated to the exploitation of aquatic resources are not very frequent, due to the scarcity of remains, very often linked to excavation methods and/or taphonomic processes. In northern Italy, evidence of Bronze Age fishing activities is attested by the recovery of ichthyofauna at Tabina di Magreta (MO), Pilastri di Bondeno (FE), Lagazzi di Vhò (CR), Canàr and Frattesina (RO). In these sites, fishing was mainly based on common freshwater and euryhaline species such as pike, tench and rudd. In addition, the presence of remains of wild aquatic species such as beaver, otter, anatidae and pond turtles at Pilastri, Canàr, Lagazzi and Frattesina underlines the importance of local riverine habitats as hunting and gathering areas. As for the malacological assemblages, mainly composed of local freshwater species (*Viviparus*, *Pseudunio*, *Unio*), they have been found in inland sites far from the coast, in many pile-dwelling sites or in settlements located on rivers (Ströbel 1877; De Grossi Mazzorin & Frezza 2000), highlighting the role of freshwater resources in the economic and settlement choices of Bronze Age sites throughout northern Italy. The aim of this paper is to present new data obtained from the archaeozoological and taphonomic study of marine and freshwater mollusc and fish remains from the Middle and Early Bronze Age sites of Larda I and Larda II di Gavello (Rovigo, Italy) and of the ichthyofauna from the sites of Campestrin (Rovigo) and Amolara (Adria) (Gazzo et al., 2025; Thun Hohenstein et al., 2018).

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G. Vicenzi (University of Bologna), L. Gournay (Université Paris 1 Panthéon-Sorbonne, University of Bologna), M. L. Carra (University of Bologna), A. Gaucci (University of Bologna)

Archaeobotanical data for the reconstruction of the waterscapes around the Etruscan city of Spina (FE)

The EOS – Etruscans on Sea project, led by the Chair of Etruscology at the University of Bologna, investigates the coastal port sites of Spina and Adria. The study at Spina combines traditional typological methods with modern scientific techniques to better understand the settlement and its broader context. The project began with extensive surface surveys aimed at identifying areas for stratigraphic investigation. Since 2022, the first stratigraphic test excavations have been conducted in the extra-urban area north of the Canale Colletore Mezzano, where previous surveys identified geophysical anomalies. The main objective is to investigate the city's perimeter to better understand interactions between the urban center and its surrounding territory.
Carpological and xylo-dendrochronological sampling was carried out in parallel with the archaeological excavations. The anoxic sediment conditions enabled excellent preservation of plant material. Numerous botanical remains were recovered, revealing a wide variety of species. Preliminary carpological analyses show a balanced distribution between cultivated and wild taxa. Among the cultivated species, grapevine dominates with over 80%, followed by cereals and legumes. The absence of glumes, chaff, and other cereal-processing residues suggests that these activities took place outside the excavation area. Wild taxa indicate a marshy and lagoonal environment around the site, consistent with xylological data showing predominant use of local mixed deciduous forest timber (oak, elm, ash), with a single silver fir element suggesting selective procurement from alpine areas. These findings, currently under study, highlight the significance of viticulture in the Spina area. Collaboration with a doctoral research project on xylological analysis provided further insight into forest resources and wood management strategies, contributing to the reconstruction of the local vegetation and settlement dynamics in the delta region. This integrated evidence offers a complex reading of the interactions between the Etruscan community and the aquatic environment of Spina landscape shaped by water, resource exploitation, and settlement choices.

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Exploring Late Holocene Landscape Changes in the Coastal Plain of the Northern Adriatic (NE Italy)

Long before Venice's rise the swampy lagoons and transitional environments of the northern Adriatic coast were stably occupied and deeply modified by late prehistoric and historical communities. These prolonged occupations created intricate palimpsests, which can now be investigated through multi-

