Session 3
INTEGRATED AND INTERDISCIPLINARY APPROACHES

Posters

HOW TO PRODUCE A NATUFIAN MORTAR? AN EXPERIMENTAL ARCHAEOLOGY RESEARCH

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The Natufian culture was a dominant culture at the Levant during the final stages of the Epipalaeolithic Period. The Natufians used new techniques and complex tools as part of the transition from hunter-gatherers to more sedentary societies. Ornaments and pendentive objects are commonly found as well as organic and inorganic findings. Among these finds, many ground stone tools were found. These tools are processing implements for plants and minerals, typically comprise of two stone objects. Stone tools' usage was already analyzed and reconstructed, yet their production technique stays unclear. It was commonly accepted that the production of a massive ground stone tool (mortar) includes drilling and require some 4-6 months of work. In this poster we will show our experimental archaeology research, aimed to reconstruct the production of those ground stone tools with ancient techniques.
Our results indicated that the most efficient technique to produce stone mortar is by pecking and battering, using compact basalt chisels, and that drilling tools are unnecessary. Also, the average production time is between 10-14 hours of working.
These results shade new light not only on the production technique but also on the craft specialization within the Natufian society.

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WEEDING THROUGH JORDAN'S PREHISTORY: WEED ECOLOGY REGIMES AT KHIRBAT AL-MUDAYNA, WADI ATH-THAMAD

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The Iron Age period in the southern Levant saw multiple shifts in political and social dimensions that potentially correlate to changes in the agricultural economies of the region. Under conditions of empire in later phases of the period, intensification of production may result from tributary systems. Archaeobotanical assemblages have the capability of revealing changing management strategies for agricultural landscapes in prehistory. Boserup's (1965) model of intensification vs.

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extensification is a useful tool in framing the agricultural production and its relationship to a developing economy of dependence. Weed ecology is a particularly salient analytic tool based on the macroremains that potentially reveal the intensity of anthropogenic impacts associated with food and fodder production. In this research project, we defined the weed taxa of Khirbat al-Mudayna, an Iron II (800 - 550 BC) settlement with industrial and fortification architecture, by ecological habitat type. We compared our assemblage qualitatively with those of contemporary sites in the broader region, finding our site features an anomalous pattern. Field weeds were dominant at Khirbat al-Mudayna, so we created an index of non-field to field weeds, roughly corresponding to extensive vs. intensive management. Based on the quantitative data, we applied multivariate statistical tests to the samples based on architectural category with context considered for intra-site analysis.

Key-words: Weed Ecology, Paleoethnobotany, Jordan, Iron Age, Statistical Analysis

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THE POTENTIAL OF STARCH GRAIN ANALYSIS IN UNDERSTANDING EARLY FARMING PRACTICES IN WESTERN EUROPE

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Starch grain analysis is a well-established methodology used in archaeology to address issues related to the exploitation of plants and food in the past. Although widely used in certain parts of the world, material from Early Neolithic (around 5200-4700 BC) sites in north-western Europe, and more specifically those located in the Paris Basin, have yet to be systematically studied. This poster presents preliminary data recovered from both grinding stones and ceramics from various sites across this area (e.g., Menneville, Ath, Loison-sous-Lens). This research will thus not only address issues related to food processing and preparation, but also regarding the function of different tools. By considering data obtained from other archaeobotanical remains, and from other disciplines such as use-wear and chemical analyses of residues in ceramic vessels, the data obtained through the study of starch grains could complement or even modify the vision we currently have on the dietary practices of the first agricultural populations in north-western Europe.

Key-words: Early Neolithic, reference collection, north-western Europe, grinding stones, plant use

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ADONIS ANNUA L. IN THE UK: PALAEOETHNOBOTANY, HISTORY AND CONSERVATION

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Arable weeds are the fastest declining group of plants in the UK with almost 60 species under threat and 7 regarded as extinct. These plants are now the subject of increased conservation efforts

including the 'Colour in the Margins' project, which aims to conserve 10 arable weed species as part of preserving arable cultural heritage (https://naturebftb.co.uk/the-projects/colour-in-the-margins/). *Adonis annua* L. (pheasant's eye) is one of the plants included in the project, partly because it is regarded as an Iron Age introduction. Pheasant's eye is currently classed as endangered in the UK and has been listed under section 41 of the Natural Environment and Communities Act 2006.
This poster will explore the history of *Adonis annua* in Britain. There is only a single archaeobotanical record, 2 seeds from an early Iron Age pit fill at Danebury hillfort. There have been no further finds, either from subsequent work in and around Danebury, or from Iron Age, Roman and medieval sites nationally. This would imply that *Adonis annua* was only ever a rare arable weed and that its treatment as archaeophyte needs revisiting. The historical evidence is more compelling, but still suggests that this plant was a relatively late recruit to the British flora. As well as growing as a cereal weed, people planted pheasant's eye in their gardens and it was sold as a cut flower London in the eighteenth century under the name "red Marocco".

