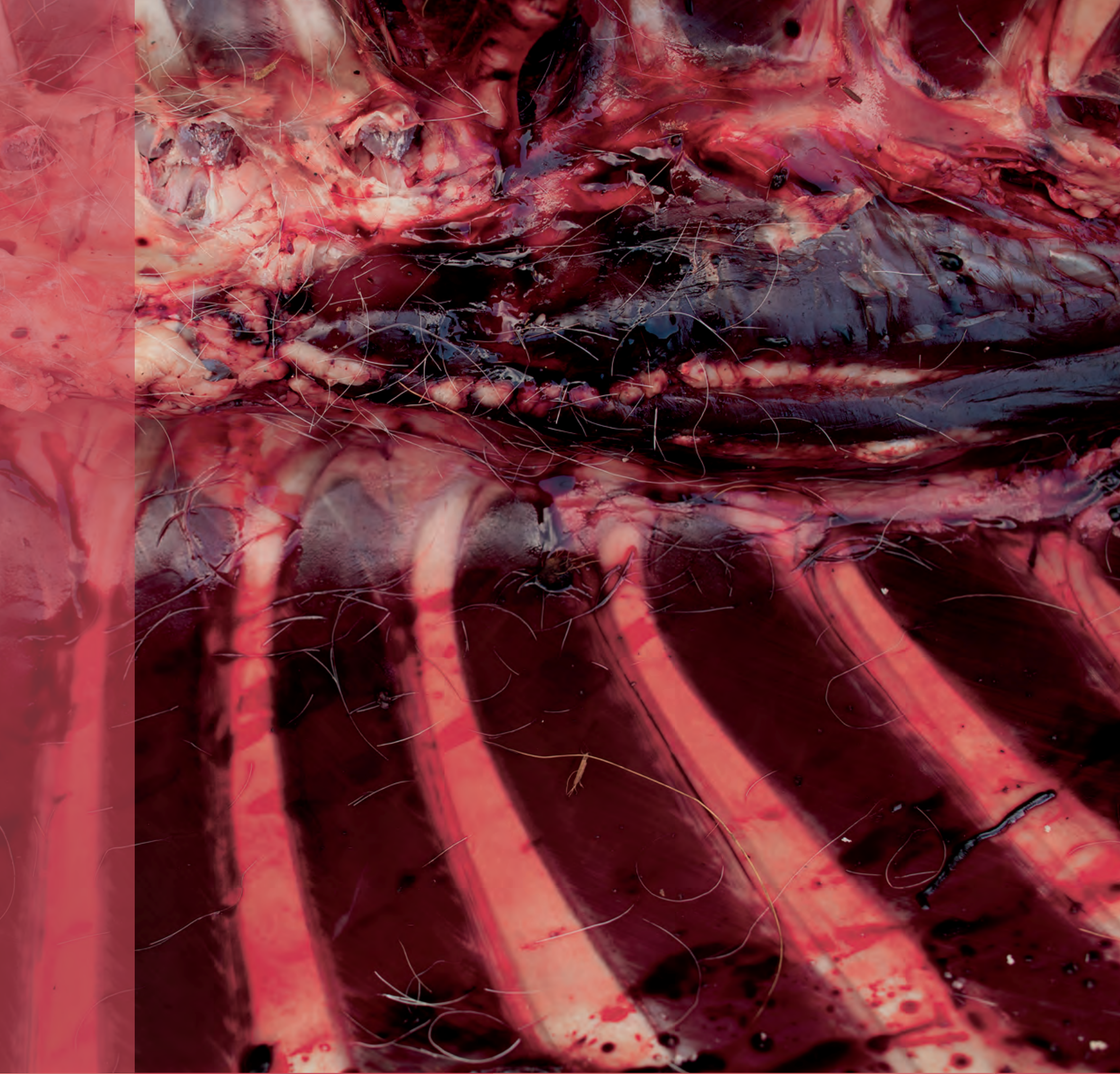

Sabine Gaudzinski-Windheuser · Olaf Jöris (Eds.)

The Beef behind all Possible Pasts

The Tandem-*Festschrift* in Honour of Elaine Turner and Martin Street

Volume 1

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Volume 2

ESTEBAN ÁLVAREZ-FERNÁNDEZ · SERGIO MARTÍN-JARQUE · ANTONIO TARRIÑO

FLINT & SHELL: RAW MATERIALS AS EVIDENCE OF LONG-DISTANCE CONTACTS IN CANTABRIAN SPAIN DURING THE MAGDALENIAN

Abstract

Two types of raw material used by Magdalenian hunter-gatherers are studied here. Based on the archaeological record of five Magdalenian assemblages of northern Spain, flint is first examined with a focus on its provenance before objects of adornment made of marine gastropods from the Mediterranean Sea are analysed. Also modifications of the materials have been studied, providing information of where, how and when these modifications were made. Regional Magdalenian mobility is discussed through the study of these artefacts.

Keywords

Raw materials, flint, malacofauna, hunter-gatherers, Cantabrian Magdalenian

INTRODUCTION

Studies documenting long-distance contacts between Magdalenian hunter-gatherer groups enjoy a long tradition of research in northern Spain. This research has been based on the presence of different kinds of lithic and osseous tools, such as different types of weaponry (e. g., Vega del Sella, 1917; Obermaier, 1925; González Echegaray, 1960; González Sainz, 1989; Utrilla, 1981, 2007) and particular representations in parietal and portable art (e. g., Alcalde del Río et al., 1911; Breuil and Obermaier, 1935; Leroi-Gourhan, 1965; Barandiarán, 1973; Corchón, 1986; González Sainz, 2004; Arias and Ontañón, 2005; Fritz et al., 2007; Utrilla, 2007; Rivero, 2015), including some types of adornment, like *contours découpés*, rondelles and reindeer teeth sawn off at the height of their alveoli (e. g., Fortea, 1983; Álvarez-Fernández, 2006; Corchón et al., 2012). The presence of this evidence in northern Spanish sites is explained by contacts between the hunter-gatherers of this region and those inhabiting other regions of south-western Europe, especially in the French Pyrenees.