proxy and multi-scalar analyses. While many sites were submerged due to sea-level rise, 20th-century reclamation efforts across 400 km² of former lagoons have led to re-emergence, leaving archaeological traces visible at the surface or accessible at shallow depths. This study integrates remote sensing, particularly LiDAR, with geo-archaeological corings, palynological analyses, and GIS spatial modelling to assess human impact over the past 7,000 years. Recent data from the lowlands of Friuli, including Concordia, Carlino, and Aquileia, highlight major landscape transformations from later prehistory to modern times. At Concordia Sagittaria, the Tagliamento River formed a large incised fluvial valley during the Late Glacial, which became an estuary by 8500 BCE, extending over 15 km inland. This area attracted prehistoric settlements and serves as an important ecological archive with continuous sedimentation until historical times. A similar situation has been recognized near Aquileia, where incised valleys and brackish swamps dating to around 6000 BCE allowed a detailed reconstruction of landscape change in the area at regional level. At Carlino Chiamana, integrated remote sensed data analysis and fieldwork has revealed a Roman clay extraction site with over 300 pits spanning 20 hectares. These pits, 5–15 m long and 1–2 m deep, significantly shaped the landscape and now contain lacustrine sediments, providing valuable paleo-environmental archives for the last 2,000 years. The collected data identify two major cycles of human impact on the environment, characterized by deforestation and agricultural intensification. These transformations occurred during the Bronze Age and Roman periods, aligning with the expansion of widespread settlement systems and marking pivotal moments of human-driven landscape change.

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Waiting for Rain: A Study on the Efficiency of the Rainwater Collection and Storage System of the Great Roman Cistern preserved in Barbariga (Istria, Croatia)

Access to freshwater has always been a fundamental factor in sustaining human settlements, particularly in regions with limited natural water resources. In the Mediterranean, where dry summers and karstic landscapes restrict water availability, ancient societies developed sophisticated rainwater collection and storage systems. Among these, cisterns played a crucial role in securing potable water supplies. However, despite their historical significance, the efficiency of these installations remains understudied compared to monumental aqueducts. This research focuses on the large Roman cistern at Barbariga Stancija, a site in southwestern Istria, Croatia, where rainwater harvesting was essential for sustaining local settlements and largescale agricultural production. By integrating archaeological evidence, modern climatological data, and paleoclimatic reconstructions, we present a quantitative model simulating the cistern's performance under varying precipitation conditions. The model utilizes

high-resolution historical meteorological data and Weibull distribution-based simulations to estimate annual water storage capacity and fluctuations in supply reliability. The study also evaluates the maximum number of individuals the cistern could have supported based on a reconstructed daily per capita water consumption rate. Our findings indicate that, under average precipitation levels, the Barbariga cistern could have reliably sustained a population of approximately 25–28 individuals throughout the year. However, seasonal variability in rainfall led to significant fluctuations in water availability, with potential shortages during dry summer months. Comparative analyses with other Roman-era cisterns in the Adriatic region further contextualize the functionality and limitations of such storage systems in ancient water management strategies. This study not only advances our understanding of local Roman hydraulic infrastructure but also contributes to broader discussions on sustainable water management in arid and semi-arid regions. The research highlights the necessity of further interdisciplinary approaches, combining archaeology, climatology, and hydrological modelling, to comprehensively assess ancient water supply mechanisms and their implications for present-day water conservation strategies.

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L. Zambito (independent researcher)

Something new from Sicily. On Eraclea Minoa's harbour

Eraclea Minoa was a colony of Selinunte, erected on the river Platani. By this river, people exchanged goods, cultures and utilities between other mediterranean cities and the inner sicilian territories. In the IV c. b.C. the city has its floruit. An urban layout of Hippodamian type and, among the best known monuments, also a theater. However, we have very few informations about port infrastructures. Despite the literary sources, from Antiochus of Syracuse onwards, speaking about it. Aim of this study is from a careful reading of the aerial photos, to investigate the peri-urban area between the city and the river. Here, a large round anomaly and two clear lines suggest the presence of the port. It seems that there is a socalled "porto-canale", well known in other Sicilian towns.
Geophysical investigations and a survey of the area will be carried out with a study of the historical cartography in a GIS environment. The primary objective of the work is therefore to give a precise topographical location to the port. From Late Classical Age to Late Antiquity, the long life of this port will be investigated, at least when, in the late antique period, the construction of an early Christian building relaunched the human presence in the area. A particular focus will due to the investigation of any presence of vici and storage structures near the outfall of the Platani river. The close sites of Verdura and Carabollace (but, also, other similar sites on the Cottone and Modione rivers) in fact present very big evidences that they starting from the end of the 4th century AD, perhaps in relation to a change in commercial and transport dynamics when many villages vacated to commercial exchanges arose.