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ABSTRACT BOOK

MARCH 8th - 9th 2021

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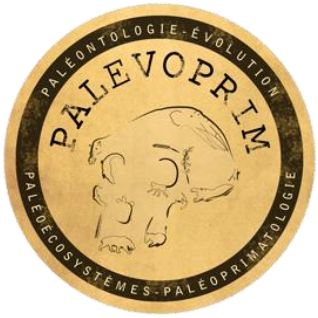

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1ST VIRTUAL CONFERENCE FOR WOMEN

ARCHAEOLOGISTS AND PALEONTOLOGISTS

New insights on past populations and environments

MONDAY, MARCH 8th

Session 1 - Morphological variability, taxonomy and adaptations

Virtual reconstruction of the torso of the genus *Homo* using 3D geometric morphometric techniques

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Keywords: Covariation; Integration; Prediction; Fossil; Landmark

Abstract

In 1961, the anthropologist A.H. Schultz first documented that "*the last few ribs are more curved in man than in the great apes to conform with the direction and curvature of the ilia which have become bent and rotated in man in contrast to their dorsal position in the apes*". This and subsequent studies reinforced the idea that the thorax, spine and pelvis compose a morpho-functional complex –the torso– that is integrated in primates, with morphological changes of some structures being linked to morphological changes in others (morphological covariation). Magnitude of integration and patterns of covariation are influenced by different factors, such as posture, mode of locomotion, sexual dimorphism and allometry, and examining these factors is important for understanding the body shape of extant hominoids and for reconstructing the body shape of extinct hominins. The aim of this talk is to present the final results of the PhD entitled "Virtual reconstruction of the torso of the genus *Homo* using 3D geometric morphometric techniques", which has four research aims: (1) to assess thoraco-pelvic covariation patterns in adult *H. sapiens* with special attention to the role of sexual dimorphism, a factor that significantly influences the thorax and pelvis morphologies; (2) to compare these covariation patterns with those of *Pan troglodytes* in order to identify species-specific patterns as well as common and conserved patterns throughout the human lineage; (3) to use *H. sapiens* covariation patterns in order to validate a statistical method to predict the thoracic morphology of a well-known *H. neanderthalensis* fossil from its pelvic morphology; (4) to perform the first quantitative reconstruction of the torso of KNM-WT 15000 (*H. ergaster*, dated to 1.6 Ma) in two steps: thorax reconstruction using virtual anthropology techniques and 3D geometric morphometrics, and lumbo-pelvic system reconstruction using the predictive method validated in this dissertation.

Sensitivity analysis to morphological changes of the shoulder joint: application to percussion gestures during Oldowan debitage

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Keywords: stone tool manufacture; palaeoanthropology; musculoskeletal modelling; form-function relationship; biomechanics

Abstract

Although stone tool use and manufacture played a major role during human evolution, the impact of those behaviours on hominin morphology has not yet reached consensus. In this context, the architecture and proportions of the shoulder in early representatives of the genus *Homo*, which consist mainly of three characteristics (i.e. low humeral torsion, relatively short clavicle and broader thorax which induced a more lateralised scapula), is of prime interest since this joint is hypothesised to have been constrained by those behaviours. To discuss the potential adaptive advantages of the shoulder in early *Homo* in the context of stone tool making, we assessed the impact of its particular anatomy on muscular forces by mean of musculoskeletal modelling. Metric and angular data collected from extant and extinct hominins and from the literature were used as reference. Upper limb kinematics of free hand lithic debitage (Oldowan context) carried out by an experimental archaeology expert were recorded using an optoelectronic motion capture system (Oqus, Qualisys). The previously characteristic morphological variations of the morphotype of an early *Homo* member were implemented on a human musculoskeletal model. All the combinations of morphological traits were tested, resulting in 27 models. Muscle forces were computed using inverse kinematics and dynamic optimization. Our results show that the clavicle shortening would disfavour the pectoralis major and subscapularis actions, whereas the thoracic broadening disfavours indirectly subscapularis action for internal humeral rotation at least. The role of lower humeral torsion is less clear: it would favour deltoid and supraspinatus for glenohumeral abduction and disfavour infraspinatus for external rotation. This sensitivity analysis, in this limited frame (muscles selected, morphological traits considered and implementation method) suggests that the relatively short clavicle in relation to the relatively broad thorax of early *Homo* may disfavour some percussion gestures. More generally, these results exemplify the benefits of biomechanical simulation for a better understanding of the form-function relationships of extinct hominin shoulders.

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Ouranopithecus macedoniensis (late Miocene, Greece): analysis of mandibular fragments using 3D geometric morphometrics

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Keywords: Hominoid evolution; Miocene hominoids; mandibular variation; sexual dimorphism; virtual anthropology

Abstract

Material belonging to the late Miocene hominoid *Ouranopithecus macedoniensis* has been poorly analyzed using advanced techniques. This study aims to explore mandibular shape variation between *Ouranopithecus macedoniensis* and a comparative sample of extant great apes, using three-dimensional (3D) geometric morphometrics. Additional aims include examining homogeneity within *Ouranopithecus*, especially as it relates to sexual dimorphism, and in comparison to those of the extant great apes. Lastly, we address the effects of size-related shape differences among taxa. Apart from four *Ouranopithecus* partial mandibles, which preserve both corpora and the symphysis (two female and two male), the comparative sample consists of digitized mandibles from adult extant great apes (*Gorilla*, *Pan*, and *Pongo*). The analysis includes the registration of 3D landmarks on the mandibular body and the hemimandible. Multivariate statistical analyses were conducted, including ordination analyses, intra- specific Procrustes distances pairs, pairwise male-female centroid size differences, and correlation analyses. Our results showed that the mandibular shapes of the male and female specimens of *Ouranopithecus* are quite similar, although they differ in size. *Ouranopithecus* also showed some similarities in mandibular shape to the larger great apes, *Gorilla,* and *Pongo*. Additionally, *Ouranopithecus* displays a similar – and possibly even greater – degree of sexual dimorphism to *Pongo*. Lastly, the results of our correlation analyses indicated that some PCs were significantly correlated with size, while the degree of correlation varied from moderate to substantial. This study suggests that some of the mandibular morphological similarities of *Ouranopithecus* to the larger great apes may reflect similarities in size. Despite the presence of sexual dimorphism in size, the shape of the mandibular body is homogenous between male and female *O. macedoniensis*.

This work was supported by the Senckenberg Gesellschaft für Naturforschung, the Leventis Foundation, and the Deutsche Forschungsgemeinschaft (DFG INST 37/706-1).

Comminution capabilities of extant and fossil anthropoids during molar intercuspation: a preliminary experiment using a chewing simulator

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Keywords: chewing performance; molar; primate; diet; early hominins

Abstract

Mammalian teeth and especially molars play a key role in food fragmentation through cyclic dental occlusion during chewing. Mammals fragment food items with various degrees of efficiency depending on their dental morphology. This implies a potential adaptive link between dental morphology and its capability to fragment consumed food items. Understanding dental evolutionary history thus requires to discern which food items, if not all, induce selective pressures on teeth.

While molar morphology is expected to influence chewing efficiency and thus the amount of assimilated nutrients, distinct dental occlusal patterns are expected to perform better with particular food items. Testing this hypothesis requires to measure the contribution of the components of chewing and an assessment of chewing efficiency in food fragmentation.

Here, we present a preliminary experiment of comminution capabilities in catarrhine primates using a chewing simulator (BeA). This study aims to test the effect of molar morphology during centric occlusion, between phases I and II, i.e. at maximal intercuspation with little or no shearing and grinding, on the comminution of five different food items, which correspond to different mechanical challenges encountered by extant catarrhines in the wild. Using the chewing simulator, we experimentally measure the number of food fragments produced after 5 successive intercuspations in catarrhines displaying different dental occlusal patterns when they consume ductile and tough foods (*Procolobus verus, Theropithecus gelada* and *Gorilla b. graueri*) and brittle foods (*Homo sapiens*).

We show that increasing bite force results overall in higher food item degradation, but exceptions are reported notably for ductile and soft foods (apples, gingers and leaves). Intercuspation contributes to the fragmentation of food during the chewing cycle, cusp interlocking fragments brittle and complex food (hazelnuts and crickets). This preliminary experiment sheds light on masticatory capacities of various occlusal patterns in primates and our ability to test these with robotics.

