

Fellowships awarded in the first call for postdoctoral contracts, within the framework of the IPHES Maria de Maeztu Unit of Excellence

BEATRIZ GAMARRA

Project title: *Dental morphological analysis of Holocene Iberian populations. The enamel-dentine junction as an alternative to genetic proxies.*

The adoption of agriculture and pastoralist lifestyle started in the Iberian Peninsula around 5,500 cal BC, followed by several cultural and technological shifts during the next several millennia. The population dynamics that followed this transition and the cultural changes associated to them in the Iberian Peninsula has been long debated. Particularly in the North- East of Iberian Peninsula, the Middle Neolithic was characterized by a noticeable regionalisation, evident in the variety of funerary practices, together with the presence of a wide exchange networks established between groups in the western Mediterranean. However, by the Late Neolithic – Chalcolithic period changes occurred at different cultural and socioeconomic levels, some of them suggesting the disappearance of some of the exchange networking of the preceding period. Ancient DNA analyses in Iberian specimens have additionally suggests human mobility and genetic admixture between different Iberian populations from Neolithic to Bronze Age times.

This project's main aim is to study the changes in dental traits of human past populations as indicators of genetic replacements (or lack thereof) following the transition to agriculture in Northeastern Spain. This hypothesis will be tested by means of the combined use of high-resolution microcomputed tomography data and geometric morphometric methods applied to dental inner tissues studies, such as the enamel-dentine junction (EDJ) in upper and lower molars. The results of this project will help to understand the biological affinities between past human populations that lived in the North-East of Iberian Peninsula from Middle Neolithic to Bronze Ages times.

LAURA MARTÍN-FRANCÉS

Project title: “*BITE*”

Biologically speaking we are what we eat. Changes in diet triggered the progressive simplification of the cranio-dental system from our ancestors until the ultimate adaption of our species. Compared to ours, Neanderthals possessed a distinctive facial and dental morphology interpreted as adaptive responses for the dissipation of heavy mechanical loads. Still, the pace of these changes along the course of human evolution is unknown. This project will analyse the largest hominin dental collections belonging to the unique Pleistocene fossil hominin populations of *H. antecessor* and Sima de los Huesos recovered from the UNESCO site of Atapuerca (Spain) that are phylogenetically related to Neanderthals. The objective is to unveil how our ancestors adapted to different dietary repertoires and provide information about the biology, ecology and evolution of three phylogenetically related and chronologically consecutive European Pleistocene groups. To achieve the aim, BITE will develop an innovative and interdisciplinary approach combining biological information (enamel wear, dental morphological traits and enamel thickness), medical imaging (mCT and 3d imaging) as well as biomechanical tools (OFA and FEA). The combination of methods will allow the simulation of the chewing cycle to determine if dental wear results from dietary choices or behavioural aspects, which morphological dental traits are an advantage from the biomechanical point of view and finally, if there is correspondence between enamel thickness and the areas with higher mechanical loads.

PEDRO PIÑERO

Project Title: *A multiproxy approach for the reconstruction of continental paleoenvironments from the Plio-Pleistocene transition to the late Early Pleistocene: implications for the earliest hominin dispersals into the western Mediterranean and southern Caucasus*

Understanding past climate and the mechanisms of climate change remain major challenges in scientific research. The Early Pleistocene registered a rich record of environmental change in terrestrial environments and is a key period for the “Out of Africa” human history. The interaction between early human dispersal and the ecological conditions in which humankind evolved are of great interest for current research and nowadays society. The understanding of how the environmental changes shaped the population dynamics of early hominin species is still a crucial issue. For this purpose, the sequence of Quibas together with the sequences with evidence of human presence of Fuente-Nueva 3 and Barranco León (southern Spain; Early Pleistocene) and Guefaït (northeastern Morocco; Plio-Pleistocene), object of study in this project, are particularly significant regarding the earliest hominin dispersal into the western Mediterranean. In Caucasus, the site of Dmanisi (Georgia; Early Pleistocene) records the earliest hominin presence outside Africa.

Small mammals collected from paleontological sites provide useful information that enables to reconstruct past environment according to methods such as Habitat Weightings and Bioclimatic Modelling. However, these reconstructions could reflect local shifts in environments instead of global or regional climatic trends. It would be interesting to contrast high-resolution paleoclimatic records from small mammal associations with an independent proxy from the ecological behaviour of the species, as are geochemical approaches based on stable isotopes. Combining paleoecological data inferred from small mammal assemblage methods with geochemical approaches offers the opportunity to reconstruct both environmental and climatic conditions, as well as to assess the classical methods of paleoenvironmental reconstructions.

