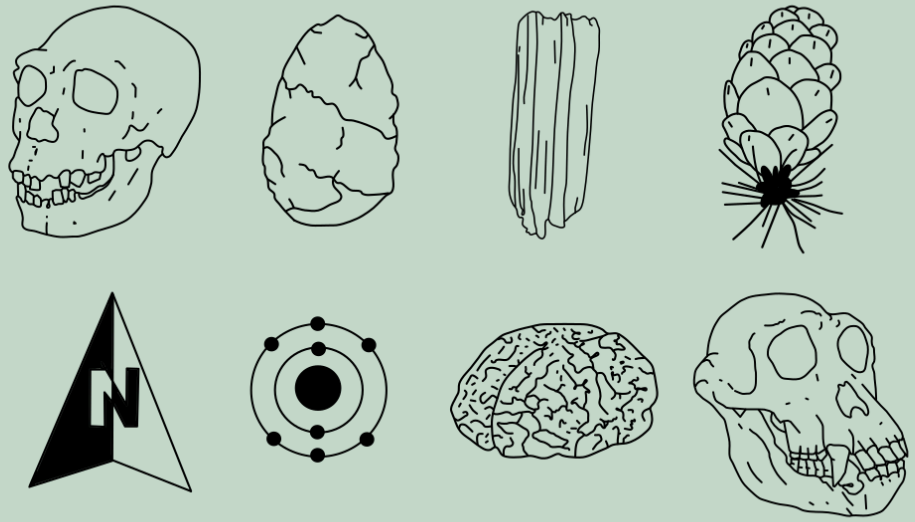
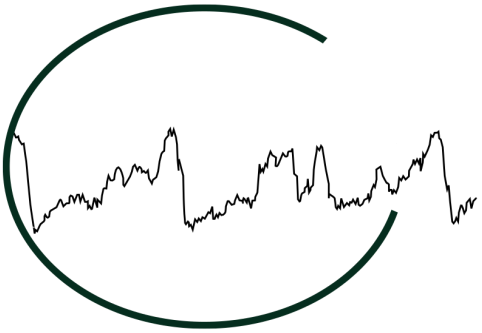
CEPEC 25

Congrés d'Estudis en Paleoecologia i Evolució Cultural

22 - 24 octubre, Tarragona





We all know about the exigencies of the academic system regarding the diffusion and socialization of investigation's results on the spaces given for them. On top of that, during the beginning of the scientific career the lack of awareness about those spaces results in the disadvantage of not obtaining those academic merits. This is the main reason behind the creation of the First Congress of Palaeoecology and Cultural Evolution Studies.

The main objective of this congress is to contribute building debate and discussion within our field of study by those who are on the first steps of their scientific career. We aim to encourage inter and transdisciplinarity of the prehistoric studies with the objective of building networks farther than our usually reduced study scope. These are the reasons why in the proposals we are looking for a cross view of the topics and materials studied.

After all the time and effort invested in the preparation of this meeting, we would like to thank the Institut Català de Paleoecologia Humana i Evolució Social (IPHES-CERCA). To all the people that constitute it, who were always willing to aid and collaborate with this project. To the Fundació Universitat Rovira i Virgili (FURV) for the guidance, support and help during the process. To the European consortium of the International Master in Quaternary and Prehistory (IMQP), which built the initial network. To the Institut Català de Arqueologia Clàssica (ICAC-CERCA), who were willing to build bridges between research institutions. Special mention to Can Peret, a bar willing to open its space to science.

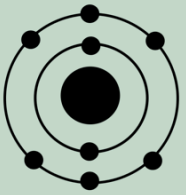
In representation of the Organizing Committee,

Saray Pascual-Moliner & Alba Vidal-Soliño

INDEX

Session 1

Biomarkers and Archaeobotany



Where we are and how do we alter it

Seasonal insights into the dietary ecology of Eastern European cave bears: a story of evolution, specialisation, competition, and ecological collapse

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Cave bears (*Ursus spelaeus* sensu lato) represent a remarkable example of Late Pleistocene megafauna, whose ecology and extinction dynamics remain a subject of intense debate. This study investigates the short-term dietary ecology of Eastern European cave bear populations using dental microwear analysis (DMA) on specimens from Romanian Carpathians, Moldavian Highlands, Northern Balkans and Southern Rhodopes, Morava-Drina Highlands and the Eurasian reaches of the continent; namely the Greater Caucasus and the Northern Urals. By analysing and quantifying microwear features, this research captures the final days-to-weeks dietary behaviour prior to death, offering a high-resolution perspective complementary to isotopic and morphological analyses. Complementing the prevailing view of cave bears as highly specialised herbivores adapted to the Mammoth Steppe biome, based on morphological evolution and stable isotope values, our results suggest a behavioural ecology more comparable to that of extant northern hemisphere ursids, characterised by landscape-based dietary opportunism. This inferred dietary flexibility is further supported by partial niche overlap with contemporaneous southern refugia dwellers *U. arctos* populations. The results challenge the long-standing paradigm of entirely separate ecological niches for these co-extinct species (*U. spelaeus* and *U. arctos*), instead suggesting a more complex relationship involving regional niche overlap and possible local-scale partitioning, with implications for interspecific competition. Additionally, the case of the *U. kudarensis* lineage from the Caucasus, which appears to shift diet in response not only to climate but also to the presence of other ursids and humans, underscores the role of ecological pressures in shaping cave bears evolutionary trajectories. Taken together, these findings call for a reassessment of cave bear extinction dynamics. Climate change alone is unlikely to explain their disappearance. Rather, ecological specialisation, particularly during resource-scarce seasons and to refugia areas, combined with pre-hibernation

competition for food and denning space with *U. arctos* and humans, likely contributed to a gradual, multifactorial extinction process.