Who is the island dwarf deer? a geometric morphometric approach to determine the taxonomy of playa don Bernardo preceramic deer

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Keywords: Dwarf deer; Preceramic; Panama; Pearl Island Archipelago; Geometric morphometrics

Abstract

The archaeological site of Playa don Bernardo is located on Pedro González island at Pearl Island Archipelago in Panama. This site was inhabited between 6200-5600 cal yr BP. They were farmers who cultivated maize and root crops. When they reached the island they found a local dwarf deer (< 10Kg) population. The archaeological record evidence that dwarfed deer was the most abundant terrestrial mammal in the assemblage. Also that, the island's inhabitants consumed venison and used deer bones to make ornaments and tools. Deer remains decreased across time, with none remaining at the end of the human occupation. The taxonomic identification of the dwarf deer is not clear, collagen fingerprinting analysis shows that the archaeological deer fingerprints do not derive from extant Panamanian *Mazama temama* but from a group of taxa that includes the *Odocoileus virginianus* and Colombian populations of *Mazama*. The PDB fingerprint match whit the collagen samples from San José Island. The aim of this presentation is to explore the taxonomy of this dwarf deer through the use of geometric morphometrics by comparing the lower third molar of the archaeological samples with extant *Mazama* and *Odocolileus* from museum collections. The results suggest that the species of deer that inhabited PDB was related to *Mazama americana*. It cannot rule out that PDB deer was the dwarf form of this species. It could be very interesting to study morphometrically the deer population at San José in order to understand the dwarfism process in islands.

Study of the morphological and morphometric variability of the mandible in the family Lemuridae and Indriidae

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Keywords: Lemuridae; Indriidae; Fourier analysis; mandible; adaptation

Abstract

While several morphometric analyzes of Lemuridae and Indriidae have focused on the craniofacial complex, the characterization of their mandibular morphology has received less attention. The mandibular outline was measured using elliptic Fourier analysis on an osteological sample of two families including Lemuridae (*Lemur*, *Eulemur*, *Hapalemur* and *Varecia*) and Indriidae (*Propithecus*), and then compared using the technique of analysis of the multivariate variance. The taxonomic value of this contour has not been demonstrated. However, the existence of a separation into three distinct groups has been demonstrated by the discriminating analysis of functions by grouping them rather in functions based on diets. This implies that : on the one hand, there is a close relationship between the diet and the shape of the mandible, particularly in terms of the consistency of food and the masticatory cycle ; and on the other hand, genetic signals are completely drowned by environmental stresses like the diet.

New sperm whale cranium from the late Miocene and a revised family attribution for the small crown physeteroid *Thalassocetus*

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Keywords: Cetacea; Odontoceti; Skull anatomy; Asymmetry

Abstract

Among cetaceans, toothed whales (Odontoceti) are known to display a unique arrangement in their skull that has been linked to their echolocation abilities. Their nasal and facial regions lack of symmetry and some of their right-sided bones (maxilla, premaxilla) impressively spread onto the left side. Despite the continuously improving fossil record, our understanding of the origin and early radiation of the two modern sperm whale families Kogiidae (incl. the pygmy and dwarf sperm whales *Kogia* spp.) and Physeteridae (incl. the great sperm whale *Physeter*) remains limited. The discovery of a new physeteroid cranium from the late Miocene (Tortonian) of Antwerp (Belgium) shed new light on the poorly resolved phylogeny. Among extinct species, based on cranial material from the late early to middle Miocene of Antwerp, the small-sized *Thalassocetus antwerpiensis* has been recognized as the earliest branching kogiid. The new specimen leads to the description and comparison of a close relative of *T. antwerpiensis*. Thanks to the relatively young ontogenetic stage of this new cranium, the highly modified plate-like bones making the floor of its facial region could be individually removed, a fact that greatly helped deciphering their identity and geometry. Close morphological similarities with *T. antwerpiensis* allow the reassessment of several facial structures in the latter; notably the reinterpretation of a crest- like structure, previously identified as a sagittal facial crest, typical for kogiids, and here revised as the left nasal (lost in known kogiids) and the left maxilla. Implemented in a phylogenetic analysis, the new anatomical interpretations result in the new Belgian specimen and *T. antwerpiensis* being recovered as sister-groups in the Physeteridae. Consequently, the geologically oldest kogiids are now dated from the Tortonian, further extending the ghost lineage separating these early late Miocene kogiid records from the estimated latest Oligocene to earliest Miocene divergence of kogiids and physeterids.

What is shaping the brain? A perspective on brain size evolution in carnivorans

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Keywords: Mammals; brain evolution; comparative methods; environmental complexity

Abstract

Understanding the selective pressures that have influenced brain evolution is among the greatest challenge in evolutionary biology. Encephalization, to be understood as a larger brain size than predicted for a given body size, is presumed to confer selective advantages due to enhanced cognition and broader behavioural flexibility. However, decades of research on brain evolution have produced conflicting results. Which selective pressures favour larger brains and whether they act in the same way in different taxonomical groups remains poorly understood. In this study, we propose to investigate the effect of ecological adaptations, geographic and environmental factors, social complexity, and life-traits features on evolution of brain size in carnivoran species (wolfs, panthers, bears and relatives), using a broad-scale dataset of 174 species. Our results highlighted a complex pattern of brain evolution within this group with differences in both tempo and disparity between families. Moreover, our analyses suggested a strong influence of environmental and ecological factors on encephalization, with the average size of the geographic range being negatively correlated with encephalization in terrestrial carnivorans. In contrast, the relative brain size appears to be positively influenced by the average home range size. Finally, we founded no evidence in favour of the "*Social Brain Hypothesis*" often proposed to explain the increase of encephalisation in relation to the complexity of social environment. These results suggest that different selective forces might drive evolution of brain size in carnivoran species and will contribute to a more comprehensive understanding of how the vertebrate brain evolved.

prWarp: A new R package to study morphological variability at different spatial scales, with an application to the papionin skull

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Keywords: adaptation ; phylogeny ; cranial shape ; geometric morphometrics ; partial warps

Abstract

In palaeontology, reconstructing the phylogeny of extinct taxa is of paramount importance. Most frequently, because genetic data is generally not available, phylogenetic affinities of fossils are inferred from anatomical features. However, phylogenetic inferences based on morphological traits is often blurred by the adaptive signal. We propose a novel approach: instead of comparing the overall morphological variability, we separate the different spatial scales. Our hypothesis is that, for an anatomical structure, raw form or large-scale shape features might be more functionally constrained, compared to small-scale shape features, the latter being more free to vary, and hence more susceptible to reflect phylogenetic history. We developped the new R package 'prWarp' to implement this approach on geometric morphometric data, and we applied it to the study of skull variability in extant papionin species. Two methods were tested: (1) comparing large-scale vs. small-scale shape features, and (2) comparing the outline of the skull vs. the relative contribution of each skull bone. Trees reconstructed from small-scale shape features and relative bone contributions were more consistent with the molecular phylogeny, while the association with ecological variables was stronger for large-scale shape features. These results confirm the potential of this approach to disentangle phylogenetic from adaptive signals. It can be applied to research questions as diverse as the ecological reconstruction of a fossil species, the evolutionary history of a lineage, animal domestication, etc.

Postnatal shape changes in the rodent mandible at a macroevolutionary scale

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Keywords: Rodents; Macroevolution; Development; Plasticity; Geometric morphometric

Abstract

Postnatal growth in mammals is a developmental period with important changes in skull and mandible functions. During the transition from the juvenile to the adult head, major biomechanical changes happen in relation to changes in the use of the masticatory apparatus around weaning, from sucking to gnawing and chewing movements. Mandible development is strongly interconnected with the muscle changes and tooth growth, much more than the skull that is constrained by additional functional demands. Epigenetic interactions are thought to integrate the different parts of the mandible by controlling the spatialization of bone formation and remodeling in response to biomechanical strain.
Rodent is a very diverse and disparate mammal order, allowing to observe postnatal changes on a large scale. They are classified according to their mandible and muscle anatomies in three main suborders: myomorphs, hystricomophs and sciuromorphs. These suborders present a wide variety of mandible forms and various types of tooth growth (brachyodonty, hypsodonty, hypselodonty) or life-history traits.
We performed 3D morphometric geometrics on juvenile and adult mandibles to model the postnatal changes at a macroevolutionary scale by analyzing variation of ontogenetic trajectories of mandible shape across 16 species of the three main suborders. We explored developmental morphospace and postnatal shape changes taking into consideration the phylogeny.
A common developmental trend of the mandible was observed across rodents leading to an enlargement of the masseter fossae, in relation to the development of the masseter muscles during postnatal growth. Hypselodonty, the continuous growth of teeth, appears to have a special signature on the mandible development. The effects of muscle and tooth growths on postnatal trajectories suggest opportunities for developmental plasticity in the evolution of the mandible shape. This may have differed across rodents, as the main patterns of postnatal growth vary between myomorphs and hystricomorphs and seem to be clade specific.

Papua New Guineans show unique phenotypic traits at altitude.

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Keywords: Altitude adaptation; Height, Waist circumference; Haemoglobin concentration; Chest depth

Abstract

Different biological adaptations to altitude have been found in highlanders from Asia, America and Africa, but only few phenotypes linked to altitude adaptation have been studied in Oceania.
We tested the hypothesis that Papua New Guinea highlanders have developed phenotypic adaptations to altitude, as a result of inhabiting the highest mountains in Oceania for at least 20,000 years.
We collected 13 phenotypes related to altitude in 209 Papua New Guineans from locations at high altitude (Mont Wilhelm, >2,300 m a.s.l.) and low altitude (Daru, < 100m a.s.l.) and found 5 significantly different phenotypes.
Papua New Guinea highlanders show a higher haemoglobin concentration, a deeper minimal and maximal chest depth associated with a short height that may reflect a higher respiratory capacity and a smaller waist circumference, a phenotype associated with less abdominal fat..
Our study describes specific phenotypes in Papua New Guinea highlanders, the first population in Oceania. In parallel with other human groups adapted to high altitude, the evolutionary history of Papua New Guineans appears to have followed an adaptive biological strategy to high-altitude as well. Further investigations will be needed to discern the roles of short-term (lifestyle, developmental adaptation) or long-term (genetic) adaptive strategy on these phenotypes.

