IMPR - PHYTOLITHS IN INTEGRATED ARCHAEOBOTANICAL AND ETHNOARCHAEOLOGICAL STUDIES

Theme: 1. Widening horizons through human-environment interconnections
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Keywords: phytoliths, crop-processing, fodder, non-food plant uses, ethnobotany, ethnoarchaeology

The session "Phytoliths in integrated archaeobotanical and ethnoarchaeological studies" is dedicated to the wide range of applications of phytoliths in archaeology, paleoanthropology and palaeoethnobotany. The identification of plant remains at an archaeological site can be indicative of the resources and environments exploited by peoples, their subsistence strategy and further economic and cultural practices. Research questions that can be addressed concern agronomy, economy and diet in the past, i.e. how phytoliths can be used to reconstruct the cultivation, processing and use of plants for food and animal fodder. In addition, phytoliths can help to disentangle plant uses for non-food purposes as well. In this case, information can be gained about, for instance, architecture, medicinal uses, textiles and other aspects of domestic, economic and ritual spheres.

In this session, studies of modern ethnographic contexts are also welcome, that offer insights into traditional plant uses and that can be used to calibrate the interpretation of the phytolith fossil assemblage from comparable archaeological contexts. Through this comparison, deposition processes, traditions and cultural choices behind human behaviour in the past can be better identified and understood. Presentations can focus on the investigation of phytoliths from specific objects or from different contexts from one or multiple sites. Contributions that show a comparison of the phytolith record with other kinds of archaeobotanical records (macro-remains, wood/charcoal, starch, pollen and NPPs, plant biomarkers), as well as with other proxies (stable isotopes of osteological records or seeds, faunal assemblages, etc.) are particularly welcome. Case studies and reviews may concern different periods and geographical regions.

This session is part of the 12th International Meeting for Phytolith Research, or IMPR, the official scientific conference of the International Phytolith Society.

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Abstracts for session #246

TRACES OF LIFE: INTEGRATING PHYTOLITH AND ETHNOARCHAEOLOGICAL ANALYSIS IN LEVANTINE SITES

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The Neolithic in southwest Asia (c 11,700-7800 cal BP) is an important period in human history that saw the advent of sedentism, agriculture and ultimately paved the way for increased social complexity and urbanism. It is also, however, one of the most poorly understood. This is partly because of the paucity of Neolithic sites and also because when sites are found preservation is often limited, particularly for organic remains. This presentation outlines results from an integrated phytolith and ethnographic study conducted on the 20th Century site of Al Ma'tan, Jordan which was similar in construction and layout to Levantine Neolithic sites. We split our samples into different context categories for example middens, hearths and floors. We found that phytolith signatures were in accord with what would be expected based on the oral histories provided by former residents of the settlement and that signatures were strongest for categories linked to construction practices rather than activities.

Keywords

Phytolith, Ethnoarchaeology, Neolithic, Levant, Jordan

THE USE OF PHYTOLITHS ANALYSIS FOR THE INTERPRETATION OF THE CONTENT OF POTTERY: AN EXPLORATORY STUDY OF AFRICAN ETHNOGRAPHIC SAMPLES

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Because it may be used for storing, transporting, preparing and serving food commodities, pottery represents a key evidence of the food practices of past societies. However, the plant content of archaeological pottery is difficult to track because of (i) the low preservation of their molecular biomarkers in organic residues, (ii) the scarcity of well-preserved botanical remains and (iii) the lack of interpretative references. This communication aims at presenting the potential and limits of phytoliths as an indicator of plant content of pots, and culinary practices of past societies. Because of their siliceous structure, phytoliths analysis offers new perspectives for identifying plants remains in organic residue, where other biological and molecular indicators are poorly preserved. Differentiating the parts of plants and Poaceae subfamilies may furthermore supply detailed information about the substances prepared inside pottery (seeds, leaves, roots, etc.).

This preliminary study focuses on the phytoliths analysis of the residues and clay paste from more than 20 ethnographic pots from Senegal used for different purposes. These were collected in two present day communities in Casamance and Bedik Country representing two regions with different traditional food systems, according to their farming practices (rice farming vs rainfed agriculture). This study has been developed in the framework of an international research program with a wider perspective of establishing an ethnoarchaeological reference of the functions of pottery that combines different proxies (typometry, use-wear, lipids, proteins, phytoliths and starch grains analyses). The first results highlight a contrasted signal of phytolith assemblages according to the content of the pots and reveal the necessity to adopt a salient sampling strategy.