Research on the identification of raw materials used in Palaeolithic artefact production (in the Magdalenian in particular), and the determination of their places of provenance have advanced greatly over the last two decades. These studies have concentrated on the flint types used in stone tool production, and some objects of adornment, particularly those made from the shells of marine molluscs.

Studies on the availability and use of flint began to develop in the 1980s, by addressing their sources in archaeological contexts of the Cantabrian region. Other studies were published in the 1990s for Asturias and Cantabria (e. g., Arias, 1990, 1991; Sarabia, 1990a, 1990b, 1999) and by Tarriño and Aguirre (1997) for the Basque Country. Since the start of this century, following the methodological approaches proposed in the doctoral thesis of one of the present authors (Tarriño, 2001), it has been made possible to draw a detailed map of outcrops of siliceous rocks to be found in the eastern part of the Cantabrian region and in the western Pyrenees. Based on this map, a first model of how these resources were used – especially

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during the Palaeolithic – has been created (Tarriño et al., 2015, 2016; Elorrieta, 2016). At present, these studies are being completed by research ongoing in central Cantabrian Spain (Herrero-Alonso, 2018). All this information indicates extensive mobility of flint in the north of the Iberian Peninsula during the late Upper Pleistocene and early Holocene.

The presence of marine molluscs that originate in the Mediterranean Sea at Upper Pleistocene sites of northern Spain was cited for the first time by H. Fischer (1923-1924: 321-323), who identified a pierced specimen of *Tritia mutabilis* in the Azilian level of El Castillo Cave, excavated by Breuil and Obermaier in 1910-1914. One of the present authors reviewed the collections of shells that were transformed into objects of adornment in his doctoral thesis (Álvarez-Fernández, 2006), in which he documented specimens from Palaeolithic sites in Asturias, Cantabria and the Basque Country. In recent years, the amount of evidence of shell ornaments has increased considerably (Álvarez-Fernández, 2016; Álvarez-Fernández et al., 2019). As a result, shells from the Mediterranean Sea are now known from all periods of the Cantabrian Upper Palaeolithic.

Here, the available information on long-distance contacts in northern Spain during the Magdalenian is compiled, presenting the material of five archaeological assemblages that produced artefacts made of exogenous flint types that originate in the Basque-Cantabrian Basin in the Western Pyrenees and in the Sud-Aquitanian Basin, as well as shells of Mediterranean marine gastropods. The archaeological contexts studied are: Level 1 in the Dwelling Area of the cave of Tito Bustillo, Level 1 in the cave of Coímbre B in Asturias, Level 6 in El Juyo, Level 1 in El Horno, and Level 17 in El Mirón; the latter three caves are located in Cantabria (**Fig. 1**).

METHODOLOGY

Allochthonous flint

Studies of the procurement and use of lithic raw materials at archaeological sites allow the reconstruction of land-use strategies employed by Palaeolithic hunter-gatherers to supply and satisfy their technological needs. Specifically, flint is an ideal material owing to certain characteristics that allow varieties to be identified and discriminated according to their origin, as well as representing one of the material categories that is best preserved in the archaeological record. Its characterisation by textural analysis with a stereoscopic microscope and occasionally with a petrographic microscope in studying thin sections is well-advanced and regularly applied by different research groups. This is possible because of the methods petrologists apply when characterising rocks in order to determine their sources. Such studies allow us to reach conclusions that can be interpreted throughout Prehistoric archaeology (Tarriño, 2001). Within this framework, flint and its outcrops can be classified depending on their distance from the archaeological site where the artefacts have been recorded. In this way, different models have been established for the management of each of the flint types (Tarriño et al., 2015, 2016):

- Local
  Flint types located within a radius that it is calculated as the distance a person can walk in half a day, i. e., < 30 km. This model can be sub-divided into *Near Local* (< 15 km) and *Distant Local* (15-30 km).
- Regional
  Also, sub-divided into *Near Regional* flint transported in a distance equivalent to a day and a half's walk, i. e., 30-60 km, and *Distant Regional*, when the flint is transported over a distance that can be covered within three days, i. e., 60-120 km.

- Tracer
  Flint that can be transported in a journey that a person can make on foot between three days and a week, i. e., ~ 120-250 km.
- Super-tracer
  Flint from distances that require a journey longer than a week, i. e., > 250 km distance.

The distances are calculated *grosso modo*, with 25 km as the average distance that at a person can walk at about 4 or 5 km/h in half a day (ca. 4-6 hours). The flint types classified as tracer and super-tracer that have been documented in the sites studied in this chapter are:

Pyrenean Flysch Flint

Upper Cretaceous Pyrenean Flysch Flint originates in turbiditic geological formations deposited in deep-water environments at the foot of the slopes connecting the marine platforms with the pelagic ocean bottoms (Tarriño, 2006). In general, the rocks containing the silicifications are formed by alternating bioclastic calcarenites with fragments of molluscs and sponge spicules. Inclusions of detritic quartz and organic matter are equally common, together with the occasional remains of planktonic foraminifera (Globigerinidae) (Tarriño, 2006).
The varieties of Upper Cretaceous Pyrenean Flysch Flint identified in the archaeological assemblages studied here are:

- Kurtzia Flysch Flint
  Described by A. Tarriño (2006) for the coastal site of Barrika (Bizkaia). This flint generally displays a translucent matrix characterised by turbiditic laminations. In the microscopic texture it can be identified by its bioclastic content with sponge spicules, detritic quartz, inclusions of organic matter and dolomite crystals.