Cranial vault healing in modern humans: input of archaeological and clinical data

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Keywords: Bioarchaeology, CT-scan, Trepanation, Skull

Abstract

Trepanation has been studied in archaeological populations since the XIXe century. Healed cases have been recognized in Neolithic populations, attesting to their great skills. It thus became a major interest in anthropological studies, causing the appearance of many hypotheses without scientific foundation and its exit from the paleopathological field. Furthermore, little attention was paid to the positive identification of the trepanation. Indeed, differential diagnosis is not always applied. One of the major issues is that thehealing processes of the skull are not known. Thus, it is difficult to recognize a healed trepanation, when the cut marks have disappeared. By studying CT-scans of medical trepanations, we wanted to determine the modality of those healing processes, as well as their timeline. This will allow identifying this surgical operation with certainty within prehistoric populations, but also to estimate the survival time of individuals. Finally, we will be able to revise published cases of healed trepanations, especially those from the Museum National d'Histoire Naturelle's collection.

Session 2 - Occupation of territories and population mobility

A transdisciplinary approach to reconstruct the Nilotic socio-ecosystem in Luxor west bank during the Ptolemaic period (3rd-1st centuries BC.).

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Keywords: fluvial geomorphology, digital cartography, papyrological analyses, Graeco-Roman Egypt

Abstract

During all its periods, Egyptian society has maintained a privileged relationship with the Nile: the location of housing, and temples has been dictated by the river's course and agricultural land has benefited from the Nile's floods. The understanding of the management of alluvial areas is mainly based on the analysis of the results of archaeological excavations or epigraphic data; geomorphological analyses to reconstruct the fluvial environment of the Nile are still few and often disconnected from the archaeological problems. The aim of this research is the reconstruction of the Nilotic socio-ecosystem of a part of Luxor west bank (called since antiquity "Memnoneia") during the Ptolemaic period (3rd-1st centuries BC.) using a new transdisciplinary approach. This latter combines digital cartography, papyrological analysis and fluvial geomorphology. In this perspective, a selection of sources related to the study area has been identified in order to better understand the fluvial environment and the microtopography of this alluvial plain.

From monoliths to megaliths: a new approach on the megalithic burials of southwestern France.

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Keywords: Megalithism; Implantation; Architecture; GIS; Natural Environment

Abstract

A major paradigm shift took place at the Neolithic period: Human transformed Nature and shaped the landscape that surrounds him. The megalithic architectures which are the first stone constructions of Humanity, illustrate well their will to mark the landscape. The megalithic burials also testify a new relationship to death, and probably to ancestors, through the perennial, aerial and therefore visible nature of these structures.
Studies on funerary megalithism have been very popular with antiquarians, prehistorians and first archaeologists since the 19th century. As a result, many of these graves were formerly excavated and even looted, leaving sparsely information on the deposits and sepulchral rites. Many research axes have been developed since, but very few on the question of the links between these monuments and the natural environment. However, these architectures are the result of choices made by builders, choices conditioned by society and the natural environment in which they lived. In southwestern France, which has the largest number of megalithic funerary architectures in Europe, such an approach has never been proposed. However, the areas of concentration of these monuments are all located on the same geological entity, the limestone plateau, called "causse".
I will therefore present here the systemic approach developed as part of my doctoral thesis, allowing us to take an interest in this Human-Environment interface.

Increasing evidence of the refugium hypothesis for the South Caucasus during the Last Glaciation

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Keywords: Late Pleistocene; south-west Asia; palaeoecology; ancient DNA; zooarchaeology

Abstract

It is generally acknowledged that the distribution and population density of many taxa have expanded and contracted in tandem with climatic cycles throughout the Quaternary. These fluctuations, with long, cold and dry glacials alternated by relatively short, warm and wet interglacials, have led to ecological restructuring, species redistribution, and extinctions that shaped the current environment.

Fossil records, as well as a large body of biogeographical data, suggest that most of the biota, particularly warm adapted species, persisted through glacial maxima in temperate refugia. In Europe, for example, the Mediterranean peninsulas (Iberia, Italia, and the Balkans) are traditionally considered as major refugial areas for temperate species, however, the knowledge on other plausible southern refugia remains limited.

Being climatically buffered by the Caucasus Mountains, and benefiting from the ameliorating effects of the Black and Caspian Seas, the South Caucasus was suggested to serve as such a biogeographical refugium throughout the Late Pleistocene (LP). The pockets of relatively stable warm climate are also distinguished by the presence of Colchic and Hyrcanian forests, which represent the refugia for the relict (Tertiary) plants. Although the hominin history of the area is now being actively explored, the LP faunal dynamics and environmental conditions of the region still stay underrepresented.

Here, we investigate if the South Caucasus could have acted as a natural shelter for biota that was threatened by cooling climate during the Last Glaciation, based on available zooarchaeological datasets combined with our recent results of ancient DNA reconstruction of LP fauna. We highlight that the MIS 3 - MIS 2 transition most likely did not cause any dramatic change in faunal composition thus supporting the refugium hypothesis for the region.

Foragers and their symbolic landscape. Understanding the role of rock art in the territoriality of Later Stone Age Matobo populations

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Keywords: Prehistoric archaeology; rock art; Southern Africa; territory structuring

Abstract

Located in south western Zimbabwe, the Matobo Hills, a UNESCO World Heritage Landscape, is well known for its hundreds of rock art sites, the oldest being 13 000 years old, and a few rich and well-preserved MSA and LSA sequences. These archaeological remains were excavated and documented mostly in the second part of the 20th century, but are still understudied. One of the researchers, Nick Walker, proposed a sequence of settlement patterns by the Middle and Later Stone Age populations, mostly based on socio-economic behaviour, giving little consideration to the symbolic sphere (Walker, 1995). Nonetheless, as a fixed media present in great number in the Matobo, and as an activity led within a socio- economic context (Robinson, 2010) in highly significant places (Deacon, 1988), rock art appears as an essential element to fully understand the Matobo past societies' landscape investment. Moreover, clearly distinct styles (i.e. technique, theme, form) of hunter gatherer's paintings are visible in different parts of the Matobo, as well as in the same sites. These images often overlap each other, sometimes forming complex palimpsests. This could be explained by the presence of different hunter-gatherer groups using the same sites, and/or by chronological changes and/or by different uses of rock art, by the same or different groups, – each reason implying a different territorial strategy. Therefore, we wonder what role rock art had in the past social networks and territory structuring, and how it changed. I will first present the general context of the Matobo Hills and the settlement model proposed by Nick Walker, and then explore to which extend rock art can offer a more comprehensive vision of the territory occupation and social relationships in the Matobo Hills.

Towards a tracking of past bird seasonal migrations through geological times: what could isotopes tell us?

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Keywords: Oxygen; Strontium; Bone; Extant birds; Fossil birds

Abstract

Bird annual migrations are today a major phenomenon shaping communities across continents, in a cyclical way highly dependent on climatic seasonality gradients. Long-distance avian migrations, in particular, have long been considered relatively recent, essentially triggered and shaped by Pleistocene glacial-interglacial cycles. It is now accepted that these modern migrations originated within different lineages in much older times, probably the late Paleogene. Nevertheless, concrete evidence for these ancient migrations through geological times are very scarce. Since long-distance migrants fly across and stop in areas with contrasted climatic conditions and bedrock mineralogies throughout a year, an approach with isotopes such as stable oxygen and radiogenic strontium seems a promising avenue. I will present here how isotopic signals can be recorded in bird bones through a model, considering several constraints. Based on existing GPS data, migration trackways of 10 species of extant long-distance migrants were mapped and correlated with the oxygen and strontium isotope compositions at each stopover locations frequented by the bird. Model outputs predict that migrating birds can be recognized from sedentary birds. This model is to be validated by analyzing bones of extant birds whose migratory behaviour is known, this work being in progress this year for the oxygen isotope composition of bone. If successful, then the methodology will be applied to fossil bird bones, taking into account past climate context. Results could yield the most concrete evidence of past migrations, and greatly help to understand the evolution of this fascinating behaviour, notably its variations in response to past and present-day climate changes.