Keywords

Phytolith, Pottery, Food practices, Senegal

THE POTTER, BETWEEN SPECIALISED PRODUCTION AND ROUTINE ACTIVITIES? MULTIDISCIPLINARY STUDY OF A COPPER AGE KILN

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One of the peculiar aspects of the Trypillia sites in Eastern Europe (beginning of the 4th mill. BCE) is the first attestation of some fired constructions in earthen architecture, mostly interpreted as technologically advanced kilns for pottery making. These structures had separate compartments for the heating material and the pottery to be fired and two or more parallel channels in the under-construction. Based on the fine guality and large guantity of painted ware assemblage at Trypillia sites, pottery production is seen as one of the earliest specialised handicrafts in Europe. In order to understand more about the potter's activities and the role of the potter in society, at the mega-site of Maidanetske, in central Ukraine, we applied a multidisciplinary approach to the investigation of one of these structures, including its surroundings and related pits. Evidence from charred botanical macro-remains, phytoliths, faunal remains, geochemistry, archaeological finds and stratigraphic information related to the kiln will be discussed and, when possible, compared with data from other excavated structures unrelated to the kiln. How do cereal processing, wood selection, and an unusual faunal record enter the potter's lifestyle? Can we trace a first, strict, labour division or is there attestation also of daily routine activities at the kiln? Through the archaeological, archaeobotanical and zooarchaeological record at Maidanetske, in comparison with similar excavated kilns at other Trypillia sites, some socio-economic aspects will be discussed about Copper Age society and production, on the light also of ethnographic models.

Keywords

kiln, pottery, crop processing, phytoliths, macroremains, society

USING PHYTOLITHS TO RECONSTRUCT ARCHAEOLOGICAL STORAGE PIT FUNCTION IN BRONZE AND IRON AGE ANATOLIA (TURKEY)

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Excavations at Kaman-Kalehöyük in Central Anatolia (Turkey) have identified the partial remains of several thousand storage pits, many of which had clearly visible linings. Identical lined storage pits appear across Bronze and Iron Age archaeological sites in Anatolia, coincident with significant socio-political reorganisation and environmental change, and are even referred to in ancient Sumerograms and Classical records. Despite their abundance, reconstructing the function and construction technology of pits been difficult, largely due to damage caused to them during continuous rebuilding in long lived settlements and the poor preservation of their contents. To overcome these issues, phytolith analysis was used to reconstruct the lining and fill of pits from the Early Bronze Age and Late Iron Age occupations of Kaman-Kalehöyük. The phytoliths recovered from the linings were dominated by inflorescence and culm long cell types from wheat/barley (Triticum/Hordeum), Setaria/Panicum (millet) and wild grass (Pooideae), likely reflecting the in situ decay of formerly stored crop contents and botanical materials used to line the pits to improve storage performance. In contrast, fills were dominated by high frequencies of grass short cells along with various Cyperaceae and spheroid dicotyledon/monocotyledon types, likely the remains of refuse from the end of the pit's use life. Taxonomic variation in the phytolith composition of pit linings and fills likely reflects local plant selection, availability and management strategies related to sociopolitical and environmental change in Bronze and Iron Age Anatolia.

Keywords

Phytoliths, Archaeobotany, Storage, Storage pits, Anatolia, Landscape management

PLANT WAYS IN MIDDLE BRONZE AGE ANATOLIA - AN ARCHAEOLOGICAL INTERPRETATION OF PHYTOLITHS AND PLANT REMAINS AT ZINCIRLI HÖYÜK, TURKEY

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The Middle Bronze Age is marked by the increasing internationalism in the Near East through the seizure of political control by Amorite kings. Various texts mention these nomadic tribes as threatening the political order of the Ur III dynasty in southern Mesopotamia at the end of 3rd millennium BC. With the beginning of the Middle Bronze Age, however, Amorite kingdoms were successfully established in large parts of the Near East. International contacts are also apparent from the Mari and Kültepe texts which document that rulers from Mesopotamia, the Levant and Minoan Crete were exchanging gifts and commodities among each other. While some of these texts mention longdistance trade of value-added commodities like olive oil and wine; they are not particularly descriptive of the production and processing stages of these products. In this paper, we present the joint results of the micro-botanical (phytoliths) and macrobotanical (seeds and fruits) remains from a Middle Bronze Age layer (ca. 1650 BCE) at Zincirli Höyük (Turkey). The study area was destroyed after a single conflagration event with several food processing installations and restorable vessels in-situ. In addition, the archaeological contexts were minimally disturbed by later sedimentary and anthropogenic activities. This preliminary contribution aims to comprehend the potential link between micro- and macro-botanical remains by focusing as to whether different crops have been stored and processed in different locations in the studied context.

