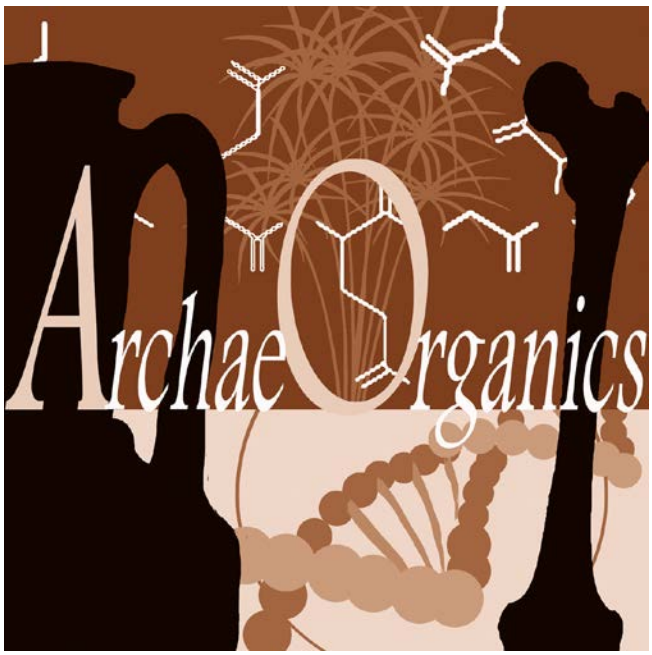

Abstracts

Elite food between the late Middle Ages and Renaissance: some case studies from Latium

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The study of plant and animal remains from archaeological sites provides important evidences on past human diet: these include species selection, food preparation practices, consumption, and discard; furthermore, information on social status may also be inferred from organic materials recovered during archaeological excavations.

Data from some elite residences, two in Northern Latium (Celleno and Graffignano) and one in Rome (Ss.Quattro Coronati complex), allow to explore, using archaeobotanical, zooarchaeological as well as genetic data, different ways people used to express wealth by means of food between the late Middle Ages and Renaissance.

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Eating, a moment of sharing. The reconstruction of dietary habits through stable isotopes analyses to interpret the social issues of Italian Copper Age.

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Although the amount of data on the Italian Copper Age has increased significantly in the last decades, little is known about the communities-territory relationship. The material culture suggests the occurrence of intense social interactions throughout the Italian Peninsula, while the funerary ritual indicate that Copper Age groups were strongly rooted in their territories. This is evidenced by clustering of burials within necropolises, which were utilised for centuries, and are rarely found in association with settlements. The graves are often collective, with secondary burials, suggesting connections among individuals. The grave goods show a general standardisation, that rarely emphasise differences between the individuals.

We attempted to define the relation within Copper Age groups by investigating one of the most important culture-related aspects of a society: dietary practices. These will be addressed through stable carbon and nitrogen isotope analysis on human bone collagen from some central and southern Italian Copper Age sites.

The preliminary results show a homogeneity in the dietary habits, which appear to be in contrast with some funerary data, and indicate a reliance on the surroundings for subsistence, suggesting how isotopic studies could document and improve some archaeological interpretation, otherwise difficult to demonstrate.

Woodland use and agri-food production in Tyrrhenian southern Tuscany during the Middle Ages (650-1300 AD): new insights from the ERC-2014-ADG nEU-Med Project