Keywords: *Ursus spelaeus* sensu lato; *Ursus arctos*; Dental microwear analysis; Eastern Europe; Pleistocene; Seasonal flexibility

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The paleoenvironmental and paleoethological reconstruction of Cova Gran using stable isotope analysis

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This study reports on the paleoclimate and paleoethology of Cova Gran (Catalonia, Spain) during the end of the Younger Dryas, using material dating back from 14.8 – 10.8 k cal BP attributed to the Magdalenian. The two objectives behind this work were firstly to reconstruct the life conditions of wild goat, estimating the potential impact of climate on their behavioural conditions. Secondly, to see the possible effects this would have on human subsistence patterns. This was done via stable isotope analysis on enamel and bone remains of *Capra pyrenaica* teeth and bone. Stable carbon isotopes ($\delta^{13}C$) were analysed to understand diet and reconstruct mean annual precipitation (MAP). Stable oxygen isotopes ($\delta^{18}O$) were analysed in tooth enamel to reconstruct the seasonality of births of *C. pyrenaica* and estimate mean annual temperatures (MAT). Lastly, $\delta^{13}C$ and $\delta^{18}O$ were used in tandem to observe the seasonal altitudinal mobility of *C. pyrenaica*. The results showed the paleoclimate of the site was warm and arid. These conditions suggest that the warming associated to the Holocene transition was already occurring on a more local level. In terms of seasonality of births for *C. pyrenaica*, the individuals were born between a 5.64 and 11.28 month period. This large birthing period was likely influenced by the warmer conditions and possibly the arid conditions led to two rutting seasons developing. *C. pyrenaica* likely consumed mainly C3 plants. The seasonal altitudinal mobility was only recorded in the isotopic record for certain individuals. This is possibly linked to the climatic conditions and the plant diet of these animals masking mobility.

The focus of this study was to use stable isotopes (a biomarker) to estimate the paleoenvironment of the site of Cova Gran. It applies stable carbon, oxygen and nitrogen isotopes to bone and enamel to do so. Whilst there is no direct use of archaeobotanical remains, there are comparisons made in the study to data from pollen analysis and the presence of C3 plants in *C. pyrenaica* diet in the area is touched on.

Keywords: Stable isotopes; Paleoclimate; Younger Dryas; Seasonality; Diet

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Pinus abundance in the eastern Iberian Peninsula during Late Middle Paleolithic: The problematic for paleoenvironmental reconstruction and Neanderthal behavioural practices regarding fire wood management

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The recurrence and abundance of the genus Pinus for Middle Paleolithic wood charcoal assemblages has been long well known on the Iberian Peninsula Mediterranean façade, dominating the record. However, its ecological representativeness and landscape prominence has been discussed due to its possible over-representation, caused by the anthropological bias, regarding the paleo-ecological context. Nevertheless, the recurrence of the fact and its broad geographical distribution may lead to debate. In order to test this, anthracological studies may be helpful when comparing assemblages from several sites and some of the alterations found within them. It could be assured that the anthracological assemblages are reliable regarding the Pinus dominance of the ecosystems.

To test this, we propose a two steps study based on the anthracological method. With the focus on the taphonomy of the assemblage, we present the results on the study of the level XI from the site of El Salt (Alcoy, Alicante) and, when possible, some considerations on the factors that may have led to those taphonomic alterations. This information will be crossed with the results from other sites within the same time-space frame to test the normality of the assemblage and discerning possible patterns. The outcome of the analyses is expected to provide new tools for the debate on the topic and to shed some light on some of the Neanderthal wood-management practices and their forest environment.

Even though during this study we could not invest into applying isotope studies, for future works it would be of great interest researching into $\delta^{13}C$. The distribution and oscillations of this isotope could provide some information regarding drought stress

conditions and even differences between the possibility of existing dominant and suppressed trees (Roibu, et al., 2024). But not only for paleoenvironment is it useful. Wood is mostly composed from cellulose, hemicellulose and lignin, which retain carbon isotopes in different proportions. The main information obtained is the atmospheric carbon value when the tree was alive. But, when the wood is burnt and it turns into wood charcoal, the ratio for the disappearance of $\delta^{13}C$ is faster for the cellulose and hemicellulose, with values getting closer to those of lignin. It is known that this values remain more or less stable up to reaching 500ºC, functioning as another proxy into the fire temperatures reached for hearths.

Keywords: Anthracology; Middle Paleolithic; Mediterranean Levant; Paleoenvironment; $\delta^{13}C$

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Una mirada microscópica al pasado: aproximación al uso de recursos vegetales a partir de microrrestos del conjunto lítico del sitio Las Locitas, Caleta Chañaral de Aceituno, Atacama [(a)]

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Este trabajo busca examinar el uso de recursos vegetales por parte de las comunidades cazadoras, recolectoras y pescadoras de la costa de la Región de Atacama durante el Holoceno medio (ca. 9000 - 5000 cal AP). El foco principal del trabajo desarrollado corresponde al análisis de microrrestos vegetales (principalmente granos de almidón y fitolitos) adheridos a artefactos líticos recuperados del sitio costero Las Locitas (Norte Semiárido de Chile), con el objetivo de reconstruir prácticas de procesamiento vegetal y aportar nuevas perspectivas sobre la subsistencia y movilidad de poblaciones sobre las cuales el conocimiento arqueológico es aún extremadamente limitado .

La investigación incluyó el muestreo sistemático de piezas líticas de distintos niveles estratigráficos, las que fueron preparados siguiendo los protocolos de control de contaminación y la observación a través de microscopia óptica con luz transmitida polarizada. Además, se elaboró una colección de referencia de especies pertenecientes a la costa en la región de estudio a partir de cortes histológicos a fin de facilitar la identificación taxonómica de los microrrestos arqueológicos.