Keywords

Bronze Age, SE-Turkey, Macrobotany, Phytoliths, food processing

IDENTIFYING THE WATER REGIME AND ITS ASSOCIATION WITH CROP HIERARCHIES DURING1850-1750 CAL BC IN THE XINZHAI SITE, CHINA

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A vital factor in the rise of urbanization is the development of a complex farming system employing labor-intensive irrigation. It is, therefore, of great significance to probe the water regime in the Xinzhai period (1850-1750 cal BC), a key period pursuing the emergence of early urbanization in China. To recover the water management in the Xinzhai period, correspondence analyses based on phytolith ecological categories and ratio analyses of Sensitive to Fixed morphotypes of 59 phytolith sediment samples from the Xinzhai site were performed. They clearly show that rice and millet were grown in different ecological settings with possibly intensive rice farming under an irrigation system and a rainfed millet farming system. Meanwhile, a regional comparative-research of phytolith and macro-remains suggests that rice was more concentrated in central settlements and the aristocratic residential area in the Xinzhai site. Since there was a rice-favorable warm and wet climate during the Xinzhai period, we argue that the uneven distribution of rice can be explained by cultural factors instead of climatic factors. Due to the intensive labor inputs, irrigated rice has been chosen from ordinary ingredients into luxury food for the wealthy and powerful while rainfed millet was more for calorific needs probably as a major staple. More than that, the practice of irrigation likely had a prolonged impact on the agricultural pattern and the social complexity in the subsequent Erlitou (1750-1550 cal BC) and Shang (1550-1046 cal BC) periods. This research proves archaeobotanical evidence can enable us to evaluate how certain crops became powerfully associated with social-cultural distinction under an irrigated system and also how it possibly contributed to the social complexity.

Keywords

Xinzhai period, Phytolith analysis, Macro-botanical remains, Crop water regime, Crop hierarchy

PHTYTOLITHS, SEEDS AND WOODEN CRAFTS: THE STUDY OF JAPANESE COLONIALISM IN NORTHERN TAIWAN (HEPING DAO, KEELUNG)

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The archaeological site of Heping Dao (northeast Taiwan) has produced relevant information about the ephemeral material culture related to the day-to-day life of the Japanese occupation of the island. The exceptional preservation of organic remains by water saturation has provided the opportunity of developing a multidisciplinary study. The study of a set of wooden remains dated to mid-20th century including the base of a bucket or a small cask, a takamakura, a koma geta and other items of unknown function has provided the opportunity of combining wood analysis, and morpho-technological studies with phytolith identification. The base of the wooden container preserved an organic adherence in the inner part which contained plant macro-remains visible at naked eye (Cucurbitaceae seeds) and phytoliths. This case study highlights the relevance of integrated archaeobotanical studies in colonial contexts to address aspects related to the daily life of these communities such as food storage or consumption but also about objects, wood, and identities

Keywords

Phytoliths, Seed analysis, Wood analysis, Vegetation, Crafts, Taiwan

PHYTOLITHS, STARCH GRAINS AND ANDEAN CROPS: THE INPUT OF THEIR DIVERSITY FROM AMERICA TO ARCHAEOBOTANICAL RESEARCH

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This paper presents preliminary results of the archaeobotanical study of South-Central Andes Culinary Heritage Digital Database. We review Andean crops collection sample and reference collection of starch grains and phytoliths making procedures. Besides, both collections include processed products from these crops (for example, flour, roasted seeds, and mote), which were found and collected from fairs and markets. Finally, samples obtained during our ethnoarchaeological and ethnobotanical fieldwork are incorporated. The collection sample includes, plants in natural or dry state, as well as those already transformed throughout culinary processing. Phytoliths and starch grains are a useful tool to identified which crops were part of ancient food. They are analyzed and described with description and identification protocols used in our archaeobotanical research. Usually, Andean crops are defined as traditional crops, growing on the Andes, with a diverse taxonomy, having in common characteristics such as drought, frost and salinity-resistant. Some of them, such as corn, potatoes, quinoa, beans, among others are produced and consumed by families from the central and south central sector of the Quebrada de Humahuaca (Argentina) at small-scale agriculture. Andean taxa with food uses, its culinary processing knowledge and practices, food serving and consumption are retrieved and systematized in a digital database. These reference materials are relevant for archaeobotanical studies. They also contribute to community bio cultural heritage recovery. Their description and registration allows us not only to catalog them in the JUA Herbarium heritage, but to enhance, visibility, safeguarding and management of South-Central Andes Culinary Heritage.

Keywords

Andean crops, digital database, Phytoliths, Starch Grains, ancient food, Culinary Heritage

SONDONDO'S AGRICULTURE AS REFLECTED IN PHYTOLITHS. USE OF SOIL ANALYSIS TO UNDERSTAND SOCIAL DEVELOPMENT IN PREHISPANIC TERRACES IN PERU

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In Peru, studies of pre-Hispanic agriculture have been adopted a number of different approaches. Some researchers have focused on botanical aspects, others on agrarian technologies, while others have concentrated on social and economic relationships. However, in almost all cases, typological and structural views have prevailed leading to conclusions strongly based on relative chronologies and broad generalizations, especially for the more complex stages of social development, mainly the horizons of the Wari and Inca Empires. Aligned with the theme of this conference, our team has begun to conduct phytolith analysis in relation to soil and land use to more fully interpret terrace construction, use, and their social implications.