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The ERC-2014-ADG "Origins of a new Economic Union (7th to 12th centuries): resources, landscapes and political strategies in a Mediterranean region (nEU-Med)", is part of the Horizon 2020 programme. Hosted by the University of Siena, the project is focusing on understanding the form and the timeframe of the cultural and economic growth between the Early and Late Medieval periods in central Italy, by a careful analysis of the changes in the human settlements and in the natural and farming landscapes, in relation to the exploitation of resources and the implementation of differing political strategies. The study area is the south-western Tuscany, between the Colline Metallifere, the valleys of the Cornia and Pecora rivers and the Thyrrenian coastal area from the Gulf of Follonica to the Promontory of Piombino. The local environmental features (lagoons and river valleys accessing to the sea) and natural resources (salt, woodland, ore deposits) have affected the project promoting archaeobotanical analysis on plant macroremains to investigate the evolution of the landscape in order to reconstruct uses and changes of the forest and agricultural resources. Through archaeobotanical analyses, the nEU-Med Project aims to study when and why these changes occurred and the role played by the agroforestry production in the processes leading to the Late Medieval economic growth.

Application of Nd isotopic ratio to the analysis of archaeological remains: the case study of the Fewet necropolis (Saharan Libya)"

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Isotopic methods have become a very important tool in archaeological and, more recently, forensic study. Radiogenic isotopes, such as those of Sr measured in skeletal human remains, reflect the isotopic signature of the environment in which the individual lived and his diet. However, sometimes, the isotopic signal can be obscured for different geographic areas share similar isotopic characteristics, thus resulting in poor provenance discrimination. Therefore, for a better identification of mobility profiles, additional constraints are requested. One may use a multiple isotopic approach, such as, for instance, Sr and Nd isotopes which provide complementary information improving the geological control. However, currently, Nd isotopes are not extensively applied to study human remains, in particular teeth, as these latter generally contain low concentrations of Nd. Moreover, bone diagenesis during burial can represent an additional problem, as Nd is quoted to enter quickly bone post-mortem, thus altering to some extent the Nd isotopic signal. Within the framework of the Archaeological Mission of Sapienza University of Rome in the Libyan Sahara, the 87Sr/86Sr and 143Nd/144Nd isotopic ratios of human diagenized bones and teeth have been determined and compared with those of undiagenized modern ruminant bones and soil extracts from the Garamantian oasis of Fewet. The very good positive correlation between Sr and Nd isotopic ratios of bone and tooth enamel from the same human individual has indicated a weak diagenesis of bones. Notwithstanding, the human bones have likely preserved their original (in-life) 143Nd/144Nd ratios, which are similar to those of the local geological substrate, suggesting a local provenance for the studied individuals. This suggestion has been corroborated by the comparison of isotopic data with those of modern undiagenized ruminant bones.

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Le informazioni che non vanno in fumo. Nuove prospettive di ricerca sui contesti a cremazione

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Per archeologi e antropologi i resti umani cremati oggi non sono più considerati come in passato un materiale "minore" dallo scarso potenziale informativo. Per quanto "depotenziate" dall'effetto distruttivo del fuoco su ossa e denti, le analisi osteologiche rimangono un momento fondamentale per una più profonda comprensione dei rituali e delle dinamiche bioculturali delle comunità del passato. In questa prospettiva, gli avanzamenti metodologici e tecnici degli ultimi anni consentono di ricavare dati quali i comportamenti rituali, il sesso e dell'età alla morte con metodi sempre più standardizzati, la mobilità, la caratterizzazione genetica e la datazione radiometrica.

In questo contributo si presentano i risultati delle più recenti ricerche condotte su questo tipo di materiale presso il Servizio di Bioarcheologia del Museo delle Civiltà. In particolare, viene discusso il nuovo metodo osteometrico di supporto all'analisi morfologica per la determinazione del sesso, basato sulla misura di 24 diversi tratti anatomici su 124 individui con corredo fortemente indicativo del genere, da siti italiani dell'età del bronzo e del ferro (Le Narde di Frattesina, Chiavari, Castenaso, Narce, Pontecagnano). Lo studio dimostra che, nonostante le variazioni volumetriche indotte dal calore, il grado di dimorfismo sessuale dei resti cremati rimane sostanzialmente inalterato e mostra una elevata correlazione con il genere archeologicamente definito.