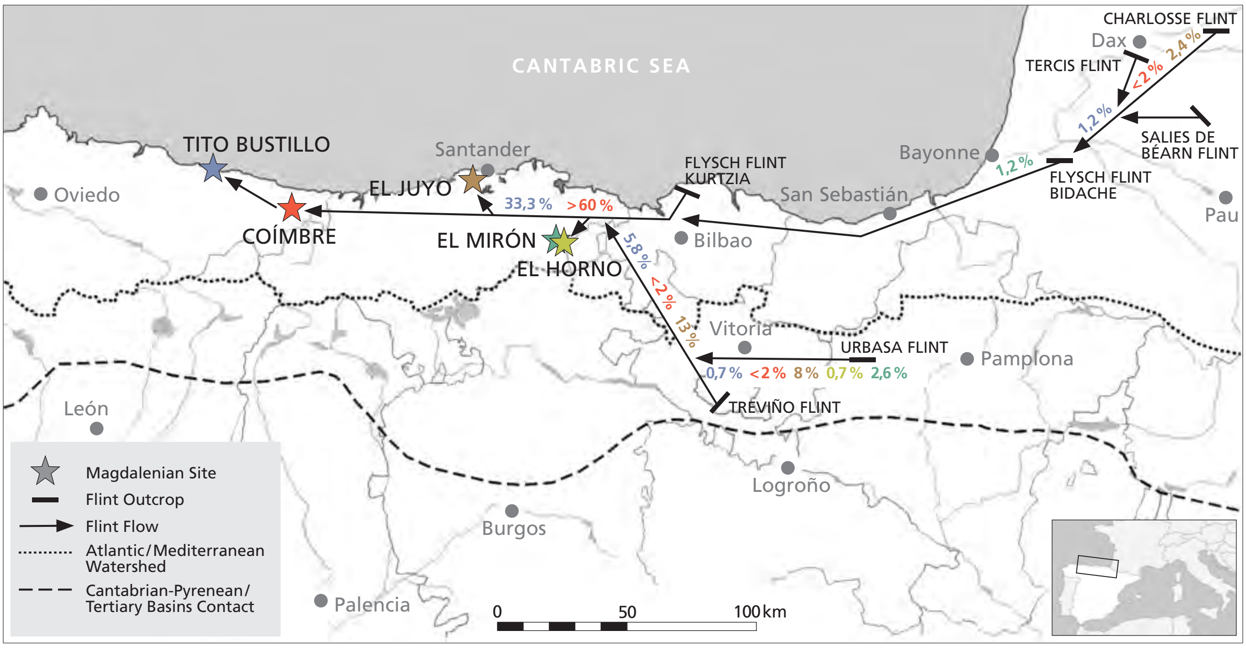

Fig. 1 Map showing the provenance of tracer and super-tracer flint varieties used at the five Magdalenian sites of northern Spain studied here. Percentages of flint flow are colour-coded, referring to the specific sites to which the raw materials have been transported.

- Bidache Flysch Flint
  Described by C. Normand (2002) for the area around the mouth of the River Adour, between Biarritz and the Bidache area (Pyrénées-Atlantiques, France). This material is greyish; one of its most noticeable macroscopic characteristics is the presence of parallel turbiditic laminations, which are quite obvious in case of intensive patination.

Treviño Flint

Continental flint from lacustrine-palustrine environments originating in outcrops located in the Miranda-Treviño Depression. Its silicifications are of Miocene age and appear in the hills of the Sierra de Araico (Treviño-Álava) and its prolongation towards the northern Cucho-Busto Hills (Treviño). Its microscopic texture is usually characterised by silcretes (siliceous layers of stratiform morphology) and micrites (homogeneous carbonate masses). Fossils indictive of continental environments (gastropods, ostracods, pedotubules, etc.) predominate (Tarriño, 2006). The four microfacies differentiated by A. Tarriño (2006) and identified in some of the archaeological assemblages studied here are:

- Bioclastic micrites
  Dark matt flint that usually displays liesegang rings, which are most visible in case of intensive patination. It is accompanied by abundant ostracods and gastropods.
- Clotted silcretes with fenestral porosity
  Dark flint from outcrops in limestone and calcareous dolomite containing stratiform silcretes formed by an accumulation of peloids.
- Brecciated silcretes
  Dark and even blackish flint from a palustrine environment. It has a macroscopic ooidal texture, with abundant moulds of roots and porosity with vadose cementations.
- Micrites with algae lamination
  Banded flint with a certain organic matter content parallel to the lamination, and occasional presence of ostracod valves.

Urbasa Flint

Palaeocene flint found in the Sierra de Urbasa (Navarre). Its silicifications, formed in the external marine platform, have been defined and dated by benthonic foraminifera: Discocyclinidae (*D. seunesi*) and Nummulitidae (*N. heberti*) (Baceta, 1996). This flint – of nodular shape and quite dark colour – contains microscopic relicts of macroforaminifera and echinoderms, and is characterised by significant incipient micro-dolomitization with idiomorphic crystals of 10-20 mm length (Tarriño et al., 2007).

Tercis Flint

From a deep marine environment in the Upper Cretaceous. Its silicifications are found in the area of Tercis-les-Bains, near Dax (Landes, France). It is generally translucent, dark, and with a high macroforaminifera content, comprising both planktonic and benthonic species (Normand, 2002; Normand et al., 2001).

Salies-de-Béarn Flint

Salies-de-Béarn Flint originates from Upper Cretaceous deep marine environments. The silicifications are located in the area surrounding the town of Salies-de-Béarn (Pyrénées-Atlantiques, France). It is a greyish flint with fossils of planktonic foraminifera that is very characteristic due to the abundancy of bioturbations, resulting in a zonal appearance (Normand, 2002).

Chalosse Flint

The Upper Cretaceous Chalosse Flint formed at the outer marine platform. Outcrops are located in the Audignon-Montaut anticline and marginally around the Bastennes-Gaujacq Diapir (Landes, France) (Chalard et al., 2010). It is a bioclastic flint with of nodular shape, translucent and varying in colour from blackish to grey. When patinated, the material acquires more or less zoned white or yellowish tones. At microscopic level it displays high contents of bioclastic inclusions, particularly of bryozoans and macroforaminifera (Lepidorbitoides) (Bon et al., 1996).

Mediterranean shell

Archaeomalacological studies of the last two decades have enabled the identification of the shells of Mediterranean gastropod species at several Upper Palaeolithic sites of northern Spain. The Mediterranean Sea is more than 200 km distant from the Magdalenian of the Bay of Biscay. The shells that derive form archaeological assemblages studied here have been classified by use of reference collections like that of the Archaeozoology Laboratory at the University of Salamanca. The studies are underpinned by both general and dedicated studies (e. g., Borja and Muxica, 2001; Dantart and Luque, 1994; Consolado et al., 1999; Galindo et al., 2016; Gianuzzi-Savelli et al., 2003; Gofas et al., 2011; Hidalgo, 1917; Ortea Rato, 1977; Palacios and Vega, 1997; Poppe and Gotto, 1991; Rolán, 1992; Sauriau, 1991; WoRMS, 2021), providing details about the description, habitat and distribution of the species and information of whether or not they are edible. The origin of the shell is determined by the present-day distribution of the species. The presence of Mediterranean species at Magdalenian sites in Cantabrian Spain, in the interior of the Iberian Peninsula, and north of the Pyrenees (and also in other parts of the centre of Europe) indicates long-distance contacts between hunter-gatherers groups and explains their presence at archaeological sites hundreds of kilometres distant from the shores (Álvarez-Fernández, 2006).