The interdisciplinary methodologies and techniques that we are applying on the terraces allow the implementation of new approaches in Agrarian Archeology in Peru that examine the cultivation sites themselves without relying exclusively on ethnographic or ethnohistorical analogies. In our paper, we will present the results of the first multiple microfossil analysis of soils analyzed from agricultural terraces in the Sondondo Valley (Department of Ayacucho, Peru) at 3200 m.a.s.l.. For example, we have been able to identify the standardization of agricultural terraces in the southern Peruvian Andes during the expansion of the Inka Empire and directly related to the need to harvest corn. Our innovative methods not only shed light on the types of crops cultivated, but also demonstrates how shifts in cultigens can serve as measures of sociopolitical transformations.

Keywords

agrarian archaeology, terraces, andean studies, paleoethnobotany

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DARK EARTHS PLANT MANAGEMENT AND THE REGIONAL DEVELOPMENT OF TAPAJO CULTURE IN THE LOWER AMAZON

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The highly fertile Amazonian Dark Earths (ADE) results from landscape transformations found in association with archaeological sites throughout Amazonia. In the Santarem region (Lower Amazon), ADEs are mainly found in ancient Tapajó settlements (AD 1000-1600), though observed in some older occupations. Our paper brings together results from different lines of evidence (phytoliths, geochemistry, micro-charcoal, and archaeology) to address landscape and social changings following the regional organization of the Tapajó culture. The data stems from three ADE sites sampled on terrestrial cores, excavation profiles, and cultural features such as house floors, fire pits, hearths, caches and refuse pits. Phytolith revealed an overall increase in plant foods, consisting of food crops and edible native species concomitant to a shaded vegetation cover. Additionally, inter-site comparison indicated a gradient of vegetation change correlated to the formation of ADEs, varying according to site size (population) and length of occupation. Microcharcoal (<125µm) showed a sharp increase throughout the ADEs layers on the studied sites indicating intense charcoal input resulting in soil amelioration confirmed by the geochemical data. Altogether, these data suggest a longterm polyculture agroforestry practice, including crop cultivation, management of edible native species, and soil enrichment beginning before the Tapajó advent and intensified by them. Therefore, regional socio-cultural and landscape transformations during the Late Holocene connect to traditional ecological knowledge and ancient subsistence practices, which applied controlled fire as a tool for shaping their surrounding environment.

Keywords

Archaeobotany, Amazonian Dark Earths, Phytoliths, Plant management, Tapajó culture, Lower Amazon

4000 YEARS OF RESILIENT PASTORALISM: THE PHYTOLITH ASSEMBLAGE FROM A MULTIPERIOD HABITATION SITE IN NORTHWESTERN MONGOLIA

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Currently, the development of mobile pastoralism and the chronology and nature of early pastoralist societies in Mongolia is known almost exclusively from burial and ritual contexts. Here we present the results of archaeological excavations carried out at a deeply stratified multiperiod habitation site situated in a protected valley draw in the Züünkhangai region of northwestern Mongolia, an area used by present-day pastoralist as a winter camp. Our data include artefacts, botanical and faunal remains, geological information and chronology that document the development of pastoralism in this region since the Early/Middle Bronze Age (c. 2000-1700 cal. BC). Our findings attest to the adaptive resilience of pastoralism for 4000 years, up to the present day, despite major changes in the sociopolitical, socioeconomic and environmental conditions through time. The phytolith assemblage is composed almost entirely of wild pooid grasses, which predominate in the Mongolian steppe. Interestingly, inflorescence phytoliths are extremely scarce throughout the site occupation sequence, suggesting that this area has been consistently used by herders as a winter camp for four millennia. Moreover, the ratio between Poaceae phytoliths fixed and sensitive to water conditions (short and long cells, respectively) suggests that during the earlier (Bronze Age) occupation of the site environmental conditions were drier than during later occupations (Iron Age and subsequent periods).