Key-words: archaeophyte, weed, Iron Age, conservation

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THE SUCCESSO-TERRA PROJECT: A LESSON OF SUSTAINABILITY FROM THE TERRAMARE CULTURE, MIDDLE BRONZE AGE OF THE PO PLAIN (NORTH ITALY)

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The SUCCESSO-TERRA Project (Human societies, climate-environment changes and resource exploitation/sustainability in the Po Plain in the mid-Holocene: the Terramare culture; PRIN-20158KBLNB) is a research program aiming at reconstructing landscape and land-use transformations that occurred during the Terramare period in the southern-central Po Plain of Northern Italy. The project joints experts on Geoarchaeology, Palynology and Archaeobotany to study high-resolution archaeological sediments with an interdisciplinary ecological perspective.
The Terramare settlements were banked and moated villages of the Middle and Recent Bronze Ages (1550–1170 cal yr BC). According to the plant record (both micro- and macro-remains), agricultural economy was based on cultivation and exploitation of forests. Pollen analysis suggests wood management, including coppicing, and fruit collection on the wild, the existence of crop fields with different types of cereals and the intercropping with legumes. The most of the open landscapes around the villages were used for pastures as suggested by pasture indicators in pollen spectra.
Our interdisciplinary study will disclose the natural (environmental aridification) and anthropic (overexploitation of natural resources) reasons of the collapse of the Terramare culture, by investigating the environmental changes in the region and their relationships with the different land-use adopted by the Terramare people.

Key-words: land-use, climate change, Terramare, mid-Holocene, interdisciplinarity

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"FROM THE EARTH TO THE PLATE": AN ARCHAEOBOTANICAL APPROACH TOWARDS UNDERSTANDING AGRICULTURAL SYSTEMS AND FOODWAYS OF PRE-COLUMBIAN PUERTO RICO.

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There is little archaeobotanical data from tropical locations due to notions of poor preservation. More so, in locations where the past peoples' subsistence consisted on tuber crops which are scarcely identified from the archaeological record. My research project focuses on the identification of botanical culinary practices of the pre-Columbian societies of Puerto Rico to identify subsistence practices, and ethnic identity through the analysis of archaeobotanical assemblages. The questions that guides this project is: *What changes in subsistence practices on tropical archipelagos can be identified on the subsistence-resource archaeobotanical assemblage of macro and micro-remains through the analysis of seeds, fruits, parenchyma tissues, possible charred food fragments, phytoliths and starches through time?* Currently, samples from 6 pre-Columbian archaeological sites of Puerto Rico are being analysed, and the presence of charred seeds, food fragments, and possible tuber fragments has been identified. Assessment of unpublished archaeobotanical reports from Puerto Rico have shown that the notions of poor preservation of archaeobotanical remains is related to inconsistencies in methodology. Now the project is on its earliest stages, and future avenues of research will focus on developing a methodology for sampling in tropical contexts, enhance recovery methodologies, and identify the effects of taphonomical effects on archaeobotanical materials.

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AT THE ORIGINS OF ROME: URBANIZATION, AGRICULTURE AND CLIMATE IN IRON AGE

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The beginning of Iron Age in Central Italy witnessed increasing social complexity, urbanization processes and climatic instability. However, understanding the mutual relations of these events as well as their effects on past agriculture is still a complex matter. This research aims at investigating changes in agricultural systems and environmental variability through the analysis of macrobotanical samples retrieved from multiple archaeological contexts dating between the late 8th and the 6th century BCE. Recent excavations at the site of Gabii, situated at the outskirt of Rome, provided charred carpological material (seeds, fruits and woods) coming from different Iron Age and Archaic levels. As Gabii was an important Latin city which experienced this phase of urbanisation such data are crucial for the understanding of its socio-economic development. Preliminary results show the presence of several cultivated cereals, mainly represented by caryopsis of *Hordeum vulgare* and *Triticum dicoccum* but also by few *T. monococcum*. Pulses include *Vicia faba* and *V. ervilia*. Some weeds are also attested, such as *Lolium*. In addition, the analysis of the stable

isotopes of carbon and nitrogen of both charred fruits and woods will allow the study of the past water availability as well as the crops growing conditions and farming practices, informing us, to a certain extent, about the possible effects of climate fluctuation on the development of these ancient societies and their agriculture.