Archaeomalacological studies also involve the study of remains of organisms that populate shell surfaces (i. e., the epifauna, such as the exoskeletons of balanoids) or of alterations caused by them (perforations and incrustations), of evidence of abrasion caused by wave action in a sandy environment (which shows that the shells were picked up on the beach when the animal was dead), of anthropic modifications (scrapings, incisions and perforations; gloss, deformations and fractures by use; intentional staining with dyes), and of post-depositional alterations (precipitation of carbonates or decalcification). These studies also take into account spatial information (e. g., if they are associated with grave goods, or a concentration indicating a possible workshop where ornaments were produced) to determine if their presence in the assemblage is to be explained by deliberate human activity or if they represent objects that were simply lost during the occupation of a site (Álvarez-Fernández, 2006, 2013, 2017).

RESULTS: IDENTIFICATION OF FLINT AND SHELL IN THE MAGDALENIAN SITES OF THE CANTABRIAN REGION

The Living Area (Área de Estancia) in Tito Bustillo Cave (Ribadesella, Asturias)

The Living Area (Área de Estancia) of the cave of Tito Bustillo – today ~300 m from the Sella Estuary and 1 km from the modern coastline – was excavated in the 1970s and 1980s (García Guinea, 1975; Moure Romanillo, 1990, 1997; Álvarez-Fernández et al., 2018). Two levels were documented: Levels 1 and 2. The upper level, Level 1, was in turn divided into two complexes (Upper and Lower Complex), comprising different stratigraphical sub-levels. Level 1 is considered to represent a palimpsest of several Magdalenian occupations. The lower level, Level 2, corresponds to a period of increased sedimentation; its few archaeological remains date into the Lower Magdalenian (Álvarez-Fernández et al., 2018).

The first study of lithic raw materials from the Living Area (Área de Estancia) of Tito Bustillo was carried out by J.A. Moure Romanillo (1990). Here, a minor predominance of flint over quartzite is observed in the Upper Complex of Level 1 (52.3 % and 47.7 %, respectively), whereas in the Lower Complex quartzite was more abundant than flint (53.6 % and 46.4 %, respectively). It was also noted that flint predominates among the tools in both complexes. However, some larger variations in frequencies occur in the sub-levels within both complexes. The sub-level for which most information on worked flint is available is sub-level 1c2 in the Lower Complex of Level 1, dated to ca. 18,200 cal BP (in the Lower Magdalenian). In this assemblage (n = 2,161) flint represents 50.4 % and quartzite 49.4 %. Rock crystal appears in minor amounts (0.2 %). Tracer and super-tracer types of lithics amount to a significant 41 % of all the flint varieties, with Pyrenean Flysch by far the most common siliceous resource (including Kurtzia Flysch), followed at a distance by Treviño and – in much smaller proportions – Urbasa and the Upper Cretaceous pelagic varieties from the South-Aquitanian Basin (Tercis and Salies-de-Béarn). The flint assemblage of this level represents quite progressed stages within the *chaîne opératoire*, including rejuvenations and resharpening, but also display some initial stages of core preparation. Blade and micro-blade blanks are most frequently made on tracer and regional flint types, and a high percentage of retouched tools was made on those blanks, mostly of Pyrenean Flysch and Treviño Flint. The Urbasa and Tercis/Salies-de-Béarn Flint types only appear as blanks and finished tools, and are not represented in cores and preparational flakes; the functional study of these items is still in progress (**Fig. 2**).

The first Mediterranean molluscs in Tito Bustillo were recognized at the start of this century (Álvarez-Fernández, 2002a, 2006). A later review of archaeomalacological remains (Álvarez-Fernández, 2013), together with other biotic material (Álvarez-Fernández et al., 2015, 2018), enabled the classification of further Mediterranean shells and determined the exact stratigraphic provenience of each one. These finds come from both, the Upper (nine specimens of *T. pellucida*, one of *T. mutabilis* and one *of H. sanguineum*) and Lower Complexes (eight *H. sanguineum*) of Level 1. The use-wear on the shell's outer surfaces indicated that they had been used as objects of adornment (**Fig. 3**).

Coímbre B (Peñamellera Alta, Asturias)

Coímbre Cave is located in the middle valley of the River Cares, a tributary of the River Deva. Following their downstream courses, the site lies about 19 km south of the present-day coastline. Zone B in the cave was excavated from 2008 to 2012. Seven Gravettian and Upper Magdalenian levels were documented.