Keywords

Phytoliths, Steppe, Seasonality, Herders, Resilience

RECONSTRUCTING BRONZE AGE AGRO-PASTORAL PRACTICE IN THE MESOPOTAMIAN-ZAGROS FOOTHILLS: PHYTOLITH AND FTIR ANALYSIS OF DUNG-RICH SEDIMENTS FROM KHANI MASI (IRAQ)

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The Zagros foothills have one of the longest histories of agro-pastoral practice globally, beginning in the Epipaleolithic. While the domestication process and Neolithic subsistence in this region have recently received much archaeological science research, the subsequent Mesopotamian Bronze Ages (late 4th-2nd millennium BCE) remain principally assessed with traditional excavation and textual evidence. As texts are often related to state-level institutional affairs in distant regions, our knowledge of local, dayto-day agro-pastoral management strategies remains conjectural. Phytolith analysis is a particularly productive method for assessing agro-pastoral practice in regions with poor macrobotanical preservation. While this approach has not been widely applied in Mesopotamia (Iraq), it has the potential to shed light on the production systems supporting its Bronze Age cities, states, and empires.

In this study we use phytoliths, dung spherulites, and Fourier Transform Infrared (FTIR) spectroscopy to identify and examine dung-rich sediments from Khani Masi, an 8 hectare mid-second millennium BCE Kassite site located in the Kurdish Region of Iraq. Our aim was to investigate (1) the range of local pastoral management strategies, (2) the degree of integration between agricultural and pastoral practice, and (3) the presence of signals related to the local ecology, seasonality, and environmental change and continuity.

Phytolith analysis reveals that sheep/goats were primarily free grazed on wild grasses. The dominance of wild grass inflorescences, a potentially strong seasonality indicator, may suggest transhumant pastoralism. However, further evidence, including occasional foddering with cereal chaff, a diverse range of crop types, and significant accumulations of burnt dung within the site, collectively suggests a closely linked local agro-pastoral subsistence economy. This study provides much-needed empirical botanical data as well as productive insights for future application of phytolith studies in the Mesopotamian region, and sheds new light on agro-pastoral practice in the Zagros foothills during Kassite imperial rule.

Keywords

Phytoliths, FTIR, Mesopotamia, Agropastoralism, Bronze Age

BEDDING LAYERS FROM BORDER CAVE, SOUTH AFRICA: A PHYTOLITH AND FTIR INVESTIGATION

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Border Cave is a well-known South African Middle and Later Stone Age archaeological site located in KwaZulu-Natal, that has provided exceptional plant preservation, probably unparalleled in South African archaeology. The site preserves multiple bedding structures in numerous layers, some survived as visually ephemeral fragments of silicified plant material while in others desiccated plant is preserved. We recently reported the discovery of grass bedding used to create comfortable areas for sleeping and working by people who lived in Border Cave at least 200,000 years ago. The complexity and distinctiveness of these deposits provide an excellent opportunity to study the relationship between plant exploitation strategies and sleeping behaviours of the ancient inhabitants of Border Cave. This study presents ongoing research on the phytolith and chemical composition of sediments from bedding layers dating from ~227 to 24 ka. The results here presented are further investigated from a taphonomical perspective, that is critical to conducting a more reliable interpretation of plant-human behaviours in the cave.

Keywords

Phytoliths, FTIR, Bedding, Early complex behaviours, Border Cave, South Africa

TAPHONOMY, ENVIRONMENT OR HUMAN PLANT EXPLOITATION STRATEGIES? DECIPHERING CHANGES IN PLEISTOCENE-HOLOCENE PLANT REPRESENTATION AT UHMLATUZANA ROCK SHELTER, SOUTH AFRICA

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The period between \sim 40 and 20 ka BP encompassing the Middle Stone Age (MSA) and Later Stone Age (LSA) transition has long been of interest because of the associated technological change. Understanding this transition in southern Africa is complicated by the paucity of archaeological sites that span this period. With its occupation sequence spanning the last ~70,000 years, Umhlatuzana Rock Shelter is one of the few sites that record this transition. Umhlatuzana thus offers a great opportunity to study past environmental dynamics from the Late Pleistocene (MIS 4) to the Late Holocene, and past human subsistence strategies, their social organisation, technological and symbolic innovations. Although organic preservation is poor (bones, seeds, and charcoal) at the site, silica phytoliths preserve generally well throughout the sequence. These microscopic silica particles can identify different plant types that are no longer visible at the site because of decomposition or burning to a reliable taxonomical level. Thus, to trace site occupation, plant resource use, and in turn reconstruct past vegetation, we applied phytolith analyses to sediment samples of the newly excavated Umhlatuzana sequence. We present results of the phytolith assemblage variability to determine change in plant use from the Pleistocene to the Holocene and discuss them in relation to taphonomical processes and human plant gathering strategies and activities. This study ultimately seeks to provide a palaeoenvironmental context for modes of occupation and will shed light on past human-environmental interactions in eastern South Africa.