Tracing Human Ancestral Migration from its Symbiotic Bacteria

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Keywords: Helicobacter pylori; phylogeny; Horizontal Gene Transfer; symbiosis

Abstract

Our understanding of the history of human migrations around the globe has greatly benefited from the development of human population genetics. It has revealed the routes of colonization and striking events of admixture of populations on the way. Many species have accompanied humans on their journey, particularly microbes closely associated to their human host. *H. pylori* is present in the stomach of 50% of humans. Its transmission is vertical, since it occurs particularly during childhood within the family, limiting the spread of a strain to its carrier human group. Previous work has established that its presence in *Homo sapiens* dates back to before the major human migrations and that *H. pylori* accompanied its host during the settlement process of continents, to the point that the phylogeny traces in broad lines the history of human migrations since *Out Of Africa*. We have developed tools to reconstruct the history of bacterial genomes and particularly Horizontal Gene Transfer, which is the ability of bacteria to acquire genetic material from other strains or species. We have shown the efficiency of these methods for retracing ancient contacts and dating the history of free-living bacteria and we use the same approach to explore the history of *H. pylori*. By reconstructing the history of a sample of representative *H. pylori* strains, we use these methods to detail the historical contacts between strains and interpret these events in terms of contacts between ancestral human populations. We focus on the complex history of European populations taking advantage of the ancient genome of H. pylori extracted from Ötzi, the iceman, which dates back to around 3000 BCA. Ötzi's *H. pylori* shows clear relationships with strains that are found today in Asia. During this presentation we will detail the method and discuss our results on the history of human mobilities in Europe, through the prism of symbiotic bacteria.

Study of human group behaviors during the Last Glacial Maximum in the east Carpathian area from zooarchaeological remains

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Keywords: Upper Palaeolithic; Dniester ; Bistriţa; Taphonomy; Subsistence.

Abstract

The east Carpathian area, which covers part of Ukraine, the Republic of Moldova and Romania, is a key region for the movements of palaeolithic human populations, between Eastern and Central Europe. We are particularly interested by the Last Glacial Maximum period which also corresponds to the transition between Gravettian and Epigravettian technocomplexes. Our aim is to better understand the modalities of adaptation of human groups to the climatic and landscapes modifications and the development and interconnections of techno-cultural particuliarities. The site of Doroshivtsy III furnished important data permitting to highlight typical regional behaviors known before and after the Last Glacial Maximum peak, with reoccupations of the same location by small human groups, linked to local flint deposit and activities oriented on reindeer hunting, but also with the apparition of new practices in boneous industry and art. Further south, several contemporaneous archaeological sites are characterized by quite similar peculiarities but some of them by different faunal spectrum and lithic industries. We purpose a synthesis about the main archaeological sites of the region and we also rely on material from new archaeological excavations and older collections coming from Valea Morilor, Climăuţi II, Bistricioara-Lutărie 3 and Raşcov VIII to complete data by zooarchaeological approach. Our goal is to better determine the taphonomic conditions, the status of the different species in human ways of life, the modalities of acquisition and use of animal resources, the hunting and butchering strategies and the modalities of carcass transporting, the seasons of occupation and the mobility strategies of human populations.

From sooty speleothems analysis to the study of occupation dynamics of caves by prehistoric societies

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Keywords: prehistory; fuliginochronology; mobility; experimentations; high resolution

Abstract

Studying past societies requires an understanding of their social organization. One of the entry points is the study of mobility patterns and land use dynamics, which can only be accessed with high temporal resolution. If this micro-chronological resolution (sub-annual to decennial) is accessible to ethnologists, it is generally not accessible to prehistoric archaeologists whose archaeological assemblages are unfortunately almost exclusively cumulative and are mostly formed over a long period of time.
In order to reach high temporal resolution in archaeology, the object of my research has been to develop fuliginochronology (from *lat. fuligo, fuliginosus*: soot, fuliginous), a microchronological study of soot deposits trapped in speleothems, witnesses of human occupation in cavities. This pioneering method thus makes it possible to reconstruct the chronicle of human occupations in cave sites. The joint study of soot films and annual calcite doublets allows the chronicles to be set on a microchronological time scale with subannual resolution. The analysis of this geoarchaeological object thus consists of an anthropological study of past societies, since mobility in its temporal dimension is accessed on the human time scale. To date, few studies have been interested in this material and yet this microchronological method presents a wide field of application both chronological and geographical, since it can be applied anywhere in the world and for any period, as long as fires have been made near active concretions.

During this presentation, the method will be presented as well as the experiments carried out to better understand the formation of these archives of anthropogenic activities that fuliginous speleothems are. The use of this method to document the mobility patterns of past societies will also be presented through case study.

The informative potential that the comparative study of the bony labyrinth has to contributing to the peopling of the Americas debate

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Keywords: peopling of the Americas; morphological evolution; human evolution; skeletal variation

Abstract

Currently there is consensus that approximately 16,000 years ago South America was the last continent on the planet to be occupied by humans. Despite research on this topic began almost 200 years ago, some old questions remain to be answered and new inquiries have recently emerged. One of those questions concerns which were the evolutionary processes by which the American populations diversified over time. The biological studies carried out so far have been based on the analysis of morphological (ectocranial, dental) and molecular (mtDNA and Y chromosome from extant populations; aDNA from skeletons) data. As a result, multiple models have been proposed to explain the evolution of human populations in South America, being the hypothesis of local diversification and the multiple migratory pulses the predominant ones. A large part of the disagreement lies in projects including a distinct set of samples, but also on the diverse assumptions and biological expectations of different data and methods. A promising strategy that would allow overcoming these issues is the analysis of some endocranial structures, such as the bony labyrinth in the inner ear, which it is expected to have a minimal or even no environmental influence at all, and therefore it allows reconstructing population history. The aim of my recently funded project is studying the morphological variation of the bony labyrinth comparing two diachronic sequences (Argentina, Peru) that include individuals from the early to the late Holocene (10,000 to 500 y BP) to track morphological changes across time that would allow explaining which evolutionary processes were involved during the diversification of South American populations. In this presentation I will show the conceptual and methodological tools, as well as the research design that I propose to be able disentangle some of the main issues in relation to the peopling of the Americas.

"Feeling at home": integration of Polynesian women inside pre-existing societies of Vanuatu (Melanesia)

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Keywords: Morphometrics; Roi Mata; Migrations history; Polynesian Outliers; Pacific Islands

Abstract

Today, some communities in the Vanuatu archipelago (Melanesia), known as "Polynesian Outliers", display Polynesian cultural features and speak Polynesian languages. These Polynesian influences differ from other cultures, present in the region, which are related to Melanesian influences. It is thought that Polynesian migrations would have particularly contributed to the formation of these "Polynesian" societies of Vanuatu during the last millennium. Yet, archaeological studies do not highlight direct episodes of human intrusion or major cultural transition in the histories of Polynesian Outliers of Vanuatu. The same goes for biological studies encompass on modern populations which do not appear to be closely related to Polynesian groups. This situation allows the development of hypothesis and models on the modalities of Polynesian settlements regarding the biological or cultural integration, within or in marge of the pre-existing societies of Vanuatu. By morphometric analysis of 13 ancient individuals (400-300 BP) form two localities in Vanuatu (Roi Mata burial complex (Eretok, Efate) and West Futuna Island) compared to a data set of modern individuals from the Oceanian region (n=232), we want to assess the physical presence of Polynesian individual in these localities. Our results show that the Polynesian individuals (n=4), identified in both localities, are all females. More specifically, the analysis of the Roi Mata burial complex shows that 3 Polynesian women certainly had a close relationship with individuals related to the Melanesian pre-existing society suggesting their integration into the local society. Combining oral records of the region, we highlight the role of Polynesian women in the transmission of Polynesian cultural and linguistical features other generations within a Melanesian society.

Gender Trouble: towards a deconstruction of binarity in archaeology

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Keywords: mortuary contexts ; interpretive bias ; non-binary ; transidentity ; gender fluidity

Abstract

Gender archaeology, which has been in constant development for more than half a century, aims both to criticize biological determinism (gender is a social construction correlated but not dependent on sex) and to analyze power relations between sexes. It also maintains that archaeologists, consciously or not, impose their own points of view and their biases in their interpretations of archaeological data. If gender archeology has made a place for itself in post-processual archeology, some feminist and queer approaches have more recently started to be integrated into research by taking into account non-binary genders, gender fluidity and transidentities in archaeological contexts, particularly through research conducted at sites in North America where many societies are non-binary. In this communication, we will briefly present the approach developed by these researchers before considering how to apply these methods to the study of well-known funeral contexts in societies where there is *a priori* a strict binarity of genders and for which a doubt related to the gender of the buried individual may have arisen. The first case will consider the case of the tomb of actor Makareus, dated to the 4th cent. BC and discovered in the Kerameikos necropolis in Athens. The second will focus on two tombs discovered in the Merovingian necropolis of Bossut-Gottechain (Belgium).

TUESDAY, MARCH 9th

Session 3 - Exploitation of natural resources and raw materials, subsistence strategies

An analysis of Iron Age Scottish wetland deposition practices

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Keywords: tradition; environment; materials; object; assemblages.