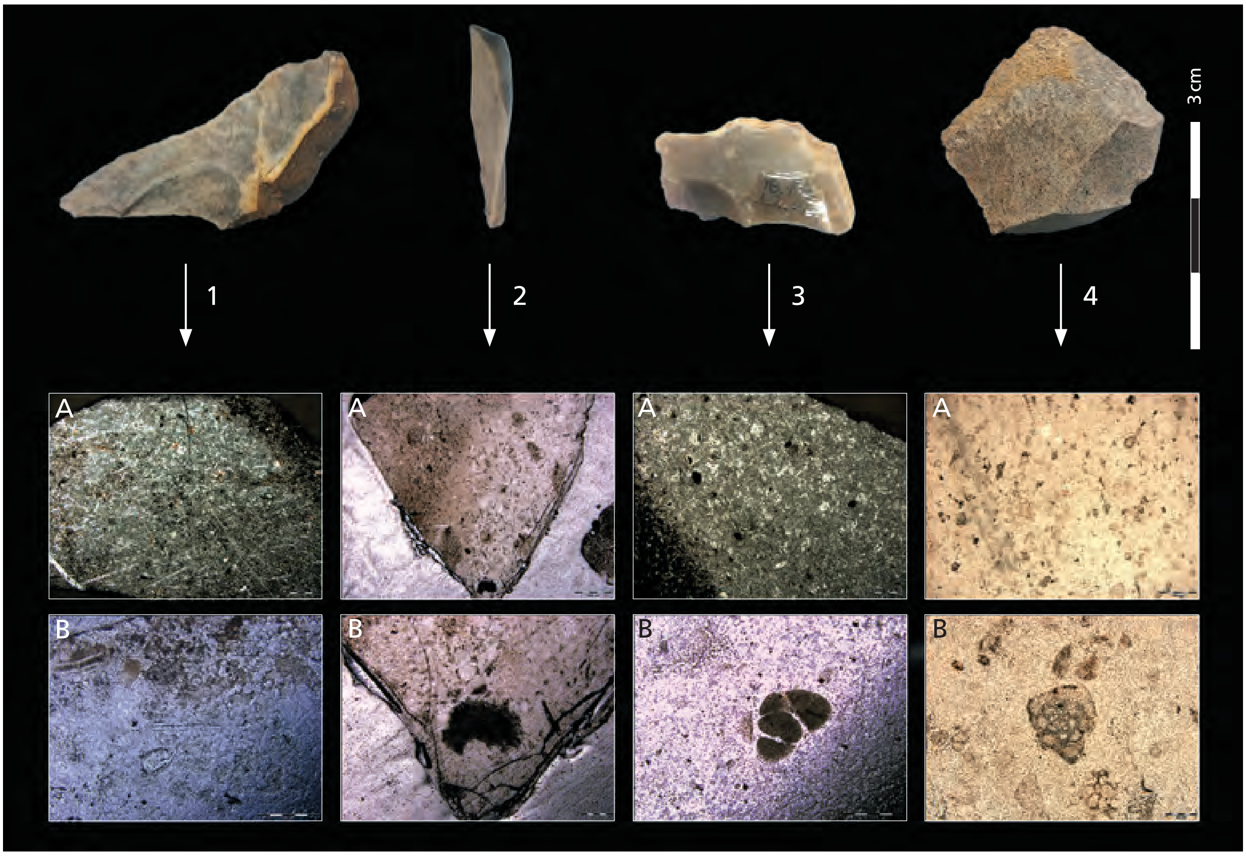

Fig. 2 Examples of the tracer and super-tracer flint varieties found in sub-Level 1c2 in the Dwelling Area in Tito Bustillo Cave.
1 Pyrenean Flysch Flint; **1A** crypto- (< 5 µm) to microcrystalline (5-20 µm) mosaic with multiple bioclast inclusions (× 25 XPL, crossed-polarized light). **1B** detail of longitudinal sections of sponge spicules (× 200 PPL, plane-polarized light). – **2** Urbasa Flint; **2A** crypto- (< 5 µm) to microcrystalline (5-20 µm) mosaic with multiple fragments of foraminifera, bryozoans and echinoderms (× 25 PPL); **2B** detail of an echinoderm relict (sea urchin plate) about 0.4 mm in diameter (× 100 PPL). – **3** Upper Cretaceous pelagic flint, probably of Tercis type; **3A** crypto- (< 5 µm) to microcrystalline (5-20 µm) mosaic, with bioclasts and opalized patination zoning (× 25 XPL); **3B** detail of a planktonic foraminifera (Globigerinidae) about 0.3 mm in diameter, with opalized internal chambers and idiomorphic ferruginised dolomite crystals with an average size of about 0.02 mm (× 200 PPL). – **4** Marine platform bioclast flint (unknown source); **4A** crypto- (< 5 µm) to microcrystalline (5-20 µm) mosaic, totally bioclastic (× 25 PPL); **4B** detail of a benthonic foraminifera (Miliolidae) about 0.4 mm in diameter (× 100 PPL).

The topmost Level 1 is dated to ca. 15,000 cal BP, i. e., into the Upper Magdalenian (Álvarez-Alonso and Yravedra, 2017).

Published studies of the Level 1 lithic raw materials (n = 7,653) indicate a predominance of quartzite (57.3 %) over other resources (40.4 % flint, 2.2 % rock crystal, 0.1 % other undetermined materials). A sample of about 200 flint artefacts, including blade blanks, retouched objects and cores, determined that about 66 % came from a distant source, as they consisted almost exclusively of Pyrenean Flysch Flint (> 60 %), whereas the Treviño, Urbasa and Chalosse Flint varieties were infrequent (< 2 % each). Significant differences are seen in the lithic *chaînes opératoires*, between those items made of quartzite – which represent quite complete *chaînes opératoires* spanning from the initial stages (mainly targeted at the production of flakes) – to those made of flint (Álvarez-Alonso et al., 2017; Tarriño and Elorrieta, 2017).

All the Mediterranean mollusc shells found in Coímbre Cave came from Level 1, comprising eight *T. pellucida* specimens, of which six displayed anthropic perforations around which use-wear was identified (Álvarez-Fernández, 2017; Álvarez-Fernández and Aparicio Alonso, 2017).

El Juyo (Camargo, Cantabria)

The cave of El Juyo is located about 4 km south of the Bay of Santander. Excavations at the site were first carried out by P. Janssens, J. González Echegaray and P. Azpeitia from 1955 to 1957, documenting Lower Magdalenian and Bronze Age occupations. L.G. Freeman and González Echegaray re-excavated the site between 1978 and the 1990s and, in general terms, confirmed the archaeological sequence that was recognized earlier (Janssens et al., 1958; Barandiarán et al., 1987; González Echegaray and Freeman, 1992-1993, 2000). Radiocarbon dates and the lithic assemblages indicate a Lower Magdalenian occupation at ~ 17,500 cal BP.

Studies of the lithic assemblage of Level 6 (n = 3,511) indicate the predominance of flint (about 66 %) over other raw materials. The latter were not differentiated at further detail and include quartzite and lutite. Regarding the flint assemblage (n = 2,317), the tracer varieties identified are the Treviño (13 %) and Urbasa Flint types (8 %) (Fontes et al., 2016). The flint *chaîne opératoire* shows a strong focus on the production of micro-blade blanks used to produce backed elements (González Echegaray and Freeman, 1992-1993).

A single specimen of *T. mutabilis* was recorded from Level 6, without any information about possible anthropic modifications being provided (Madariaga de la Campa and Fernández Pato, 1987).