Este estudio contribuye a llenar vacíos de información sobre las poblaciones costeras del Norte Semiárido de Chile, ampliando la comprensión de sus patrones de asentamiento, movilidad y adaptación a contextos ambientales cambiantes. Asimismo, resalta el valor que tienen los microrrestos como una herramienta para abordar estas materialidades y lograr avanzar en reconstrucciones más completas de las dinámicas socioecológicas de los grupos del Holoceno medio.

Palabras clave: Arqueobotánica; Microrrestos; Subsistencia; Holoceno medio; Norte Semiárido de Chile.

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(a) This work is within the project: ANID-FONDECYT 1221825 *"Ocupación Humana en la costa del interfluvio entre los ríos Elqui y Huasco (28°-29° lat S) durante el Holoceno Medio (ca. 9000–5000 cal AP)"*.

Session 2

Palaeoanthropology and Primatology

Where do we come from and what are we evolving into

Methodological advancements in the analysis of dental wear: Examining the possibilities of the 3D Digital Hirox KH8700 microscope

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Dental Microwear analysis is considered an important non-destructive method for the reconstruction of diets and behaviors of past human populations, providing insights into the subsistence strategies with subsequent social implications. Throughout the conduction of the specific discipline in archaeological science, different methodological frameworks have overlapped, which have been affected by the technological advancements in the field and the development of more precise microscopy equipment. The specific study adopts a comparative approach to infer the possibilities of a piece of equipment, which has been recently implemented in the studies of dental wear, the 3D Digital Hirox KH8700 microscope. By comparing the values obtained from an Optical microscope (ZEISS Axioscope A1 metallographic microscope), we provide insights concerning the utilization of a 3D Digital microscope for the detection and quantification of diet-related wear patterns on the enamel surfaces of human dental remains. The methodology includes the production of high-precision molds and casts, and the subsequent microscopic observation of replicas and original teeth under both microscopes. By applying different ranges of magnification (x35, x50, x100, and x140) and exploring the several applications of the equipment used, we highlight the possibilities of the Hirox KH8700 microscope for the detection and interpretation of striations on labial and buccal surfaces, thus advancing methodologically in the conduction of Dental Microwear analysis. In this context, our contribution aims at the provision of the first approach for the integration of a 3D Digital microscope for understanding and interpreting dental wear patterns related to the alimentation of past populations, opening new possibilities in this line of research.

The application of Dental Microwear analysis is closely linked to disciplines that utilize microscopy to address archaeological questions. This specific approach has already benefited from insights of use-wear analysis of lithic artifacts using the 3D Digital Hirox KH8700 microscope. At the same time, it offers a promising starting point for integrating the specific equipment into studies that demand relatively rapid processing of archaeological materials, while also enabling the obtainment of images with large surface areas and fast quantification of the exhibited features. In this context, we aim to foster a constructive dialogue with researchers from various disciplines, which can potentially further advance the proposed methodological framework.

Keywords: Dental Microwear analysis; Diet; Intermicroscopy variability; Optical Microscope; 3D Digital Microscope

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Lateralization and brain asymmetries in humans through the study of the endocranium

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The lateralization present in humans due to cerebral asymmetries is mainly related to verbal capacity and object manipulation. The most common brain asymmetries are petalias, where one hemisphere protrudes into the other hemisphere, leaving marks on the inside of the skull. Paleoneurology studies the anatomy and evolution of the brain through the analysis of endocasts, which are created from the endocranial cavities using virtual anthropology techniques and reveal the external anatomy of the brain.

In this research, we work with a representative sample of 30 endocasts of individuals of the genus Homo sapiens, with an equal number of males and females, created from the computed tomography scans of 30 skulls obtained from the NESPOS repository (Pleistocene People and Places) managed by the Neanderthal Museum. The study of the constructed endocasts aims to demonstrate that the petalial pattern of these individuals is the typical pattern of Homo sapiens, that is, the predominant pattern is the right frontal- left occipital petalia. The research also seeks to verify whether there is a relationship between petalias and sex, endocranial volume, dominant hemisphere, and manual laterality, and to compare the petalias present in Homo sapiens with those described in other species of hominins and non-human primates.

This sample has a typical Homo sapiens petalial pattern, with a positive petalia described in 83% of the reconstructed endocasts, of which 64% present a right frontal-left occipital petalia. While males and females show differences in the absolute size of brain capacity, there are no differences in petalia frequency. Additionally, it has been verified that the dominant hemisphere is not related to sex, petalias, or the volume of the endocast.

The 30 Homo sapiens endocasts studied present a characteristic petalial pattern of this species, with the right frontal-left occipital petalia predominating over the left frontal-right occipital petalia. This supports the existence of a dominant petalial pattern in Homo sapiens. Paleoneurological studies and magnetic resonance imaging have been conducted to determine the petalias of other hominin species and non-human primates,

enable the comparison of the petalial pattern of Homo sapiens with that of other hominin species and non-human primates. These studies aim to identify when the right frontal-left occipital petalia became predominant in the population.

Keywords: Cerebral asymmetries; Petalia; Endocasts; Homo sapiens; Lateralization.