Abstract

Study of prehistoric deposition is extensive. However, holistic analyses of regional trends in Scotland and Wales for wetland deposition for the Iron Age has not been attempted. The project's overarching aim was to observe, analyse, and interpret wetland depositional practices for Iron Age Scotland and Wales, based on the object and site records acquired. The project collected object records from museums, online databases, heritage trusts, and archaeological units. Variables such as environment, tradition assemblage, object type, material, manufacture periods and discovery dates are evaluated for their commonality. The project's objective was to identify trends and patterns in the data to provide new or confirm pre-existing depositional traditions. The result of such analyses revealed Iron Age wetland deposition practices served as a reaffirmation of social identity, tradition, and cultural mnemonic. Depositional practices served both functionalist and traditionalist purposes, which is unsurprising as in prehistory these roles tend to coincide. In the case of wetland deposition, we can surmise that the tradition intertwined these theoretical roles whereby collective memory benefited both the group and the individuals who participated, even marginally.

Study on the origins of iron metallurgy in North-East Madagascar (11th-16th century): Reinvention or technology transfer?

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Keywords: Smelting tradition; Chaine opératoire.

Abstract

Recent survey and excavation missions on the North-East coast of Madagascar (2017-2020) have enabled the identification of numerous iron production workshops between the modern town of Vohémar and Cape Masoala. Radiocarbon dating estimates that the smelting activities took place between the 11th and 16th centuries. The detailed study of the metallurgical wastes and of the spatial organization of the workshops as well as laboratory analyses (XRF, XRD, optical microscope and SEM) helped to reconstruct the technology. The furnace forms a bowl dug directly into the sand without any clay lining. A single short cylindrical tuyere was wedged in a wall made of sand. No other superstructure could be identified during the excavations. Lateritic concretions with high iron content have been smelted as iron ore.

This area of Madagascar was occupied between the 7th and the 16th century by the so-called Rasikajy. This population was Islamized and participated actively in the Great Indian Ocean Trade. The Rasikajy were thus in contact with a wide variety of foreign populations who had mastered the art of making iron. A comparison of the iron smelting technology studied in northeastern Madagascar with known technologies around the Indian Ocean (from East Africa to China via India and Arabia) would help to better understand the geographical origin and transfer modalities of the Rasikajy technology.

Identification of embalming material of bird mummies through molecular and compound-specific $\delta^{13}C$ analyses

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Keywords: Organic balms, bird mummies, molecular and isotopic archeology, Egypt.

Abstract

The molecular and isotopic analysis of organic residues is used more and more frequently in archaeological studies, to provide an insight into the chemical composition and potential origin of organic materials used by ancient civilizations. In Ancient Egypt, some humans and animals were mummified following a precise process, some parts of which are still unknown. There are a lot of questions concerning the balms used for mummification: which materials were used to produce this balm? Was the same 'recipe' used in all Egypt? My Master thesis aims at analysing and comparing the molecular and isotopic compositions of the balm of twenty different bird mummies (Ibis and birds of prey) from known locations, to determine if it is possible to differentiate their method of production and/or potential origin(s) based on their chemical composition. I will present the basic principles and goals of my study, the methods used, preliminary results and perspectives.

New insights into the study of past populations: archeozoology and cementochronology in the Middle Palaeolithic.

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Keywords: Mediterranean; territory; subsistence; hunting strategies; seasonality.

Abstract

The upper Middle Paleolithic is marked by climatic changes of great amplitude (glacial and interglacial periods) which have affected the environment of human communities living in Western Europe and, consequently, their behavior. The problems of group organization in the face of seasonal variations in resources in the environment (seasonality) and spatial variations in biotopes (territorial mobility) are therefore central to our understanding of their lifestyles. In recent years, archaeological research has led to questioning models based on the hypothesis of opportunistic practices of big game exploitation, with little planning, in favor of more complex strategies (collective and specialized hunts, storage and deferred consumption).

South of France is rich of archaeological sites and many dynamics of the research carried out there. Is a particularly interesting space to apprehend the rhythms and ruptures in the adaptations of past prehistoric societies in the face of environmental changes and for identifying adaptive responses on a regional scale.

To provide new answers to these problems, the approach used in this doctoral work combines classic archeozoological methods (demography, transport, seasonality) with a technique for microscopic analysis of animal teeth, cementochronology. This method provides more precise information on the biological ages of individuals and their seasonality of slaughter.

The results presented here are based on the study of the dental remains of ungulates (deer, fallow deer, ibex, aurochs, and bison) from the Canalettes (Aveyron), Rescoundudou (Aveyron) and Mandrin (Drôme) sites.

Through this study, we propose a reflection on our current knowledge of this prehistoric period, as well as the contribution of new methods to our understanding of faunal assemblages of anthropic origin.

Main dish: red deer. Subsistence strategies at La Viña rock shelter (northern Iberia) during the Solutrean

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Keywords: Cantabrian Region; Zooarchaeology; Taphonomy; Economy

Abstract:

La Viña rock shelter, located in the western part of the Cantabrian Region (northern Iberia), has an important archaeological sequence with human occupations from the late Mousterian to the Middle Magdalenian (>50 to 13.6 ka BP). The study of this long and stable sequence allows a better understanding of the human subsistence strategies. The zooarchaeological and taphonomic results of the macromammal assemblage found on levels VI and V (Middle and Upper Solutrean, respectively) are presented here. The anthropogenic origin of the assemblage is attested by bone surface modifications such as cut marks, fresh fractures for marrow extraction and impact notches recorded in the ungulate species identified. The prey ranking is dominated by mainly red deer, followed by horse and Spanish ibex. Other ungulates such as chamois and large bovids are also present but in a lesser proportion. The assemblage has also been altered by natural taphonomic processes (weathering, concretion, and mineral manganese coatings), especially in the central part of the rock shelter. The hunter-gatherer groups who occupied La Viña during the Solutrean exploited different ecological niches: rocky montane areas (caprids preferential habitat niche), open landscapes (horse) and mixed environments of forest with clearings (red deer), with a preference for the latter. These subsistence strategies correlate with the regional framework established for that period.

Neanderthal facing climatic disruptions of the MIS 4 in southwestern France: between cynegetic choices and environmental constraints.

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Keywords: Quina Mousterian ; Paleoenvironments ; Cervids ; Spatial analysis.

Abstract

The MIS 4 climatic's period (approximately 75-60 ka BP) corresponds, in southwestern France, to the gradual replacement of Atlantic forests, sheltering non-migratory temperate fauna (Deer, Roe Deer, Wild boar), by a biotope dominated by the arctic steppe, in which Reindeer would have found a favorable place to live. These environmental disturbances were accompanied by major changes in Neanderthal societies, with the establishment of the Quina Mousterian, a remarkable techno-complex of the end of the Mousterian which saw the emergence of massive and seasonal reindeer slaughter, associated with butchery operations and tool's production and maintenance now sequenced in time and space. As part of this phD, data from classical archaeozoology and cementochronology are combined and integrated into 3D taphonomic and spatial studies, in order to investigate under high stratigraphic resolution the recording sequences covering the implementation and dissemination of the Quina Mousterian system, and to specify its links with the environmental disturbances of MIS 4, at a time when Reindeer and Red Deer - two species whose current distributions seldom overlap (taiga) - are observed within the same assemblies, one gradually replacing the other.

The preliminary examination of the spatial data acquired (taphonomic and taxonomic variables) on two famous sequences from Perigord (Grotte XVI and Roc-de-Marsal) reveals a particular distribution of taxa in cross-section: Red Deer and Reindeer are not found together within the same units, but are in fact superimposed, thereby invalidating the stratigraphic division made during excavations. These first results undoubtedly have palaeoenvironmental implications (and could perhaps reflect the prey avaibility) and show once again the need to call on taphonomic and spatial studies before any reconstruction from archaeological material.

Retouched bone tools: which place in Neanderthal technical systems?

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Keywords : mousterian; taphonomy; zooarchaeology; bone industry

Abstract

Neanderthal have occupied Europe during thousands of years. He disappeared shortly after the arrival of anatomically modern humans, about 40,000 years ago. The reasons of his disappearance are debated for years. Some researchers postulate that it is due to a cognitive superiority of the anatomically modern man over Neanderthal. The Late Palaeolithic bone tools, more diversified and standardized, are an argument to define the behavioral modernity of the anatomically modern humans, according to these researchers.

Although the last few years have seen the emergence of numerous studies devoted to Neanderthal bone tools, we nevertheless note a great disparity in our knowledge of the different types of tools. A whole part of Neanderthal equipment is still unknown, especially the bone tools which are shaped by percussion, also named "retouched tools". While some bone tools have very characteristic stigmas, others are less retouched and, therefore, more complicated to understand. These remains are essential in our global understanding of Neanderthal technical systems.

Thus, my PhD work revolves around the discovery of these bone tools, which have sometimes very discreet characters. Today, no specific methodology of analysis has been developed and adapted for this type of remain, which presenting series of removals. Micro-wear analysis are rarely carried out and the pieces are often extracted from their context. Are these stigmas the result of taphonomic processes such as trampling or carnivore activities? Or then, are they the result of the human action, for example during butchering or retouching activities? To try to answer these questions, we decided to conduct a study of all the faunal remains of the archaeological site of Combe-Grenal (Dordogne), combining archaeology, technology, micro-wear analysis and experimentation.