El Horno (Ramales de la Victoria, Cantabria)

This cave is located in the Asón valley, some 20 km south of the present-day coastline. It was excavated by M. Fano in four field seasons (1999, 2000, 2001 and 2004). Beneath a superficial layer, a Late Upper Palaeolithic level (Level 0) and three levels dated to the Final to Upper Magdalenian (Levels 1-3) were documented. Level 1 dates to ~ 14,800 cal BP (Fano, 2005).

The information available about Level 1 (n = 146) raw materials emphasises an almost exclusive use of flint, whereas the proportions of quartzite and rock crystal are very small (1.4 % and 2.7 %, respectively). Among the flint (95.9 %), the only tracer type is Urbasa Flint (0.7 %). The lithic assemblage – mainly in Pyrenean Flysch Flint – represents a quite late stage within the *chaîne opératoire*, with clear evidence of core rejuvenation and resharpening, indicating that knapping took place *in situ*, and mostly focussed on the production of micro-blade blanks for backed artefacts. The functional analysis carried out on a sample of tools (with different types of taphonomic alterations), indicates they were used in activities connected with hunting and working fresh hides (Fano et al., 2016).

A single broken shell of *T mutabilis* was found in Level 1. No signs of anthropic modification were recognised (Fano and Álvarez-Fernández, 2010).

El Mirón (Ramales de la Victoria, Cantabria)

This cave lies near El Horno Cave in the vicinity of the confluence of the Rivers Gándara and Calera in the Asón valley. It is located about 20 km distant from the present-day coast. Between 1996 and 2013, M. González Morales and L.G. Straus excavated the cave deposit systematically. Three areas were excavated: the rear vestibule or 'Corral' (inside the cave), the mid-vestibule (in the centre) and the outer vestibule or 'Cabin' near the cave entrance. They documented occupations from the Mousterian to the Bronze Age. Level 17 in the outer vestibule or 'Cabin', dated to ca. 18,500 cal BP, is attributed to the Lower Magdalenian (González Morales and Straus, 2014).

Fig. 3 Mediterranean marine gastropod species documented in Level 1 of Tito Bustillo Cave. **1** *Tritia mutabilis*; **2** *Tritia pellucida*; **3** *Homalopoma sanguineum*.

The Level 17 assemblage (n = 33,718) is characterized by the predominance of flint, while the percentages of quartzite is 14.2 %, and of quartz and calcite amount only 1.2 %. Limestone, lutite and other undetermined raw materials sum up to a total of 23.1 %. The tracer and super-tracer varieties in the flint assemblage (61.6 %) are Urbasa (2.4 %), Bidache Flysch (1.2 %) and Chalosse Flint (2.2 %) (Fontes et al., 2018). The lithic *chaîne opératoire*, based on the use of Kurtzia Flysch Flint and another two regional varieties, is quite complete with plentiful evidence of core preparation, rejuvenation and resharpening, as well as abundant micro-waste, which shows that reduction took place *in situ*. The *chaîne opératoire* principally aimed at micro-blade production for backed elements. Bidache Flysch and the Urbasa and Chalosse Flint types appear in the form of cores, with evidence of their preparation on the spot, as well as various kinds of blanks and finished tools. The functional analysis performed on a sample of 'nucleiform endscrapers' showed that these cores were used to produce bladelets and only occasionally served other purposes (Straus et al., 2016).

A single pierced specimen of *H. sanguineum* was found in Level 17 in the outer vestibule (Álvarez-Fernández, 2006).

Site and layer	Local quartzite	Other local	Regional	Tracer/ Super-tracer	Indeterminate	Other
Tito Bustillo 1c2 (n = 2,161)	49.4 %	15.5 %	11.4 %	20.7 %	3.0 %	-
Coímbre B 1 (n = 7,653)	57.3 %	> 2.5 %	> 0.4 %	> 1.9 %	> 0.3 %	0.1 %
El Juyo 6 (n = 3,511)	no data	> 2.8 %	49.2 %	13.9 %	-	-
El Horno 1 (n = 146)	1.4 %	2.7 %	82.2 %	0.7 %	13.0 %	-
El Mirón 17 (n = 33,718)	14.2 %	32.8 %	29.4 %	3.8 %	14.8 %	5.0 %

Tab. 1 Lithic raw material management in the five Magdalenian assemblages of northern Spain studied here. The percentages are calculated over the total number of lithic artefacts for each of the assemblages.

DISCUSSION

In northern Spain, the Magdalenian assemblages in which both tracer or super-tracer flint varieties and Mediterranean shells have been found are: Level 1 in the Living Area (Área de Estancia) in Tito Bustillo Cave, Level 1 in the cave of Coímbre B, Level 6 in El Juyo, Level 1 in El Horno and Level 17 in El Mirón.

Lithic raw material studies at these sites have identified flint varieties from the Basque-Cantabrian Basin (Kurtzia Flysch, Treviño and Urbasa). Other varieties from outside this area that originate in the Western Pyrenees (Bidache Flysch) and the Sud-Aquitanian Basin (Tercis, Salies-de-Béarn and Chalosse) are present in at least three Magdalenian assemblages, albeit in much smaller proportions (Tito Bustillo, Coímbre B and El Mirón). This allows the reconstruction of Magdalenian land-use patterns for the management of lithic resources (**Fig. 1**; **Tabs. 1-2**).

However, because of the varying distances from the flint outcrops in the Basque-Cantabrian Basin to the archaeological sites studied, it needs to be emphasized that not all flint types can be considered as tracer types. Thus, the westernmost sites studied here (Tito Bustillo and Coímbre B, both in Asturias) possess higher percentages of tracer and super-tracer types than those in the centre of the Cantabrian region (El Juyo, El Horno and El Mirón, all in Cantabria), because the latter are located closer to the main sources of lithic raw materials (**Tab. 3**).

Flint types from outcrops ≥ 120 km distant have also been found, in some cases reaching 300 km for the Urbasa Flint at Tito Bustillo and ~ 350 km for Chalosse Flint at Coímbre B. These super-tracer flint types amount to larger percentages only at Tito Bustillo and El Juyo (ca. 21 % and 14 %, respectively), contrasting with El Mirón (ca. 4 %), Coímbre B (ca. 2 %) and El Horno (< 1 %).