Keywords

Phytoliths, Pleistocene-Holocene transition, Hunter-gatherer plant use, Palaeoenvironments, KwaZulu-Natal, South Africa

TOWARDS A MODEL OF A MAMMALIAN INTERFACE WITH THE PHYTOLITHS IN THEIR NATURAL ENVIRONMENT: INSIGHTS FROM TAÏ CHIMPANZEE FAECAL PHYTOLITHS

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In recent years, there has been increasing use of human dental calculus as a source of phytoliths for inferring dietary data on ancient human subsistence and behaviours. The dental calculus of contemporary human and non-human populations with known diets have been used as reference data sets, including the chimpanzees of Taï National Park (Côte d'Ivoire), but explaining the preservation mechanism involved is challenged by our incomplete knowledge of the microremain content within the diets of these reference populations and our rudimentary information on the process of microremain incorporation into dental calculus. This paper presents phytolith analysis of faecal samples from a population with previously published dental calculus phytolith assemblages to assess to what extent dietary phytoliths are reflected in the dental calculus as well as in the egested faeces.

In this study, we detect and identify faecal phytolith assemblages as an indicator of plant consumption in two Western chimpanzees of the Taï National Park (Côte d'Ivoire) before (wet season), during (dry season) and after (dry season) a dust-rich period. In tandem, observational dietary records of these two individuals were compiled to improve the interpretability of this dental calculus phytolith dataset. The most common phytolith morphotypes were eudicot plates, single-cell and multi-cell tracheids, monocot rugulose and echinate spheroids. Using observational dietary records as a starting point and our faecal results as a terminus, we consider how dental calculus can accumulate phytoliths. Our findings enable identification of the phytolith morphotypes that are underrepresented in dental calculus such as eudicot plates, single-cell and tracheids, which is informative for future dental calculus research strategies. Keywords dental calculus, phytolith taphnomy, assemblage bias, diet and phytoliths

INVESTIGATING DIETARY CHANGES AT TELL KAMID EL-LOZ, BETWEEN THE 2ND-1ST MILLENNIA B.C.E USING PLANT MICROREMAINS RECOVERED FROM DENTAL CALCULUS

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Tell Kamid el-Loz, identified as the site of Kumidi in the Amarna Letters, is located in the Lebanese Bega Plain on the central trade axis between the southern Levant and the early urban centers of Syria. The tell was inhabited since the late Neolithic (5th millennium BC) and flourished during the Middle (ca. 2000-1600 BC) and Late Bronze Age (ca. 1600-1200 BC), as attested by the temples and palaces uncovered during excavation. The settlement lost its importance in the Iron Age (1200-600 B.C.), the most important find in the subsequent Persian period (600-330 B.C.) being a large cemetery. Approximately 108 burials of individuals dated between the Middle Bronze Age and the Persian period were uncovered at the site. These burials had previously been investigated within the framework of the Max Planck Harvard Research Center for the Archaeoscience of the Ancient Mediterranean (MHAAM) at the Max Planck Institute for the Science of Human History in Jena (MPI-SHH) to identify population genetic developments, biological relationships between individuals, their mobility and diseases. In addition, all of the individuals were radiocarbon dated. Of these burials, fifteen usable samples of dental calculus from individuals dating to the Middle Bronze Age through to the Persian period were studied using phytolith and starch analysis to understand the diversity and dynamics of individual human nutrition. Here, I will discuss the results of the micro-remain analysis carried out on dental calculus from individuals at Kamid el-Loz, and integrate this new dataset with the existing bioarchaeological data to inform on the dietary changes of its inhabitants.

Keywords

Phytoliths, Starch, Dental Calculus, Diet reconstruction, Ancient Near East, Tell Kamid el-Loz

A GLIMPSE INTO SHELLMOUND BUILDERS DIET DURING MID-TO-LATE HOLOCENE ON MARAJO ISLAND

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Shellmounds are anthropic intentional constructions produced by pre-Columbian fishing/gathering communities. In general, they are composed of a primary layer of mollusc carapaces, fish bones and, in some cases, human burials. This paper briefly reviews the literature on Marajo Island's landscape transformations, highlighting anthrosols formations following social changes during the mid-to-late Holocene. Our case study is the Tucumã shellmound located on western Marajó Island. The site has two occupation components comprising sequential formation of anthrosols: the shellmound layers buried under an Amazonian Dark Earth soil. These soils are addressed as ecological legacies resulting from a cumulative knowledge of the environment and related to social changes within the island. Our results reveal the impact on the vegetation composition and a shift in plant dietary preferences from the beginning to the end of the occupation. Changes from known domesticates such as maize (Zea mays) and squash (Cucurbita sp.) shifted to palms and cassava (Manihot sp.) at the upper layers.

