

Analysis of biomarkers from pre-protolithic archaeological contexts by means of separation techniques coupled with mass spectrometry

(Proposer: Prof. Cristiano Nicosia)

This PhD project's scholarship is funded in the framework of the DIANE project (*DIANE: Integrating high-resolution sediment analysis and advanced biomolecular archaeology*), which complements and integrates the ERC-funded project GEODAP (*GEODAP: Geoarchaeology of Daily Practices: extracting bronze age lifeways from the domestic stratigraphic record*). The project is carried out in co-supervision with Prof. D. Battistel of the *Dipartimento di Scienze Ambientali, Informatica e Statistica* of the Ca' Foscari University of Venice, where most of the analyses will be carried out. Research funds foreseen in the GEODAP project amount to 60.000 € and will be available to cover all necessary analytical and operating costs and the costs of reagents. The candidate will focus on the extraction, identification and quantification – in sediments deriving from pre-protolithic archaeological sites - of a set of biomarkers such as steroids, aliphatic and aromatic hydrocarbons that can derive from specific domestic activities. Moreover, the candidate will develop and optimize novel analytical methods for the detection of degradation resistant fatty acids. The chief analytical techniques that will be employed are gas and liquid chromatography coupled with single and triple quadrupole mass spectrometry (GC/MS). The potential identification and consequent quantification of unknown compounds (untargeted approach) will be explored by means of high-performance liquid chromatography coupled with Orbitrap mass analyzer (Orbitrap HPLC-HRMS). This PhD project will be aimed mainly at obtaining a detailed mapping of specific biomarker distribution on earthen house floors to reconstruct activity areas (i.e., food preparation, concentrations of dung or excrements, storage of foodstuff, etc.). The integration of soil micromorphology within this project will be useful to put in context at the micro-stratigraphic level all the traces determined by mass spectrometry, with special focus on fecal material. This is due to the fact that the DIANE project has an overall focus on the extraction of aDNA data from ancient fecal material, with the aim of providing an image of the so-called 'ancestral' gut microbiome in the communities who inhabited the investigated sites (this specific project component will be implemented by other PhDs and post-docs). A second component of this very project will be, instead, the investigation of the residues adsorbed on pottery such as for example fats, waxes and resins. These biomarkers can in fact be used to identify the animal and plant foodstuffs processed in ceramic vessels, hence allowing us to understand their function and significance in past communities.