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# Spatial distribution analysis of the Lower Magdalenian human burial in El Mirón Cave (Cantabria, Spain)

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ABSTRACT

By using Geographical Information System software this study presents the spatial distribution of the human remains and features within the burial found in a Lower Magdalenian level of El Mirón cave (Cantabria, Spain). The aim is to identify how the interment was created and discern its primary or secondary origin. Three-dimensional analyses have been applied to recognize the physical location of the burial and its structural elements in relation with the grave assemblage and the significance of the red ochre and specular hematite in the burial context. In addition, a comparison of the vertical and horizontal dispersal of human skeletal elements was carried out according to their representation and evidence of taphonomic modifications. The association of human bones with other archaeological finds was also taken into account. The results show that the human body was placed at the edge of the living area of the site, at the rear of the cave vestibule, but in a separate place behind an engraved block and covered with limestone rocks. The position of the anatomical elements and the spatial distribution of the taphonomic bone modifications prove that it was a primary burial, minimally disturbed by carnivores, after body decomposition. The absence of the cranium and most of the long bones seems to be the result of a deliberate anthropogenic extraction from the burial pit, possibly for redeposition at another, unknown location perhaps a secondary burial. This fact disturbed the initial primary body deposition. Therefore, the results show that the El Mirón Lower Magdalenian burial was a disturbed primary interment, rather than a secondary deposit.



## 1. Introduction

The Magdalenian in southern Europe ranged between ca. 17,000–11,500 uncalibrated BP., – i.e., 20,400–13,600 calibrated BP (Straus and González-Morales, 2012a). From this cultural period, with a 6800 year-duration and a geographical distribution eventually stretching from southwestern to north-central Europe, only a few human burials are known. While more human remains have been discovered in Magdalenian and contemporaneous (mainly Italian) Late Epigravettian contexts than in any other Upper Paleolithic techno-complex, only 23 of the Late Upper Paleolithic burials are considered to be primary interments (Orschiedt, 2013; Pettitt, 2011; Riel-Salvatore and Gravel-Miguel, 2013). Findings of secondary burials are more regularly found within European Magdalenian contexts (particularly in France, Germany, Poland and the United Kingdom) where a significant quantity of loose human remains both with and without traces of anthropogenic modifications reflect deliberate selection of body parts (Bello et al., 2011; Orschiedt, 2013). Notable human remains from northern Spain were recovered from El Castillo cave in 1911 by Hugo Obermaier (1924). These two human frontal bones were found in a secondary interment context in the very thick Initial and Lower Magdalenian Beta-horizon. Aside from these isolated remains, in the Iberian Peninsula until recently not many *Homo sapiens* bones have been found and no clear burials have been identified (Arias and Alvarez-Fernandez, 2004; Aura-Tortosa, 2010). Perforated shells related to late Magdalenian human remains from a child, a juvenile and an adolescent suggesting other burial practices found in Galería de Cisterna, Portugal (Trinkaus et al., 2011).

Straus et al. (2011) preliminarily published the discovery in 2010 and 2011 of a possible ritualized burial of an adult female in a Lower Magdalenian context at El Mirón Cave (Cantabria, Spain). With no clear anatomical relationships among the bones during excavation, but an exceptional amount of red ochre staining, the preliminary

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interpretation of the deposit was that of a secondary burial, due to the skewed anatomical representation. However, subsequent excavations in 2013, taphonomic studies and the spatial distribution analyses presented here have generated further evidence on the nature of the burial. Together these results indicate an alternative view that this context was actually a disturbed primary interment.

It is now common for Geographical Information System (GIS) software to be applied to analyze the intra-site spatial distribution of archaeological finds in order to reconstruct complex ancient activities (Baxter et al., 1997; Henry, 2012; Marín-Arroyo, 2009; Oron and Goren-Inbar, 2014). However application of GIS to Paleolithic burials in Upper Paleolithic contexts has to date been rare (Henry-Gambier et al., 2013). Paleolithic burials are phenomena whose interpretation comprises a number of different archaeological features, such as the relationship of human bones with possible grave goods, the association of the burial pit with grave-covering stones, or the location within the site. Because spatial distribution analysis can be a powerful tool to reconstruct complex Paleolithic human activities, it ought to be applied to burial contexts. This was the aim of the research reported on here.

The goal of this paper is to analyze the context and the remains found in the Paleolithic human burial in El Mirón cave, rather than to suggest any possible spiritual meaning of mortuary practice in Paleolithic societies. Therefore, four main analytical steps have been designed: 1) explore the human burial location inside the cave, 2) define the natural and artificial area chosen by humans in which to deposit the human body 3) establish the human skeletal representation and the spatial distribution of taphonomic modifications to the bones and 4) determine the relationship of human bones with other finds in the immediate area of the burial.