New perspectives, old collections: a technological approach to the bone industry of archaic coastal groups of northern Chile

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Keywords: bone technology; Archaic Period; maritime hunter-gatherers; museum collections; operational chains.

Abstract

The north-central coast of Chile (29-30°S) was one of the most intensely occupied sectors during the Archaic Period (6000-2000 BP). Numerous archaeological sites have been recorded in this area, mostly extensive shell-middens, which were exhaustively excavated during the second half of the 20th century. These pioneering studies enabled the characterization of ways of life based on hunting, fishing, and marine gathering. One of the technologies that played a relevant role in the acquisition of these resources was the bone industry. However, the research carried out between the 1960s and 1980s concentrated mainly on the typological description of objects for the definition of cultural complexes and traditions, always based on finished objects. Until now, and despite its relevance, the modes of production of this industry have never been studied. This situation was accentuated because the artefacts, beyond the finished objects, were not recognized, being stored as part of the zooarchaeological remains. Through the French school of technology and the methods adapted to bone material, it is possible to study these assemblages in a global manner: from the supply of raw material, production, consumption, and discard of tools. In this work, we address the bone industry of the archaic groups of the north-central coast of Chile, through the re-evaluation of old museum collections. The preliminary results of the analyses carried out based on a technological approach (*chaînes opératoires*) are presented. These show the majority use of land mammals for the manufacture of bone instruments, which point to acquisition strategies hitherto little considered. Also, some of the manufacturing techniques of the site's bone production are recorded. Through a review of old collections, this work offers a new look at the technical and economic knowledge and cultural choices of these archaic groups of hunters and gatherers.

New perspectives on ancient human-proboscidean interactions in South America

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Keywords: *Notiomastodon*; Megafauna; Ecological interactions; Big game; Taphonomy

Abstract

Only two Quaternary proboscideans are recorded In South America: *Notiomastodon platensis* and *Cuvieronius hyodon*. While the last most probably never interacted with ancient humans here, the former is widely distributed and frequent in paleoarchaeological sites. From Northern Venezuela (Taima-Taima) to Central Chile (Monte Verde), and from the Colombian Andean valleys (Toro) to Brazilian lowlands (Lagoa Santa), the review of paleoarchaeological evidence raises new perspectives to human-proboscidean relations in South America's prehistory. Although their contemporaneity was supported only in the last decades, the first to suggest that they shared South American Quaternary landscapes was Peter Lund, a Danish paleontologist/archeologist who explored several Brazilian caves, including the most significant human settlement in Brazil, the Lagoa Santa Karst. We reviewed the *Notiomastodon platensis* records from 25 South American paleoarchaeological sites, and the evidence of its exploitation by humans relies mostly on long bones and ribs with cut marks (butchering) and skeleton remains in co-occurrence with human-made artifacts (same sedimentary deposit). Nevertheless, two sites stand out by their record: Toro site, in Colombia, and Lapa do Caetano cave, in Lagoa Santa Karst, Brazil. From the Colombian site, we recovered the first *Notiomastodon* tusk tip remodeled by humans into a complex projectile point (exploitation of proboscideans as natural resources in the tool industry) and a femur of juvenile proboscidean with dismemberment marks (hand-axe marks), and an associated weapon. In Brazil, the Lapa do Caetano cave provided another extraordinary evidence for human-proboscidean interaction: a *Notiomastodon* baby skull pierced by a perforator tool with intentional posterior breakage for brain consumption. Although knowledge on *Notiomastodon platensis* exploitation by humans still needs improvements, an analytical review of paleoarchaeological records has already reassessed many ecological interactions (predation and competition) and archaeological aspects (subsistence strategies) of South American ancient humans.

Analysis of Artefact Form: the application of morphometric methods to archaeology

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Keywords: geometric morphometrics; formal artefacts; Brazilian prehistory; hunter-gatherers; occupation of southeastern South America.

Abstract

This presentation will verse on the subject and methods used in my doctoral research project. I am currently developing research in Brazilian archaeology, with a project aiming to contribute to the understanding of the occupation processes of southeastern Brazil by hunter-gatherer groups during the Holocene. More specifically, this research focusses on the State of São Paulo, concentrating on the study of two classes of formal lithic artefacts, namely bifacial projectile points and unifacial, plane-convex scrapers. The scope of the research is to characterize the diversity of the southeastern Brazilian lithic industries by means of a morphometric approach, in order to explore the differences or similarities in the 2 characteristics of bifacial points and unifacial artefacts of São Paulo territory in relation to these same artefact classes found in the south (Umbu Tradition, with bifacial points) and in the midwest and part of the northeast of the country (Itaparica Tradition, with unifacial artefacts). These data will be theoretically interpreted in light of the assumptions of Cultural Transmission Theory, aiming the proposal of hypotheses related to the scenarios of regional settlement, territory delineation and cultural contact, and relating these scenarios to the population dynamics of these human groups throughout the Holocene. The endeavors for application of morphometric methods to the morphological analysis of material culture is fairly new – a little more than a decade – and it has been gaining more interest among archaeologists as an effective, quantitative and complementary approach to the more disseminated technological analyses, mainly regarding lithic artefacts. This project has not yielded research results so far, so the idea for this occasion is to present results of recent morphometric works applied to lithic studies in Brazil and to introduce the morphometric approach as a promising method of analysis in archaeological studies.

Session 4 - Paleoclimates and environmental changes

The middle triassic palaeoflora of monte Prà della Vacca/Kühwiesenkopf (NE Italy) – new investigations

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Keywords: Anisian, plant fossils, $\delta^{13}C_{org}$, amber, organic carbon

Abstract

The Triassic locality of Monte Prà della Vacca/Kühwiesenkopf (MPdV), in the Northern Dolomites (NE Italy), is considered a *Fossillagerstätte* for its richness and good preservation of its fossils, and represents one of the best witnesses of the biotic recovery after the end-Permian mass extinction. The paleontological assemblage includes marine and terrestrial fauna and flora, which permitted to reconstruct both marine and terrestrial middle-late Anisian (Middle Triassic) environments dating back to around 245 million years ago. Plant fossils occur in lens-shaped siltstone layers, which alternate with silty and marly limestone layers and represent rapid burial events caused by submarine flows within a marine basin, triggered by heavy storms. The terrestrial plant assemblage is very diverse and is well-documented by the rich macrofossil plant collection, stored at the Museum of Nature South Tyrol in Bozen/Bolzano: ca. 1200 specimens of leaves, branches, trunks, cones, and seeds of at least 36 different species and 29 genera, including lycopods, horsetails, ferns, seed ferns, cycads, and conifers.
The MPdV flora corresponds with a local shift to more humid conditions during the otherwise arid Middle Triassic. This makes the flora of MPdV an ideal candidate for an integrated palaeobotanical, geochemical and palaeoclimatic study. We performed taxon-specific geochemical analyses on the organic carbon collected from plant fossils belonging from different taxa, providing insights on the isotopic composition of different groups of plants. A wide isotopic variability was observed in conifers, cycads and lycopods, while low variability was observed in ferns. The review of the palaeobotanical collection led to the discovery of one of the oldest records of amber worldwide. Moreover, the comparison between Triassic amber occurrences and humid episodes suggests some close causal-effect relationship between the two.

Carnivore dens as ecological proxies during the Late Pleistocene? The case of Caverne Marie-Jeanne (Belgium), a unique MIS3 hyaena natal den.

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Keywords: palaeoecology; *Crocuta crocuta*; ethology; settlement strategies; Middle Palaeolithic

Abstract

Despite the harsh and fluctuating environmental conditions of the Late Pleistocene, the Belgian Ardennes was one of the most intensively occupied regions of North-West Europe. There, both humans and large carnivores took advantage of the ungulate biomass availability and the numerous natural shelters offered by the karstic valleys surrounding the Meuse river.

This region has been extensively explored by the first archaeologists during the 19th and 20th centuries and has yielded a prodigious quantity of assemblages from the Palaeolithic. These vestiges clearly indicate the relative attractiveness of the region during the last glaciation of the Pleistocene, but also suggest that the two main top predators - hyaenas and humans - were in competition for food and shelter. Although the complex settlement patterns and adaptations of both Neanderthals and anatomically modern humans are becoming more and more documented, their direct and indirect relationships with their carnivore competitors are often forgotten - or even overlooked. Caverne Marie-Jeanne is one of the many under-investigated palaeontological collections that are housed at the RBINS, Brussels. Despite being excavated in the 1940's, the assemblage is very well-preserved (stratified deposits, collection of the fine fraction, etc.) which allows advanced faunal analyses. The study of the faunal material from Level 4 has highlighted the existence of a unique natal hyaena den with remains of more than 200 cubs. Interestingly, ethological studies on modern spotted hyena show that such a mortality rate is exclusively seen under very variable environments with highly fluctuating resource availability. This study explores the cause of this high death rate and how this could be used as an ecological proxy to understand local adaptations.