La possibilità di ottenere diagnosi di sesso rafforza gli studi sulle dinamiche di mobilità del passato, linea d'indagine portata avanti dal Servizio di Bioarcheologia per alcuni contesti protostorici, tra i quali, Pithecusa, Cuma, Le Narde di Frattesina. Per quest'ultima necropoli del Bronzo Finale si presentano i risultati delle analisi isotopiche dello stronzio (87Sr/86Sr) su un campione di 50 individui cremati e inumati. I dati indicano un'intensa mobilità nell'ambito dell'hinterland, soprattutto degli individui con un corredo più ricco, mentre i più "poveri" appaiono del tutto indigeni.

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Morphotypical characterization of the medieval dog found in the Castle of Santa Severa (Latium, Italy)

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Between 2003 and 2009, several soundings and excavations were carried out within the Castle of Santa Severa in various sectors of the citadel and the village (Enei 2013).

In particular, the remains of an early Christian church, partially hypogean, were identified in the Piazza della Rocca under the modern pavement. This church was built starting in the second half of the 5th century. During the second half of the 14th century, when the castle was owned by the Bonaventura and Venturini, the walls of the church were partially leveled and the interior was filled with several dumping layers , containing archaeological and osteological materials that allowed to reconstruct the history and the daily life of the castle between the 13th and he mid-14th century (Fatucci, Cerilli 2016).

The castle refurbishment could be related to the disastrous consequences of the plague that swept Italy and Europe between 1348 and 1350, resulting in the decline, collapses, fires and improper uses of the internal structures of the castle.

During the investigations inside the church and along its northern wall, the skeleton of an adult dog (Canis familiaris) was found in the same alignment and within the same depositional horizon of two burials of adult men. This dog skeleton was in complete anatomical connection and placed on its right side (fig 1).

The direct radiocarbon dates on the human skeleton placed near the dog skeleton, indicate that the burials occurred in a range between 1380 and 1450, just before the leveling of the walls of the church and the completion of the refurbishment of the castle.

The skeletal elements of the dog were analyzed from an anatomical, morphological, biometric, and taphonomic point of view.

The biomorphometric parameters indicate that it was an adult individual, with fairly pronounced height at the withers and slender proportions.

The presence of some cut marks produced by a metal tool, identified on some metapodials, allows to suggest that the animal had been skinned before the burial.

The multivariate analysis on the biometric parameters of the skull and of the bones of the appendicular skeleton, compared to those of numerous modern canine breeds (cluster

analysis, PCA, PCoA) allowed to advance hypotheses on the type and appearance of the dog which was probably similar to a greyhound..

The iconographic search of the artistic representations of dogs (e.g., frescoes, paintings, miniatures) produced in the centuries around the date of the dog burial, showed that the greyhound morphotype was well known and used in various human activities during that time.

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Macromolecules in Archaeology

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Since ancient times, a wide variety of natural organic materials have been used as adhesives, sealants, painting and coating materials. Proteins, oils, gums, natural resins and resinous materials played a prominent role, since their intrinsic properties meant that they could be used not only as painting materials, adhesives, hydro-repellents, coating and sealing agents, but also as flavours, incense, ingredients for cosmetics, medicines and mummification balms. The chemical characterization of such organic materials when properly integrated with related information from historical sources and archaeological data, has in the last few years considerably improved our knowledge of painting techniques, crafts and technologies of the past, and has provided archaeologists with valuable information. In fact, identifying specific materials from molecular patterns helps in assessing the role that these substances played and in determining the use of artifacts on which these residues survive.

The characterization of organic materials in archaeology is a challenge for a chemist, due not only to the complexity of the chemical composition of the natural substances that may be present alone and in mixtures, but also to changes in the chemical composition as a consequence of human activities. For instance, heating processes applied to plant resins deeply modified their chemical composition, inducing aromatisation, demethylation and decarboxylation reactions with formation of new species. Moreover, degradation due to ageing under the influence of different environmental circumstances or improper storage leads to further changes in the composition of the original materials.