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Defining carpal morphology across primates: a virtual landmark template approach

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The wrist has only recently gained attention among scholars, largely due to advancements in 2D and 3D imaging analysis since the late 1980s. The development of precise virtual image and a wide range of analytical tools is providing new understanding on wrist function and its complex morphological variation across our Hominin family. In this study, we proposed ten landmarks (categories I and II) on three carpal bones - the scaphoid, capitate, and trapezium - from a comparative sample of primate species, including Homo sapiens, Gorilla sp., Pan troglodytes, Papio sp., Ateles sp., Colobus sp., and Homo naledi. For each specimen, five individual bones of each type were analysed. The landmark templates applied were originally developed in a prior study focusing exclusively on human carpal morphology. Here, we assess the cross-species applicability of these templates to non-human primates. This work highlights the value of virtual anthropology by using anatomical landmarks and General Procrustes Analysis (GPA) performed in R. The repeatability of each landmark configuration was evaluated for all bones included, and shapes variation are studied through geomorphometry applications. The objective is to determine whether landmark templates initially designed for human carpal bones can be extended to primate species with various functional adaptations of the hand, particularly those related to locomotor behaviours. We expect to observe a decreasing index of landmark template reliability corresponding to increasing phylogenetic distance between species. Alternatively, we also anticipate that differences in hand use related to locomotor behaviour may challenge the reliability of the landmark templates across taxa.

This work contributes to both of the research fields by exploring morphology variation across a range of extant as well as extinct primates with Homo naledi hands remains. Through the application of a third discipline which is virtual anthropology, the study offers a framework for comparing wrist anatomy across species with different use of the hand and evolutionary histories. By testing the applicability of human based landmark template to non-human primates it provides insights into evolution of wrist function and structure through Hominin lineage. This has direct implications also for interpreting

fossil wrist remains and understanding the biomechanical adaptations in primates history.

Keywords: Paleoanthropology; 3D mesh; Geomorphometry; Wrist; Comparative study

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Exploring Cultural Evolution through Tool Use in Chimpanzees (*Pan troglodytes*)

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The study of technical behaviour in non-human primates has significantly contributed to the debate on the evolutionary origins of material culture. In particular, chimpanzees (Pan troglodytes) have shown remarkable abilities to create, use and transmit tools, becoming a key model for analysing the roots of social learning and cultural traditions. This research adopts a comparative approach to explore how the mechanisms of social transmission observed in chimpanzees can shed light on the emergence of cumulative culture in the human lineage.

The study was conducted at Fundació Mona (Riudellots de la Selva, Girona), a chimpanzee rescue centre, using a complex instrumental task presented as a novel enrichment situation. The task required the sequential use of two different tools to obtain a food reward. Two mixed social groups of five individuals each participated. Focal observation and systematic data recording were used to track variables such as tool type, interaction time, tool modifications, presence of bystanders, and transfer dynamics (voluntary, passive, aggressive). Statistical analyses are currently being applied to explore correlations between technical success, social context, and individual profiles.

The main objective is to assess the role of social learning in the acquisition and spread of technical behaviours, and to identify the cognitive and social factors that enhance or limit such transmission. The expected outcomes aim to clarify the minimal conditions required for the emergence of stable cultural forms in non-human species, and to contribute to our understanding of the evolutionary foundations of human technical behaviour and cumulative culture.

This research bridges primatology and paleoanthropology by using chimpanzee tool behaviour as a comparative model to infer cultural processes in early hominins. Through systematic observation, and the analysis of acquisition and social transmission

of tool use in two groups of captive chimpanzees the study aims to identify the minimal cognitive and social requirements for the emergence of group-level technical practices. These data allow for the formulation of more grounded hypotheses about the appearance of material culture in the archaeological record, providing an empirical link between primate behaviour and past human dynamics. Thus, the work contributes both to the study of cultural evolution and to the development of cross-species comparative methodologies

Keywords: Social learning; Cumulative culture; Tool use; Primatology; Cultural evolution.

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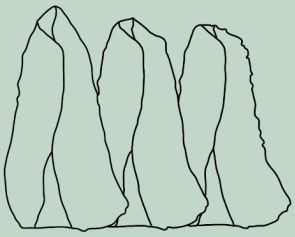
Session 3



Experimental and Taphonomy

How did it happen and
how do we know it

Análisis tafonómico-espacial del nivel II.1 de La Mina (Barranc de la Boella, Tarragona, España): procesos de formación e ideas a futuro

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El Barranc de la Boella es un yacimiento arqueológico clave para la investigación sobre las migraciones hacia el oeste del continente europeo durante el Pleistoceno inferior y la transición al Pleistoceno medio. Presenta una secuencia litoestratigráfica de nueve metros de potencia, dividida en seis unidades (I a VI, de base a techo). La unidad II, datada en cronologías de 0,96 – 0,78 Ma., es la que ha concentrado los trabajos de excavación hasta la fecha. Se han intervenido en tres catas diferentes: *Pit 1,* La Mina y El Forn. En este trabajo se presentan los resultados del análisis tafonómico y del análisis espacial del nivel II.1 de La Mina. El conjunto presenta una conservación de elementos con un alto índice de fragmentación. Las superficies óseas se caracterizan por la alta presencia de alteraciones subaéreas y fosildiagenéticas. Se ha identificado la actividad de carnívoros y homininos, estos últimos atestiguados a través de la industria lítica conservada aunque su actividad sobre las carcasas no está demostrada. Se trata de un contexto de elevada competencia inferido a través de los perfiles anatómicos y la destrucción diferencial de elementos y sus porciones. Los análisis espaciales, sumados a la información tafonómica sobre alteraciones bioestratinómicas, han mostrado una importante influencia de corrientes de baja intensidad en el proceso de formación del conjunto. El Barranc de la Boella corresponde a un lugar de tránsito rico en recursos, atractivo para especies predadoras, que favorecería la interacción entre distintas especies animales, permitiendo realizar una aproximación al rol de los homininos en este contexto.