Key-words: Archaeobotany, Urbanization, Rome, Iron Age, Agriculture

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CARPOLOGY AND XYLOLOGY, ARCHEOBOTANICAL STUDY OF A 4TH CENTURY BC WELL AT TARANTO "TORRE MONTELLO", SALENTO, ITALY

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In 2010 rescue excavations at Taranto "Torre Montello" (Salento, Italy) brought to light a settlement situated in the Chora Tarantina. The excavated area revealed an occupation from the Archaic to Hellenistic periods. The campaign reflects the singularity of the site: several sectors revealed traces possibly belonging to an agricultural holding. A well structure contained a high concentration of plant macro-remains whose important was quickly established. Indeed, it constitutes the only waterlogged context that we have for the Apulia Region and for this particular period.
In my lecture I will present the main results of my study of the macro-remains from strata belonging to the late classical period. These form an important addition to the existing archaeobotanical spectrum for Southern Italy. The main goal is to create a parallel between the corpus, the occupation and use of neighboring areas. Seeds spectrum demonstrate an agricultural area near the well structure. Its span invites to interpret the well as a supply structure.
I will also discuss the difficulties in interpreting this kind of context and at the same time open the dialogue about the potentialities of morphometric observations (wood diameter considerations, cutting marks) as parameters to reconstruct and understand the use of this type of organic material, before its deposition.

Key-words: Salento, Magna Grecia, carpology, xylology, waterlogged

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MORPHO- AND MOLECULAR GENETIC ANALYSIS OF GRAPE SEED REMAINS FROM TOKAJ/HUNGARY

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According to literary sources in Tokaj wine region – its wines especially the noble sweet Tokaji Aszú widely known all over the world – were more than fifty cultivated grape varieties in the Early New Age, however we know little about the diversity of wine-grape. Currently we produce less than 10 varieties of them (70% is Furmint, 20% is Hárslevelű, 5% is Sárga muskotály and the rest 5% is the others). All for this could be interesting the analysis of those half-peated winegrape seed material (approx. 10 thousand), what was found in 2016 of March next to the 'Rakoczi' cellar in

Tokaj. The samples were 5 meters deep in the ground at the bottom of a trash hole. These are the oldest archaebotanical grape seed remains from this area, the age of the seeds is based on radiocarbon dating: cal AD 1654-1808. The morphological measurement of seeds was graduated by Fovea Pro 4.0 software and using all the 33 parameters the cluster analyses represents which seeds could belong to one variety. The molecular genetic part of our research is based on comparing SSR markers from samples to Hungarian Vitis Microsatellite Database. Our aim is with this research is by using morphological and molecular genetic methods we could provide explanation and give reconstruction of the original wine grape diversity at the Early New Ages.

Key-words: Archaeobotany, Grape Seeds, Fovea Pro 4.0, SSR markers

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HUMANS AND THEIR ENVIRONMENT IN EPHESUS AND THE EPHESIA – A COMPARISON OF ON-SITE AND OFF-SITE PALAEOECOLOGICAL DATA

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During the past seven millennia, huge environmental changes have occurred in the environs of the (later) city of Ephesos (W Turkey) due to the delta progradation of the Küçük Menderes and its tributaries within an extended former marine embayment. In addition, an ever increasing human influence on the landscape (settlements, agriculture, herding) has been documented for the area with an emphasis since the beginning of the 1st millennium BCE. For the first time, various environmental signals from the Roman harbour and harbour canal of Ephesus have been compared to synchronous data from the (supposedly unchanged) natural lake of Belevi in the hinterland of Ephesos. The results of palynological, microfaunal, parasitological, geochemical, sedimentological, mineralogical and tephrochronological analyses from both areas were evaluated in order to study the interactions between the antique city and its surroundings.
In contrast to the natural site of Belevi, sources of pollen influx other than pollen rain and surface runoff water have to be considered in addition for the Roman harbour basin and canal of Ephesos. During the period when the harbour was in operation, several pollen types increased significantly, several of them probably related to harbour and naval activities such as the unloading of ships. The clearly changing pollen spectra after the intensive use of the harbour may be due to the damage of parts of Ephesos during an earthquake and declining settlement activities thereafter.