This lecture outlines the analytical procedures based on mass spectrometric techniques applied to archaeological samples. In particular, analytical pyrolysis (EGA-MS and Py-GC/MS), and gas chromatography/mass spectrometry (GC/MS) will be discussed highlighting their abilities in solving complex molecular mixtures and in achieving reliable results.

Case studies are herein presented where the identification of materials is based on the detection of both molecular fingerprint and the presence of specific molecular biomarkers which have survived ageing or which are formed over the centuries as stable products of ageing processes. In particular, it will be shown the detection of lipids

derived from ergot fungi (genus Claviceps) in archaeological vessels, providing a unique and relatively recalcitrant chemical signature for cereals.

Hidden foods, health and lifestyles in the Mesolithic Balkans: Dietary debris and microbiota in mineralised dental calculus

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Advances in bioarchaeology have challenged persistent narratives of hunter-gatherer diets dominated by protein intake. There is a growing evidence for the persistent role of plant foods in dietary strategies of pre-agrarian groups. Recently, analysis of dental calculus has shown its potential when reconstructing diet, health and non-masticatory activities through the identification of organic remains and ancient microbiota.

Here, we discuss the results of the microscopic and metagenomic analyses on the dental calculus record of 48 individuals from 4 different sites from the Danube Gorges area in Serbia. We take a long-term diachronic perspective—from the start of the Holocene up to the period of forager-farmer interactions at the end of the seventh millennium cal BC. Evidence from dental calculus complements the available genome-wide data for the same pool of individuals as well as organic residues from lithic technology used at the sites for processing foods. Our results indicate that in the course of the Early Holocene, local foragers used a specific range of wild edible and medicinal plants. This familiarity with and knowledge of a spectrum of plant species might have played a role in enabling the introduction and swift acceptance of domesticated plant foods towards the end of the Mesolithic.

Ab Urbe condita: biomolecular evaluation of Ancient Romans.

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Imperial Rome was by far one of the largest city of the European Antiquity and despite the plentiful cultural records, the biological profiles of Imperial Age Romans (1st-3rd centuries CE) is still a partially matched issue. The outstanding developments in archaeo-anthropological research make the skeletal remains a terrific source of knowledge to reconstruct the biology of the Romans to be accordingly framed by historical sources on their lifestyle and society.

The ancient biomolecules are powerful tools for reconstructing crucial aspects of the history of Rome communities as well as their ecological and genetic structure.

One of the main topics to be addressed by molecular assessment is the nutritional habits through isotopic analysis: the data pertaining more than 300 people buried in the Suburbium are consistent with a heterogeneous landscape where each community seems to be featured by private foodstuff exploitation, even though Roman authorities started to step in food supply of the City since the mid-Republican period. As the center of the Empire, Rome appealed to people into its walls to gain better life conditions. Imperial Rome should have had a dense population and at least moderate migration rates that helped to combat the extremely high mortality rates: the oxygen isotopes analysis performed in more than 100 samples seems to confirm this moderate migration rate at least in the commoners, with an average value of 10% newcomers in several necropolises. Genomic evaluation of ancient Romans is a main task for accounting the population stratification. Whole genome sequences by Next Generation Sequencing approach have been gained in selected samples: the analysis, along with strontium and oxygen isotopes data, are starting to shed light on people origin and this genomic approach stands for a valuable tool in the differential diagnosis of specific genetic-related disorders some people suffered from in Ancient Rome.

A new archaeobotanical and isotopic database of vegetation in the Vesuvian archaeological area

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The eruption of Vesuvius of 79 AD caused extensive destructions all over the ancient Campanian area, burying the cities of Pompei, Herculaneum, Oplonti and Stabiae. The circumstances of their destruction preserved their remains as a unique document of Greco-Roman world. Archaeobotanical remains coming from this area are today stored in the Museo Archeologico Nazionale di Napoli (MANN): it is an extraordinary and unique collection includes thousands of botanical samples. The identification of the botanical remains is almost complete and about 30 species of plant for alimentary use are counted. Our project aims to realize a complete archaeobotanical and isotopic database of the cultivated plants in roman epoch, which can be an important source of information for analyzing the diet of the population in this historical period.