The rediscovery of Caverne Marie-Jeanne material may help us contextualise human settlements in relation to their main competitors, and further our understanding of MIS 3 ecosystems in northern Europe.

Revising the microvertebrates from the Palaeolithic site of Kalamakia (Mani Peninsula), Greece

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Keywords: Palaeoenvironment; taphonomy; palaeoecology; predation; geometric morphometrics

Abstract

Mani peninsula has a significant number of Palaeolithic sites, highlighting its importance as a paleoanthropological related locus. Kalamakia cave is such a site, bearing thousands of small and larger animal fossils, some Neanderthal remains, as well as numerous lithic artifacts. The present study, however, focuses on the microfaunal assemblage retrieved from the three fossiliferous units of the cave dating from ca. 90-25 kya BP, in order to re- examine and evaluate past identifications of the microvertebrate material under a palaeoenvironmental, palaeoecological and taphonomical perspective. A total of 32,319 microvertebrate specimens were examined and 38 taxa were identified, from which Reptilia were found to be the most diverse and Rodentia (specifically, *Microtus* sp.) the most abundant. No species considered typical of colder climates were identified, with the most common habitat types surrounding the cave throughout all three units being shrubland, forest and rocky. Concerning the taphonomy, no major events have been detected from the microvertebrate fossils' condition, other than the occasionally naturally occurring high humidity within a cave and a mild amount of post- depositional breakage that possibly resulted from trampling (by the larger animals' or human occupants' activity in the interior of the cave). The main accumulators of the microvertebrate assemblage seem to have been owl predators (category 1 and/ or 2, depending on the unit). Finally, Microtus lower first molars- randomly but equally selected from each unit- were examined using geometric morphometrics and the results indicated that the local population consisted of rather robust individuals of a species within the Terricola subgenus (the dominant morphotype being *M. subterraneus*). A correlation trend between centroid size and molar morphology with climate seems to be plausible, since a slight divergence between the clusters of the fossilised molars corresponding to warmer and colder climate conditions was detected, something that cannot be stated definitively and needs further investigation.

Looking inside small-mammal teeth: understanding the climatic trends of last neanderthal settlements in north-eastern Iberia

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Keywords: Paleoenvironment; Stable isotopes; Middle Paleolithic; MIS3; Southwestern Europe

Abstract

Repeated occupations of neanderthal human groups, long and short, are recorded in the northeastern region of Iberia, which constitutes a key area to understand human resilience to changing environmental conditions experienced during Marine Isotope Stage 3 (MIS 3; ca. 60-30 ka). Recurrently, changes in settlement patterns and even the disappearance of this species have been linked to environmental causes. The recovering of small mammals (insectivores, rodents and bats) in some Middle Paleolithic sites of this region (Abric Romaní, Teixoneres cave, Arbreda cave and Xaragalls cave) provides a good opportunity to get closer to the climate and landscape of this period. Rodents are well-known as paleoclimatic tracers in a local scale, but usually limited to qualitative approaches dependant on species taxonomy. The advance in laboratory techniques in the geochemistry domain now allows the application of stable isotopes analysis also on these small body tissues. Oxygen isotope composition of rodent incisors are here analysed, considering their relationship with past meteoric waters; thus, providing high-resolution quantitative data to estimate paleoclimatic parameters, as paleotemperatures. In combination with taxonomic and taphonomic studies on these sites, obtained results suggest slightly cooler and wetter climatic conditions. However, considerable climatic stability is detected in all sites, with only occasional fluctuations on the presence of Mediterranean and mid-European species. Species associated with forest landscapes are always well-represented and rodent communities are globally stable. All this leads us to consider the singularities of northeastern Iberia in contrast to the climatic instability considered in northern Eurasia during MIS 3, the optimal conditions that this region offered to human occupations and the importance of forest landscape surrounding their settlements. Last stages of MIS 3 point to a progressive and not abrupt deterioration of the climate and opening of the landscape is detected.

A multi-proxy approach to reconstruct the paleoecology of the Rhinocerotidae from the early Miocene Béon 1 locality (SW France).

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Keywords: Microwear (DMTA); mesowear; enamel hypoplasia; mortality curves; rhinoceros

Abstract

With around 90 species, the mid-Orleanian Béon 1 locality (Occitanie, SW France) yielded one of the richest Miocene vertebrate assemblages in Europe. Rhinocerotidae are exceedingly dominant over other faunal components, with dental remains documenting four species: the teleoceratines *Brachypotherium brachypus* (minimum number of individuals [MNI] ≈ 5) and *Prosantorhinus douvillei* (MNI ≈ 40), the hornless rhinocerotine *Plesiaceratherium mirallesi* (MNI ≈ 38), and the early elasmotheriine *Hispanotherium beonense* (MNI ≈ 7). This abundance within ca. 500 m^2 raises questions about habitat capacity and niche partitioning as all species were strictly coeval. The four rhinoceroses are thought to inhabit different ecotopes, except for both teleoceratines, considered swamp dwellers. Here, we propose a multi-proxy approach to better understand the ecology of these four rhinoceroses, using microwear (DMTA) and mesowear (diet proxies at two different time scales), enamel hypoplasia (marker of stress), and mortality curves. While DMTA revealed significant differences between species and facets (MANOVA, p-values < 0.05), mesowear scores were similar in all species and suggestive of browsing habits. All fossil specimens exhibit microwear patterns distinct from those of all extant species, yet suggesting soft browsing or mix-feeding. The prevalence of enamel hypoplasia is very high at Béon 1 with about 26% of all teeth being affected. Proportions vary between species – from 13% in *H. beonense* to 28.8% in *Pl. mirallesi* – and dental loci. The most affected teeth were m3, p4, and d4/D4, suggesting birth (d4/D4), weaning (P4), and environment-related stresses (m3). The mortality curves of all species are relatively similar (Khi2, p-value > 0.1), with three modes: around weaning, sexual maturity, and late in life. Furthermore, all species but *B. brachypus* show a similar population structure to that of extant *Diceros bicornis* in South Africa with about 15% of juveniles, 15% of subadults, and 70% of adults.

Environments, climates and technological changes in late middle Palaeolithic in southwestern France

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Keywords: Neanderthal ; pollen analysis ; Bayesian modelling

Abstract

One of the joint issues in Archaeology and paleoenvironment is the impact of climate and environmental changes on human populations and their means of adaptation. Determining the impact of these changes on past human populations is difficult. It first of all requires the identification of a synchronicity between climatic and technological transitions. However, the identification of this contemporaneity is undermined by the chronological uncertainties and different time resolution of both archaeological sites and environmental records. Our study aims to improve the temporal resolution of the environmental data for southwestern France, a region marked by abundant and rich archaeological sites, and in particular for the Middle Palaeolithic.

Southwestern France environmental and climatic changes were reconstructed between ~35 and 63 kyr by analysing at high resolution, between 300 and 500 years, the pollen grains and spores preserved in a deep-sea core collected in the Bay of Biscay. The analysed period corresponds in Europe to the disappearance of Neanderthals and the arrival of anatomically modern humans. In order to determine whether regional climate and vegetation changes have been concomitant with lithic techno-complex transitions, we have compared our environmental record with a new chronological framework of technological successions based on a new critical database and a chronological modelling using Bayesian statistics.

The high-resolution pollen analysis reveals warmings associated with temperate forest expansions and three extremely steppe cold events. Despite increasing the resolution of environmental changes in southwestern France, the new chronology of the regional lithic techno-complex need to be improve to compare in a reliable and robust way both records and assess the degree of impact of environmental and climate changes in lithic techno-complex changes.

Poster session (on Discord platform)

The role (or lack of) Gender theory in Portuguese Archaeology

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Keywords: Archaeological Theory; Women; Feminism; Portugal

Abstract

Gender and Feminist Archaeology emerged, particularly in Western countries, in the 1980s as a reaction against a male-dominated field constantly disregarding gender research. Since then, it has gained much importance and became an important line of thought informing many areas, from research to museum studies, and opening new avenues of investigation. This perspective has offered new and important views that have transformed the way we understand prehistory. In fact, discussions around gender, and particularly feminist theory, have been crucial to challenge Eurocentric and patriarchal assumptions, which were commonly directly extrapolated to past contexts.

In countries like Portugal, however, where there is a noticeable lack of Archaeological Theory underpinning the profession as a whole, there is a markedly lack of gender studies, and these are still viewed by many as inadequate and unnecessary.

This paper is intended as a starting point for reflection regarding the situation of Gender Archaeology studies in Portugal. We will reflect on the very scarce work done so far and its impact, and on our concerns regarding the ongoing marginalisation of gender in archaeology in general as a field, and specifically in archaeological interpretation. Finally, we will offer our view on the need to pursue an intersectional agenda, and the development of a wider debate that will, at least, begin to open minds for further discussions.