Keywords

Shellmounds, Plant management, Amazonian Archaeology, Phytoliths

PHYTOLITHS, POLLEN, AND PALEOECOLOGY AT A MIDDLE WOODLAND SITE IN THE AMERICAN SOUTHEAST

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Phytoliths and pollen are complementary forms of evidence attesting to paleoecological conditions at archaeological sites. When considered together, ancient environmental conditions can be posited, helping to reconstruct the paleoecological contexts that humans lived in and interacted with. Here, we present a study of pollen and phytoliths from a midden context at Rice Farm, a Middle Woodland Native American site in the American Southeast. Sample collection and analysis methods will be presented before discussing the social and environmental significance of the results. Our data contextualizes a record of native vegetation alongside use or discard of the cultigen maize by Native Americans at the Rice Farm site. The pollen and phytolith records couch this local signature within the broader environmental context of north Georgia's Piedmont during the Middle Woodland period. Taken alone, the phytolith data would not have provided an adequate means to properly contextualize past human-environmental interaction at the site, demonstrating the necessity of combining the results with pollen analysis to best reconstruct the paleoecological context at this site and archaeological sites in general.

Keywords

Phytolith, Pollen, Paleoecology, Environment, Middle Woodland, Native American

FURTHER EVIDENCE FOR SEASONAL TRANSHUMANCE OF YAMNAYA COMMUNITIES DURING THE LATE COPPER - EARLY BRONZE AGE OF THE CARPATHIAN BASIN

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To learn more about the diets of Yamnaya communities (LCA/EBA, 3rd Millennium BC) in the Carpathian Basin, we studied the dental calculus of a woman's remains from a burial place (Bojt, Great Hungarian Plain). Plant microfossils (starch grains and phytoliths) were identified in the matrix of the calculus. Based on our findings, millet could be a consumed crop. Besides meat and milk - as the primary food source for the Yamnaya people - the young Yamnaya woman might have supplemented her diet with immature grass or crop shoots. However, the most exciting result is that the calculus matrix was rich in conifer phytoliths, apparently from Abies alba (silver fir) and Picea abies (Norway spruce) needles. As there were no conifers in the Great Hungarian Plain of the Carpathian Basin about five-thousand years ago, this may be new evidence for immigration or transhumance. The closest conifer habitat is located in the Transylvanian Apuseni Mountains, with higher pastures on the mountains' top. A traditional transhumant route of Yamnaya people between the western part of the Apuseni Mountains and the microregion of the burial site has been presumed based on evidence of both archaeological and stable isotope data sets of human remains. The hypothesis is that the transhumance with livestock passing the winter and spring in the Great Hungarian Plain's milder regions and returning to higher pastures in the warmer months is supported by our results. Consequently, we found further evidence for the seasonal transhumance of Yamnaya communities during the LCA-EBA Transitional Period of the Eastern Carpathian.

Keywords

dental calculus, phytolith, Yamnaya, Bronze Age, Carpathian Basin, conifer needles

GRINDING PLANTS FOR FOOD AT THE EARLY BRONZE AGE SITE OF AGIOS ATHANASIOS: A MULTIPROXY APPROACH

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In recent years, multiproxy approaches to ground stone tool analysis, which incorporate plant micro-remains with use-wear, have become integrated component of archaeological projects around the world, increasing our understanding of plant processing and culinary practices. These methods however have not been frequently applied in Mediterranean research. This poster aims to demonstrate the value of combining the results of phytolith and starch grain analyses with multi-scale use-wear analyses through the examination of 10 ground stone tools recovered at the Early Bronze Age short- term settlement of Agios Athanasios, in northern Greece. The selected tools were recovered from both interior and exterior occupational contexts and, for comparative purposes, the analysis was conducted on residue extracted from utilized and unutilized surfaces. The results indicate that the inhabitants of the site were exploiting a wide variety of plant products, including different kinds of legumes and cereals. The condition of the micro-remains also suggests that a range of practices were employed during the processing of different plants. Above all this study demonstrates the usefulness of a combined methodological approach for enhancing our understanding of tool use and plant processing activities at archaeological sites in Greece.

Keywords

phytolith analysis, starch grain analysis, ground stone tools, Greece

UNDERSTANDING CROP PROCESSING MODELS AND THEIR SOCIAL MEANINGS DURING THE XINZHAI PERIOD (1850-1750 CAL BC)

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In China, the Xinzhai period (1850-1750 cal BC), which is exclusively recorded in the Central Plain, has widely been regarded as a critical period for the formation of Chinese urbanization. However, little is known about the labor and social organization in this period. In this research, archaeobotanical assemblages were used to explore the cropprocessing model and further provide insights into the mobilization of labor and the organization of society at the archaeological site of Xinzhai on the Central Plain. It offers the first case study linking agricultural activities and social organization about the Xinzhai period. By integratedly discussing macro-botanical remains and phytolith remains, it concludes that hulled cereals foxtail millet, common millet, and rice and also the free-threshing pulse species soybean were all semi-processed before storage with minor labor involved in the initial harvest period. Since they are all summer crops and harvested during the later summer and autumn, the practice of semi-processing might imply less labor was deployed before storage. Thus, the labor in crop processing appeared to be organized on a small scale in more focused units of production such as household basis. This pattern is different from the bulk processing of crops before storage by the communal community in the contemporaneous Dongzhao site. Differentiation of social organization among settlements in the Xinzhai period thus can be suggested. This conclusion contributes to a comprehensive understanding of the social development in the Central Plain by indicating it highly possibly witnessed a constant increase in social complexity before urbanization.