Identifying non-locals in the Italian Copper Age cemetery at Pantano Borghese (Rome)

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The isotopic ratio of strontium 87Sr/86Sr, measured by Thermal Ionization Mass Spectrometry (TIMS), was used to highlights the mobility patterns of an Italian community of the 3rd millennium BC. In nature strontium has four stable isotopes: 88Sr, 87Sr, 86Sr and 84Sr. Three of them (88Sr, 86Sr and 84Sr) are non-radiogenic, while 87Sr is the product of the spontaneous β-decay of 87Rb, which turns into 87Sr with a half-life T 1/2 of ~4.7x1010 y. The strontium isotopic composition in soils depends therefore on the age and on the composition (Sr/Rb ratio) of the soil. Variations in the Sr/Rb system can generate differences in the 87Sr/86Sr ratio both on a global and local scale. These small differences can be used to determine the geographical origin of individuals, given that biological processes, such as metabolism, do not significantly fractionate strontium isotopes1 and that the 87Sr/86Sr ratios on samples reflect the sources of strontium available during their formation2. In this study 13 human teeth and 4 samples of local markers (fauna and geology) from Pantano Borghese have been analyzed. The Copper Age cemetery at Pantano Borghese (Rome)3 has been chosen for its significant quantity of archeological and anthropological data, as well as for the good preservation of the human and faunal odontoskeletal remains.

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Putting ancient human remains in context: archaeological, palaeopathological and ^{14}C observations on cases spanning 6,000 years

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The multidisciplinary study of skeletonized ancient human remains is remarkably corroborated by the implementation of radiocarbon-dating which, together with data derived from material culture, helps contextualizing relevant bioarchaeological and palaeopathological discoveries. In this talk we examine the diagnostic workflow and the crucial role played by ^{14}C dating in three recent investigations. The first case is represented by a Neolithic skeleton from Caltagirone (Catania, Sicily) dated back to 4134-4057 BC (5th millennium BC), characterized by multiple skeletal lesions including multiple cysts and an anemic habitus. The second example, another poorly preserved Sicilian skeleton from Pianotta di Calatabiano (Catania), dating 418-536 AD (5th-6th centuries AD) presents both a unique benign oncological manifestation, namely an osteoid osteoma of the frontal sinus, until recently not detected in the antiquity, and a large bregmatic bone, whose relevance in medical anthropology and the history of pharmacology is examined. Finally, the notable case of the previously presumed mortal remains of Domenico "Novello" Malatesta, the Renaissance lord of Cesena (1418-1465 AD) are anthropologically and chemically demonstrated not to be authentic as C14 yielded an earlier dating, 1184-1298 AD.

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Dentine microsections reveal diachronic changes in life history adaptations in prehistoric Liguria (Italy, northwestern Mediterranean)