The case of Tito Bustillo Cave is particularly interesting because tracer and super-tracer flint types amount to 20.7 % of the total raw materials. However, it should be noted that Pyrenean Flysch Flint makes up a third of the total flint assemblage and represents the main siliceous resource used. Flint varieties from Upper Cretaceous pelagic environments, equivalent to the Tercis and Salies de Béarn Flint types in the Sud-Aquitanian Basin, have also been documented; however, a more precise discrimination between the different varieties has not yet been possible due to taphonomic processes that affected most of the artefacts and hinder their straight-forward differentiation. Instead, an *ad hoc* category has been applied for their recording. Furthermore, another siliceous variety has been recorded which still remains of unknown geographic and

Site and layer	Flysch	Treviño	Urbasa	Upper Cretaceous pelagic flint	Chalosse	Other	Indeterminate
Tito Bustillo 1c2 (n = 1,089)	41 %				-	53.0 %	6.0 %
Coímbre B 1 (n = 200)	> 60 %	< 2 %	< 2 %	-	< 2 %	> 27.0 %	< 10.0 %
El Juyo 6 (n = 2,317)	17.9 %	13.0 %	8.0 %	-	-	60.9 %	-
El Horno 1 (n = 140)	80.0 %	2.1 %	0.7 %	-	-	3.6 %	13.6 %
El Mirón 17 (n = 20,770)	31.0 %	1.8 %	2.6 %	-	2.4 %	50.0 %	12.2 %

Tab. 2 Flint types documented in the five Magdalenian assemblages of northern Spain studied here. The percentages are calculated over the total number of lithic artefacts for each of the assemblages.

geological origin; from its characteristics it is likely that it formed in a marine platform on the northern side of the Pyrenees, but at present it is impossible to be more precise.

Except for the assemblages of Level 17 of El Mirón and of sub-Level 1c2 of Tito Bustillo, information about the raw material related differentiation of the *chaîne opératoire* is still very imprecise, especially with regard to the tracer and super-tracer varieties. For both assemblages, it has been emphasised that most of the reduction took place at the sites, since cores, evidence of preparation and different kinds of blanks and finished tools have been documented. This accounts for the Bidache Flysch, Urbasa and Chalosse Flint types at the former site and for the Pyrenean Flysch and Treviño Flint at the latter, suggesting that the raw material was distributed from the outcrops in the form of cores. Different types of finished tools were probably distributed, too, but this needs to be tested in the future; for example, by more detailed functional studies.

Some siliceous raw material types from the Basque-Cantabrian Basin have been found at Magdalenian sites in other regions, comparable to exogenous flint types from outside northern Spain that have been documented at the sites studied here. Thus, for example, Treviño and Urbasa Flint have been found in the Middle Magdalenian at Isturitz and Berroberria and in the Middle to Upper Magdalenian at Zatoya (Elorrieta, 2016). It has also been suggested that Treviño Flint forms part of the Middle and Upper Magdalenian assemblages at Laa 2, in an area between the eastern and central Pyrenees (Sánchez de la Torre, 2015).

A total of 28 marine gastropod shells from the Mediterranean have been recorded in the levels at the five sites presented here. They belong to the species *Homalopoma sanguineum*, *Tritia pellucida*/*Tritia neritea* and *Tritia mutabilis*. At present-day *T. pellucida* and *T. mutabilis* do not exist on the coasts of northern Spain, so it needs to be considered that in colder periods (in the present case, at the end of the last glaciation), these species they would have been restricted to the Mediterranean, just as they are today. The other species found in Magdalenian deposits would have colonised these coasts in the course of the Holocene for which the timing of the colonisation is known with greater (*T. neritea)* or lesser precision (*H. sanguineum*) (**Fig. 3**, cf. **Tab. 4**). All the shells classified as *T. pellucida*/*neritea* are small and preserve hardly any of their original colouring. They are all thought to belong to the smaller species, *T. pellucida*.

26 of the studied shells preserve intentionally pierced holes (in Level 1 at Tito Bustillo, Level 1 at Coímbre B and Level 17 at El Mirón). We do not know if the other two were also pierced (one each in Level 6 at El Juyo and Level 1 at El Horno). *H. sanguineum* and *T. pellucida* are characterised by their small size and lack of nutritional value. Additionally, evidence of marine abrasion can be observed on the shells, and it is therefore

Site and layer	Flysch	Treviño	Urbasa	Upper Cretaceous pelagic flint	Chalosse
Tito Bustillo 1c2	200 km	250 km	300 km	350 km	-
Coímbre B 1	150 km	200 km	250 km	-	350 km
El Juyo 6	reg.	120 km	155 km	-	-
El Horno 1	reg.	reg.	120 km	-	-
El Mirón 17	170 km	reg.	120 km	-	250 km

Tab. 3 Approximate distances in kilometres, as the bird flies, between the main outcrops of tracer and super-tracer flint types and in the five Magdalenian sites of northern Spain studied here. In some cases, when the distance is < 120 km, the type forms part of a regional raw material management mode (reg.).

clear that they were picked up on a beach after the animal had died. Although *T. mutabilis* is currently fished in the Adriatic for consumption (Poppe and Gotto, 1991: 156), the shells that have been found were not gathered as food, as they are equally eroded by sea water in a sandy environment.

Polish caused by their use can be observed around the orifices of the well-conserved shells. This suggests that these objects were probably picked up on the Mediterranean shore, where they were pierced, and probably joined into some form of more complex ornamentation, either stitched to garments or threaded to form a bracelet or necklace, etc. They were then handed from person to person until they reached the sites in northern Spain studied here (Álvarez-Fernández 2002a, 2002b, 2006). Tito Bustillo, about 600 km from the Mediterranean Sea in a straight line, is currently the most distant site where shells from this source have been recorded.