Trabajos previos relacionados con las alteraciones de marcas de origen antrópico han mostrado un alto grado de alteración química de corticales, afectando gravemente a la conservación de características que permiten identificar algunas estrías como antrópicas. Para solventar dicha problemática, se propone de cara al futuro la realización de un trabajo experimental con la aplicación de morfometría geométrica para llevar a cabo la comparación entre marcas de corte experimentales bajo alteración química y marcas de

origen dudoso encontradas durante este estudio en el registro del Barranc de la Boella, las cuales aun manteniendo una morfología similar a una marca antrópica no conservan las características necesarias para su correcta identificación. Este proyecto permitirá complementar el análisis tafonómico desarrollado en este trabajo además de avanzar en el marco experimental del estudio de marcas de corte alteradas desde un enfoque cuantitativo.

Palabras clave: Análisis Espacial; Arqueología experimental; Tafonomía; Paleoecología; Pleistoceno inferior.

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Under the shadow of megafaunal remains: taphonomy as a tool and theoretical background to understand the relevance of small faunas in the subsistence of the earliest inhabitants of Tagua Tagua, Central Chile

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Taguatagua 1, 2 and 3 are the oldest open-air archaeological sites in Central Chile (12,600 – 11,600 cal BP), with unambiguous interaction between early hunter-gatherers and extinct megafauna, like proboscideans, deer and horses. Two of these, TT-1 and TT-3, extend their record into the Holocene (8,200 cal AP). They are in the ancient lakeshore of a present-day drained lake, where butchering activities were made, expressed in cutmarks, burned surfaces, and bone tools, as was the case with TT-1. Spatially associated, an extensive and diverse record of small vertebrates has also been recovered (Class: Amphibia, Aves, Mammalia, Reptilia and Teleostei). Through taphonomic studies, a mixed origin can be attributed to the faunal assemblage, with humans and non-human agents conforming the faunal record, which includes predators and environmental changes. With a deeper understanding of their taphonomic trajectories, it has been possible to reconstruct how and why the animals died, but also how different combinations of taphonomic processes shaped the faunal composition in the area and their variations through time.

Fauna and taphonomy are the key concepts of this presentation. The latter is intimately shaped by experimental archaeology, where the observation of present-day taphonomic processes provides a background to understand how different small taxa are affected differentially by similar taphonomic agents, but also to evaluate how they happened, in which sequences, and how they are influenced by factors like region and environment. Also, cultural decisions such as what and how animals are processed and consumed follow differentiated paths that can be identified through taphonomic studies. Several case studies have been largely discussed in Europe and North America, but the taxonomic and taphonomic scenarios are utterly distinct from South America, where new studies are needed for a deeper understanding of how the faunal assemblages are deposited and generated in the local archaeological records.

Keywords: Pleistocene; South America; Taphonomy; Small vertebrates; Megafauna.

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Tras la huella de la técnica. Análisis Experimental y Traceológico de la Industria ósea en la transición Pleistoceno-Holoceno:

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Piedra y hueso son los elementos que han definido por norma general a los yacimientos arqueológicos, dando a su vez vida a las interpretaciones de los investigadores, permitiendo esbozar cómo era el planeta que nuestros antepasados pisaban y su relación con este. En los últimos siglos lo común ha sido relacionar la piedra a las herramientas y los huesos al consumo de carne. Los huesos o fragmentos de estos, encontrados en los yacimientos han sido catalogados dependiendo del agente tafonómico que ha actuado sobre ellos. Donde lo común ha sido vincular en el caso de que el agente fuera antrópico, los restos a actividades de carnicería y consumo, pero raramente a acciones relacionadas a la manufactura de industria, a excepción de los conjuntos del Paleolítico Superior. El objetivo de este proyecto es crear una base de datos de las distintas trazas (huellas o marcas) que la acción antrópica puede dejar sobre el hueso o asta al emplear estos como materia prima base en la manufactura de una herramienta. Para ello nos centramos en la transición Pleistoceno-Holoceno, donde un abanico de técnicas y métodos conformaban la confección de la industria ósea. Así, hemos reproducido las principales técnicas de fragmentación y las 7 técnicas principales de uso/desgaste. Todas ellas en distintas condiciones del estado de la materia y del artesano que trabajaba sobre ella. Con el fin de obtener un catálogo referencial de marcas antrópicas que demuestren la acción intencionada sobre el hueso o el asta. Esperamos así emplear este inventario de huellas (trazas) sobre los registros faunísticos de los yacimientos arqueológicos del Paleolítico Superior y Epipaleolítico, en función de una revisión de las esquirlas o fragmentos de huesos indeterminables y mediante el uso del microscopio y la comparación de lo observado en el catálogo de huellas poder determinar estos como parte de una cadena operativa en la manufactura de una herramienta ósea.

La tafonomía se encarga de analizar y estudiar los restos de los yacimientos arqueológicos con la finalidad de determinar si el estado de estos se debe a una acción u otra o a un agente u otro. Siendo la más llamativa, la determinación de la acción antrópica sobre estos. Normalmente relacionada a marcas de corte o fractura del hueso

con la finalidad de consumo. No obstante, la materia dura de origen animal (hueso, dientes, moluscos, asta, cuerno) puede haber sido usada también como materia prima base para la manufactura de útiles y herramientas. Para conocer por tanto la intencionalidad detrás de la mente humana en la acción sobre la materia animal y las marcas dejadas tras esta, es necesario tener un espejo en el presente al que mirar y con el que poder comparar. Siendo así imprescindible el empleo de la arqueología experimental con el fin de replicar las trazas que encontramos en los materiales del registro arqueológico.

Palabras clave: Industria ósea; Arqueología Experimental; Huella de uso; Microscopio; Cadena Operativa.

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Poster

Calcite as a ceramic temper: an experimental approach to prehistoric technological choices at El Mirador Cave (Atapuerca, Spain).