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Our study investigates changes in diet, life history parameters, and mobility among early agropastoral communities in Liguria, from the Impresso-Cardial Complex and Square Mouthed Pottery Neolithic to the Iron Age (6th-1st millennium BCE). Seven developing permanent teeth belonging to individuals ranging from 4 to 15 years of age have been analysed via carbon, nitrogen and sulphur stable isotope analysis on dentine microsections, providing information from c. 1 year of life up to the moment of death. In addition, this work evaluates for the first time the potential to infer diet and geographic origin from the application of sulphur isotope ratios to high-resolution data from dentine. All individuals have been directly dated, and all come from neighbouring sites in the Finalese region (Arma dell'Aquila, Grotta delle Arene Candide, Arma delle Anime, Arma dei Parmorari), allowing for a diachronic evaluation within the same environment. Results evidenced a dramatic difference between the Neolithic and the Metal Ages in the pattern of changing isotopic ratios during development. Overall, isotopic ratios suggest that Neolithic people may have been breastfed longer, into the third year of life, and that animal proteins were used as weaning food. This is consistent with human reproductive strategies attempting to maximize the weanling immune protection and growth in a highly infectious environment, which is suggested by numerous cases of tuberculosis found in the Ligurian skeletal series. Conversely, with the Bronze and Iron Ages, weaning happened significantly earlier, and plant protein were used. This may be explained by the development of agricultural practices and by the probable introduction of higher quality plant-based weaning foods as millet. Finally, our study suggests a local origin for the Neolithic individuals, and increased mobility in the Bronze and Iron Ages.

The project BUR.P.P.H: Burial practices at the Pleistocene - Holocene transition: the changing role of pathology, violence, and “exceptional events” (VSS) has received financial support from the French State in the framework of the “Investments for the future” Program, IdEx Bordeaux, reference ANR-10-IDEX-03-02. The project DEN.P.H.: Dental anthropology at the Pleistocene-Holocene transition – insights on lifestyle and funerary behaviour from Neolithic Liguria (Italy) (ID) is funded by the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 752626.

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Identification of the residues in the glasses found in Santa Maria Antiqua al Foro Romano in Rome

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Different beautiful glasses of different colours were retrieved from the ruins of Santa Maria Antiqua al Foro Romano in Rome. Residues in the form of incrustation on the walls of the glasses, were analysed by pyrolysis gas chromate graphy-mass spectrometry. Different organics have been found. The results of the experiments will be given in this presentation.

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At the origins of starch diet. A multidimensional approach to investigate use-related biogenic residues on stone tools

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Among the constraints affecting dietary energy balance during the Late Pleistocene, the uneven representation of the putative food resources has to be accounted. Animal bones (inferring proteins and fats rich diets) and stone tools are evident and lasting compared to perishable vegetal foods, sourcing for calorific carbohydrates.

We report on use-related biogenic residues recognized and extracted from grinding stones dating back to Early Upper Palaeolithic (EUP): tubers and roots were processed by Homo sapiens while colonizing Eurasia, supplying calories to maintain homeostasis during the MIS 3 climatic downturn.

Our multiproxy protocol, optical and SEM microscopy together with FTIR analysis confirmed the presence of starch granules, modified by the mechanical action procured by the grinding activities carried out in two EUP sites: Brinzeni I (Moldova) and Surein I (Crimea). Signals compatible with spectral feature of amylopectin at 1620 cm-1 had been identified at SISSI-Chem beam-line (ELETTRA Sincrotrone). The isotopic characterization of bones collagen from the sites, by means of IRMS analysis, is informing on the photosynthetic pathways of the plants available during the colder stages of MIS 3. C3 and C4 plants show different nutritional compositions and digestibility (dietary carbohydrates and proteins), as source of food for both humans and animals.

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State of the art Isotope Ratio Mass Spectrometry (IRMS) applied to the analysis of organic materials in archaeological sciences

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Several analytical techniques such as aDNA, residue analysis, dating, archaeobotany and zooarchaeology are applied to the analysis of organic materials in archaeological sciences. Isotope Ratio Mass Spectrometry (IRMS) is a particularly efficient technique when it becomes necessary to distinguish between the sources (what from) and between the origins (where from).

The isotope ratio fingerprinting is based on the analysis of small isotopic differences in compounds in order to determine the relative isotopic abundances of elements such as C, N, O, H and S contained in the material. The measured isotopic differences are originating from the physical and biochemical isotope fractionation occurring in nature.

For instance, isotopic ratios are providing information about the original source and the biochemical and environmental origins of substances. They also offer paleodietary information from body tissues.

