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WG2 Training School **"Qualitative and Quantitative Methods for the study of Middle Palaeolithic material culture"**	
Organisers	Emanuela Cristiani, Università degli Studi "La Sapienza" di Roma (Italy) Francesca Romagnoli, Universidad Autónoma de Madrid (Spain)
Duration dates	8-9/7/2021
Description	Aims: To provide necessary theoretical and practical knowledge about qualitative and quantitative analytical approaches currently applied to the study of Middle Palaeolithic organic and inorganic material culture. Description and outputs: The course will be held *online*. Students will learn about the most recent analytical trends in the research of Middle Palaeolithic material culture with particular emphasis on technological and use wear analysis, residue analysis, 3D modeling, spatial analysis, surface metrology, laser scanning confocal microscopy. Different case studies will be discussed so to provide a broad archaeological framework to the course. Students will become familiar with the main optical equipment associated with material culture analysis (e.g., stereoscope; metallographic and polarised microscopes; transmitted microscopy; Scanning electron Microscope, etc.). Additionally, they will learn about a wide range of non-anthropic traces that can develop on material culture and possibly affect our interpretation of Middle Palaeolithic material culture.

PROGRAM

8th of July 2021

9:30-11:00	**Romagnoli F.** *Universidad Autónoma de Madrid* *Dpto. Prehistoria y Arqueología*	**Lithic technology: human mobility and assemblage formation processes**
Keywords: Technological reading; Refitting; Recycling; Intra-site point pattern analysis		
One of the most complex thing when studying technology is how to move from the analysis of single lithic elements to the interpretation of the assemblage as a whole, beyond labelling the collection with general technological concepts ("it is a Levallois techno-complex", "micro-production is well attested" etc.) or chrono-cultural definition ("This layer is Middle Magdalenian"). The difficulty is amplified by the fact that each assemblage is the result of not necessarily connected import, export, production, foraging, and discard events mixed together. So how to interpret a stone tool assemblage? How to link it to human behaviours? In this lecture, we will introduce how to deal with these issues and interpret a stone tool collection according to the time-resolution of the assemblage (RMA units, refitting, recycling) and the mobility of technology, taking into account two different scale of analysis: the landscape and the site. Furthermore, the spatial intra-site analysis of technology will allow us to discuss taphonomic issues and to deal with the campsite as a living and dynamic space. Through Middle Palaeolithic archaeological case studies, we will discuss the limit and potential of this approach for identifying socio-economic changes at short scales of analysis otherwise unperceived.		
11:30-13:00	**Zupancich A.** *Sapienza University of Rome* *DANTE-Diet and Ancient Technology Lab*	**Functional studies on lithic tools**
Keywords: Use wear traces, microscopy, experimental archaeology, Quina		
Stone tools represent the largest and most direct source of behavioural clues relating to the Palaeolithic. They are the most enduring evidence for hominin evolution over at least the last 3.4 million years. Lithic artefacts can be defined as *"exosomatic objects that organisms use to manipulate energy, modify other materials from their natural state, and to insulate themselves from environmental stresses"* (Shea 2017). Following Shea's definition, stone tools provide relevant information about their makers, both in terms of technical ability and behaviour. Lithic artefacts are studied by different means, ranging from the analysis of raw materials, their production modes and their use. This lecture focuses on the application of use-wear analysis in the study of ancient stone technology. Starting with the presentation of the first examples of functional analyses carried out on prehistoric tools during the 20th century, we will then concentrate on the		

methodologies discussing the different information obtained through the observation of use wear at low and high magnifications and the strict connection with experimental archaeology. We will also deal with the limits of use-wear analysis, addressing the issue of Post Depositional Modifications (PDM). Finally, we will present the results of the functional study of Middle Palaeolithic Quina scrapers, demonstrating how the application of use-wear analysis can provide us with important information about the lifestyle and knowledge of ancient human groups.

14:30-16:00	**Cristiani E.** *Sapienza University of Rome* *DANTE-Diet and Ancient Technology Lab*	**Body ornaments and symbolism**

Keywords: beads, ornamentation, symbolic material culture, Neanderthal, microscopic analysis, experimental archaeology

The last decade has witnessed an increase in the record of Neanderthal non-utilitarian material culture, thanks to the recovery of perforated animal teeth and shells, grooved bones, peculiar stone items, and residues on stone tools. Such evidence has played a pivotal role in the discussions about Neanderthal symbolism, underlying the active engagement of these populations in highly "symbolic" cultural behaviours, previously associated with anatomically modern human populations only. We will examine the ample evidence of Neanderthal symbolic material culture and discuss the potential of specific methodologies for the analysis of non-utilitarian material culture to reveal Neanderthals symbolic behavior and cognitive capacities such as language.