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This pilot experiment, conducted within the framework of a Master's thesis, aims to evaluate the technological and mechanical properties of calcite when used as a ceramic temper, as observed in El Mirador Cave (Atapuerca, Spain). At this site, calcite-tempered pottery was found in close stratigraphic association with calcite speleothems, and both macroscopic observations and preliminary Environmental Scanning Electron Microscopy (ESEM) analyses suggest that the calcite was manually processed and intentionally added to the ceramic paste. To explore this hypothesis, nine archaeological replicas were produced, each incorporating different concentrations of calcite. The ceramic vessels were fired using animal dung as fuel, with temperature being continuously recorded throughout the process using four type-K thermocouples and a thermometer. The objective was to assess overall performance during firing and to determine whether calcite-tempered pottery exhibits enhanced thermal stability and resistance to thermal shock. Finally, post-firing mechanical resilience and heat retention tests were conducted to further evaluate the potential advantages of using calcite as a tempering agent.

Experimental Archaeology offers a powerful methodological framework for reconstructing past technological choices. Despite its potential, it has been underutilized in the study of ceramic tempers —materials that ethnographic research has shown to be fundamental to traditional pottery production. Traditionally, tempers have been investigated primarily through provenance studies, employing petrographic thin sections or X-ray diffraction to characterize raw materials sources. However, their specific functional properties within archaeological contexts remain insufficiently understood. Experimental Archaeology, along with analytical tools from material sciences —such as scanning electron microscopy (SEM) and mechanical performance testing— provides a

comprehensive interdisciplinary approach for evaluating the behavior and performance of tempered prehistoric ceramics.

Keywords: Experimental Archaeology; Pottery Technology; Ceramic Tempers; El Mirador Cave; Calcite.

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Session 4

Fauna and Lithics

What we all know as “the material”

The fall of the Palaeolithic world and the beginning of the Holocene in north-east Iberia from the lithic and faunal record

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The Pleistocene to Holocene transition is characterized by rapid environmental changes that affected the social and economic organization of the hunter-gatherer populations. This period, known as Late Glacial, starts with the Greenland Interstadial 1 -GI-1- (14.700-12.900 cal BP), which is the first warm period after the Last Glacial Maximum, and ends with the Greenland Stadial 1 -GS-1- (12.900-11.700 cal BP), a new glacial episode that stopped this climatic improvement. The GI-1 entailed the transformation of populations that were well adapted to glacial conditions during millennia, to interglacial conditions, with the appearance of forests in places that before were occupied by steppes. The archaeological record of the Iberian Peninsula and France during this period is well preserved, showing a high concentration of sites, with the occupation of new ecological niches.

These palaeoecological changes likely shaped the behaviour of post Last Glacial Maximum or Late Upper Palaeolithic (LUP) populations as indicated by lithic assemblages. Technological behaviour shows a simplification of lithic production systems, local raw material procurement, a predomination of flake (over blade) production, and a process of microlithization.

In parallel with the lithic industry, faunal remains indicated shift at the end of the LUP, especially in subsistence patterns. There is a predominance of small game (especially rabbit and birds), and forest large game such as red deer, boar, and roe deer, rocky and mountain taxon such as ibex, and the first consumption of snails.

This work aims at identifying changes in human behaviour during the Late Glacial. To do this, we carried out a systematic review of the lithic and faunal record in north-east of the Iberian Peninsula cross comparing these data with ecological and archaeological interpretations.

This research aims at understanding how dynamic environments shaped the behaviour of past populations, specially in a period that has been traditionally described as challenging for hunter-gatherer populations.

Keywords: Late Glacial; Late Upper Palaeolithic; Lithic industry; Fauna; Subsistence strategies.

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Space, time and movements: a multidisciplinary advances study on the human occupation of Cueva de Los Cabezazos (Tenerife, Canary Islands, Spain)

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This paper aims to present the application of a multidisciplinary methodology applied to Cueva de Los Cabezazos, located in the municipality of Tegueste, specifically in the Barranco de Agua de Dios, a geographic area with a significant presence of human occupation by the Guanches, the original inhabitants of the island of Tenerife. Currently, chronological data allow for the establishment of uninterrupted occupation between the 7th to 15th century C.E. However, the current fieldwork started in 2023 suggests two differentiated phases of occupation within the cave. On the one hand, the oldest phase spans from 7th to the first half of the 9th century CE and it is located in the area J. On the other hand, the latter phase spans from the second half of the 9th century to the Castilian conquest at the 15th century C.E in the area K.

The multi-proxy analysis including bone refits, ZooMS and spatial analysis techniques, through the integration of zooarchaeological and taphonomic information, will allow to specify the nature of the occupations and their temporalities in a redefined stratigraphic framework. Given the peculiarities of the site and the potential linked to the archaeological evidence, the project has the main objective of contributing to the data set enrichment on the settlement dynamics environment exploitation, within the aboriginal communities of the Canary Islands that arrived in the archipelago around the 1st-2nd century C.E.

Keywords: Cueva de Los Cabezazos; Canary Islands; Aboriginal populations; Behaviour; Zooarchaeology; Bone refits; ZooMS.

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The occupation and use of the cave Kheng El Ghar (Ksour Mountains, Saharan Atlas) by the last hunter-gatherers during the Holocene

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The Kheneg el-Ghar cave, Imi-n-Aqvun in the local language, is located on the southern slopes of the Ksour mountains, an integral part of the western Saharan Atlas. Is located 30 km south of the Boussemghoun ksar. The ancient ecology of the pre-Saharan zones, visible through the biodocuments discovered during our excavation campaigns (2023-2025), announces the nature of the climate and its upheavals during the Holocene.

The first results from the excavations, which began in 2023, show encouraging signs of intense human activity. These human groups had developed specific behaviours based on the use of animals as a resource and on the use of ornaments for aesthetic purposes. The bones unearthed - fractured, carved, burnt or bearing traces of cutting - indicate the main protein consumed. The variety of lithic objects shows the use of blunt objects to help cut the consumed animal.