The purpose of the presentation is to explore and to illustrate the state of the art in Isotope Ratio Mass Spectrometry applied to analysis of organic materials in archaeological sciences.

Recent advances in instrumentation and in applications will be highlighted.

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Analyzing maternal diet, infant feeding and weaning via histologically-defined, spatially-resolved compositional profiles of human dental enamel

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Deciduous dental enamel represents a biological archive of individual growth, well-being and diet from the intra-uterine life to the first year of age. The sequential nature of enamel secretion/mineralization allows to define the chronology of compositional patterns at high time-resolution through the combined use of histology and LA-ICPMS analyses (laser-based mass spectrometry).

In this contribution we present how it is possible to extract dietary information from a set of deciduous teeth from both modern individuals with known feeding histories and infants from archaeological horizons. In all deciduous crowns, Sr/Ca and Ba/Ca indicate dietary information, Zn/Ca signals enamel mineralization, Pb/Ca environmental pollution and U, Ce and Y are used as indicators of post-mortem alteration (diagenesis). Results show that variation in the compositional profiles records well the individual dietary life histories. However, the complex process of enamel secretion and mineralization can overprint the dietary signal, unless attention is paid in selecting the sampling region of the crown, namely closest to the enamel-dentine-junction.

Such compositional changes coupled with histologically-defined chronologies in the deciduous dentition offer a unique window on the maternal diet (proxied by the prenatally formed enamel), on the infant's early feeding history, and on the onset of weaning.

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The transport of goods. Achievements, problems and perspectives in the organic residue analysis of amphorae.

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Amphorae are e very important product for the study of ancient trade and economy. Organic resdue analysis carried out during the last years have provided new data that allow a deeper understanding of the use (and re-use) of these containers. Examples taken from different case study will be used to show the potentials and limits of this approach. The presentation is part of the RACAMed project financied by the Spanish Ministery.

L'evoluzione del percorso archeologico verso la Archaeological Science

Juan Antonio Quirós Castillo

Università dei Paesi Baschi

Il seminario intende analizzare il percorso intellettuale, metodologico e teorico che ha seguito la pratica archeologica nel sud dell'Europa negli ultimi decenni, in relazione alla crescente centralità delle science esperimentali, alla loro evoluzione e alle variegate applicazione in siti archeologici. L'archeologia delle società storiche è nata in stretto rapporto con le discipline umanistiche, quali la storia dell'arte o la storia sociale, mantenendo una certa distanza, se non diffidenza, rispetto al ruolo delle discipline archeometriche. E anche se non sono mancate figure di spicco che hanno contribuito in modo decisivo alla costruzione di ponti fra le due aree di studio, prima fra tutti Tiziano Mannoni, solo negli ultimi anni si è creata una nuova spinta culturale e si sperimentano nuovi approcci comuni, anche grazie al forte influsso dell'esperienza anglosassone nel settore.

L'intervento si focalizzerà su tre tematiche principali: i) le sfide di carattere teorico presenti nei contesti archeologici e la cui soluzione suppone la crescente rilevanza dell'"archaeological science"; ii) il problema della formazione e l'organizzazione accademica; iii) gli aspetti metodologici e pratici che sono alla base del disegno sperimentale di progetti archeologici capaci di costruire record complessi sfruttando a pieno le potenzialità delle *Archaeological Science*.

Questi percorsi saranno illustrati attraverso la presentazione di diversi progetti condotti da recente, sia in Spagna che in altri siti del sud d'Europa.