Key-words: paleoecology, human impact, harbour activity, hinterland, Western Turkey

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ESTABLISHING A RAINFALL/TEMPERATURE ISOTOPIC BASELINE FOR NORTH-WEST SOUTH ASIA

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Establishing the monsoon variability during the Holocene is paramount to understand the social dynamics of prehistoric societies in northwest South Asia. In this study we have designed a transect cutting the diverse rainfall zones from the Gulf of Cambay (Gujarat) to the Thar Desert (Rajasthan) and sampled a set of arboreal species at ca. 20 km steps. The isotopic information will be then used to assess the isotopic signal of charred wood recovered from three Holocene hunter-gatherer and agro-pastoral settlements from North Gujarat.

Key-words: Isotopes; Climate, Rainfall; Temperature; South Asia; Holocene

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THE FRIKIEH, ANTHER PRODUCT OF HARD WHEAT IN PALESTINE

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Frikieh is one of the traditional dishes in Palestine; the first mention of it historically was in 13th century AD, in the cookery book (Kitab al-Tabikh) of Al Baghdadi, the processing of wheat, for producing Frikieh is long-hard process, but it is important to document the whole process, for understanding the byproducts presence and the verities of wheat species that could be found in archaeological samples.
As a part of ethnographic work of Ph.D. thesis research, we was documented the frikieh production, in Ajaa village, Jenin governorate in the north of the West Bank/Palestine. This documentation that contains sampling also, gave us a good possibility to compare those samples with archaeobotanical remains of hard wheat whom came from the archaeological sites which concerning to our thesis such as Qasr Hisham in Jericho which is belonging to 8th century AD (Umayyad period).

Key-words: Frikieh, Ajaa, Qasr Hisham, Umayyad period

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PLANTS AND ANIMALS TOGETHER: A DIACHRONIC PERSPECTIVE ON THE SUBSISTENCE ECONOMY OF LATE NEOLITHIC DRENOVAC, SERBIA

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This study investigates subsistence economy of the large Neolithic settlement in Drenovac in central Serbia, located in the Morava river valley that served as a major communication route in Balkan prehistory. The site was occupied during the Early and Late Neolithic (6-5th mill BC); the Late Neolithic settlement lasted 500-700 years and was uninterrupted. The paper focuses on the Late Neolithic occupation and takes advantage of the evidence offering a diachronic perspective on subsistence strategies and food economy on a local, single-settlement scale. The aim is to detect patterns of plant and animal use through time and explore their correlation and interdependence that likely contributed to the duration of the settlement. The faunal and botanical data from Drenovac suggest that, the subsistence of the Late Neolithic community was based primarily on farming (of mainly hulled wheats and lentil) and herding (of cattle, caprines and pigs); hunting and gathering were practiced to a lesser extent. We note minor shifts in animal exploitation and greater diversity of plant species in the later phases of the occupation, but the core strategies, and the close integration of plant and animal husbandry, did not change. The long occupation, the large size of the settlement and its substantial architecture support the impression gained from the archaeobotanical and faunal data about the stable and resilient subsistence economy through the several centuries of the site's history.

Key-words: plant and animal husbandry, subsistence, Late Neolithic, Drenovac, Serbia

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CAN WE RECOGNISE *SITOPHILUS GRANARIUS* INFESTATION IN CHARRED CEREALS? AN EXPERIMENTAL APPROACH

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The granary weevil, *Sitophilus granarius* (L.) is one of the most commonly encountered and numerous granary insect pests in Roman Britain, along with the saw-toothed granary beetle (*Oryzaephilus surinamensis* (L.)) and the rust-red grain beetle (*Laemophloeus ferrugineus* (Steph.). These strongly synanthropic beetle species are not native to the British Isles and there are no archaeological records of them in Britain before the arrival of the Roman army despite being present in Northern Germany from the Early Neolithic. While the absence of grain storage insect pests in the pre-Roman Iron Age is well documented, it is also true that there is a paucity of archaeological insect assemblages from appropriate deposits associated with storage facilities. Grain assemblages from the Iron Age are, however, abundant, including from storage structures (4-post structures, pits) and large scale disposal contexts. The recognition of granary insect pests therefore relies on the archaeobotanists to accurately and systematically record damage to grain caused by the various beetles. This paper presents a first attempt to use charring experiments to determine whether it is possible to characterise the results of the activities of *Sitophilus granarius* in grain as opposed to other effects resulting from the charring process or other types of damage. In particular, it will discuss whether it is possible to develop a set of criteria to reliably identify insect damage in charred grain.