Ceramic fragments with different decorations are abundant. These are cultural clues linked to the bone remains of the animals eaten. These animals would have been exploited for their raw materials, such as milk, and the ceramics would have been used to contain the food products. millstones, grinding wheels and adzes indicate one of the main activities linked to their subsistence economy: the grinding of seeds or berries collected in the surrounding area, some of which were burnt (study in progress). The presence of malacofauna raises the question of its origin and the species collected during excavation. Some shells were used to make pearls (rings), as were ostrich egg tests to make the same object.

Keywords : Cave; Holocene; Bones; Ceramic; Lithic.

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La explotación faunística en la secuencia arcaica del sitio Las Locitas, Chañaral del Aceituno, Región de Atacama [(a)]

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En la última década, diversos equipos de investigación han abordado de manera sistemática el estudio de grupos cazadores recolectores pescadores en la costa del Norte Semiárido. Este desarrollo, sin embargo, no ha tenido un correlato homogéneo, permaneciendo aún varias áreas escasamente abordadas desde la arqueología. Esta situación ha impedido la incorporación de algunas áreas en el relato general sobre los grupos humanos que habitaron esta zona, lo que deriva un desconocimiento de las trayectorias históricas propias de las comunidades que habitaron esta costa. En la presente comunicación, abordaremos el consumo de fauna identificada en el sitio Las Locitas, ubicado en la localidad costera de Chañaral de Aceituno, Freirina, Región de Atacama, sector vagamente abordado desde una perspectiva arqueológica. El sitio corresponde a una dispersión de conchales ubicados sobre un amplio campo dunar actualmente activo frente a una bahía protegida. Estos conchales evidencian en superficie una amplia diversidad taxonómica de especies animales, restos de material lítico, anzuelos de concha, entre otros materiales arqueológicos. Esta área es además utilizada hasta la actualidad como espacio para el desarrollo de actividades de explotación de recursos costeros de baja escala. Recientes excavaciones desarrolladas en el marco del Proyecto ANID-FONDECYT 1221825 “Ocupación Humana en la costa del interfluvio entre los ríos Elqui y Huasco (28º-29º lat S) durante el Holoceno Medio (ca. 9000-5000 cal AP)” han revelado una secuencia de ocupación adscribible a comunidades de recolección, pesca y caza costera que incluye el consumo de una amplia diversidad de moluscos, peces, aves y mamíferos terrestres y marinos, en proporciones variables a lo largo de la secuencia de ocupación. A partir de la información faunística, este trabajo busca caracterizar no sólo la dimensión económica de las poblaciones que habitaron la costa de los 28° lat. Sur, sino aproximarnos a preguntas acerca de la movilidad residencial, la variabilidad diacrónica y las implicancias ecológicas de estas evidencias para la interpretación de los modos de vida de los grupos de recolección, caza y pesca en un sector hasta ahora poco abordado para la arqueología de la costa del Norte Semiárido.

Palabras clave: Cazadores-recolectores-pescadores; Ictioarqueología; Arqueología costera; Conchales; Holoceno medio.

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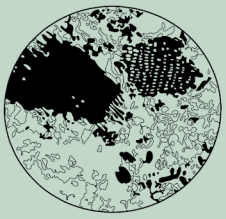
(a) ANID-FONDECYT 1221825 *"Ocupación Humana en la costa del interfluvio entre los ríos Elqui y Huasco (28°-29° lat S) durante el Holoceno Medio (ca. 9000–5000 cal AP)"*.

Session 5



Geoarchaeology and Spatial analysis

The ones we all need,
the ones we all forget

Palaeosols and Chronological Complexity in Gran Dolina TD10

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Cave entrance environments, frequently encountered in archaeological contexts, can present analytical challenges due to the interplay of diverse depositional and post-depositional processes. Gran Dolina TD10, within the Sierra de Atapuerca (Burgos, Spain), exemplifies the complexity of such a setting, where these dynamics can complicate palaeoenvironmental and archaeological interpretation. Establishing a robust chronological and palaeoecological framework for the formation of this unit is therefore a major interpretive hurdle.

This study investigates the palaeoenvironmental context of this unit based on soil stratigraphy and micromorphological analysis. Large-format thin sections were prepared from undisturbed monolith samples collected from the N12, N16/N17, and K22 stratigraphic columns. Unit TD10 was subdivided into three lithostratigraphic sub-units: TD10a, TD10b, and TD10c. Different stages of Rendzina soil development were identified in TD10a, while TD10b exhibits evidence of permafrost and palaeo-argillic brown earths. No soil formation features were observed in TD10c. Subsequently, soil profiles were identified and interpreted based on thin section analysis. These revealed various types of palimpsests: temporal in TD10a, and both cumulative and spatial in TD10b, which provide key insights into site formation processes and the archaeological record. These processes were then correlated with Bayesian age estimates. TD10a aligns with MIS 9, consistent with interglacial Rendzina soils. In contrast, TD10b presents a chronological discrepancy between Bayesian dates and permafrost and palaeoargillic horizons, which are typically associated with MIS 12–11 in north-western Europe.

TD10 thus constitutes a valuable case study for discerning how soil formation processes contribute to palaeoenvironmental reconstruction in cave entrance contexts. By integrating micromorphology, stratigraphy, and Bayesian modelling, this research contributes to a refined framework at the intersection of geoarchaeology and

palaeoecology, bridging sedimentary analysis, palaeoclimate interpretation, and archaeological context.

Keywords: Rendzina; Permafrost; Paleo-argilic brown earths; Gran Dolina TD10; Palaeoenvironment reconstruction.