Keywords

Xinzhai period, Macro-botanical remains, Phytolith, Crop processing, Labor mobilization, Social organization

BEFORE AND AFTER OF THE HUDSON VOLCANO ERUPTION: PALEOECOLOGICAL APPROACH BY MULTIDISCIPLINARY ANALYSIS OF CAMELID COPROLITES

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The earliest human occupation evidence in the Pueyrredón-Posadas lake basin (Santa Cruz, Argentina) is dated to ca. 8,600 cal BP. However, there are no archaeological records between ca. 8,100-7,700 cal BP. This hiatus coincides with the H1 Hudson volcano eruption about 7,900 cal BP, as indicated by the presence of tephra in the stratigraphy of two archaeological sites in the area. This eruption was recorded as the largest in the southern of the Andes during the post glacial period. The proposed hypothesis is that this event influenced the permanence of camelids and the human population in this region. Camelids were the main resource of hunter-gatherer populations of Patagonia during the Holocene. At regional scale, archaeological studies showed variations in lithic technology, styles of projectile points, instrument size and rock art among the sets recorded before and after the H1 eruption. The hypothesis will be tested in part through a multiproxy analysis of camelid coprolites collected from layers immediately below and above the Hudson ash level at the Cueva Milodón Norte 1 site (47.30°S 71.89°W). Silicophytoliths, pollen, plant remains, stable isotopes (C and N) and aDNA of coprolites will be analyzed to evaluate changes in the frequency and abundance of these proxies that may be associated with paleodiet, seasonality in the use of the site before and after the H1 eruption. In the present work, results of silicophytoliths, pollen and plant remains in current guanaco feaces collected near the site are presented as a reference model for the coprolites analyses. Forest taxa such as, Nothofagus spp. (Nothofagaceae) and steppe taxa such as, Caryophyllaceae, Cyperaceae, Poa ligularis (Poaceae subf. Pooideae), Empetrum rubrum (Empetraceae), Mulinum spinosum (Apiaceae), among others, were identified. These results will contribute to interpreting the changes and interactions in pre- and post-eruption scenarios.

Keywords

Camelid coprolites, Multiproxy analysis, Human occupation, Argentine Patagonia

PREDATOR-PREY RELATIONSHIPS INFERRED BY COPROLITE PHYTOLITH ANALYSIS FROM ARGENTINE PATAGONIA

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Knowing about past biological interactions is possible thanks to the study of coprolites found in archaeological sites. Evidence of herbivores consumption by omnivorous organisms was found in Patagonia through bone remains studies. With the aim to recognize the limitations and potentialities of the phytolith analysis to infer predator-prey relationships, a comparative analysis among the content of phytoliths obtained from omnivores and herbivores coprolites was performed. The coprolites were found in the archaeological site Cerro Casa de Piedra 5, Perito Moreno National Park, Patagonia, Argentina, in an archaeological layer dated to 7,402 cal BP. According to their morphological features and content, the coprolites were assigned to omnivores organisms and camelids. Samples were rehydrated, filtered, concentrated, dried, and mounted in immersion oil. Counting and identification of phytoliths were made under optical microscope. The results showed the dominance of phytolith association of the subfamily Pooideae in the omnivore and camelid coprolites suggesting that the grasses were part of the diet of these organisms. This result was even confirmed through pollen and plant remains analyze. Also, isolated and articulated phytoliths and preserved silicified cells within the producing plant tissue were observed in camelid coprolites, while in omnivore samples only isolated phytoliths were observed. The presence of isolated phytoliths in these last samples could indicate that the phytoliths consumed could have been subjected to alteration processes, such as chewing, food processing prior to consumption, digestion or were indirectly incorporated by the consumption of guanaco viscera, exposing phytoliths on more than one occasion to the alteration processes. Future studies on the gualitative and guantitative production of phytoliths in species linked to the diet of herbivores and omnivores as well as on the effects of taphonomic processes from the digestive systems of consumers may contribute to the knowledge of past biological interactions.

Keywords

Coprolites, Phytoliths, Argentina