Key-words: Sitophilus granarius, Roman Britain, experimental approach

THE VEGETABLE MACROREMAINS IN THE INTERPRETATION OF FORMATION PROCESSES AND CHRONOLOGY OF ARCHAEOLOGICAL SITES. THE CASE OF EL COLORADO, YOCAVIL VALLEY, NORTHWEST ARGENTINA

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The aim of this paper is to analyse the processes of site formation by integrating into the evaluation the vegetable macroremains recovered in an housing area (E3) from the archaeological locality El Colorado, Yocavil Valley in northwest Argentina (NOA). The locality has an extension of 60 ha., with evidence of occupation since the Formative Period (ca. 2000 BP) to the present. In the excavation of E3 was observed an overlap of four occupation moments, defined from use surfaces and associated features. Space remodeling was recorded, both before and after the construction of the enclosure, from the beginnings of Late Period to the Early Colonial Period. The identified macroremains belong to wild and domesticated native species, and domesticated non-native species such as *Triticum* sp. and *Hordeum* sp., the latter were introduced in the Americas in the colonial era and their finding in this archaeological site is the first reported for an indigenous domestic context in the NOA. This information together with the detailed stratigraphy, the analysis of the ceramic styles with chronological value, radiocarbon dating and the presence of seeds with chronological information (charred wheat and barley grains and dried seeds of *Trichocereus* sp.) in the different occupation deposits and post-abandonment strata allowed us to evaluate the vertical migration of ecofacts, considering the different processes involved in the sedimentation and disturbance of cultural deposits in the site.

Key-words: Argentinian northwest, seeds with chronological information, process site formation

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THE DYNAMICS OF A NON-FORESTED AREA IN THE KRUŠNÉ MTS.: THE EFFECT OF A SHORT-LIVED MEDIEVAL VILLAGE ON THE LOCAL ENVIRONMENT

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Spindelbach was a short-lived medieval village in Krušné Mts., North-west Bohemia, Central Europe. It was located above 800 m a.s.l. and it was founded in 2nd half of the 13th century. Analyses of pollen, macro remains, micro- and macro- charcoals, diatoms and concentrations of microelements was done using a sediment profile originating from the wet-stand located in the centre of the former village to study medieval vegetation-human-climate interactions. One of our aim was

to specify the vegetation background and reconstruct the dynamics of local vegetation cover driven by this village and describe the vegetation succession after its collapse.
Because of the village was founded in time of Medieval Warm Period, it is assumed arable farming (self-sustaining cultivation of winter cereals) was enabled even at such elevations. Collapse of the village in 15th century had several reasons. It could be caused by socioeconomic stagnation in the Czech Lands, by exploitation of the surrounding forest and by weather fluctuation at the onset of the Little Ice Age.
Human and grazing impacts drove *Calthion palustris* montane wet meadows and the dynamics of wet stand vegetation. *Filipendula ulmaria* and *Salix stands* replaced annual and biennial herbaceous species that peaked immediately after abandonment of village. The secondary forest was composed of *Picea* stands and later was developed mesic montane meadows of medium tall grasses combined with *Meum athamanticum* and mountain dry pastures.