The spatial distribution analyses have obtained new results for the various finds recovered in the burial area. This fact has allowed us to identify when and how the burial pit was made, what post-depositional events affected the primary burial and how human bones were spatially related to lithic and faunal remains in the surrounding sediments. Spatial study, in combination with the taphonomic analyses of the human and animal bones, has been essential to identify the origin of the Lower Magdalenian burial in El Mirón as a disturbed primary deposit.

## 2. Material and methods

El Mirón cave is located in the upper Rio Asón drainage on the northern edge of the Cantabrian Cordillera, some 20 km upstream from the modern Atlantic shoreline (Fig. 1). The impressive entrance faces west and looks out over the surrounding 1000-m high mountains and the confluence of three river valleys. The cave has been excavated since 1996 under the direction of L.G. Straus and M.R. Gonzalez-Morales. More than 80 radiocarbon dates reveal a chronostratigraphic sequence from the late Middle Paleolithic to the early Bronze Age (Straus and González-Morales, 2012b, 2010, 2007, 2003). The large, main excavation areas (Fig. 2) are in the outer and rear parts of the cave vestibule (Cabin and Corral), which are connected by a 9 x 1-meter mid-vestibule trench. Additional excavation concentrated on the space behind a large engraved block ($2 \times 1 \times 1$ m) – an area in the archaeologically rich, vestibule rear not affected by previous looter activities (Straus et al., 2011: pp.1154; Fig. 3). In the southeastern corner of the cave, at the rear of the vestibule (Fig. 2), an area of around 3,75 $m^2$ bounded by the cave wall to the east and south and the engraved block to the northwest was excavated in the final years of the project, after having first been identified in 2001 as apparently containing Magdalenian deposits. The first human remains were actually recovered in partial squares X7 and Y7 in 2001 (Fig. 3). The excavation of these two squares was eventually completed in 2010 (when discovery of the red ochre-stained human jaw and tibia made clear the existence of a burial, not simply isolated small bones) and 2011 (Straus and González-Morales, 2015, Fig. 3). Further excavations in 2013 extended the burial area to the south (squares X5/6 and Y5/6), revealing more human remains from Level 504, characterized, as in the earlier years, by sediments with sparkling hematite crystals and red ochre.

This paper examines the spatial distribution of human and animal bones, lithic and osseous artifacts, and chunks of red ochre from Level 504 found within the burial area by using their three-dimensional- coordinates as recorded by an EDM total station. For stratigraphic studies, Level 504 was compared to the over- (503) and under-lying (505, 506) levels. Two and three-dimensional (2D & 3D) distribution plots were made, respectively by applying Quantum GIS and ARC GIS 10. The individual coordinates recorded during excavation were used to display the stratigraphic sequence in the X5/6/7 squares. Photographs taken during excavation were geo-referenced to reconstruct burial limits and features. By using the Triangulated Irregular Network (TIN) tool, a three-dimensional polygon surface was created to visualize the distribution of ochre. The reconstruction of the human body position was based on vector graphics overlying the distribution of human bones by means of their X and Y coordinates. Density plots were generated by artifact frequencies within a 0.25 $m^2$ mesh grid overlay.

In this paper, the term burial is used for the intentional interment of a dead body, which may involve modifying the existing sedimentary deposit to place the body underground and/or making a structure to cover it. Based on the contemporaneous cultural context, this act is a ritualized activity and involves preparation of the corpse and burial area (for example, the use of red ochre) and/or the placement of grave goods. Being aware that the human burial remains might have been originated within a complex ritual sequence conducted by Paleolithic human groups, the recovered evidence is only recognized by the presence of physical elements left over from the ritual activity. Only a selection of these aspects of human burial practices would be consequently archaeologically observable (Pettitt, 2011).

## 3. Results

The analysis results concerning the location of the human interment within the cave, structural elements found at that context, spatial distribution of the human bones, as well as the distribution of taphonomic alterations of human and animal bones, and finally, the association of the human bones with other finds are explained in the following sections.

### 3.1. Human burial location within the cave vestibule

At the back of the large cave vestibule, 20 m from the cave entrance, a $1 \times 1 \times 2$ m limestone block fell from the roof around 16,500 uncal BP (González-Morales and Straus, 2014). Humans engraved the western face of the block after it had fallen (González-Morales and Straus, 2015, Fig. 8). The human burial was deliberately placed between the block and the eastern and southern cave walls, in an area of approximately 3.75 $m^2$, (Figs. 2 and 3). The burial contained a single adult female with a body height about 1.59 m and 60 kg weight (Carretero et al., 2015; Straus et al., 2011; pp. 1161–2). Behind the engraved block, two medium-sized stone blocks, a smaller one and a slab were found in square X7 in 2010. The dimensions of the two bigger blocks and the slab are $40 \times 35 \times 18$, $31 \times 25 \times 21$ and $40 \times 24 \times 8$ cm respectively (compare counterclockwise the blocks in Fig. 4). Some of the human remains were found under these rocks (Straus and González-Morales, 2015, Fig. 4). The reconstructed locations of