The aim of this project is to get high-resolution paleoenvironmental approaches from these sections based on all available small mammal data. These data allow a correlation of the succession of biotic events and the continental paleoenvironmental shifts to the marine oxygen isotope record. This gives us the opportunity to evaluate local and regional ecological and climatic conditions around the two shores of the western Mediterranean and Caucasus and their variations forced by the global climatic oscillations as recorded in the Northern Hemisphere. This project is also interested in the linkages between environmental and landscape changes in relation to the hominin dispersals during the Early Pleistocene in Western Mediterranean and Georgia.

JORDI REVELLES

Project title: *Socio-ecological resilience and environmental changes during the Holocene in the western mediterranean region*

The adoption of the farming lifestyle changed the way in which humans and nature interacted, resulting in the onset of an increasingly process of **landscape transformation**. While environmental changes during the Early Holocene where **climatically driven**, the role of human activities became decisive during Middle Holocene and exponentially increased since the Late Holocene. Detailed paleoenvironmental research is required to reconstruct past landscapes and to assess the relationship between vegetation, climate and humans, and other natural processes as

wildfires and volcanism. The Mediterranean region is in the focus of current challenges concerning **global warming**, **sea-level rise** and **extreme mega-fire events**, and long-term archaeological and paleoecological data provide a reference period against which current conditions are compared in order to understand the dynamics linking climate, vegetation, fire and human activities.

The main aim of this project is the study of **socio-ecological resilience** and **environmental changes** during the Holocene in the Western Mediterranean region, and four general objectives have been established: 1) Human-environment interaction and paleoenvironmental reconstruction during the Holocene in **Western Mediterranean Islands**; 2) **Fire-vegetation dynamics** during the Holocene in Western Mediterranean; 3) Socio-ecological impact of Neolithisation in the Mediterranean and application of **palynological studies in Neolithic archaeological sites**; 4) **Socio-ecological impact** of last **volcanic eruptions** in NE Iberia.

ANTONIO RODRIGUEZ

Project title: *Ancient modern*

The **Ancient-Modern** project is an integrative approach based on **third-generation archaeological taphonomy** that combines the potential of the digital revolution and molecular-based approaches to taphonomic studies. The main idea of this project is simple: beyond the hunting and scavenging debate, what are the main milestones in the evolutionary foraging strategies development of Pleistocene hominins? Is their appearance gradual or do they appear suddenly in the fossil record? To get closer to our goal, this project focuses on in to establish the changes and continuities of the foraging system along the **Gran Dolina** site sequence (Atapuerca) and stablish what specific factors are related with. The development of the project will provide us with a new definition of "**modernity**" from the subsistence point of view. From an evolutionary perspective, our work aims to delve into what is primitive and what is derived in the foraging systems and explore whether the information gaps that we find in the record are related to true foraging revolutions, slow accumulative processes, or incremental processes in which profound changes occur on very short time scales. The development of the project has a global focus. From this point of view, it is a first step in which a new way of approaching empirical data (third generation taphonomy) to a specific record (Gran Dolina) will be implemented. However, the research project is to extend this approach to other key deposits in East Africa, Europe, and the near East.

CARLOS TORNERO

Project title: *READ: Revealing Earliest Animal Domestication in the Fertile Crescent*

The Neolithic represents a major turning point in human history. The domestication of the four major livestock species and the subsistence economies based on those species, involved radical changes to the structure of ancient human societies and the lifestyle that humans had for millennia. The deeper consequences and the commonly accepted momentous outcomes of this phenomenon are still present in modern societies and make the origin of domesticates and emergence of breeding activities in the Fertile Crescent a major research topic for ecologists, anthropologists, animal biologists, historians, and livestock veterinarians interested in human-animal relationships through time.

The READ project will build an alternative, ground-breaking approach by using biogeochemical analytical methods to reconstruct the earliest steps of caprine domestication, and decipher these old, but unresolved paradigms. The project will investigate the historical life-traits of specimens with a high-resolution time analysis by employing cutting edge and frontier analyses on fossil caprines teeth. This will allow the PI to reconstruct the individual histories of sampled specimens over time based on tooth ontogenetic formation parameters.

The project will proceed data from three key geographical regions for this research area: the Southern Levant, the Northern Levant, and the Eastern Fertile Crescent. This includes a set of the most important and significant faunal assemblages from archaeological sites where caprine domestication is thought to have started; and will put together a major reference data-set compiled from modern collections (wild relatives and present-day specimens). Results from the project will provide, for the first time, answers to questions regarding the origin of Neolithic animal domesticates in the Southwest Asia (SWA).