Key-words: deserted medieval village, environmental reconstruction, peripheral mountain area, Central Europe, succession

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FROM HUNTER-GATHERERS TO FOREST HERDERS: A MULTI-PROXY STUDY OF A HOLOCENE SEQUENCE CONTAINING ANIMAL DUNG AT THE ROCK-SHELTER SITE VELKÝ MAMUŤÁK, NORTHERN BOHEMIA

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The unique geographical setting of North Bohemian sandstone region, with its extremely varied topography rich in caves and rock-shelters, has always been studied with special focus on the Late Paleolithic and especially Mesolithic hunter-gatherer communities. However, rock-shelters and caves were frequently used also as pens in the European prehistory. The site Velký Mamuťák represents one of the largest Bohemian rockshelter with a continuous, uninterrupted sequence of sediments recording almost permanent human presence throughout the Holocene. The most interesting settlement phases, especially with respect to forest land use, are dated to the Late Bronze Age, Hallstatt, La Tène and Early Medieval period, providing strong evidence of livestock penning. Using pollen and plant macroremain analyses, grazing practices are documented by the presence of extra-local species, which reflects livestock roaming over long distances and importing pollen grains and macroremains from different environments by defecating under the rock-shelter. Such interpretation is confirmed by finds of well-preserved dung pellets. Their analysis proved the presence of several animal species (likely pigs, goats and/or sheep) grazing in forests as well as ruderal habitats and foddering with twigs and crops.

Key-words: Holocene, forest grazing, animal dung, sandstones

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LAND ABANDONMENT AND MIGRATION DURING THE IRON AGE IN CENTRAL EUROPE - ARCHAEOLOGICAL AND BOTANICAL EVIDENCE

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Reforestation on abandoned fields is first dominated by *Betula* and clearly visible in the pollen record. This stage lasts between 20 and 100 years, from the first flowering to the suppression of *Betula* by other trees, or it is terminated earlier by fresh human impact and re-opening of the landscape. *Betula* peaks are visible in most central European pollen profiles if examined completely in close intervals, thus resulting in periods of less than 20 years. They indicate local land abandonment during all periods, their frequency increasing from the Bronze Age onwards. Beyond local events, nearly all profiles in southern Germany show an accumulation of land abandonment in the Late Iron Age (2nd/1st centuries B.C.). In the same period, at the beginning of the 1st century B.C., due to archaeological finds the settlements of the so-called "Celtic" peoples were abandoned whereas the Roman colonization did not start at least 150 years or more later. Yet the whole time gap cannot be closed by *Betula* peaks which were terminated by the resuming of intensive land use. We must therefore consider that immediately after the Celtic collapse new immigrating groups, identifiable by faint archaeological traces (Caesar's "Germanic peoples"?), settled the land for a while. The question if and when these immigrants disappeared, so that the Romans found a waste land, we try to answer with a new research project looking for a more precise radiocarbon dating of pollen profiles and particularly its *Betula* peaks.

Key-words: Land use - migration - archaeobotanical indicators – archaeological interpretation

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PRELIMINARY ARCHAEOBOTANICAL AND MICROMORPHOLOGICAL INVESTIGATIONS ON THE BRONZE AGE TELL OF TOBOLIU (ROMANIA)

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The Middle Bronze Age (ca. 1880–1530 BC) tell settlement from Toboliu *Dâmbu Zănăcanului* (Bihor County, Western Romania) with its outer settlement is located in the Great Hungarian Plain between the Crişul Repede floodplain and the high plain of Miersig. The tell forms a mound rising approximately 4 meters above the surrounding plain and a diameter of approximately 95 meters. According to the archaeological investigations seven occupation phases (corresponding to architectural construction, use and destruction sequences) were documented in the 4 m thick stratigraphic sequence. Complete sequences of houses have been preserved as well as wooden planks could be discovered.
Correlated archaoebotanical and micromorphological samples were taken from different contexts of the tell sequences such as floors, domestic waste and destruction levels. This integrated approach intends to reconstruct aspects of houshold practices, diet, subsistence strategies and might also reveal palaeoenvironmental conditions. Micromorphological features can be associated to

different anthropogenic activities such as cooking, cleaning, production processes as well as architectonical construction details. The analysis of plant macro-remains provided mostly remnants of cultivated plants. In addition to several cereals, "new glume wheat“ was also found. The spectrum is supplemented by *Pisum sativum* and *Camelina sativa*; as collected plants *Cornus* mas and *Prunus* cf. insititia were documented.

