ABSTRACTS

2014 burgos
1-7 sept.
uispp
Union International de Sciences Préhistoriques et Protohistoriques

ATAPUERCA

XVII World UISPP Congress
XVIIe Congrès Mondial de l'UISPP
XVII Congreso Mundial de UISPP

systems. Although it is still difficult to accurately reconstruct prehistoric projectile methods, the patterns of the impact fractures on the backed pieces from the Takakurayama site implies that several specimens were mechanically delivered projectile armatures.

The usewear analysis of the "backed knives" from the Takakurayama site suggests that the morphologically diverse tools were used as knife as well as hunting weaponry. There are some correlations between the function and the morphology, such as leaf-shaped form with hunting weaponry and un-pointed form with knife, whereas the other morphological sub-types show multiple traces resulted from hunting and the processing of osseous materials and hide. The large number of fractured pieces due to impact which may include mechanically delivered armatures illustrates that hunting was closely related to the occupation at the Takakurayama site and the existence of the processing tools designates that the subsequent processing activity of faunal remains were also undertaken.

ORAL

13. EXPLORING PALAEOLITHIC WEAPON DELIVERY SYSTEMS USING A CONTROLLED AND REALISTIC EXPERIMENTAL SET-UP: PRELIMINARY RESULTS

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In the last decades many researchers in the field of lithic use wear studies made an effort in developing solid methods to identify stone artefacts that were used as tips of penetrative hunting weapons (lances, javelins, darts, and arrows). This study focuses on the approach proposed by Karl Hutchings [1], which relies on secondary fracture characteristics (namely, Wallner lines [WL] and fracture wings [FW]). These features occure on crack fronts of brittle solids, like glass, obsidian and finer-grained chert, and are used to infer the precursory loading rate of the impact that caused the fracture and, consequently, the type of launching mechanism used in the delivery of the weapon.
New experiments were conducted to evaluate the reliability of this method. Since in a previous controlled experiment from Iovita et al. [2] only impact velocities were simulated, whereas other similar experiments only reported launch velocities, we aimed to check velocity curves from launch to impact. Using soda-lime glass points and synthetic targets in the same experiment, we wanted to produce a comparative, yet well controlled dataset with a more 'realistic' set-up, using animal targets and a naturally-occurring raw material. We measured the velocities and acceleration of three delivery systems (lance, javelin, and spearthrower dart) to 1) evaluate the magnitude of the distinction between impact velocities (at target entry as well as inside the target) and 2) determine if the pattern observed can be related to a particular delivery system as claimed in the literature.

In total 75 identical glass copies of a Levallois point [2] and 75 knapped obsidian points of the same size were hafted on the spears/darts and thrust/thrown on a complete wild boar carcass by experienced experts (25 each per delivery system). The acceleration curve for each shot was measured, including during the actual impact, using an accelerometer mounted to the weapon itself. Projectile velocities were recorded using a video camera. The broken points were analysed under a microscope and WL and FW photographed and fracture speeds calculated.

Preliminary results suggest that the relation between precursory loading rate and the pattern observed is weak and dependent on factors that are difficult to reconstruct archaeologically, such as species hunted and point-type used. The influence of parameters like hide and flesh, which slow down a travelling projectile, play a more important role than previously assumed during impact until moment of crack initiation. Consequently they should not be underestimated when reconstructing weapon launching mechanisms from artefacts of archaeological origin.

ORAL

14. AMBIGUITY IN TERMINOLOGIES USED TO DOCUMENT IMPACT WEAR ON PROJECTILE POINTS: TOWARDS AN IMPROVED DESCRIPTIVE FRAMEWORK

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Recently, lithic projectile points have become a key element in discussions about the complexity of Palaeolithic human behavior. The appearance of different projection systems has certainly played an important role in technological changes that occurred during the Palaeolithic. Unfortunately, only the lithic components of these projection systems are generally recovered, and over the

years, several studies have focused on finding macroscopic and microscopic evidence that would allow the identification of potential lithic projectile points in the archaeological record.

Initial studies used a more typological approach to describe the morphology of the damage observed, while subsequent studies used a terminology based on the description of fracture initiations and terminations. At present, there is quite some variation in the descriptions of the wear features and fractures observed, both in their detail as in the elements that are considered as being diagnostic of projectile use. While discussion may reign about the latter, it is clear that the descriptive framework that is currently used lacks some homogeneity and if one wants to be able to evaluate the degree to which evidence may or may not be diagnostic of projectile use, it is important that we share a common vocabulary and that we agree on the fracture and wear characteristics that ought to be described. Some attributes are only mentioned infrequently, such as the size of certain removals as well as the association between different fracture types or damage features on a single piece. Independent of their potential importance, it often makes it difficult to compare the wear features observed between different researchers as well as to make robust statements about the diagnostic value of certain traces or fractures.

We present a synthesis of the variation in terminology that was identified in projectile studies and we attempt to document what researchers have referred to with specific descriptions. Above all, we would like to open discussion in view of the creation of a shared and systematic descriptive framework for wear features or fractures that may potentially result from projectile use.

ORAL

15. EXPERIMENTAL MANUFACTURE AND USE OF LATE EPIGRAVETTIAN PROJECTILE IMPLEMENTS: NEW EVIDENCE FOR INTERPRETING USE-WEAR PATTERN ON LITHIC WEAPONS

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The use-wear based criteria for recognizing ancient lithic weapons are nowadays strongly debated (Lazuèn, 2014; Rots and Plisson, in press). The difficulty in identifying projectiles implements is related to the great variability of extrinsic and intrinsic techno-functional parameters that influence wear patterns. If an integrated macro- and microscopical approach is required, it is also crucial considering all the wear features present on an armature and interpreting them on the basis of strong experimental references. A new contribution to this issue comes from an experimental program carried out by the authors and focused on Late Epigravettian projectile implements.

The experiment in fact addressed the production and use of lithic armatures from the Late Epigravettian layers of Dalmeri rock shelter (North-eastern Italy). Among lithic armatures, backed points and backed (bi)truncated bladelets are the most common artifact types and their production represents a mental template well rooted in the bladelets operational project (Duches and Peresani, submitted; Montoya 2008a; 2008b). The main goals of the experiment were to explore the performance of these types of projectile implements in penetrating medium-size ungulates, to prove their functional suitability within the bow-arrow delivery system and to create a reliable experimental reference of impact damages essential for the archaeological interpretation. The experimental protocol was thus devised to reflect the efficiency and the operating conditions of this kind of projectile during the Late Epigravettian. Some variables were kept fixed (choice of the projecting mode, animal target, shooting distance, setting) while some others were modified (armatures typology and numbers of them, hafting, bow poundage, shooting angle).

The results let to define the pattern of use wears meaningful in recognizing Epigravettian armatures and to evaluate the role of different mechanical stress in creating that pattern. First of all, the projectiles demonstrated the efficiency of this kind of lithic implements. About the fractures, the experimental evidences could be summarized as follow: a) a tip breakage is strictly connected to the fact of hitting a bones (as the edge crushing); b) the point of fracture on the tips matches in 80% of the cases with the end of the hafting; c) the combined action of bending and compressive stress in hafting area causes rarely a simple bending fracture but more frequently different and multiple breakages; d) the compressive stress contributes to the wear pattern in creating specific features on the tip and also on the cutting elements; e) hafting and armatures arrangement influence both the penetrating capability and the durability of this kind of projectiles. In conclusion, this study adds new clues