Assessing harvesting strategies in western Italy through isotope archaeobotany

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Stable isotope analysis of archaeobotanical remains is a promising research tool for reconstructing past agricultural strategies, such as amendment (e.g. manure) and watering practices. This study aims to shed light on agricultural strategies and environment from the Copper to the Iron age in Italy (c. 3300–400 BC) using four sites samples in Liguria (north-western Italy). Archaeobotanical remains consisted of different cereals (e.g., wheat, barley) and pulses (e.g., bean, lentil, ervil).
Carbon, nitrogen and sulphur stable isotope analyses were performed predominantly on well-preserved samples. Data analysis shows that different agricultural strategies were employed at each site: in fact, even though there is a general increase in nitrogen isotopes and hence the application of manuring through the study interval, we highlight a diversity in cultivation strategies depending on the site. This outcome is more evident when considering results diachronically within each site. Furthermore, plant carbon isotope discrimination (Δ13C), has been generated for each site and indicate that the cultivated plants were moderately to well-watered in all the chronological phases. It should be noted that although there is complexity when comparing sites from the same designated period, each site should be considered individually.

The project Metal.LI (Food and society. Reconstructing lifestyle, diet and mobility during the Metal ages in Italy (AV) has received financial support from the Junior Research Fellowship (Marie Curie COFUND), Stable Isotope Biogeochemistry Laboratory (SIBL), University of Durham (UK) and from the Museo Civico di Sanremo, Imperia.

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The application of stable isotope analysis to archaeobotanical remains: a view from Turkey

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Water availability and soil fertility were the main factors conditioning ancient agricultural practices in the Mediterranean basin. The analysis of stable carbon and nitrogen isotopes on cereal remains is one of the main supports to the archaeobotanical research for the reconstruction of water and nutrient sources for grain filling. The stable carbon isotopes on wood remains also reveal fluctuations of the past climate. Thus, the complementary isotopic study of both cultivated and wild plants from archaeological sites may distinguish natural changes from human choices in agriculture.

We present the first multi-millennial agronomic and environmental reconstruction based on stable isotope data in Turkey. The isotopic composition of barley, emmer and wheat grains has been analysed from 4700 to 2000 BCE levels at the site of Arslantepe and joined with the isotope values of juniper and oak trees from the same contexts. It is evidenced that irrigation and manuring were supplied, especially to barley, when the Arslantepe early-state of the late-4th millennium BCE needed to foster this crop and to cope with reduced precipitations. From 3000 BCE an intercropping cultivation (cereal-legume) is inferred during wet conditions, suggesting the increase of pasturelands by herders and the concentration of crop fields around the site.

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Project nEU-Med: the contribution of isotopic analysis in the differential diagnosis of anemia, the case of the medieval cemetery of Vetricella (Scarlino, GR)

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Nell'analisi antropologica di un campione scheletrico, l'iperostosi porotica, nelle due forme di cribra cranii e cribra orbitalia (Walker et al., 2009) viene rilevata come indicatore di stress. La causa è una patologia metabolica caratterizzata dalla diminuzione del numero di globuli rossi o di emoglobina nel sangue: l'anemia. Questa alterazione può essere legata a stati anemici con diversa eziologia, come anemie emolitiche ereditarie, anemie conseguenti a malattie infettive o parassitarie, anemie da carenza di ferro o anemie megaloblastiche.

Nel campione di 51 individui provenienti dal sito archeologico di Vatricella (Scarlino, GR), l'analisi è stata eseguita su tutte le orbite presenti (cribra orbitalia) e su tutte le ossa parietali osservabili (cribra cranii) ed ha restituito percentuali particolarmente alte di incidenza di iperostosi porotica.

Un'analisi differenziale tra anemia metabolica e anemia congenita è indispensabile nello studio di questa condizione, considerando la presenza in queste aree del Plasmodium falciparum e della possibile conseguente diffusione del gene della talassemia, in questa come in altre zone d'Italia.

L'analisi degli isotopi stabili per la dieta è un importante elemento da prendere in considerazione in una diagnosi differenziale di questo tipo, per mettere a fuoco il tipo di alimentazione della comunità in esame. Questo potrà essere d'aiuto per confermare carenze nutrizionali nel caso di anemia acquisita o, eventualmente, escluderle nel caso di anemia congenita.