Key-words: macro remains, micromorphology, tell, archaeology

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CHARRING-INDUCED FRACTIONATION OF δ13C AND δ15N IN COTTON (*GOSSYPIUM ARBOREUM*) SEEDS: IMPLICATIONS FOR RECONSTRUCTING ARCHAEOLOGICAL ENVIRONMENTS

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The ancient diffusion of cotton (*Gossypium* sp.) across the Old World is one of the most outstanding examples of social, environmental, technical and economic entanglement. The various trajectories of cotton products, including raw and processed seeds and fibres, are relevant markers of the circulation of knowledge, goods and people. However, understanding cotton diffusion in the past is limited by the fact that cotton products could have been produced locally and/or imported from different regions. Furthermore, cotton seeds and to a lesser extent, cotton fibres, are generally only found in charred form in archaeological contexts and this can be problematic as in some cases, the charring of plant remains results in an offset of the biogenic isotope values. In this study, the isotope composition of modern uncharred and experimentally charred cotton seeds that were grown in irrigated fields in Seville, Spain and greenhouses in Montpellier, France, was measured to establish the range of isotope fractionation that takes places across several parameters (temperature range: 50, 100, 150, 200, 225, 250, 275, 300, 325 and 350°C; time range: 2, 4, 8 and 16 hours). The results provide information on the extent to which carbonization effects measured δ13C and δ15N values and if such values can be used successfully to reconstruct the nature of the local growing environment.

Key-words: carbon isotopes, nitrogen isotopes, cotton (Gossypium arboreum), carbonization

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WEAVING LOOMS, INTENTIONAL DEMOLITIONS, BURNT OFFERINGS…? TRENCHLIKE FEATURES OF THE URNFIELD PERIOD IN CENTRAL EUROPE BY THE WIEV OF ARCHAEO-ENVIRONMENTAL ANALYSIS

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Archaeological excavation in the Late Bronze Age settlements in southern and western Bohemia, southern Germany and the Austrian Land Salzburk have repeatedly provided examples of an unusual type of settlement features: long narrow pits or trenches, mostly typical not only for their shape but also orientation according to cardinal points, their arrangement on the site, and contents of finds. The largest number of these features was found in Březnice in south Bohemia. The aim of this paper is to provide information about archaeo-environmental analyses of the sediment from trenchlike features from Březnice, and to indicate the ways we intend to proceed in their interpretation.
A significant set of plant macroremains and charcoals was obtained. The presence of proteins was investigated using antibody detection and protein mass spectrometry. Samples were also analysed for the presence of diatoms, starches and phytoliths.
On the basis of the analysis we assume that the filling of the trenches was formed by the waste of different composition. Construction wood, utility plants and waste after their processing, vegetation from different environment, meat etc. were recorded. The human activities that had led to the storage of this material of various kinds had to have a complex structure.

Key-words: Late Bronze Age, weaving looms, burnt offerings, waste

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MICROBOTANICAL APPROACH TO EXPLORING THE ORIGINS OF JAPANESE HISTORICAL PAPERS

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In Japan, the study of starch grain assemblages in an archaeological context has become more common in the last decade. Emphasis has been placed on utilizing starch grains to determine the functions of stone and wooden tools, plants cooked in pottery, and past plant food consumption reconstructed by human dental calculus. Such methods are now applied to analyse historical documents. The preliminary studies have mentioned fibres and tried to identify paper types and quality. Historical materials basically require non-destructive surveys, and no botanical or mineralogical

analyses have ever been conducted or emphasised. In this study, historical papers were examined through detailed microscopic observations. Experimental DNA analysis of modern plants used for making papers such as kozo (Broussonetia kazinoki × B. papyrifera) were also conducted to identify the original compositions of historical papers. Differences in surface conditions and fibre arrangements showed different materials, and the quantity and density of the mixtures such as fibres, plant tissues, starch grains, and minerals may have been created by paper-making techniques or conservation processes. The taxonomic identification of components enables to reconstruct the origins of papers, which can lead to interpreting their historical and environmental backgrounds of documents. Biomarkers of kozo were extracted from the modern samples, and their sex markers can show the areas where they were possibly produced.