Finds of objects of adornment from the Mediterranean at Magdalenian sites midway between the Mediterranean and Atlantic shores, on both sides of the Pyrenees, allow us to follow the routes of the contacts along valleys and rivers. Thus, for example, to the north of the Pyrenees, *H. sanguineum* has been reported from the Middle Magdalenian at Espélugues, Le Mas d'Azil (Chambre Piette), Enlène (Salle des Morts) and

Taxa	Recent distribution	Bathymetry	Substrate	Colour	Size
Homalopoma sanguineum (Linnaeus, 1758)	Mediterranean, Strait of Gibraltar, W. Portugal, Asturias	from the intertidal zone down to 50 m	rocky	red/pink	6-7 mm in diameter
Tritia pellucida (Risso, 1826)	S. Portugal, Gulf of Cadiz, Mediterranean	15-1,200 m	sandy	yellowish with clear reticule; brown suture; white callosity	6-8 mm in diameter
Tritia neritea (Linnaeus, 1758)	Mediterranean, Gulf of Cadiz, S. Portugal, N. Atlantic coast of Spain (since early 1900s)	lower intertidal zone and low shore	muddy	yellowish with brown reticule; yellowish or brown callosity	12-20 mm in diameter
Tritia mutabilis (Linnaeus, 1758)	Mediterranean, Gulf of Cadiz, S. Portugal	intertidal zone	sandy	yellowish pale to darker	up to 25 mm in length

Tab. 4 Characteristics of the different marine gastropod species that are represented in the five Magdalenian assemblages of northern Spain studied here.

Canecaude I, and in the Upper Magdalenian at La Vache and Tournal. *T. neritea*/*T. pellucida* (= *Cyclope* sp. in the original publication of Y. Taborin, 1993) has been found in the Middle Magdalenian at Tournal and Canecaude I and in the Upper Magdalenian at La Vache and Rhodes II. *T. mutabilis* has been documented in the Upper Magdalenian at La Crouzade, Le Mas d'Azil and Montfort (Taborin, 1993). To the south of the Pyrenees and closely related to the tributaries of the River Ebro, the latter two species have been cited in the Lower (Montlleó) and in the Middle to Upper Magdalenian (El Parco) (Mangado et al., 2014), and in the transition from the Upper Palaeolithic to the Holocene at Balma Guilanyà (Martínez and Mora, 2009) and Balma Margineda (Guilaine et al., 2007). Pierced specimens of *H. sanguineum* have also been documented at sites in the interior of the Iberian Peninsula, in the Badegoulian at El Gatos (Classification EAF) and in the Middle Magdalenian at Buendía (Torre et al., 2015), and of Cyclope in the Upper Magdalenian levels at Estebanvela (Avezuela, 2013).

Most of the pierced gastropod shells found in these five Cantabrian Magdalenian assemblages studied here came from the coasts on the Bay of Biscay, rather than from the Mediterranean. In the case of Level 1 at Tito Bustillo, Level 1 at Coímbre B and Level 17 at El Mirón, Atlantic molluscs represent ca. 80-87 % of the gastropods made into adornments. These percentages would be maintained in Level 6 at El Juyo and Level 1 at El Horno, if we suppose that the *T. mutabilis* form those levels were also objects of adornment (there is no information regarding the former site, as the preserved fragment was strongly decalcified). If we suppose that shells of the Atlantic species were picked up on the shore near the site, this would have been a local raw material acquisition in the Magdalenian as even the most inland of the five sites would not have been further than 30 km from the Bay of Biscay at that time. However, this does not mean that they could not have been collected on more distant Atlantic coasts, up to several hundreds of kilometres (i. e., ca. 300-400 km) further away.

CONCLUSIONS

Evidence of long-distance contacts between northern Spain and other parts of south-western Europe during the Magdalenian has been documented over recent decades, mainly through objects of adornment and portable art objects. This evidence is based on the use of identical raw materials (e. g., reindeer teeth), formal analogies (e. g., *contours découpés*, rondels, engraved or sculpted representations of herbivore legs, etc.), similar *chaînes opératoires* for their fabrication (e. g., scraping in the case of pointed horse teeth), in decoration (e. g., chevrons) and functionality (e. g., reindeer teeth used as ornamentation and pointed horse teeth as awls). Similarly, in the case of parietal art, thematic and technical similarity is observed in the use of certain conventions in the depictions of some animal figures (e. g., hind's heads with striated engraving or ibex depicted as frontal views), in anthropomorphs (e. g., more or less schematic female figures of 'Gönnersdorf' type), and in signs (e. g., claviforms). The presence of a larger number of a particular type of adornment, a portable art object, or a certain engraved or painted morpho-type in portable and parietal art have been used to reconstruct the territories in which they must have been 'created' and from where they were later 'distributed'. Thus, for instance, the schematic depictions of ibex in frontal views would have originated in northern Spain, whereas the *contours découpés* representing horse heads would come from the Pyrenees (see e. g., Taborin, 2004; Fritz et al., 2007). However, it is currently not possible to provide unambiguous proof of these origins.

The study of different flint types and marine mollusc shells enables greater precision in the documentation of long-distance contacts in Prehistory. The analysis of these raw materials from five Magdalenian assemblages at sites located in Cantabrian Spain has enabled us to determine not only their place of origin but also to characterize where they were procured and where and how they were modified; in particular, in the case of the flint from sub-Level 1c2 at Tito Bustillo, the geological areas where the materials have been procured have been identified. After acquisition of the material, the raw material was transported to the sites in the form of cores from which different types of artefacts were produced at the sites. Similarly, we can establish whether a shell originated in the Atlantic or the Mediterranean and if it reached a site as raw material or as a finished (and used) object of adornment. In the latter case, the shells arrived as pierced objects (that had been used as adornments) and not as raw material for their fabrication.

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This Tandem-*Festschrift* pays tribute to Elaine Turner and Martin Street, to celebrate all you have both contributed to the MONREPOS Archaeological Research Centre and Museum for Human Behavioural Evolution of the Römisch-Germanisches Zentralmuseum, in ensuring high research standards, and for your contributions to Palaeolithic Archaeology in Germany and beyond. It should be understood as a big "CHEERS" from the MONREPOS staff and many other friends and colleagues from all over the world, who contributed to this *Festschrift*.

The double volume comprises a broad spectrum of topics from the Lower Palaeolithic to the early Holocene and even to the Medieval period – touching upon the vast array of topics Elaine and Martin have dealt with over the last more than 30 years. It starts with the discussion of the oldest evidence for fire and addresses many other key-topics of scientific debate at fascinating levels of detail.