A new Late Pleistocene fossil-bearing locality from Olduvai Gorge (Tanzania).

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Keywords: palaeontology; dating; chronology; mammal assemblage; volcanic.

Abstract

Olduvai is a 48-km-long gorge located in the SE Serengeti Plains within the Ngorongoro Conservation Area (Tanzania). The Olduvai stratigraphic succession spans the last 2 million years (Ma) and is very rich in palaeontological and archaeological remains, offering a clear glimpse of human evolution in the context of East African Quaternary environmental changes. Much of the fame of Olduvai is due to research by Mary and Louis Leakey, who worked at the site for more than thirty years. The Olduvai succession is divided into seven stratigraphic units (Bed I, Bed II, Bed III, Bed IV, Masek Beds, Ndutu Beds and Naisiusiu Beds, from bottom to top; Hay 1976). Although research in Olduvai has been ongoing for over a century, not all stratigraphic units have been studied in detail. The older layers (Beds I-IV), which yield Early Stone Age tools and archaic hominin species such as *Homo habilis* and *Paranthropus boisei*, have been investigated much more intensively than the younger ones. The field activities carried out in Olduvai by the THOR (Tanzania Human Origins Research) team in 2018-2019, led to the discovery of a very interesting Late Pleistocene palaeontological assemblage in Geolocality 83. The assemblage includes some exceptionally preserved fossils of large mammals, among which some remains of carnivorans stand out. The total number of remains collected so far is about 200. The Ndutu and Naisiusiu Beds (about 0.4-0.01 Ma; Hay 1976), which extensively crop out in the area, are of remarkable palaeoanthropological interest, representing one of the few well-datable geological contexts in Africa in which a key transition in human evolution can be studied, i.e. the emergence of *Homo sapiens*, dated at 0.4-0.3 Ma on molecular and palaeontological grounds.

Reference:

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Photogrammetry and possibilities in "Phylogeny and Taxonomy of Tapiridae (Mammalia, Perissodactyla)"

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Keywords: Geometric Morphometry; 3D Morphometry; tapirs; evolution.

Abstract

In Biology, Geometric Morphometry relies on the study of shape evolution by the acquisition and quantification of shape through the establishment of homologous Cartesian coordinates called landmarks. In this technique, landmarks can be placed on a 2D morphospace or on a 3D morphospace. One of the benefits of Geometric Morphometry is the study of shape independent of size effects. For many years, 3D morphometric data have been acquired through the usage of expensive machines such as CT-scans. Nevertheless, a relatively recent 3D data acquirement technique has been proposed: Photogrammetry, which includes the acquisition of pictures from many points of view of the interested shape. Affordable Photogrammetry software (e.g. Agisoft Metashape) aligns pictures based on common details and builds a 3D model from the aligned images, that will lately receive landmarks for the study of shape variation (e.g. Landmark software). Multivariate analysis can be taken in many softwares (e.g. Past, MorphoJ) to generate morphospace graphics that allow the interpretation of the mathematical information placed on the landmarks and show how different the aimed species are. A Guide by Catalano and Goloboff 2018 has been made for the usage of those landmark information into a topology. Considering this scenario, the goal of the present study entitled "Phylogeny and Taxonomy of Tapiridae (Mammalia, Perissodactyla)" is to better understand cranial and skeletal evolution among living and extinct tapirs. Our preliminary results for tapir dentition indicate that teeth of larger species show variation independent of body size. Further work on this project will use geometric morphometrics in phylogeny, with quantitative data applied to build evolutionary trees, offering new avenues for 3D morphometric data usage. The combination of Photogrammetry with geometric morphometrics and quantitative phylogenetic methods thus opens the door for lower-income scientific communities to build and analyse highly detailed 3D datasets.

The earliest Tyrannida (Aves, Passeriformes), from the Oligocene of France

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Keywords: biogeography, distribution, paleogeography, Tyrannides

Abstract

Passeriformes is the most diverse bird order. Nevertheless, passerines have a remarkably poor early fossil record. In addition, high osteological homoplasy across passerines makes partial specimens difficult to systematically assign precisely. Here we describe one of the few earliest fossil passerines, from the early Oligocene (ca 30 Ma) of southern France, and one of the best preserved and most complete. This fossil can be conservatively assigned to Tyrannida, a subclade of the New World Tyranni (Suboscines), i.e. of the Tyrannides. A most probably stem-representative of Tyrannida, the new fossil bears strong resemblance with some manakins (Pipridae), possibly due to plesiomorphy. Furthermore, it yields a new point of calibration for molecular phylogenies, already consistent with the age of the fossil. Tyrannida, and the more inclusive Tyrannides, are today confined to the New World. Therefore, the new fossil calls for scenarios of transatlantic crossing during or near the Oligocene. Later, the European part of the distribution of the Tyrannida disappeared, leading to a relictual modern New World distribution of this clade, a pattern known in other avian clades. The history of Tyrannida somehow mirrors that of the enigmatic *Sapayoa aenigma*, sole New World representative of the Eurylaimides (Old World Tyranni), with transatlantic crossing probably favoured by similar events.

New insights from old bones

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Abstract

When hearing the word fossil most people have a few famous examples in mind. However, besides well-known, iconic specimens, many less known and sometimes forgotten materials can be found in storage rooms and museum basement. These little-known materials have great potential to provide us with new insights about human evolution and evolution in general. Technological improvements of the last decades allow us to analyze even very fragmented and damaged fossils in a comprehensive framework and thereby, to study materials that could not be analyzed in depth at the time of their discovery. The fossil crania from Apidima and the isolated molar from Megalopolis, Greece, are examples illustrating the potential of new analyses of materials excavated decades ago to our understanding of Neanderthal legacy. On the one hand, the virtual reconstruction, direct dating and comparative shape analysis of the Apidima remains overturned previous hypotheses by indicating the presence of an early Homo sapiens population, followed by a Neanderthal one, at this site (Harvati et al. 2019). On the other hand, the previously unidentifiable Megalopolis molar, likely assigned to the Neanderthal lineage through its crown shape comparative analysis, contributes to the scarce Pleistocene human fossil record of Greece (Röding et al. in press). Such re-evaluations of old materials can therefore provide important new insights, and are particularly crucial in cases where new excavations are not always possible, to better integrate our knowledge. In addition, methodologies and their improvements, like the examples above, might be applied beyond their intended use and in a variety of contexts, ranging from paleontology, zooarchaeology to (paleo-)anthropology.

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The villa of Argentelle: remains of a gallo-roman elite

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Keywords : Antiquity, Rutene, Aveyron

Abstract

The department of Aveyron, whom ancient gaulish people are known as the Rutenes, has a rich heritage dated to antiquity. While the site of La Graufesenque can be cited as a reference by its popularity throughout the Empire for its production of terra sigillata, other sites lesser renown deserve special attention. Such is the case of the Gallo-Roman villa of Argentelle located in the village of Montrozier. It dates from the 1st century BC to the 4th century AD and is currently the largest ancient rural settlement in the department. Nevertheless, the information we have is only the legacy of excavations carried out in 1860 by an abbot named Paulin François Cérès. The amateur archaeologist gives us in excavation notebooks a plan of the excavated remains as well as some small information on the obtained results. Materials can still be seen at the Fenaille Museum in Rodez and in Montrozier museums but also in the reserves. When you look carefully at the plan, it appears that Ceres did not excavate the complete villa and the different stages of construction over the centuries were mixed up. In an attempt to update the data on this huge villa I undertook geophysical prospections in 2020, especially to enrich the plan. Thanks to the collaboration with the Environmental Geoscience Laboratory in Toulouse, students and researchers have participated in the setting up and running of these operations. Carried out last autumn, the aim of this prospecting was to find the location of the villa and to test the reliability of two geophysical methods: magnetic and electrical. The convincing results allowed us to learn more about this aristocratic residence and to schedule a new operation for April 2021.

The Mousterian Levels of Riparo Tagliente (MIS3-4, Italy): Monospecific hunting strategy of roe deer by Neandertal

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Abstract

Monospecific hunting strategies is a behavior highlighted in some of Middle Palaeolithic sites for medium and large-sized ungulate. However, the specific prey selection of small sized ungulates is a less common behaviour, which were observed within the Mousterian levels of Riparo Tagliente (MIS 3-4, Italy). Riparo Tagliente is a rock shelter discover in 1958 and excavated since the sixties. A first study of the faunal remains shows that the roe deer dominated (80% of the remains taxonomically identified) in the Mousterian assemblages, mostly in the upper level (level 35). The revision of the faunal assemblage of this level, according to a classical zooarchaeological and taphonomic approach, allows us to identify which innovative methodologies can be tested on this material (such as ZooMS, isotopic analysis or dental calculus). This first review of the faunal assemblage provides the opportunity to select the appropriate remains for such analyses to cross-reference the results related to the Neandertal subsistence strategies with environmental data. Included in a regional and chronological perspective within the SUBSILIENCE project, these results will allow a better understanding of the resilience of these populations to the different climatic changes that may have occurred during the transition between the last two *Homo* species.

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