Key-words: DNA marker, fibre, origins of historical papers, mixture, starch grains

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GONE WITH THE WATER. THE INFLUENCE OF FLUVIO-LAGOON ENVIRONMENTS AND HUMAN ACTIVITIES ON THE VEGETATION OF THE ANCIENT PORT CITY OF LATTARA (LATTES, FRANCE)

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Previous experience in lakeshore environments in central Europe proved that the use of modern analogue botanical data was helpful in order to establish water level changes and detecting flooding episodes in archaeological stratigraphies. For this reason, it is important to expand this type of approach to new amphibious environments, such as lagoon areas. This project aimed to reconstruct water agency in the sedimentation processes of the Gallic-Roman port city of *Lattara* (Lattes), one of the most important commercial enclaves in the area during Antiquity (5th cent. BCE - 2nd cent. CE). For this, modern analogue botanical macroremains were gathered from different wetland habitats around the Mediterranean wetland observatory and nature reserve Tour du Valat (Arles), where conditions might still be close to *Lattara*'s environment in the past. The sampling points were chosen in order to represent different natural agents that could have influenced *Lattara*, which was founded at the mouth of the river Lez on the edge of a lagoon, almost completely surrounded by water. In the modern analogue botanical data, we found differences between saline and brackish water samples compared to fresh water ones as well as differences between submerged samples compared to samples taken from landwards of the shoreline. The modern analogue data was then used for the reconstruction of formation processes in samples of *Lattara* to determine how strongly different water sources have influenced the site.

Key-words: modern analogue data, functional ecological groups, experimental approach

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A NEW WAY OF SEEING PULSES. PRELIMINARY RESULTS OF GEOMETRIC MORPHOMETRIC ANALYSES OF ARCHAEOLOGICAL PULSE SEEDS IN LA FONT DE LA CANYA (CATALONIA, SPAIN)

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La Font de la Canya (Catalonia, Spain) is a storage area of the Iron Age (625-150 BC). Its important archaeobotanical record is dominated by cereals together with fruit seeds and legumes. The good state of conservation of these remains allowed rather straightforward identifications.
This study is part of a project that investigates the role of legumes in the Western Mediterranean during the Iron and Bronze ages. This work is a pilot study for the application of geometric morphometrics (outline analyses) to pulse seeds. Geometric morphometrics has been successfully applied to archaeological seeds of cereals and fruit trees but not to legumes. Our objective is to quantify morphological differences, if any, of seeds between and within the species identified in La Font de la Canya: Lathyrus sativus, Lens culinaris and Vicia faba.
Here, morphometrics is used to compare different samples and different phases of the site: five samples of the 1st Iron Age (625-575 BC), one of the Iberico Antiguo (575-450 BC) and three of the Iberico Pleno (450-180 BC). We study possible significant morphometric and biometric changes that may evidence changes in agrobiodiversity (cultivated varieties) or in environmental and technical cultivation conditions. The similarity between patterns of variations between the three species are discussed, as well as usefulness of predictive approaches to relieve current taxonomical doubts on some remains.

Key-words: Morphogeometrics, Iron Age, Lathyrus sativus, Lens culinaris, Vicia faba

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THE LCHF (LOW CARB HIGH FAT) DIET IN RELATION TO ARCHAEOBOTANICAL AND ARCHAEOZOOLOGICAL EVIDENCES FROM INDIA: SOME PRELIMINARY OBSERVATIONS

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The paper discusses possibility of exploring interconnections amidst LCHF (Low Carb High Fat) dietary pattern and the archaeobotanical and archaeozoological findings and development of vegetarianism in Indian sub-continent. The LCHF is often loosely and interchangeably called as ketogenic or paleo diet and sometimes termed as Cave-Man's diet. It was prevalent during palaeolithic periods and based upon hunting –gathering subsistence strategies, prior to the evolution of plant food production and agricultural economies during terminal Pleistocene – Holocene periods, about ten to eight thousand years before the present. The exact time framework varied regionally, depending upon local factors, availability of wild progenitors and cultural influences, etc. During the pre-neolithic period the Man depended essentially upon hunting of wild animals

(predominantly lean/fatty muscle proteins, bone marrow fats and blood for salts) and occasional consumption of seasonal wild fruits, seeds, leaves, tubers, rhizomes and forest honey as carbohydrates. Preservation of animal bones with cutting, splitting marks and charring(for extraction of marrow) is much better in most of the stone age sites worldwide, as compared to plants which get sparsely preserved under restrictive conditions, mainly due to gradual accidental carbonization and slow charring activities, waterlogging, etc.

The paper reviews archaeobotanical evidence of cereal grains, pulses and fruits visa-vis zooarchaeological finds of wild and domestic animals and suggests evolution of vegetarianism and veganism much later during later protohistorical - historic times in India, It could been due to the influence of religious and cultural practices.

Key-words: Lchf Diet, Archaeobotany, Archaeozoology,Health,vetetarianism

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