16:00-17:30	**Marin Arroyo A.** *Universidad de Cantabria* *Grupo I+D+i EVOADAPTA*	**Anthropic vs. non-anthropic modifications on osseous remains**

Keywords: anthropic traces, taphonomy, microscopy

This training session will introduce students to the current methodologies applied for identifying, recording and interpreting anthropic and non-anthropic modifications that can be identified on Middle Palaeolithic faunal assemblages. Case studies will provide evidence for discussing the potential of taphonomy on archaeozoological analyses for understanding Neanderthal behaviour.

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9:30-11:00	**Delpiano D.** *University of Ferrara* *Dipartimento di Studi Umanistici*	**Lithic technology and 3D**

Keywords: 3D visual technology, refitting, Neanderthal technology

The 3D recording of lithic artefacts has become a common practice among lithic technologists for purposes of both documentation and analysis. The potential of 3D visual technology for the analysis of Middle Palaeolithic technological and behavioural strategies will be here presented and discussed against the evidence from various archaeological case studies. In particular, we will focus on the cost-benefit analysis of the main acquisition techniques when applied to lithics, which largely depends on the research objectives. Neanderthal lithic technologies will be then investigated through virtual refits, and we'll see how a combined approach between standard and virtual analysis (including 3D geometric morphometrics) could be used in order to maximize the informative potential of Middle Palaeolithic technical behaviours.

11:30-13:00	**Cristiani E.** *Sapienza University of Rome* *DANTE-Diet and Ancient Technology Lab*	**Bone technology**

Keywords: Neanderthal, bone tools, microscopy, experimental archaeology, technological analysis, use wear

The Neanderthal use of bones as raw material for the production of tools is known since the beginning of the 20th century when bone retouchers were identified for the first time in the Mousterian levels of the Quina site in France. Since then, and for a long time, bone retouchers were considered the most common type of Neanderthal osseous tools. However, in the last decade, new methodologies for analyzing anthropic marks on osseous surfaces combined with the systematic investigation of Middle Palaeolithic osseous remains provided new data about the peculiarity and variability of Nenderthal osseous industry. In particular, such analyses revealed that Neanderthal used forma tools and a wide range of unshaped bone artifacts, the identification of which is not always easy. By discussing various archaeological case studies, we will explore issues related to identifying "opportunistic" tools in Middle Palaeolithic assemblages and the potential of new approaches based on experimental archaeology and microscopic analysis of osseous surfaces to characterize Neanderthal technological behavior.

14:30-16:00	**Zupancich A.** *Sapienza University of Rome* *DANTE-Diet and Ancient Technology Lab*	**Close Range Photogrammetry**

Keywords: Close-Range Photogrammetry, 3D models, stone technology

During the last decade, the application of new technologies and, in particular of digital methods in archaeology have risen significantly. Close Range Photogrammetry (CRP) represents one of the most common approaches utilised to record ancient artefacts. In this lecture, we will present the principles of creating 3D models using Close-Range Photogrammetry. We will start by going through each of the steps leading to the creation of a 3D model. We will discuss the equipment, the optimal camera parameters and tune them according to different subjects and lighting environments to create a 3D model using Agisoft Metashape Pro. We will also present several case studies regarding the application of Close-Range Photogrammetry and 3D modelling to investigate ground stone tool use. We will disclose the range of quantitative data obtained by processing 3D models using geomatic techniques (e.g. GIS and surface metrology). Specifically, we will discuss how the combination of these quantitative datasets the qualitative information obtained through the use-wear analysis allows for robust, reliable and replicable functional interpretations.

16:00-17:30	**Romagnoli F.** *Universidad Autónoma de Madrid* *Dpto. Prehistoria y Arqueología*	**Shell tools**

Keywords: Coastal adaptations; Experimental archaeology; Technological analysis; Use-wear analysis; Taphonomy

Coastal adaptation has recently become a key topic for the scientific community working on human evolution. It has been traditionally associated only with *Homo sapiens*. Recent studies have shown that Neanderthals also consumed coastal resources, and in particular molluscs. Coastal adaptations could have facilitated human dispersal and generated new socio-economic and territorial behaviours. Usually, shells in archaeology are interpreted as subsistence waste or ornaments. However, shells can also be used to shape functional tools and their understanding as raw material is still poor. The lecture will introduce the problematic of coastal adaptations in Prehistory and the history of research of marine shells in archaeology for tool production, presenting relevant case studies.

Furthermore, we will discuss Neanderthal shell technology in Southern peninsular Europe. This Middle Palaeolithic innovation was related to several factors, including the available resources, environment, economy, mobility, technical traditions, and capacity to generate adaptive information. We will discuss how to develop an experimental protocol to investigate shell tools and how to combine ethnoarchaeology, taphonomy, technological and use-wear analysis on this material. Finally, we will discuss open questions and future perspectives in shell tools studies.