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Aproximación paleodemográfica a partir de la aplicación del método por anillos y sectores en el Nivel O de Abric Romaní (54.6 kya)

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En la sesión se presentarán los resultados de la aplicación del método por anillos y sectores en el Nivel O de l'Abric Romaní. A partir de la distribución espacial de los restos asociados a las estructuras de combustión centrales y de las dimensiones de la zona dormitorio, se propone una aproximación paleodemográfica a la capacidad estructural del asentamiento en diversas fases de ocupación.

Abric Romaní es un abrigo de travertino con sedimentación muy rápida y de baja energía, lo que hace que sus materiales ofrezcan una conservación excepcional y muy escasa afectación tafonómica. Esto supone un escenario totalmente antropizado, en el que la distribución de los restos responde a la acción humana de forma prácticamente exclusiva. Por este motivo constituye un caso de estudio óptimo para estudiar las dinámicas de distribución de las comunidades prehistóricas. El nivel O ha sido datado alrededor de los 54.6 mil años de antigüedad, correspondiente al Paleolítico Medio, con presencia de comunidades neandertales.

La metodología utilizada para estudiar la distribución espacial de los restos alrededor de las estructuras de combustión, como se ha mencionado, se basa en el método por anillos y sectores propuesto por Dick Stapert y desarrollado posteriormente por Henry en el caso de Tor Faraj. Por un lado, se establecen anillos concéntricos a partir del centroide de las estructuras de combustión centrales, y por otro lado la misma área se divide en ocho sectores diferentes. En base a la distribución de los restos por anillos y por sectores, se pueden realizar aproximaciones en cuanto al desarrollo de las ocupaciones e inferir la capacidad máxima de habitantes que podrían asumir las estructuras de combustión.

Para poder desarrollar el método por anillos y sectores es fundamental un análisis arqueoestratigráfico correcto. La geoarqueología confiere un marco para entender la formación de los diferentes subniveles, lo que se relaciona directamente con nuestro estudio. El análisis de la micromorfología de las estructuras de combustión también

contribuye a comprender las características de cada estructura de combustión, su formación y su función.

De hecho, la arqueología espacial, en sus propias bases, no se entiende sin la interdisciplinariedad. Los análisis faunísticos, líticos y antracológicos son cruciales para poder interpretar la coherencia espacial del yacimiento de Abric Romaní. Concretamente en el caso del nivel O, la fauna y la lítica también han contribuido a establecer los diferentes subniveles arqueoestratigráficos y a establecer interacciones entre diferentes zonas de actividad.

Palabras clave: Arqueología espacial; Estructuras de combustión; Paleodemografía; Neandertales; Geoarqueología.

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Archaeological and Paleoenvironmental Dynamics of the Sahara and Its Northern and Southern Margins: Recent Contributions

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Since 2022, archaeological research has been conducted on the Late Pleistocene and Holocene in the Sahara and its northern and southern margins, particularly in the Atlas-Saharan mountain ranges. These investigations have focused on key sites such as the caves of Kheneg-el-Ghar / Imi-nw-Aqvun in the Saharan Atlas, Telem Fezza, as well as open-air sites like Ti-n-Hetan and In-Aradigh in the Tassili-tan-Ahaggar region of the Central Sahara.

Our interdisciplinary project combines biogeochemical, paleobotanical, paleoanthropological, micromorphological proxies, and prehistoric archaeology. This approach, together with stratigraphic analyses, radiocarbon dating, and geochemical and sedimentological indicators, is used to reconstruct environmental conditions and human activities. Ultimately, the study aims to examine the interactions between human settlement and environmental changes observable at different temporal and ecological scales.

Our initial observations reveal fluctuating patterns of occupation linked to climatic variability, particularly during the humid and arid phases of the Holocene. The diversity of remains reflects complex adaptation strategies to environmental pressures.

The Tarragona meeting offers a valuable opportunity to present these first results and to deepen discussions on settlement dynamics, behavioral adaptations, processes of mixing, interactions with the environment, and territorial transformations in the changing climatic context of the Quaternary.

Keywords: Paleoenvironment; Atlas-Saharan massif; Pleistocene; Holocene; Human mobility.

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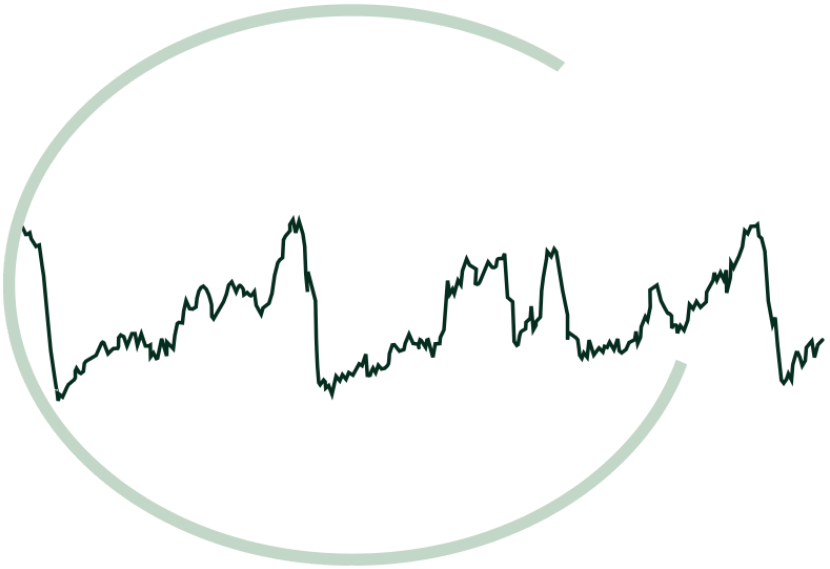

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